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SCHOOLCRAFT COUNTY TRANSIT AUTHORITY BUILDING RENOVATION AND ADDITION

Prepared for:
Schoolcraft County Transit Authority
335 N. East Road
Manistique, Michigan 49854

Prepared by:
Bittner Engineering, Inc.
113 So. 10th Street
P.O. Box 713
Escanaba, MI 49829

June, 2022

DIVISION 0

BIDDING AND CONTRACT DOCUMENTS

BIDDING DOCUMENTS

Advertisement for Bids

Instructions to Bidders

Bid Form

Bid Bond

CONTRACT DOCUMENTS

Notice of Award

Agreement

Notice to Proceed

Performance Bond

Payment Bond

CONDITIONS OF CONTRACT

General Conditions

Change Order

Certificate of Substantial Completion

**SCHOOLCRAFT COUNTY TRANSIT AUTHORITY
Manistique, Michigan**

Existing Building Renovation and Addition

ADVERTISEMENT FOR BIDS

Sealed Bids for the construction of the **Existing Building Renovation and Addition** will be received by the **Schoolcraft County Transit Authority** office until **11:00 A.M Eastern Daylight Savings Time** on **July 21, 2022**. The Bids received will be publicly opened and read at **11:00 AM Eastern Daylight Savings Time** on **July 21, 2022** at the **Schoolcraft County Transit Authority, 335 North East Road, Manistique, MI**. The Project consists of constructing the **Existing Building Renovation and Addition**.

Bids will be received for a single prime Contract. Bids shall be on a lump sum as indicated in the Bid Form.

The Issuing Office for the Bidding Documents is:

Bittner Engineering, Inc. 113 South 10th Street, P.O. Box 713, Escanaba, MI. Contact person is Dennis Bittner, (906) 789-1511, bittnerengineering@bittnerengineering.com.

Prospective Bidders may examine the Bidding Documents at the Issuing Office on Mondays through Fridays between the hours of **9:00 a.m. and 4:00 p.m.** and may obtain copies of the Bidding Documents from the Issuing Office as described below. There is a scheduled walk through at 2:00 PM Eastern time on June 30th. This is **not** a mandatory walk through.

Bidding Documents also may be examined at **the Marinette/Menominee Builder's Exchange, the Delta County Builder's Exchange, the Iron Mountain/Kingsford Builder's Exchange, Traverse City Builders Exchange, Marquette County Builder's Exchange, and the Builders Exchanged of Wisconsin**. Bids can also be viewed at <https://www.sctransit.org>

Bidding Documents may be obtained from the Issuing Office during the hours indicated above. Bidding Documents are available on compact disc (as portable document format (PDF) files) for a non-refundable charge of **\$ 65.00** including shipping via overnight express service. Alternatively, printed Bidding Documents may be obtained from the Issuing Office with 24 hour advance notice either via in-person pick-up or via mail, upon Issuing Office's receipt of payment for the Bidding Documents. The non-refundable cost of printed Bidding Documents is **\$ 125.00** per set, payable to "**Bittner Engineering**", plus a non-refundable shipping charge. Upon Issuing Office's receipt of payment, printed Bidding Documents will be sent via the prospective Bidder's delivery method of choice; the shipping charge will depend on the shipping method chosen. The date that the Bidding Documents are transmitted by the Issuing Office will be considered the prospective Bidder's date of receipt of the Bidding Documents. Partial sets of Bidding Documents will not be available from the Issuing Office. Neither Owner nor Engineer will be responsible for full or partial sets of Bidding Documents, including Addenda if any, obtained from sources other than the Issuing Office.

This project is funded by the Federal Transit Administration (FTA) and the Michigan Department of Transportation (MDOT). It is subject to federal and state guidelines. The federal requirements for this project are the Federal Contract Clauses for Construction More than \$150,000, as attached as Attachment A (Document 3163 issued by the Michigan Department of Transportation). Contractor shall provide signed copies of the clauses prior to the approval of the contract. The selected firm may need to have a 3rd party subcontract approved by MDOT.

The Contractor and Subcontractors on this project must comply with the Davis-Bacon Act, Nondiscrimination, Equal Employment Opportunity, Affirmative Action, Section 3 requirements, Anti-Kickback Act, Federal Occupational Safety and Health Act and Department of Labor Standards and

Regulations set forth in the Contract Bid Documents. The Davis-Bacon wage determination is attached and Certified payroll reports shall be submitted weekly.

++ END OF ADVERTISEMENT FOR BIDS ++

This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

INSTRUCTIONS TO BIDDERS FOR CONSTRUCTION CONTRACTS

Prepared by



Issued and Published Jointly by



Endorsed by



INSTRUCTIONS TO BIDDERS

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ARTICLE 1 – DEFINED TERMS

- 1.01 Terms used in these Instructions to Bidders have the meanings indicated in the General Conditions and Supplementary Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below:
- A. *Issuing Office* – The office from which the Bidding Documents are to be issued.
 - B. *Owner* – The owner is the Schoolcraft County Transit Authority.
 - C. *Engineer* – The project engineer is Bittner Engineering, Inc.

ARTICLE 2 – COPIES OF BIDDING DOCUMENTS

- 2.01 Complete sets of the Bidding Documents may be obtained from the Issuing Office in the number and format stated in the advertisement or invitation to bid.
- 2.02 Complete sets of Bidding Documents shall be used in preparing Bids; neither Owner nor Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.
- 2.03 Owner and Engineer, in making copies of Bidding Documents available on the above terms, do so only for the purpose of obtaining Bids for the Work and do not authorize or confer a license for any other use.

ARTICLE 3 – QUALIFICATIONS OF BIDDERS

- 3.01 The apparent low Bidder's qualifications will be assessed to determine the Bidders's responsibility . Federal guidance requires awards to only go to responsive and responsible firms”
- 3.02 A Bidder's failure to submit required qualification information within the times indicated may disqualify Bidder from receiving an award of the Contract.
- 3.03 No requirement in this Article 3 to submit information will prejudice the right of Owner to seek additional pertinent information regarding Bidder's qualifications.
- 3.04 Bidder is advised to carefully review those portions of the Bid Form requiring Bidder's representations and certifications.

ARTICLE 4 – SITE AND OTHER AREAS; EXISTING SITE CONDITIONS; EXAMINATION OF SITE; OWNER'S SAFETY PROGRAM; OTHER WORK AT THE SITE

- 4.01 *Site and Other Areas*
- A. The Site is identified in the Bidding Documents. By definition, the Site includes rights-of-way, easements, and other lands furnished by Owner for the use of the Contractor. Any additional lands required for temporary construction facilities, construction equipment, or storage of materials and equipment, and any access needed for such additional lands, are to be obtained and paid for by Contractor.
- 4.02 *Existing Site Conditions*
- A. Subsurface and Physical Conditions; Hazardous Environmental Conditions

1. The Supplementary Conditions identify:
 - a. Those reports known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site.
 - b. Those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities).
 - c. Reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site.
 - d. Technical Data contained in such reports and drawings.
 2. Owner will make copies of reports and drawings referenced above available to any Bidder on request. These reports and drawings are not part of the Contract Documents, but the Technical Data contained therein upon whose accuracy Bidder is entitled to rely, as provided in the General Conditions, has been identified and established in the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any Technical Data or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.
 3. If the Supplementary Conditions do not identify Technical Data, the default definition of Technical Data set forth in Article 1 of the General Conditions will apply.
- B. Underground Facilities: Information and data shown or indicated in the Bidding Documents with respect to existing Underground Facilities at or adjacent to the Site are set forth in the Contract Documents and are based upon information and data furnished to Owner and Engineer by owners of such Underground Facilities, including Owner, or others.
- C. Adequacy of Data: Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to subsurface conditions, other physical conditions, and Underground Facilities, and possible changes in the Bidding Documents due to differing or unanticipated subsurface or physical conditions appear in Paragraphs 5.03, 5.04, and 5.05 of the General Conditions. Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to a Hazardous Environmental Condition at the Site, if any, and possible changes in the Contract Documents due to any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work, appear in Paragraph 5.06 of the General Conditions.

4.03 *Site Visit and Testing by Bidders*

- A. Bidder shall conduct the required Site visit during normal working hours, and shall not disturb any ongoing operations at the Site.
- B. Bidder is not required to conduct any subsurface testing, or exhaustive investigations of Site conditions.
- C. On request, and to the extent Owner has control over the Site, and schedule permitting, the Owner will provide Bidder access to the Site to conduct such additional examinations, investigations, explorations, tests, and studies as Bidder deems necessary for preparing and submitting a successful Bid. Owner will not have any obligation to grant such access if doing so is not practical because of existing operations, security or safety concerns, or restraints on Owner's authority regarding the Site.
- D. Bidder shall comply with all applicable Laws and Regulations regarding excavation and location of utilities, obtain all permits, and comply with all terms and conditions established

by Owner or by property owners or other entities controlling the Site with respect to schedule, access, existing operations, security, liability insurance, and applicable safety programs.

- E. Bidder shall fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies.

4.04 *Owner's Safety Program*

- A. Site visits and work at the Site may be governed by an Owner safety program. As the General Conditions indicate, if an Owner safety program exists, it will be noted in the Supplementary Conditions.

4.05 *Other Work at the Site*

- A. Reference is made to Article 8 of the Supplementary Conditions for the identification of the general nature of other work of which Owner is aware (if any) that is to be performed at the Site by Owner or others (such as utilities and other prime contractors) and relates to the Work contemplated by these Bidding Documents. If Owner is party to a written contract for such other work, then on request, Owner will provide to each Bidder access to examine such contracts (other than portions thereof related to price and other confidential matters), if any.

ARTICLE 5 – BIDDER'S REPRESENTATIONS

5.01 It is the responsibility of each Bidder before submitting a Bid to:

- A. examine and carefully study the Bidding Documents, and any data and reference items identified in the Bidding Documents;
- B. visit the Site, conduct a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and satisfy itself as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work;
- C. become familiar with and satisfy itself as to all Laws and Regulations that may affect cost, progress, and performance of the Work;
- D. carefully study all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings, and (2) reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings;
- E. consider the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder; and (3) Bidder's safety precautions and programs;
- F. agree, based on the information and observations referred to in the preceding paragraph, that at the time of submitting its Bid no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the Work at

- the price bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents;
- G. become aware of the general nature of the work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents;
 - H. promptly give Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by Engineer is acceptable to Bidder;
 - I. determine that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance and furnishing of the Work; and
 - J. agree that the submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article, that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

ARTICLE 6 – PRE-BID CONFERENCE

- 6.01 A Pre-Bid conference will be held at the time and location stated in the invitation or advertisement to bid. Representatives of Owner and Engineer will be present to discuss the project. Bidders are encouraged to attend and participate in the conference. Engineer will transmit to all prospective Bidders of record such Addenda as Engineer considers necessary in response to questions arising at the conference. Oral statements may not be relied upon and will not be binding or legally effective.

ARTICLE 7 – INTERPRETATIONS AND ADDENDA

- 7.01 All questions about the meaning or intent of the Bidding Documents are to be submitted to Engineer in writing. The Engineer is Bittner Engineering, Inc. P.O.Box 713 Escanaba, Mi. 49829 to the attention of Dennis Bittner, P.E. (bittnerengineering@bittnerengineering.com). Questions and answers will be sent to all contractors who received an Invitation to Bid, or have submitted a bid or questions, and will be publicly posted on the Schoolcraft County Transit Authority website, www@sctransit.org. Verbal comments are not a part of this solicitation.
- 7.02 Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda delivered to all parties recorded as having received the Bidding Documents. Questions received less than seven days prior to the date for opening of Bids may not be answered. Only questions answered by Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.
- 7.03 Addenda may be issued to clarify, correct, supplement, or change the Bidding Documents.

ARTICLE 8 – BID SECURITY

- 8.01 A Bid must be accompanied by Bid security made payable to Owner in an amount of 5 percent of Bidder's maximum Bid price (determined by adding the base bid and all alternates) and in the form of a certified check, bank money order, or a Bid bond (on the form included in the Bidding

Documents) issued by a surety meeting the requirements of Paragraphs 6.01 and 6.02 of the General Conditions.

- 8.02 The Bid security of the apparent Successful Bidder will be retained until Owner awards the contract to such Bidder, and such Bidder has executed the Contract Documents, furnished the required contract security, and met the other conditions of the Notice of Award, whereupon the Bid security will be released. If the Successful Bidder fails to execute and deliver the Contract Documents and furnish the required contract security within 15 days after the Notice of Award, Owner may consider Bidder to be in default, annul the Notice of Award, and the Bid security of that Bidder will be forfeited. Such forfeiture shall be Owner's exclusive remedy if Bidder defaults.
- 8.03 The Bid security of other Bidders that Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of seven days after the Effective Date of the Contract or 61 days after the Bid opening, whereupon Bid security furnished by such Bidders will be released.
- 8.04 Bid security of other Bidders that Owner believes do not have a reasonable chance of receiving the award will be released within seven days after the Bid opening.

ARTICLE 9 – CONTRACT TIMES

- 9.01 The number of days within which, or the dates by which, the Work is to be substantially completed, and completed and ready for final payment, are set forth in the Agreement.

ARTICLE 10 – LIQUIDATED DAMAGES

- 10.01 Provisions for liquidated damages, if any, for failure to timely attain a Milestone, Substantial Completion, or completion of the Work in readiness for final payment, are set forth in the Agreement.

ARTICLE 11 – SUBSTITUTE AND “OR-EQUAL” ITEMS

- 11.01 The Contract for the Work, as awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents, and those “or-equal” or substitute or materials and equipment subsequently approved by Engineer prior to the submittal of Bids and identified by Addendum. No item of material or equipment will be considered by Engineer as an “or-equal” or substitute unless written request for approval has been submitted by Bidder and has been received by Engineer at least 7 days prior to the date for receipt of Bids. Each such request shall comply with the requirements of Paragraphs 7.04 and 7.05 of the General Conditions. The burden of proof of the merit of the proposed item is upon Bidder. Engineer's decision of approval or disapproval of a proposed item will be final. If Engineer approves any such proposed item, such approval will be set forth in an Addendum issued to all prospective Bidders. Bidders shall not rely upon approvals made in any other manner.
- 11.02 All prices that Bidder sets forth in its Bid shall be based on the presumption that the Contractor will furnish the materials and equipment specified or described in the Bidding Documents, as

supplemented by Addenda. Any assumptions regarding the possibility of post-Bid approvals of “or-equal” or substitution requests are made at Bidder’s sole risk.

- 11.03 If an award is made, Contractor shall be allowed to submit proposed substitutes and “or-equals” in accordance with the General Conditions.

ARTICLE 12 – SUBCONTRACTORS, SUPPLIERS, AND OTHERS

- 12.01 A Bidder shall be prepared to retain specific Subcontractors, Suppliers, or other individuals or entities for the performance of the Work if required by the Bidding Documents (most commonly in the Specifications) to do so. If a prospective Bidder objects to retaining any such Subcontractor, Supplier, or other individual or entity, and the concern is not relieved by an Addendum, then the prospective Bidder should refrain from submitting a Bid.
- 12.02 Subsequent to the submittal of the Bid, Owner may not require the Successful Bidder or Contractor to retain any Subcontractor, Supplier, or other individual or entity against which Contractor has reasonable objection.
- 12.03 The apparent Successful Bidder, and any other Bidder so requested, shall within five days after Bid opening, submit to Owner a list of the Subcontractors or Suppliers proposed for the following portions of the Work: See Section 3.01

If requested by Owner, such list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, Supplier, or other individual or entity. If Owner or Engineer, after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, individual, or entity, Owner may, before the Notice of Award is given, request apparent Successful Bidder to submit an acceptable substitute, in which case apparent Successful Bidder shall submit a substitute, Bidder’s Bid price will be increased (or decreased) by the difference in cost occasioned by such substitution, and Owner may consider such price adjustment in evaluating Bids and making the Contract award.

- 12.04 If apparent Successful Bidder declines to make any such substitution, Owner may award the Contract to the next lowest Bidder that proposes to use acceptable Subcontractors, Suppliers, or other individuals or entities. Declining to make requested substitutions will constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor, Supplier, individual, or entity so listed and against which Owner or Engineer makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner and Engineer subject to subsequent revocation of such acceptance as provided in Paragraph 7.06 of the General Conditions.

ARTICLE 13 – PREPARATION OF BID

- 13.01 The Bid Form is included with the Bidding Documents.
- A. All blanks on the Bid Form shall be completed in ink and the Bid Form signed in ink. Erasures or alterations shall be initialed in ink by the person signing the Bid Form. A Bid price shall be indicated for each section, Bid item, alternate, adjustment unit price item, and unit price item listed therein.
- B. If the Bid Form expressly indicates that submitting pricing on a specific alternate item is optional, and Bidder elects to not furnish pricing for such optional alternate item, then Bidder may enter the words “No Bid” or “Not Applicable.”

- 13.02 A Bid by a corporation shall be executed in the corporate name by a corporate officer (whose title must appear under the signature), accompanied by evidence of authority to sign. The corporate address and state of incorporation shall be shown.
- 13.03 A Bid by a partnership shall be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The partnership's address for receiving notices shall be shown.
- 13.04 A Bid by a limited liability company shall be executed in the name of the firm by a member or other authorized person and accompanied by evidence of authority to sign. The state of formation of the firm and the firm's address for receiving notices shall be shown.
- 13.05 A Bid by an individual shall show the Bidder's name and address for receiving notices.
- 13.06 A Bid by a joint venture shall be executed by an authorized representative of each joint venturer in the manner indicated on the Bid Form. The joint venture's address for receiving notices shall be shown.
- 13.07 All names shall be printed in ink below the signatures.
- 13.08 The Bid shall contain an acknowledgment of receipt of all Addenda, the numbers of which shall be filled in on the Bid Form.
- 13.09 Postal and e-mail addresses and telephone number for communications regarding the Bid shall be shown.
- 13.10 The Bid shall contain evidence of Bidder's authority and qualification to do business in the state where the Project is located, or Bidder shall covenant in writing to obtain such authority and qualification prior to award of the Contract and attach such covenant to the Bid. Bidder's state contractor license number, if any, shall also be shown on the Bid Form.

ARTICLE 14 – BASIS OF BID

14.01 *Lump Sum*

- A. Bidders shall submit a Bid on a lump sum basis as set forth in the Bid Form.

14.02 *Unit Price*

- A. Bidders shall submit a Bid on a unit price basis for each item of Work listed in the unit price section of the Bid Form.
- B. The "Bid Price" (sometimes referred to as the extended price) for each unit price Bid item will be the product of the "Estimated Quantity" (which Owner or its representative has set forth in the Bid Form) for the item and the corresponding "Bid Unit Price" offered by the Bidder. The total of all unit price Bid items will be the sum of these "Bid Prices"; such total will be used by Owner for Bid comparison purposes. The final quantities and Contract Price will be determined in accordance with Paragraph 13.03 of the General Conditions.
- C. Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.

14.03 *Allowances*

- A. For cash allowances the Bid price shall include such amounts as the Bidder deems proper for Contractor's overhead, costs, profit, and other expenses on account of cash allowances, if

any, named in the Contract Documents, in accordance with Paragraph 13.02.B of the General Conditions.

ARTICLE 15 – SUBMITTAL OF BID

- 15.01 With each copy of the Bidding Documents, a Bidder is furnished one separate unbound copy of the Bid Form, and, if required, the Bid Bond Form. The unbound copy of the Bid Form is to be completed and submitted with the Bid security and the other documents required to be submitted under the terms of Article 7 of the Bid Form.
- 15.02 A Bid shall be received no later than the date and time prescribed and at the place indicated in the advertisement or invitation to bid and shall be enclosed in a plainly marked package with the Project title (and, if applicable, the designated portion of the Project for which the Bid is submitted), the name and address of Bidder, and shall be accompanied by the Bid security and other required documents. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid shall be enclosed in a separate package plainly marked on the outside with the notation “**Schoolcraft County Transit Authority BID ENCLOSED**”. A mailed Bid shall be addressed to **Schoolcraft County Transit Authority 335N E Road, Manistique, MI 49854: Attention John Stapleton.**
- 15.03 Bids received after the date and time prescribed for the opening of bids, or not submitted at the correct location or in the designated manner, will not be accepted and will be returned to the Bidder unopened.

ARTICLE 16 – MODIFICATION AND WITHDRAWAL OF BID

- 16.01 A Bid may be withdrawn by an appropriate document duly executed in the same manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids. Upon receipt of such notice, the unopened Bid will be returned to the Bidder.
- 16.02 If a Bidder wishes to modify its Bid prior to Bid opening, Bidder must withdraw its initial Bid in the manner specified in Paragraph 16.01 and submit a new Bid prior to the date and time for the opening of Bids.
- 16.03 If within 24 hours after Bids are opened any Bidder files a duly signed written notice with Owner and promptly thereafter demonstrates to the reasonable satisfaction of Owner that there was a material and substantial mistake in the preparation of its Bid, that Bidder may withdraw its Bid, and the Bid security will be returned. Thereafter, if the Work is rebid, that Bidder will be disqualified from further bidding on the Work.

ARTICLE 17 – OPENING OF BIDS

- 17.01 Bids will be opened at the time and place indicated in the advertisement or invitation to bid and read aloud publicly. An abstract of the amounts of the base Bids and major alternates, if any, will be made available to Bidders after the opening of Bids.

ARTICLE 18 – BIDS TO REMAIN SUBJECT TO ACCEPTANCE

- 18.01 All Bids will remain subject to acceptance for the period of time stated in the Bid Form, but Owner may, in its sole discretion, release any Bid and return the Bid security prior to the end of this period.

ARTICLE 19 – EVALUATION OF BIDS AND AWARD OF CONTRACT

- 19.01 Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Owner will reject the Bid of any Bidder that Owner finds, after reasonable inquiry and evaluation, to not be responsible. If Bidder purports to add terms or conditions to its Bid, takes exception to any provision of the Bidding Documents, or attempts to alter the contents of the Contract Documents for purposes of the Bid, then the Owner will reject the Bid as nonresponsive; provided that Owner also reserves the right to waive all minor informalities not involving price, time, or changes in the Work.
- 19.02 The OWNER ” reserves the right to reject any or all Bids for sound, documentable, business reasons.”
- 19.03 Evaluation of Bids
- A. In evaluating Bids, Owner will consider whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices, and other data, as may be requested in the Bid Form or prior to the Notice of Award.
 - B. In the comparison of Bids, alternates will be applied in the same order of priority as listed in the Bid Form. To determine the Bid prices for purposes of comparison, Owner shall announce to all bidders a “Base Bid,(plus alternates, if any) budget after receiving all Bids, but prior to opening them. For comparison purposes alternates will be accepted, following the order of priority established in the Bid Form, until doing so would cause the budget to be exceeded. After determination of the Successful Bidder based on this comparative process and on the responsiveness, responsibility, and other factors set forth in these Instructions, the award may be made to said Successful Bidder on its base Bid and any combination of its additive alternate Bids for which Owner determines funds will be available at the time of award.
- 19.04 In evaluating whether a Bidder is responsible, Owner will consider the qualifications of the Bidder and may consider the qualifications and experience of Subcontractors and Suppliers proposed for those portions of the Work for which the identity of Subcontractors and Suppliers must be submitted as provided in the Bidding Documents.
- 19.05 Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders and any proposed Subcontractors or Suppliers.

ARTICLE 20 – BONDS AND INSURANCE

- 20.01 Article 6 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth Owner’s requirements as to performance and payment bonds and insurance. When the Successful Bidder delivers the Agreement (executed by Successful Bidder) to Owner, it shall be accompanied by required bonds and insurance documentation.

ARTICLE 21 – SIGNING OF AGREEMENT

When Owner issues a Notice of Award to the Successful Bidder, it shall be accompanied by the unexecuted counterparts of the MDOT-approved third party subcontract (Agreement) along with the other Contract Documents as identified in the Agreement. Contract will be a Fixed Price Contract. Within 15 days thereafter, Successful Bidder shall execute and deliver the required number of counterparts of the Agreement (and any bonds and insurance documentation required to be delivered by the Contract Documents) to Owner. Within ten days thereafter, Owner shall deliver one fully executed counterpart of the Agreement to Successful Bidder, together with printed and electronic copies of the Contract Documents as stated in Paragraph 2.02 of the General Conditions.

PROHIBITION OF DISCRIMINATION IN STATE CONTRACTS

In connection with the performance of work under this contract; the contractor agrees as follows:

1. In accordance with Public Act 453 of 1976 (Elliott-Larsen Civil Rights Act), the contractor shall not discriminate against an employee or applicant for employment with respect to hire, tenure, treatment, terms, conditions, or privileges of employment or a matter directly or indirectly related to employment because of race, color, religion, national origin, age, sex, height, weight, or marital status. A breach of this covenant will be regarded as a material breach of this contract. Further, in accordance with Public Act 220 of 1976 (Persons with Disabilities Civil Rights Act), as amended by Public Act 478 of 1980, the contractor shall not discriminate against any employee or applicant for employment with respect to hire, tenure, terms, conditions, or privileges of employment or a matter directly or indirectly related to employment because of a disability that is unrelated to the individual's ability to perform the duties of a particular job or position. A breach of the above covenants will be regarded as a material breach of this contract.
2. The contractor hereby agrees that any and all subcontracts to this contract, whereby a portion of the work set forth in this contract is to be performed, shall contain a covenant the same as hereinabove set forth in Section 1 of this Appendix.
3. The contractor will take affirmative action to ensure that applicants for employment and employees are treated without regard to their race, color, religion, national origin, age, sex, height, weight, marital status, or any disability that is unrelated to the individual's ability to perform the duties of a particular job or position. Such action shall include, but not be limited to, the following: employment; treatment; upgrading; demotion or transfer; recruitment; advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship.
4. The contractor shall, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, national origin, age, sex, height, weight, marital status, or disability that is unrelated to the individual's ability to perform the duties of a particular job or position.
5. The contractor or its collective bargaining representative shall send to each labor union or representative of workers with which the contractor has a collective bargaining agreement or other contract or understanding a notice advising such labor union or workers' representative of the contractor's commitments under this Appendix.
6. The contractor shall comply with all relevant published rules, regulations, directives, and orders of the Michigan Civil Rights Commission that may be in effect prior to the taking of bids for any individual state project.

7. The contractor shall furnish and file compliance reports within such time and upon such forms as provided by the Michigan Civil Rights Commission; said forms may also elicit information as to the practices, policies, program, and employment statistics of each subcontractor, as well as the contractor itself, and said contractor shall permit access to the contractor's books, records, and accounts by the Michigan Civil Rights Commission and/or its agent for the purposes of investigation to ascertain compliance under this contract and relevant rules, regulations, and orders of the Michigan Civil Rights Commission.
8. In the event that the Michigan Civil Rights Commission finds, after a hearing held pursuant to its rules, that a contractor has not complied with the contractual obligations under this contract, the Michigan Civil Rights Commission may, as a part of its order based upon such findings, certify said findings to the State Administrative Board of the State of Michigan, which State Administrative Board may order the cancellation of the contract found to have been violated and/or declare the contractor ineligible for future contracts with the state and its political and civil subdivisions, departments, and officers, including the governing boards of institutions of higher education, until the contractor complies with said order of the Michigan Civil Rights Commission. Notice of said declaration of future ineligibility may be given to any or all of the persons with whom the contractor is declared ineligible to contract as a contracting party in future contracts. In any case before the Michigan Civil Rights Commission in which cancellation of an existing contract is a possibility, the contracting agency shall be notified of such possible remedy and shall be given the option by the Michigan Civil Rights Commission to participate in such proceedings.
9. The contractor shall include or incorporate by reference, the provisions of the foregoing paragraphs (1) through (8) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Michigan Civil Rights Commission; all subcontracts and purchase orders will also state that said provisions will be binding upon each subcontractor or supplier.

Revised August 2011

CONSTRUCTION MORE THAN \$150,000

LOBBYING

Applicability – construction/architectural and engineering/acquisition of rolling stock/professional service contract/operational service contract/turnkey contracts over \$150,000.

Byrd Anti-Lobbying Amendment, 31 U.S.C. 1352, as amended by the Lobbying Disclosure Act of 1995, P.L. 104- 65 [to be codified at 2 U.S.C. § 1601, et seq.] - Contractors who apply or bid for an award of \$150,000 or more shall file the certification required by 49 CFR part 20, "New Restrictions on Lobbying." Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant or any other award covered by 31 U.S.C. 1352. Each tier shall also disclose the name of any registrant under the Lobbying Disclosure Act of 1995 who has made lobbying contacts on its behalf with non-Federal funds with respect to that Federal contract, grant or award covered by 31 U.S.C. 1352. Such disclosures are forwarded from tier to tier up to the recipient.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. § 1352 (as amended by the Lobbying Disclosure Act of 1995). Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

CONTRACTOR / COMPANY NAME

NAME, TITLE AND SIGNATURE OF CONTRACTOR'S AUTHORIZED OFFICIAL:

TYPE OR PRINT NAME	TITLE
SIGNATURE	DATE

BUY AMERICA CERTIFICATION (STEEL AND MANUFACTURED PRODUCTS)

Applicability – construction contracts and acquisition of goods or rolling stock (valued at more than \$150,000).

Contractor shall comply with 49 USC 5323(j) and 49 CFR 661, as amended by MAP-21 stating that Federal funds may not be obligated unless steel, iron and manufactured products used in FTA-funded projects are produced in the United States, unless a waiver has been granted by FTA or the product is subject to a general waiver. General waivers are listed in 49 CFR 661.7, and include software, microcomputer equipment and small purchases (currently less than \$150,000) made with capital, operating or planning funds. A bidder or offeror shall submit appropriate Buy America certification to the recipient with all bids on FTA-funded contracts, except those subject to a general waiver. Proposals not accompanied by a completed Buy America certification shall be rejected as nonresponsive. This requirement does not apply to lower tier subcontractors.

Certificate of **Compliance** with Buy America Requirements.

The bidder or offeror hereby certifies that it will comply with the requirements of 49 U.S.C. 5323(j)(1), and the applicable regulations in 49 CFR part 661.

CONTRACTOR / COMPANY NAME

NAME, TITLE AND SIGNATURE OF CONTRACTOR'S AUTHORIZED OFFICIAL:

TYPE OR PRINT NAME	TITLE
SIGNATURE	DATE

Only sign either Certificate of **Compliance** or Certificate of **Non-Compliance**

Certificate of **Non-Compliance** with Buy America Steel or Manufactured Products Requirements The bidder or offeror hereby certifies that it cannot comply with the requirements of 49 U.S.C. 5323(j), but it may qualify for an exception to the requirement pursuant to 49 U.S.C. 5323(j)(2), as amended, and the applicable regulations in 49 C.F.R. 661.7.

CONTRACTOR / COMPANY NAME

NAME, TITLE AND SIGNATURE OF CONTRACTOR'S AUTHORIZED OFFICIAL:

TYPE OR PRINT NAME	TITLE
SIGNATURE	DATE

GOVERNMENT WIDE DEBARMENT AND SUSPENSION (NON PROCUREMENT)

Applicability – all contracts more than \$25,000.

The Recipient agrees to the following:

1. It will comply with the requirements of 2 C.F.R. part 180, subpart C, as adopted and supplemented by U.S. DOT regulations at 2 C.F.R. part 1200, which include the following: (a) It will not enter into any arrangement to participate in the development or implementation of the Project with any Third Party Participant that is debarred or suspended except as authorized by: 1 U.S. DOT regulations, "Nonprocurement Suspension and Debarment," 2 C.F.R. part 1200, 2 U.S. OMB, "Guidelines to Agencies on Governmentwide Debarment and Suspension (Nonprocurement)," 2 C.F.R. part 180, including any amendments thereto, and 3 Executive Orders Nos. 12549 and 12689, "Debarment and Suspension," 31 U.S.C. § 6101 note, (b) It will review the U.S. GSA "System for Award Management," <http://www.sam.gov.proxy1.semalt.design> if required by U.S. DOT regulations, 2 C.F.R. part 1200, and (c) It will include, and require each of its Third Party Participants to include, a similar provision in each lower tier covered transaction, ensuring that each lower tier Third Party Participant: 1 Will comply with Federal debarment and suspension requirements, and 2 Reviews the "System for Award Management" at <http://www.sam.gov.proxy1.semalt.design> if necessary to comply with U.S. DOT regulations, 2 C.F.R. part 1200.

Construction More Than \$150,000

2. If the Recipient suspends, debars, or takes any similar action against a Third Party Participant or individual, the Recipient will provide immediate written notice to the: (a) FTA Regional Counsel for the Region in which the Recipient is located or implements the Project, (b) FTA Project Manager if the Project is administered by an FTA Headquarters Office, or (c) FTA Chief Counsel.

CONTRACTOR / COMPANY NAME

NAME, TITLE AND SIGNATURE OF CONTRACTOR'S AUTHORIZED OFFICIAL:

TYPE OR PRINT NAME	TITLE
SIGNATURE	DATE

SEISMIC SAFETY

Construction of new buildings or additions to existing buildings. These requirements do not apply to micropurchases (\$10,000 or less, except for construction contracts of more than \$2,000).

Contractor agrees that any new building or addition to an existing building shall be designed and constructed in accordance with the standards required in USDOT Seismic Safety Regulations 49 CFR 41 and shall certify compliance to the extent required by the regulation. Contractor shall also ensure that all work performed under this contract, including work performed by subcontractors, complies with the standards required by 49 CFR 41 and the certification of compliance issued on the project.

BONDING REQUIREMENTS

Applicability – for those construction or facility improvement contracts or subcontracts exceeding \$150,000, FTA may accept the bonding policy and requirements of the recipient, provided that they meet the minimum requirements for construction contracts as follows:

1. A bid guarantee from each bidder equivalent to five (5) percent of the bid price. The "bid guarantees" shall consist of a firm commitment such as a bid bond, certified check, or other negotiable instrument accompanying a bid as assurance that the bidder will, upon acceptance of his bid, execute such contractual documents as may be required within the time specified.
2. A performance bond on the part to the Contractor for 100 percent of the contract price. A "performance bond" is one executed in connection with a contract to secure fulfillment of all the contractor's obligations under such contract.
3. A payment bond on the part of the contractor for 100 percent of the contract price. A "payment bond" is one executed in connection with a contract to assure payment, as required by law, of all persons supplying labor and material in the execution of the work provided for in the contract. FTA, however, has determined that payment bonds in the following amounts are adequate to protect FTA's interest and will accept a local bonding policy that meets the following minimums:
 - a. 50% of the contract price if the contract price is not more than \$1 million;
 - b. 40% of the contract price if the contract price is more than \$1 million but not more than \$5 million; or
 - c. \$2.5 million if the contract price is more than \$5 million.
4. A cash deposit, certified check or other negotiable instrument may be accepted by a grantee in lieu of performance and payment bonds, provided the grantee has established a procedure to assure that the interest of FTA is adequately protected. An irrevocable letter of credit would also satisfy the requirement for a bond.

Bid Bond Requirements (Construction):

- a. Bid Security - A Bid Bond must be issued by a fully qualified surety company acceptable to (Recipient) and listed as a company currently authorized under 31 CFR, Part 223 as possessing a Certificate of Authority as described thereunder.

- b. Rights Reserved - In submitting this Bid, it is understood and agreed by bidder that the right is reserved by (Recipient) to reject any and all bids, or part of any bid, and it is agreed that the Bid may not be withdrawn for a period of [ninety (90)] days subsequent to the opening of bids, without the written consent of (Recipient). It is also understood and agreed that if the undersigned bidder should withdraw any part or all of his bid within [ninety (90)] days after the bid opening without the written consent of (Recipient), shall refuse or be unable to enter into this Contract, as provided above, or refuse or be unable to furnish adequate and acceptable Performance Bonds and Labor and Material Payments Bonds, as provided above, or refuse or be unable to furnish adequate and acceptable insurance, as provided above, he shall forfeit his bid security to the extent of (Recipient's) damages occasioned by such withdrawal, or refusal, or inability to enter into an agreement, or provide adequate security therefor. It is further understood and agreed that to the extent the defaulting bidder's Bid Bond, Certified Check, Cashier's Check, Treasurer's Check, and/or Official Bank Check (excluding any income generated thereby which has been retained by (Recipient) as provided in [Item x "Bid Security" of the Instructions to Bidders]) shall prove inadequate to fully recompense (Recipient) for the damages occasioned by default, then the undersigned bidder agrees to indemnify (Recipient) and pay over to (Recipient) the difference between the bid security and (Recipient's) total damages, so as to make (Recipient) whole. The undersigned understands that any material alteration of any of the above or any of the material contained on this form, other than that requested, will render the bid unresponsive.

Performance and Payment Bonding Requirements (Construction)

The Contractor shall be required to obtain performance and payment bonds as follows:

- a. Performance bonds
1. The penal amount of performance bonds shall be 100 percent of the original contract price, unless the (Recipient) determines that a lesser amount would be adequate for the protection of the (Recipient).
 2. The (Recipient) may require additional performance bond protection when a contract price is increased. The increase in protection shall generally equal 100 percent of the increase in contract price. The (Recipient) may secure additional protection by directing the Contractor to increase the penal amount of the existing bond or to obtain an additional bond.
- b. Payment bonds
1. The penal amount of the payment bonds shall equal:
 - I. Fifty percent of the contract price if the contract price is not more than \$1 million.
 - II. Forty percent of the contract price if the contract price is more than \$1 million but not more than \$5 million; or
 - III. Two and one half million if the contract price is more than \$5 million.
 2. If the original contract price is \$5 million or less, the (Recipient) may require additional protection as required by subparagraph 1 if the contract price is increased.

Performance and Payment Bonding Requirements (Non-Construction)

The Contractor may be required to obtain performance and payment bonds when necessary to protect the (Recipient's) interest.

- a. The following situations may warrant a performance bond:
1. (Recipient) property or funds are to be provided to the contractor for use in performing the contract or as partial compensation (as in retention of salvaged material).
 2. A contractor sells assets to or merges with another concern, and the (Recipient), after recognizing the latter concern as the successor in interest, desires assurance that it is financially capable.
 3. Substantial progress payments are made before delivery of end items starts.
 4. Contracts are for dismantling, demolition, or removal of improvements.
- b. When it is determined that a performance bond is required, the Contractor shall be required to obtain performance bonds as follows:
1. The penal amount of performance bonds shall be 100 percent of the original contract price, unless the (Recipient) determines that a lesser amount would be adequate for the protection of the (Recipient).

2. The (Recipient) may require additional performance bond protection when a contract price is increased. The increase in protection shall generally equal 100 percent of the increase in contract price. The (Recipient) may secure additional protection by directing the Contractor to increase the penal amount of the existing bond or to obtain an additional bond.
- c. A payment bond is required only when a performance bond is required, and if the use of payment bond is in the (Recipient's) interest.
- d. When it is determined that a payment bond is required, the Contractor shall be required to obtain payment bonds as follows:
 1. The penal amount of payment bonds shall equal:
 - I. Fifty percent of the contract price if the contract price is not more than \$1 million;
 - II. Forty percent of the contract price if the contract price is more than \$1 million but not more than \$5 million; or
 - III. Two and one half million if the contract price is increased.

Advance Payment Bonding Requirements

The Contractor may be required to obtain an advance payment bond if the contract contains an advance payment provision and a performance bond is not furnished. The (recipient) shall determine the amount of the advance payment bond necessary to protect the (Recipient).

Patent Infringement Bonding Requirements (Patent Indemnity)

The Contractor may be required to obtain a patent indemnity bond if a performance bond is not furnished and the financial responsibility of the Contractor is unknown or doubtful. The (recipient) shall determine the amount of the patent indemnity to protect the (Recipient).

Warranty of the Work and Maintenance Bonds:

1. The Contractor warrants to (Recipient), the Architect and/or Engineer that all materials and equipment furnished under this Contract will be of highest quality and new unless otherwise specified by (Recipient), free from faults and defects and in conformance with the Contract Documents. All work not so conforming to these standards shall be considered defective. If required by the [Project Manager], the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.
2. The Work furnished must be of first quality and the workmanship must be the best obtainable in the various trades. The Work must be of safe, substantial and durable construction in all respects. The Contractor hereby guarantees the Work against defective materials or faulty workmanship for a minimum period of one (1) year after Final Payment by (Recipient) and shall replace or repair any defective materials or equipment or faulty workmanship during the period of the guarantee at no cost to (Recipient). As additional security for these guarantees, the Contractor shall, prior to the release of Final Payment [as provided in Item X below], furnish separate Maintenance (or Guarantee) Bonds in form acceptable to (Recipient) written by the same corporate surety that provides the Performance Bond and Labor and Material Payment Bond for this Contract. These bonds shall secure the Contractor's obligation to replace or repair defective materials and faulty workmanship for a minimum period of one (1) year after Final Payment and shall be written in an amount equal to ONE HUNDRED PERCENT (100%) of the CONTRACT SUM, as adjusted (if at all).

DAVIS-BACON AND COPELAND ANTI-KICKBACK ACTS

Applicability – construction contracts and subcontracts, including actual construction, alteration and/or repair, including decorating and painting, of more than \$2,000.

1. Minimum wages - (i) All laborers and mechanics employed or working upon the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the

Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR Part 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein. Provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classifications and wage rates conformed under paragraph (1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

(ii)(A) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met: (1) Except with respect to helpers as defined as 29 CFR 5.2(n)(4), the work to be performed by the classification requested is not performed by a classification in the wage determination; and (2) The classification is utilized in the area by the construction industry; and (3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination; and (4) With respect to helpers as defined in 29 CFR 5.2(n)(4), such a classification prevails in the area in which the work is performed. (B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary. (C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary. (D) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a)(1)(ii) (B) or (C) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification. (iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof. (iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program. (v)(A) The contracting officer shall require that any class of laborers or mechanics which is not listed in the wage determination and which is to be employed under the contract shall

be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefor only when the following criteria have been met: (1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and (2) The classification is utilized in the area by the construction industry; and (3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination. (B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary. (C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination with 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary. (D) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a)(1)(v) (B) or (C) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

2. Withholding - The recipient shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), all or part of the wages required by the contract, the grantee may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.
3. Payrolls and basic records - (i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work (or under the United States Housing Act of 1937, or under the Housing Act of 1949, in the construction or development of the project). Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs. (ii)(A) The contractor shall submit weekly for each week in which any contract work is performed a copy of all

payrolls to the recipient for transmission to the Federal Transit Administration. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under section 5.5(a)(3)(i) of Regulations, 29 CFR part 5. This information may be submitted in any form desired. Optional Form WH-347 is available for this purpose and may be purchased from the Superintendent of Documents (Federal Stock Number 029-005-00014-1), U.S. Government Printing Office, and Washington, DC 20402. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. (B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following: (1) That the payroll for the payroll period contains the information required to be maintained under section 5.5(a)(3)(i) of Regulations, 29 CFR part 5 and that such information is correct and complete; (2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3; (3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract. (C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (a)(3)(ii)(B) of this section. (D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code. (iii) The contractor or subcontractor shall make the records required under paragraph (a)(3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the Federal Transit Administration or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the Federal agency may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

4. Apprentices and trainees - (i) Apprentices - Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State Apprenticeship Agency recognized by the Bureau, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification.

If the Administrator of the Wage and Hour Division of the U.S. Department of Labor determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Bureau of Apprenticeship and Training, or a State Apprenticeship Agency recognized by the Bureau, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved. (ii) Trainees - Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved. (iii) Equal employment opportunity - The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

5. Compliance with Copeland Act requirements - The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.
6. Subcontracts - The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the Federal Transit Administration may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.
7. Contract termination: debarment - A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.
8. Compliance with Davis-Bacon and Related Act requirements - All rulings and interpretations of the Davis- Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.
9. Disputes concerning labor standards - Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.
10. Certification of Eligibility - (i) By entering into this contract, contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1). (ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1). (iii) The penalty for making false statements is prescribed in 18 USC 1001.

CONTRACT WORK HOURS & SAFETY STANDARDS ACT

Applicability – contracts of more than \$150,000.

1. Overtime requirements - No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of 40 hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of 40 hours in such workweek.
2. Violation; liability for unpaid wages; liquidated damages - In the event of any violation of the clause set forth in para. (1) of this section, contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in para. (1) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of 40 hours without payment of the overtime wages required by the clause set forth in para. (1) of this section.
3. Withholding for unpaid wages and liquidated damages - the recipient shall upon its own action or upon written request of USDOL withhold or cause to be withheld, from any moneys payable on account of work performed by contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours & Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in para. (2) of this section.
4. Subcontracts - Contractor or subcontractor shall insert in any subcontracts the clauses set forth in this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. Prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in this section.

BREACHES AND DISPUTE RESOLUTION

Applicability – all contracts more than \$150,000.

Disputes arising in the performance of this contract which are not resolved by agreement of the parties shall be decided in writing by the recipient's authorized representative. This decision shall be final and conclusive unless within ten (10) days from the date of receipt of its copy, contractor mails or otherwise furnishes a written appeal to the recipient's CEO. In connection with such appeal, contractor shall be afforded an opportunity to be heard and to offer evidence in support of its position. The decision of the recipient's CEO shall be binding upon contractor and contractor shall abide by the decision. FTA has a vested interest in the settlement of any violation of Federal law including the False Claims Act, 31 U.S.C. § 3729. Performance During Dispute - Unless otherwise directed by the recipient, contractor shall continue performance under this contract while matters in dispute are being resolved. 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 party or of any of his employees, agents or others for whose acts he is legally liable, a claim for damages therefore shall be made in writing to such other party within ten days after the first observance of such injury or damage. Remedies - Unless this contract provides otherwise, all claims, counterclaims, disputes and other matters in question between the recipient and contractor arising out of or relating to this agreement or its breach will be decided by arbitration if the parties mutually agree, or in a court of competent jurisdiction within the residing State. Rights and Remedies - Duties and obligations imposed by the contract documents and the rights and remedies available thereunder shall be in addition to and not a limitation of any duties, obligations, rights and remedies otherwise imposed or available by law. No action or failure to act by the recipient or contractor shall constitute a waiver of any right or duty afforded any of them under the contract, nor shall any such action or failure to act constitute an approval of or acquiescence in any breach thereunder, except as may be specifically agreed in writing.

CLEAN AIR

Applicability – all contracts more than \$150,000.

1. Contractor shall comply with all applicable standards, orders or regulations pursuant to the Clean Air Act, 42 USC 7401 et seq. Contractor shall report each violation to the recipient and understands and agrees that the recipient will, in turn, report each violation as required to FTA and the appropriate EPA Regional Office.
2. Contractor shall include these requirements in each subcontract exceeding \$150,000 financed in whole or in part with FTA assistance.

CLEAN WATER

Applicability – all contracts and Subcontracts more than \$150,000. Contractor shall comply with all applicable standards, orders or regulations issued pursuant to the Federal Water Pollution Control Act, as amended, 33 USC 1251 et seq. Contractor shall report each violation to the recipient and understands and agrees that the recipient shall, in turn, report each violation as required to FTA and the appropriate EPA Regional Office. Contractor shall include these requirements in each subcontract exceeding \$100,000 financed in whole or in part with FTA assistance.

FLY AMERICA REQUIREMENTS

Applicability – all contracts involving transportation of persons or property, by air between the U.S. and/or places outside the U.S. These requirements do not apply to micro-purchases (\$10,000 or less, except for construction contracts over \$2,000).

Contractor shall comply with 49 USC 40118 (the "Fly America" Act) in accordance with General Services Administration regulations 41 CFR 301-10, stating that recipients and subrecipients of Federal funds and their contractors are required to use US Flag air carriers for US Government-financed international air travel and transportation of their personal effects or property, to the extent such service is available, unless travel by foreign air carrier is a matter of necessity, as defined by the Fly America Act. Contractor shall submit, if a foreign air carrier was used, an appropriate certification or memorandum adequately explaining why service by a US flag air carrier was not available or why it was necessary to use a foreign air carrier and shall, in any event, provide a certificate of compliance with the Fly America requirements. Contractor shall include the requirements of this section in all subcontracts that may involve international air transportation.

CARGO PREFERENCE

Applicability – all contracts involving equipment, materials or commodities which may be transported by ocean vessels. These requirements do not apply to micro-purchases (\$10,000 or less, except for construction contracts over \$2,000).

Contractor shall: a. use privately owned US-Flag commercial vessels to ship at least 50% of the gross tonnage (computed separately for dry bulk carriers, dry cargo liners and tankers) involved, whenever shipping any equipment, material or commodities pursuant to the underlying contract to the extent such vessels are available at fair and reasonable rates for US flag commercial vessels; b. furnish within 20 working days following the loading date of shipments originating within the US or within 30 working days following the loading date of shipments originating outside the US, a legible copy of a rated, "on-board" commercial bill-of-lading in English for each shipment of cargo described herein to the Division of National Cargo, Office of Market Development, Maritime Administration, Washington, DC 20590 and to the recipient (through contractor in the case of a subcontractor's bill-of-lading.); c. include these requirements in all subcontracts issued pursuant to this contract when the subcontract involves the transport of equipment, material or commodities by ocean vessel.

ENERGY CONSERVATION

Applicability – all contracts except micro-purchases (\$10,000 or less, except for construction contracts over \$2,000).

Contractor shall comply with mandatory standards and policies relating to energy efficiency, stated in the state energy conservation plan issued in compliance with the Energy Policy & Conservation Act.

ACCESS TO RECORDS AND REPORTS

Applicability – as shown below. These requirements do not apply to micro-purchases (\$10,000 or less, except for construction contracts over \$2,000).

The following access to records requirements apply to this Contract:

1. Where the purchaser is not a State but a local government and is an FTA recipient or a subgrantee of FTA recipient in accordance with 49 CFR 18.36(i), contractor shall provide the purchaser, the FTA, the US Comptroller General or their authorized representatives access to any books, documents, papers and contractor records which are pertinent to this contract for the purposes of making audits, examinations, excerpts and transcriptions. Contractor shall also, pursuant to 49 CFR 633.17, provide authorized FTA representatives, including any PMO contractor, access to contractor's records and construction sites pertaining to a capital project, defined at 49 USC 5302(a)1, which is receiving FTA assistance through the programs described at 49 USC 5307, 5309 or 5311.
2. Where the purchaser is a State and is an FTA recipient or a subgrantee of FTA recipient in accordance with 49 CFR 633.17, contractor shall provide the purchaser, authorized FTA representatives, including any PMO Contractor, access to contractor's records and construction sites pertaining to a capital project, defined at 49 USC 5302(a)1, which receives FTA assistance through the programs described at 49 USC 5307, 5309 or 5311. By definition, a capital project excludes contracts of less than the simplified acquisition threshold currently set at \$150,000.
3. Where the purchaser enters into a negotiated contract for other than a small purchase or under the simplified acquisition threshold and is an institution of higher education, a hospital or other non-profit organization and is an FTA recipient or a subgrantee of FTA recipient in accordance with 49 CFR 19.48, contractor shall provide the purchaser, the FTA, the US Comptroller General or their authorized representatives, access to any books, documents, papers and record of the contractor which are directly pertinent to this contract for the purposes of making audits, examinations, excerpts and transcriptions.
4. Where a purchaser which is an FTA recipient or a subgrantee of FTA recipient in accordance with 49 USC 5325(a) enters into a contract for a capital project or improvement (defined at 49 USC 5302(a)1) through other than competitive bidding, contractor shall make available records related to the contract to the purchaser, the Secretary of USDOT and the US Comptroller General or any authorized officer or employee of any of them for the purposes of conducting an audit and inspection.
5. Contractor shall permit any of the foregoing parties to reproduce by any means whatsoever or to copy excerpts and transcriptions as reasonably needed.
6. Contractor shall maintain all books, records, accounts and reports required under this contract for a period of not less than three (3) years after the date of termination or expiration of this contract, except in the event of litigation or settlement of claims arising from the performance of this contract, in which case contractor agrees to maintain same until the recipient, FTA Administrator, US Comptroller General, or any of their authorized representatives, have disposed of all such litigation, appeals, claims or exceptions related thereto. Re: 49 CFR 18.39(i)(11). FTA does not require the inclusion of these requirements in subcontracts.

FEDERAL CHANGES

Applicability – all contracts except micro-purchases (\$10,000 or less, except for construction contracts over \$2,000).

Contractor shall comply with all applicable FTA regulations, policies, procedures and directives, including without limitation those listed directly or by reference in the Master Agreement between the purchaser and FTA, as they may be amended or promulgated from time to time during the term of the contract. Contractor's failure to comply shall constitute a material breach of the contract.

RECYCLED PRODUCTS

Applicability – all contracts for items designated by the EPA, when the purchaser or contractor procures \$10,000 or more of one of these items during the current or previous fiscal year using Federal funds.

The contractor agrees to comply with all the requirements of Section 6002 of the Resource Conservation and Recovery Act (RCRA), as amended (42 U.S.C. 6962), including but not limited to the regulatory provisions of 40 CFR Part 247, and Executive Order 12873, as they apply to the procurement of the items designated in Subpart B of 40 CFR Part 247.

NO GOVERNMENT OBLIGATION TO THIRD PARTIES

Applicability – all contracts except micro-purchases (\$10,000 or less, except for construction contracts over \$2,000).

1. The recipient and contractor acknowledge and agree that, notwithstanding any concurrence by the US Government in or approval of the solicitation or award of the underlying contract, absent the express written consent by the US Government, the US Government is not a party to this contract and shall not be subject to any obligations or liabilities to the recipient, the contractor, or any other party (whether or not a party to that contract) pertaining to any matter resulting from the underlying contract.
2. Contractor agrees to include the above clause in each subcontract financed in whole or in part with FTA assistance. It is further agreed that the clause shall not be modified, except to identify the subcontractor who will be subject to its provisions.

PROGRAM FRAUD AND FALSE OR FRAUDULENT STATEMENTS OR RELATED ACTS

Applicability – all contracts except micro-purchases (\$10,000 or less, except for construction contracts over \$2,000).

1. Contractor acknowledges that the provisions of the Program Fraud Civil Remedies Act of 1986, as amended, 31 USC 3801 et seq. and USDOT regulations, "Program Fraud Civil Remedies," 49 CFR 31, apply to its actions pertaining to this project. Upon execution of the underlying contract, contractor certifies or affirms the truthfulness and accuracy of any statement it has made, it makes, it may make, or causes to be made, pertaining to the underlying contract or FTA assisted project for which this contract work is being performed. In addition to other penalties that may be applicable, contractor further acknowledges that if it makes, or causes to be made, a false, fictitious, or fraudulent claim, statement, submittal, or certification, the US Government reserves the right to impose the penalties of the Program Fraud Civil Remedies Act (1986) on contractor to the extent the US Government deems appropriate.
2. If contractor makes, or causes to be made, a false, fictitious, or fraudulent claim, statement, submittal, or certification to the US Government under a contract connected with a project that is financed in whole or in part with FTA assistance under the authority of 49 USC 5307, the Government reserves the right to impose the penalties of 18 USC 1001 and 49 USC 5307(n)(1) on contractor, to the extent the US Government deems appropriate.
3. Contractor shall include the above two clauses in each subcontract financed in whole or in part with FTA assistance. The clauses shall not be modified, except to identify the subcontractor who will be subject to the provisions.

TERMINATION

Applicability – all contracts more than \$10,000, except contracts with nonprofit organizations and institutions of higher learning, where the threshold is \$150,000.

- a. Termination for Convenience (General Provision) the recipient may terminate this contract, in whole or in part, at any time by written notice to contractor when it is in the recipient's best interest. Contractor shall be paid its costs, including contract close-out costs, and profit on work performed up to the time of termination. Contractor shall promptly submit its termination claim to the recipient. If contractor is in possession of any of the recipient's property, contractor shall account for same, and dispose of it as the recipient directs.
- b. Termination for Default [Breach or Cause] (General Provision) If contractor does not deliver items in accordance with the contract delivery schedule, or, if the contract is for services, and contractor fails to perform in the manner called for in the contract, or if contractor fails to comply with any other provisions of the contract, the recipient may terminate this contract for default. Termination shall be effected by serving a notice of termination to contractor setting forth the manner in which contractor is in default. Contractor shall only be paid the contract price for supplies delivered and accepted, or for services performed in accordance with the manner of performance set forth in the contract. If it is later determined by the recipient that contractor had an excusable reason for not performing, such as a strike, fire, or flood, events which are not the fault of or are beyond the control of contractor, the recipient, after setting up a new delivery or performance schedule, may allow contractor to continue work, or treat the termination as a termination for convenience.
- c. Opportunity to Cure (General Provision) the recipient in its sole discretion may, in the case of a termination for breach or default, allow contractor an appropriately short period of time in which to cure the defect. In such case, the notice of termination shall state the time period in which cure is permitted and other appropriate conditions. If contractor fails to remedy to the recipient's satisfaction the breach or default or any of the terms, covenants, or conditions of this Contract within ten (10) days after receipt by contractor or written notice from the recipient setting forth the nature of said breach or default, the recipient shall have the right to terminate the Contract without any further obligation to contractor. Any such termination for default shall not in any way operate to preclude the recipient from also pursuing all available remedies against contractor and its sureties for said breach or default.
- d. Waiver of Remedies for any Breach In the event that the recipient elects to waive its remedies for any breach by contractor of any covenant, term or condition of this Contract, such waiver by the recipient shall not limit its remedies for any succeeding breach of that or of any other term, covenant, or condition of this Contract.
- e. Termination for Convenience (Professional or Transit Service Contracts) the recipient, by written notice, may terminate this contract, in whole or in part, when it is in the recipient's interest. If the contract is terminated, the recipient shall be liable only for payment under the payment provisions of this contract for services rendered before the effective date of termination.
- f. Termination for Default (Supplies and Service) If contractor fails to deliver supplies or to perform the services within the time specified in this contract or any extension or if the contractor fails to comply with any other provisions of this contract, the recipient may terminate this contract for default. The recipient shall terminate by delivering to contractor a notice of termination specifying the nature of default. Contractor shall only be paid the contract price for supplies delivered and accepted, or services performed in accordance with the manner or performance set forth in this contract. If, after termination for failure to fulfill contract obligations, it is determined that contractor was not in default, the rights and obligations of the parties shall be the same as if termination had been issued for the recipient's convenience.
- g. Termination for Default (Transportation Services) if contractor fails to pick up the commodities or to perform the services, including delivery services, within the time specified in this contract or any extension or if contractor fails to comply with any other provisions of this contract, the recipient may terminate this contract for default. The recipient shall terminate by delivering to contractor a notice of termination specifying the nature of default. Contractor shall only be paid the contract price for services performed in accordance with the manner of performance set forth in this contract. If this contract is terminated while contractor has possession of the recipient goods, contractor shall, as directed by the recipient, protect and preserve the goods until surrendered to the recipient or its agent. Contractor and the recipient shall agree on payment for the preservation and protection of goods. Failure to agree on an amount shall be resolved under the Dispute clause. If, after

termination for failure to fulfill contract obligations, it is determined that contractor was not in default, the rights and obligations of the parties shall be the same as if termination had been issued for the recipient's convenience.

- h. Termination for Default (Construction) If contractor refuses or fails to prosecute the work or any separable part, with the diligence that will insure its completion within the time specified, or any extension, or fails to complete the work within this time, or if contractor fails to comply with any other provisions of this contract, the recipient may terminate this contract for default. the recipient shall terminate by delivering to contractor a notice of termination specifying the nature of default. In this event, the recipient may take over the work and complete it by contract or otherwise, and may take possession of and use any materials, appliances, and plant on the work site necessary for completing the work. Contractor and its sureties shall be liable for any damage to the recipient resulting from contractor's refusal or failure to complete the work within specified time, whether or not contractor's right to proceed with the work is terminated. This liability includes any increased costs incurred by the recipient in completing the work. Contractor's right to proceed shall not be terminated nor shall contractor be charged with damages under this clause if: (1). Delay in completing the work arises from unforeseeable causes beyond the control and without the fault or negligence of contractor. Examples of such causes include: acts of God, acts of the recipient, acts of another contractor in the performance of a contract with the recipient, epidemics, quarantine restrictions, strikes, freight embargoes; and (2). Contractor, within 10 days from the beginning of any delay, notifies the recipient in writing of the causes of delay. If in the recipient's judgment, delay is excusable, the time for completing the work shall be extended. The recipient's judgment shall be final and conclusive on the parties, but subject to appeal under the Disputes clauses. If, after termination of contractor's right to proceed, it is determined that contractor was not in default, or that the delay was excusable, the rights and obligations of the parties will be the same as if termination had been issued for the recipient's convenience.
- i. Termination for Convenience or Default (Architect & Engineering) the recipient may terminate this contract in whole or in part, for the recipient's convenience or because of contractor's failure to fulfill contract obligations. The recipient shall terminate by delivering to contractor a notice of termination specifying the nature, extent, and effective date of termination. Upon receipt of the notice, contractor shall (1) immediately discontinue all services affected (unless the notice directs otherwise), and (2) deliver to the recipient all data, drawings, specifications, reports, estimates, summaries, and other information and materials accumulated in performing this contract, whether completed or in process. If termination is for the recipient's convenience, it shall make an equitable adjustment in the contract price but shall allow no anticipated profit on unperformed services. If termination is for contractor's failure to fulfill contract obligations, the recipient may complete the work by contract or otherwise and contractor shall be liable for any additional cost incurred by the recipient. If, after termination for failure to fulfill contract obligations, it is determined that contractor was not in default, the rights and obligations of the parties shall be the same as if termination had been issued for the recipient's convenience.
- j. Termination for Convenience or Default (Cost-Type Contracts) the recipient may terminate this contract, or any portion of it, by serving a notice of termination on contractor. The notice shall state whether termination is for convenience of the recipient or for default of contractor. If termination is for default, the notice shall state the manner in which contractor has failed to perform the requirements of the contract. Contractor shall account for any property in its possession paid for from funds received from the recipient, or property supplied to contractor by the recipient. If termination is for default, the recipient may fix the fee, if the contract provides for a fee, to be paid to contractor in proportion to the value, if any, of work performed up to the time of termination. Contractor shall promptly submit its termination claim to the recipient and the parties shall negotiate the termination settlement to be paid to contractor. If termination is for the recipient's convenience, contractor shall be paid its contract closeout costs, and a fee, if the contract provided for payment of a fee, in proportion to the work performed up to the time of termination. If, after serving a notice of termination for default, the recipient determines that contractor has an excusable reason for not performing, such as strike, fire, flood, events which are not the fault of and are beyond the control of contractor, the recipient, after setting up a new work schedule, may allow contractor to continue work, or treat the termination as a termination for convenience.

CONTRACTS INVOLVING FEDERAL PRIVACY ACT REQUIREMENTS

Applicability – when a grantee maintains files on drug and alcohol enforcement activities for FTA, and those files are organized so that information could be retrieved by personal identifier, the Privacy Act requirements apply to all contracts except micro-purchases (\$10,000 or less, except for construction contracts over \$2,000) The following requirements apply to the Contractor and its employees that administer any system of records on behalf of the Federal Government under any contract:

1. The Contractor agrees to comply with, and assures the compliance of its employees with, the information restrictions and other applicable requirements of the Privacy Act of 1974, 5 U.S.C. § 552a. Among other things, the Contractor agrees to obtain the express consent of the Federal Government before the Contractor or its employees operate a system of records on behalf of the Federal Government. The Contractor understands that the requirements of the Privacy Act, including the civil and criminal penalties for violation of that Act, apply to those individuals involved, and that failure to comply with the terms of the Privacy Act may result in termination of the underlying contract.
2. The Contractor also agrees to include these requirements in each subcontract to administer any system of records on behalf of the Federal Government financed in whole or in part with Federal assistance provided by FTA.

CIVIL RIGHTS REQUIREMENTS

Applicability – all contracts except micro-purchases (\$10,000 or less, except for construction contracts over \$2,000).

The following requirements apply to the underlying contract: The Recipient understands and agrees that it must comply with applicable Federal civil rights laws and regulations, and follow applicable Federal guidance, except as the Federal Government determines otherwise in writing. Therefore, unless a Recipient or Program, including an Indian Tribe or the Tribal Transit Program, is specifically exempted from a civil rights statute, FTA requires compliance with that civil rights statute, including compliance with equity in service: a. Nondiscrimination in Federal Public Transportation Programs. The Recipient agrees to, and assures that each Third Party Participant will, comply with Federal transit law, 49 U.S.C. § 5332 (FTA's "Nondiscrimination" statute):

- a. FTA's "Nondiscrimination" statute prohibits discrimination on the basis of: (a) Race, (b) Color, (c) Religion, (d) National origin, (e) Sex, (f) Disability, (g) Age, or (h) Gender identity and (2) The FTA "Nondiscrimination" statute's prohibition against discrimination includes: (a) Exclusion from participation, (b) Denial of program benefits, or (c) Discrimination, including discrimination in employment or business opportunity, (3) Except as FTA determines otherwise in writing: (a) General. Follow: 1 The most recent edition of FTA Circular 4702.1, "Title VI Requirements and Guidelines for Federal Transit Administration Recipients," to the extent consistent with applicable Federal laws, regulations, and guidance, and 2 Other applicable Federal guidance that may be issued, but (b) Exception for the Tribal Transit Program. FTA does not require an Indian Tribe to comply with FTA program-specific guidelines for Title VI when administering its projects funded under the Tribal Transit Program.
- b. Nondiscrimination – Title VI of the Civil Rights Act. The Recipient agrees to, and assures that each Third Party Participant will: (1) Prohibit discrimination based on: (a) Race, (b) Color, or (c) National origin, (2) Comply with: (a) Title VI of the Civil Rights Act of 1964, as amended, 42 U.S.C. § 2000d et seq., (b) U.S. DOT regulations, "Nondiscrimination in Federally-Assisted Programs of the Department of Transportation – Effectuation of Title VI of the Civil Rights Act of 1964," 49 C.F.R. part 21, and (c) Federal transit law, specifically 49 U.S.C. § 5332, as stated in the preceding section a, and (3) Except as FTA determines otherwise in writing, follow: (a) The most recent edition of FTA Circular 4702.1, "Title VI and Title VI-Dependent Guidelines for Federal Transit Administration Recipients," to the extent consistent with applicable Federal laws, regulations, and guidance. (b) U.S. DOJ, "Guidelines for the enforcement of Title VI, Civil Rights Act of 1964," 28 C.F.R. § 50.3, and (c) Other applicable Federal guidance that may be issued.
- c. Equal Employment Opportunity. (1) Federal Requirements and Guidance. The Recipient agrees to, and assures that each Third Party Participant will, prohibit discrimination on the basis of race, color, religion, sex, or national origin, and: (a) Comply with Title VII of the Civil Rights Act of 1964,

as amended, 42 U.S.C. § 2000e et seq., (b) Facilitate compliance with Executive Order No. 11246, "Equal Employment Opportunity," as amended by Executive Order No. 11375, "Amending Executive Order No. 11246, Relating to Equal Employment Opportunity," 42 U.S.C. § 2000e note, (c) Comply with Federal transit law, specifically 49 U.S.C. § 5332, as stated in section a, and (d) Comply with other applicable EEO laws and regulations, as provided in Federal guidance, including laws and regulations prohibiting discrimination on the basis of disability, except as the Federal Government determines otherwise in writing, (2) General. The Recipient agrees to: (a) Ensure that applicants for employment are employed and employees are treated during employment without discrimination on the basis of their: 1 Race, 2 Color, 3 Religion, 4 Sex, 5 Disability, 6 Age, or 7 National origin, (b) Take affirmative action that includes, but is not limited to: 1 Recruitment advertising, 2 Recruitment, 3 Employment, 4 Rates of pay, 5 Other forms of compensation, 6 Selection for training, including apprenticeship, 7 Upgrading, 8 Transfers, 9 Demotions, 10 Layoffs, and 11 Terminations, but (b) Indian Tribe. Title VII of the Civil Rights Act of 1964, as amended, exempts Indian Tribes under the definition of "Employer". (3) Equal Employment Opportunity Requirements for Construction Activities. In addition to the foregoing, when undertaking "construction" as recognized by the U.S. Department of Labor (U.S. DOL), the Recipient agrees to comply, and assures the compliance of each Third Party Participant, with: (a) U.S. DOL regulations, "Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor," 41 C.F.R. chapter 60, and (b) Executive Order No. 11246, "Equal Employment Opportunity," as amended by Executive Order No. 11375, "Amending Executive Order No. 11246, Relating to Equal Employment Opportunity," 42 U.S.C. § 2000e note.

- d. Disadvantaged Business Enterprise. To the extent authorized by applicable Federal law, the Recipient agrees to facilitate, and assures that each Third Party Participant will facilitate, participation by small business concerns owned and controlled by socially and economically disadvantaged individuals, also referred to as "Disadvantaged Business Enterprises" (DBEs), in the Project as follows: 1) Requirements. The Recipient agrees to comply with: (a) Section 1101(b) of MAP-21, 23 U.S.C. § 101 note, (b) U.S. DOT regulations, "Participation by Disadvantaged Business Enterprises in Department of Transportation Financial Assistance Programs," 49 C.F.R. part 26, and (c) Federal transit law, specifically 49 U.S.C. § 5332, as stated in section a, (2) Assurance. As required by 49 C.F.R. § 26.13(a), (b) DBE Program Requirements. Recipients receiving planning, capital and/or operating assistance that will award prime third party contracts exceeding \$250,000 in a Federal fiscal year must: 1 Have a DBE program meeting the requirements of 49 C.F.R. part 26, 2 implement a DBE program approved by FTA, and 3 establish an annual DBE participation goal, (c) Special Requirements for a Transit Vehicle Manufacturer. The Recipient understands and agrees that each transit vehicle manufacturer, as a condition of being authorized to bid or propose on FTA-assisted transit vehicle procurements, must certify that it has complied with the requirements of 49 C.F.R. part 26, (d) the Recipient provides assurance that: The Recipient shall not discriminate on the basis of race, color, national origin, or sex in the award and performance of any DOT-assisted contract or in the administration of its DBE program or the requirements of 49 C.F.R. part 26. The Recipient shall take all necessary and reasonable steps under 49 C.F.R. part 26 to ensure nondiscrimination in the award and administration of DOT-assisted contracts. The Recipient's DBE program, as required by 49 C.F.R. part 26 and as approved by DOT, is incorporated by reference in this agreement. Implementation of this program is a legal obligation and failure to carry out its terms shall be treated as a violation of this agreement. Upon notification to the Recipient of its failure to carry out its approved program, the Department may impose sanctions as provided for under 49 C.F.R. part 26 and may, in appropriate cases, refer the matter for enforcement under 18 U.S.C. § 1001 and/or the Program Fraud Civil Remedies Act of 1986, 31 U.S.C. § 3801 et seq., (2) Exception for the Tribal Transit Program. FTA exempts Indian tribes from the Disadvantaged Business Enterprise regulations at 49 C.F.R. part 26 under MAP-21 and previous legislation.
- e. Nondiscrimination on the Basis of Sex. The Recipient agrees to comply with Federal prohibitions against discrimination on the basis of sex, including: (1) Title IX of the Education Amendments of 1972, as amended, 20 U.S.C. § 1681 et seq., (2) U.S. DOT regulations, "Nondiscrimination on the Basis of Sex in Education Programs or Activities Receiving Federal Financial Assistance," 49 C.F.R. part 25, and (3) Federal transit law, specifically 49 U.S.C. § 5332, as stated in section a,

- f. Nondiscrimination on the Basis of Age. The Recipient agrees to comply with Federal prohibitions against discrimination on the basis of age, including: (1) The Age Discrimination in Employment Act (ADEA), 29 U.S.C. §§ 621 – 634, which prohibits discrimination on the basis of age, (2) U.S. Equal Employment Opportunity Commission (U.S. EEOC) regulations, “Age Discrimination in Employment Act,” 29 C.F.R. part 1625, which implements the ADEA, (3) The Age Discrimination Act of 1975, as amended, 42 U.S.C. § 6101 et seq., which prohibits discrimination against individuals on the basis of age in the administration of programs or activities receiving Federal funds, (4) U.S. Health and Human Services regulations, “Nondiscrimination on the Basis of Age in Programs or Activities Receiving Federal Financial Assistance,” 45 C.F.R. part 90, which implements the Age Discrimination Act of 1975, and (5) Federal transit law, specifically 49 U.S.C. § 5332, as stated in section a.
- g. Nondiscrimination on the Basis of Disability. The Recipient agrees to comply with the following Federal prohibitions pertaining to discrimination against seniors or individuals with disabilities: (1) Federal laws, including: (a) Section 504 of the Rehabilitation Act of 1973, as amended, 29 U.S.C. § 794, which prohibits discrimination on the basis of disability in the administration of federally funded programs or activities, (b) The Americans with Disabilities Act of 1990 (ADA), as amended, 42 U.S.C. § 12101 et seq., which requires that accessible facilities and services be made available to individuals with disabilities, 1 General. Titles I, II, and III of the ADA apply to FTA Recipients, but 2 Indian Tribes. While Titles II and III of the ADA apply to Indian Tribes, Title I of the ADA exempts Indian Tribes from the definition of “employer,” (c) The Architectural Barriers Act of 1968, as amended, 42 U.S.C. § 4151 et seq., which requires that buildings and public accommodations be accessible to individuals with disabilities, (d) Federal transit law, specifically 49 U.S.C. § 5332, which now includes disability as a prohibited basis for discrimination, and (e) Other applicable laws and amendments pertaining to access for elderly individuals or individuals with disabilities, (2) Federal regulations, including: (a) U.S. DOT regulations, “Transportation Services for Individuals with Disabilities (ADA),” 49 C.F.R. part 37, (b) U.S. DOT regulations, “Nondiscrimination on the Basis of Disability in Programs and Activities Receiving or Benefiting from Federal Financial Assistance,” 49 C.F.R. part 27, (c) U.S. DOT regulations, “Transportation for Individuals with Disabilities: Passenger Vessels,” 49 C.F.R. part 39, (d) Joint U.S. Architectural and Transportation Barriers Compliance Board (U.S. ATBCB) and U.S. DOT regulations, “Americans With Disabilities (ADA) Accessibility Specifications for Transportation Vehicles,” 36 C.F.R. part 1192 and 49 C.F.R. part 38, (e) U.S. DOJ regulations, “Nondiscrimination on the Basis of Disability in State and Local Government Services,” 28 C.F.R. part 35, (f) U.S. DOJ regulations, “Nondiscrimination on the Basis of Disability by Public Accommodations and in Commercial Facilities,” 28 C.F.R. part 36, (g) U.S. EEOC, “Regulations to Implement the Equal Employment Provisions of the Americans with Disabilities Act,” 29 C.F.R. part 1630, (h) U.S. Federal Communications Commission regulations, “Telecommunications Relay Services and Related Customer Premises Equipment for Persons with Disabilities,” 47 C.F.R. part 64, Subpart F, (i) U.S. ATBCB regulations, “Electronic and Information Technology Accessibility Standards,” 36 C.F.R. part 1194, and (j) FTA regulations, “Transportation for Elderly and Handicapped Persons,” 49 C.F.R. part 609, and (3) Other applicable Federal civil rights and nondiscrimination guidance.
- h. Drug or Alcohol Abuse - Confidentiality and Other Civil Rights Protections. The Recipient agrees to comply with the confidentiality and civil rights protections of: (1) The Drug Abuse Office and Treatment Act of 1972, as amended, 21 U.S.C. § 1101 et seq., (2) The Comprehensive Alcohol Abuse and Alcoholism Prevention, Treatment and Rehabilitation Act of 1970, as amended, 42 U.S.C. § 4541 et seq., and (3) The Public Health Service Act, as amended, 42 U.S.C. §§ 290dd – 290dd-2.
- i. Access to Services for People with Limited English Proficiency. Except as the Federal Government determines otherwise in writing, the Recipient agrees to promote accessibility of public transportation services to people whose understanding of English is limited by following: 1) Executive Order No. 13166, “Improving Access to Services for Persons with Limited English Proficiency,” August 11, 2000, 42 U.S.C. § 2000d-1 note, and (2) U.S. DOT Notice, “DOT Policy Guidance Concerning Recipients’ Responsibilities to Limited English Proficiency (LEP) Persons,” 70 Fed. Reg. 74087, December 14, 2005.

- j. Other Nondiscrimination Laws. Except as the Federal Government determines otherwise in writing, the Recipient agrees to: (1) Comply with other applicable Federal nondiscrimination laws and regulations, and (2) Follow Federal guidance prohibiting discrimination.
- k. Remedies. Remedies for failure to comply with applicable Federal Civil Rights laws and Federal regulations may be enforced as provided in those Federal laws or Federal regulations.

DISADVANTAGED BUSINESS ENTERPRISE

Applicability – contracts over \$10,000 awarded on the basis of a bid or proposal offering to use DBEs:

- a. This contract is subject to the requirements of Title 49, Code of Federal Regulations, Part 26, and Participation by Disadvantaged Business Enterprises in Department of Transportation Financial Assistance Programs. The national goal for participation of Disadvantaged Business Enterprises (DBE) is 10%. The recipient's overall goal for DBE participation is listed elsewhere. If a separate contract goal for DBE participation has been established for this procurement, it is listed elsewhere.
- b. The contractor shall not discriminate on the basis of race, color, religion, national origin or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of this contract. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the municipal corporation deems appropriate. Each subcontract the contractor signs with a subcontractor must include the assurance in this paragraph (see 49 CFR 26.13(b)).
- c. If a separate contract goal has been established, Bidders/offerors are required to document sufficient DBE participation to meet these goals or, alternatively, document adequate good faith efforts to do so, as provided for in 49 CFR 26.53.
- d. If no separate contract goal has been established, the successful bidder/offeror will be required to report its DBE participation obtained through race-neutral means throughout the period of performance.
- e. The contractor is required to pay its subcontractors performing work related to this contract for satisfactory performance of that work no later than 30 days after the contractor's receipt of payment for that work from the recipient. In addition, the contractor may not hold retainage from its subcontractors or must return any retainage payments to those subcontractors within 30 days after the subcontractor's work related to this contract is satisfactorily completed or must return any retainage payments to those subcontractors within 30 days after incremental acceptance of the subcontractor's work by the recipient and contractor's receipt of the partial retainage payment related to the subcontractor's work.
- f. The contractor must promptly notify the recipient whenever a DBE subcontractor performing work related to this contract is terminated or fails to complete its work, and must make good faith efforts to engage another DBE subcontractor to perform at least the same amount of work. The contractor may not terminate any DBE subcontractor and perform that work through its own forces or those of an affiliate without prior written consent of the recipient.

PROMPT PAYMENT

Applicability – all contracts except micro-purchases (\$10,000 or less, except for construction contracts over \$2,000).

The prime contractor agrees to pay each subcontractor under this prime contract for satisfactory performance of its contract no later than 30 days from the receipt of each payment the prime contract receives from the Recipient. The prime contractor agrees further to return retainage payments to each subcontractor within 30 days after the subcontractors work is satisfactorily completed. Any delay or postponement of payment from the above referenced time frame may occur only for good cause following written approval of the Recipient. This clause applies to both DBE and non-DBE subcontracts.

INCORPORATION OF FEDERAL TRANSIT ADMINISTRATION (FTA) TERMS

Applicability – all contracts except micro-purchases (\$10,000 or less, except for construction contracts over \$2,000).

The preceding provisions include, in part, certain Standard Terms & Conditions required by USDOT, whether or not expressly stated in the preceding contract provisions. All USDOT-required contractual provisions, as stated in FTA Circular 4220.1F, are hereby incorporated by reference. Anything to the contrary herein notwithstanding, all FTA mandated terms shall be deemed to control in the event of a conflict with other provisions contained in this Agreement. The contractor shall not perform any act, fail to perform any act, or refuse to comply with any request that would cause the recipient to be in violation of FTA terms and conditions.

"General Decision Number: MI20220150 02/25/2022

Superseded General Decision Number: MI20210150

State: Michigan

Construction Type: Building

County: Schoolcraft County in Michigan.

BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories).

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60).

If the contract is entered	. Executive Order 14026
into on or after January 30,	generally applies to the
2022, or the contract is	contract.
renewed or extended (e.g., an	. The contractor must pay
option is exercised) on or	all covered workers at
after January 30, 2022:	least \$15.00 per hour (or
	the applicable wage rate
	listed on this wage
	determination, if it is
	higher) for all hours
	spent performing on the
	contract in 2022.

If the contract was awarded on	. Executive Order 13658
or between January 1, 2015 and	generally applies to the
January 29, 2022, and the	contract.
contract is not renewed or	. The contractor must pay all
extended on or after January	covered workers at least
30, 2022:	\$11.25 per hour (or the
	applicable wage rate listed
	on this wage determination,

	if it is higher) for all
	hours spent performing on
	that contract in 2022.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at <https://www.dol.gov/agencies/whd/government-contracts>.

Modification Number	Publication Date
0	01/07/2022
1	02/25/2022

ASBE0127-004 06/01/2021

	Rates	Fringes
ASBESTOS WORKER/HEAT & FROST INSULATOR.....	\$ 34.24	25.31

BOIL0169-002 01/01/2021

	Rates	Fringes
BOILERMAKER.....	\$ 35.95	34.52

BRMI0006-001 05/01/2020

	Rates	Fringes
BRICKLAYER.....	\$ 27.30	22.54
TILE SETTER.....	\$ 27.30	22.54

CARP1510-005 06/01/2020

Rates	Fringes
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MILLWRIGHT.....\$ 30.00 21.48

CARP1510-006 06/01/2020

 Rates Fringes

CARPENTER (Including
Acoustical Ceiling
Installation, Drywall
Finishing/Taping, Drywall
Hanging, Form Work, and Soft
Floor Layer - Carpet).....\$ 25.15 20.90

ELEC0979-001 06/01/2019

 Rates Fringes

ELECTRICIAN (Excludes Low
Voltage Wiring).....\$ 33.43 21.78

ENGI0324-031 05/01/2021

 Rates Fringes

POWER EQUIPMENT OPERATOR:

Crane operator, main boom & jib 120' or longer.....\$ 36.41	24.60
Crane operator, main boom & jib 140' or longer.....\$ 37.23	24.60
Crane operator, main boom & jib 220' or longer.....\$ 37.52	24.60
GROUP 1.....\$ 33.11	24.60
GROUP 2.....\$ 29.86	24.60
GROUP 3.....\$ 28.46	12.10

Premium rate: main boom and jib 300 feet or longer is \$1.50 per hour above the 220 ft. boom and jib rate. Main boom and jib 400 feet or longer is \$3.00 per hour above the 220 ft. boom and jib rate.

POWER EQUIPMENT OPERATOR CLASSIFICATIONS

GROUP 1: backhoe, bulldozer; crane, front end loader,

excavator, paver, roller, and scraper (self-propelled and tractor drawn)
GROUP 2: fork truck
GROUP 3: oiler

IRON0008-008 06/01/2021

	Rates	Fringes
IRONWORKER, REINFORCING AND STRUCTURAL		
Contracts \$10,000,000 or greater.....	\$ 31.39	26.90
Contracts less than \$10,000,000.....	\$ 31.39	26.90

Paid Holidays: New Year's Day, Memorial Day, July 4th, Labor Day, Thanksgiving Day & Christmas Day.

LABO1329-005 05/01/2021

	Rates	Fringes
LABORER		
Common or General; Mason Tender - Brick; Mason Tender - Cement/Concrete; and Sandblaster.....	\$ 30.09	12.95
Pipelayer.....	\$ 30.09	12.95

PAIN1011-001 06/02/2019

	Rates	Fringes
PAINTER (Insulator Foam Only)....	\$ 27.54	13.33

PAIN1011-004 06/02/2021

	Rates	Fringes
PAINTER (Brush and Spray Only)...	\$ 23.37	14.38

PLAS0016-037 04/01/2014

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER...	\$ 20.17	10.13

PLUM0111-002 06/01/2021

	Rates	Fringes
PIPEFITTER (Excludes HVAC Pipe & System Installation).....	\$ 34.48	25.18
PIPEFITTER (HVAC Pipe Installation Only).....	\$ 36.39	26.25
PLUMBER (Excluding HVAC Pipe & System Installation).....	\$ 34.48	25.18

SHEE0007-006 07/01/2017

	Rates	Fringes
SHEET METAL WORKER (Excluding HVAC Duct & System Installation).....	\$ 27.24	27.35
SHEET METAL WORKER (HVAC Duct & System Installation).....	\$ 27.24	27.35

* SUMI2011-075 02/14/2011

	Rates	Fringes
GLAZIER.....	\$ 17.50	2.27
LABORER: Landscape & Irrigation.....	\$ 14.95 **	0.00
OPERATOR: Grader/Blade.....	\$ 24.04	6.03
OPERATOR: Tractor.....	\$ 19.60	7.31
PAINTER: Roller.....	\$ 16.58	2.84
ROOFER.....	\$ 19.10	8.00

TRUCK DRIVER: Flatbed Truck.....\$ 17.44 4.51

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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** Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 (\$15.00) or 13658 (\$11.25). Please see the Note at the top of the wage determination for more information.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at <https://www.dol.gov/agencies/whd/government-contracts>.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage

determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a

new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- * an existing published wage determination
- * a survey underlying a wage determination
- * a Wage and Hour Division letter setting forth a position on a wage determination matter
- * a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION"

This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

BID FORM FOR CONSTRUCTION CONTRACTS

Prepared by



Issued and Published Jointly by



Endorsed by



BID FORM

Schoolcraft County Transit Authority

Existing Building Renovation and Addition

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ARTICLE 1 – BID RECIPIENT

- 1.01 This Bid is submitted to:
Schoolcraft County Transit Authority, 335N E Road, Manistique, MI, 49854 – John Stapleton, Director
- 1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2 – BIDDER’S ACKNOWLEDGEMENTS

- 2.01 Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 60 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

ARTICLE 3 – BIDDER’S REPRESENTATIONS

- 3.01 In submitting this Bid, Bidder represents that:
 - A. Bidder has examined and carefully studied the Bidding Documents, and any data and reference items identified in the Bidding Documents, and hereby acknowledges receipt of the following Addenda:

<u>Addendum No.</u>	<u>Addendum, Date</u>
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

- B. Bidder has visited the Site, conducted a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and satisfied itself as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
- C. Bidder is familiar with and has satisfied itself as to all Laws and Regulations that may affect cost, progress, and performance of the Work.
- D. Bidder has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings, and (2) reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings.

- E. Bidder has considered the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and any Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder; and (3) Bidder's safety precautions and programs.
- F. Bidder agrees, based on the information and observations referred to in the preceding paragraph, that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents.
- G. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.
- H. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and confirms that the written resolution thereof by Engineer is acceptable to Bidder.
- I. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance and furnishing of the Work.
- J. The submission of this Bid constitutes an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article, and that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

ARTICLE 4 – BIDDER'S CERTIFICATION

4.01 Bidder certifies that:

- A. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation;
- B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;
- C. Bidder has not solicited or induced any individual or entity to refrain from bidding; and
- D. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 4.01.D:
 - 1. "corrupt practice" means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the bidding process;
 - 2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;
 - 3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels; and

4. “coercive practice” means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

ARTICLE 5 – BASIS OF BID

- 5.01 Bidder will complete the Work in accordance with the Contract Documents for the following price(s):

Lump Sum Bid Price	\$
---------------------------	----

ARTICLE 6 – TIME OF COMPLETION

- 6.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.
- 6.02 Bidder accepts the provisions of the Agreement as to liquidated damages.

ARTICLE 7 – ATTACHMENTS TO THIS BID

- 7.01 The following documents are submitted with and made a condition of this Bid:
 - A. Required Bid security;
 - B. List of Proposed Subcontractors;
 - C. List of Proposed Suppliers;
 - D. List of Project References;
 - E. List of Completed Projects;
 - F. Evidence of authority to do business in the state of the Project; or a written covenant to obtain such license within the time for acceptance of Bids;
 - G. Contractor’s License No.: [REDACTED] [or] Evidence of Bidder’s ability to obtain a State Contractor’s License and a covenant by Bidder to obtain said license within the time for acceptance of Bids; and
 - H. Required Bidder Qualification Statement with supporting data.

ARTICLE 8 – DEFINED TERMS

- 8.01 The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

ARTICLE 9 – BID SUBMITTAL

BIDDER: *[Indicate correct name of bidding entity]*

By:
[Signature] _____

[Printed name] _____
(If Bidder is a corporation, a limited liability company, a partnership, or a joint venture, attach evidence of authority to sign.)

Attest:
[Signature] _____

[Printed name] _____

Title: _____

Submittal Date: _____

Address for giving notices:

Telephone Number: _____

Fax Number: _____

Contact Name and e-mail address: _____

Bidder's License No.: _____
(where applicable)

Bid Bond

Any singular reference to Bidder, Surety, Owner or other party shall be considered plural where applicable.

BIDDER (*Name and Address*):

SURETY (*Name, and Address of Principal Place of Business*):

OWNER : Schoolcraft County Transit Authority, 335N E Road, Manistique, MI 49854

BID

Bid Due Date: July 21, 2022
 Description : Existing Building Renovations and Addition

BOND

Bond Number: _____
 Date: _____
 Penal sum _____ \$ _____
(Words) (Figures)

Surety and Bidder, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Bid Bond to be duly executed by an authorized officer, agent, or representative.

<p>BIDDER</p> <p>_____ (Seal)</p> <p>Bidder's Name and Corporate Seal</p>	<p>SURETY</p> <p>_____ (Seal)</p> <p>Surety's Name and Corporate Seal</p>
--	--

<p>By: _____</p> <p style="margin-left: 40px;">Signature</p> <p>_____</p> <p style="margin-left: 40px;">Print Name</p> <p>_____</p> <p style="margin-left: 40px;">Title</p>	<p>By: _____</p> <p style="margin-left: 40px;">Signature (Attach Power of Attorney)</p> <p>_____</p> <p style="margin-left: 40px;">Print Name</p> <p>_____</p> <p style="margin-left: 40px;">Title</p>
---	--

<p>Attest: _____</p> <p style="margin-left: 40px;">Signature</p> <p>_____</p> <p style="margin-left: 40px;">Title</p>	<p>Attest: _____</p> <p style="margin-left: 40px;">Signature</p> <p>_____</p> <p style="margin-left: 40px;">Title</p>
---	---

Note: Addresses are to be used for giving any required notice.

Provide execution by any additional parties, such as joint venturers, if necessary.

1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to pay to Owner upon default of Bidder the penal sum set forth on the face of this Bond. Payment of the penal sum is the extent of Bidder's and Surety's liability. Recovery of such penal sum under the terms of this Bond shall be Owner's sole and exclusive remedy upon default of Bidder.
2. Default of Bidder shall occur upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents.
3. This obligation shall be null and void if:
 - 3.1 Owner accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents, or
 - 3.2 All Bids are rejected by Owner, or
 - 3.3 Owner fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by Paragraph 5 hereof).
4. Payment under this Bond will be due and payable upon default of Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.
5. Surety waives notice of any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by Owner and Bidder, provided that the total time for issuing Notice of Award including extensions shall not in the aggregate exceed 120 days from the Bid due date without Surety's written consent.
6. No suit or action shall be commenced under this Bond prior to 30 calendar days after the notice of default required in Paragraph 4 above is received by Bidder and Surety and in no case later than one year after the Bid due date.
7. Any suit or action under this Bond shall be commenced only in a court of competent jurisdiction located in the state in which the Project is located.
8. Notices required hereunder shall be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier, or by United States Registered or Certified Mail, return receipt requested, postage pre-paid, and shall be deemed to be effective upon receipt by the party concerned.
9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent, or representative who executed this Bond on behalf of Surety to execute, seal, and deliver such Bond and bind the Surety thereby.
10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond shall be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute shall govern and the remainder of this Bond that is not in conflict therewith shall continue in full force and effect.
11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.

NOTICE OF AWARD

Date of Issuance:

Owner: **Schoolcraft County Transit Authority** Owner's Contract No.:

Engineer: **Bittner Engineering, Inc.** Engineer's Project No.: **21-99-2342**

Project: **Existing Building Renovation and Addition** Contract Name: **Existing Building Renovation and Addition**

Bidder:
Bidder's
Address:

TO BIDDER:

You are notified that Owner has accepted your Bid dated [_____] for the above Contract, and that you are the Successful Bidder and are awarded a Contract for:

[describe Work, alternates, or sections of Work awarded]

The Contract Price of the awarded Contract is: \$ _____ *[note if subject to unit prices, or cost-plus]*

[] unexecuted counterparts of the Agreement accompany this Notice of Award, and one copy of the Contract Documents accompanies this Notice of Award, or has been transmitted or made available to Bidder electronically. *[revise if multiple copies accompany the Notice of Award]*

a set of the Drawings will be delivered separately from the other Contract Documents.

You must comply with the following conditions precedent within 15 days of the date of this Notice of Award:

1. Deliver to Owner [_____] counterparts of the Agreement, fully executed by Bidder.
2. Deliver with the executed Agreement(s) the Contract security *[e.g., performance and payment bonds]* and insurance documentation as specified in the Instructions to Bidders and General Conditions, Articles 2 and 6.
3. Other conditions precedent (if any):

Failure to comply with these conditions within the time specified will entitle Owner to consider you in default, annul this Notice of Award, and declare your Bid security forfeited.

Within ten days after you comply with the above conditions, Owner will return to you one fully executed counterpart of the Agreement, together with any additional copies of the Contract Documents as indicated in Paragraph 2.02 of the General Conditions.

Owner: **Schoolcraft County Transit Authority**

Authorized Signature

By:

Title:

Copy: Engineer

AGREEMENT
BETWEEN OWNER AND CONTRACTOR
FOR CONSTRUCTION CONTRACT (STIPULATED PRICE)

THIS AGREEMENT is by and
between

Schoolcraft County Transit Authority (“Owner”) and

 (“Contractor”).

Owner and Contractor hereby agree as follows:

ARTICLE 1 – WORK

1.01 Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows: **Renovation of approximately 1,300 square feet of existing building and construction of 3,600 square feet of addition.**

ARTICLE 2 – THE PROJECT

2.01 The Project, of which the Work under the Contract Documents is a part, is generally described as follows: The renovation of a portion of the existing building and constructing a 60ft. by 60ft. addition

ARTICLE 3 – ENGINEER

3.01 The part of the Project that pertains to the Work has been designed by **Bittner Engineering, Inc.**
3.02 The Owner has retained **Bittner Engineering, Inc.** (“Engineer”) to act as Owner’s representative, assume all duties and responsibilities, and have the rights and authority assigned to Engineer in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.

ARTICLE 4 – CONTRACT TIMES

4.01 *Time of the Essence*

A. All time limits for Milestones, if any, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

4.02 *Contract Times: Dates*

A. The Work will be substantially completed on or before **June 30, 2023** and completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before **August 30, 2023**.

B. Parts of the Work shall be substantially completed on or before the following Milestone(s):

~~1. Milestone 1 [event & date/days]~~

~~2. Milestone 2 [event & date/days]~~

~~3. Milestone 3 [event & date/days]~~

4.03 *Liquidated Damages*

A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above and that Owner will suffer financial and other losses if the Work is not completed and

Milestones not achieved within the times specified in Paragraph 4.02 above, plus any extensions thereof allowed in accordance with the Contract. The parties also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty):

1. Substantial Completion: Contractor shall pay Owner \$ 200 for each day that expires after the time (as duly adjusted pursuant to the Contract) specified in Paragraph 4.02.A above for Substantial Completion until the Work is substantially complete.
 2. Completion of Remaining Work: After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times (as duly adjusted pursuant to the Contract) for completion and readiness for final payment, Contractor shall pay Owner \$ 500 for each day that expires after such time until the Work is completed and ready for final payment.
 3. Liquidated damages for failing to timely attain Substantial Completion and final completion are not additive and will not be imposed concurrently.
 - ~~4. Milestones: Contractor shall pay Owner \$ _____ for each day that expires after the time (as duly adjusted pursuant to the Contract) specified above for achievement of Milestone 1, until Milestone 1 is achieved.~~
- ~~B. Bonus: Contractor and Owner further recognize the Owner will realize financial and other benefits if the Work is completed prior to the time specified for Substantial Completion. Accordingly, Owner and Contractor agree that as a bonus for early completion, Owner shall pay Contractor \$ _____ for each day prior to the time specified in Paragraph 4.02 for Substantial Completion (as duly adjusted pursuant to the Contract) that the Work is substantially complete. The maximum value of the bonus shall be limited to \$ _____.~~

4.04 *Special Damages*

(Deleted)

ARTICLE 5 – CONTRACT PRICE

- 5.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents the amounts that follow, subject to adjustment under the Contract, a fixed price, a lump sum of: \$ _____.

ARTICLE 6 – PAYMENT PROCEDURES

6.01 *Submittal and Processing of Payments*

- A. Contractor shall submit Applications for Payment in accordance with Article 15 of the General Conditions. Applications for Payment will be processed by Engineer as provided in the General Conditions.

6.02 *Progress Payments; Retainage*

- A. Owner shall make progress payments on account of the Contract Price on the basis of Contractor's Applications for Payment on or about the 5th day of each month during performance of the Work as provided in Paragraph 6.02.A.1 below, provided that such

Applications for Payment have been submitted in a timely manner and otherwise meet the requirements of the Contract. All such payments will be measured by the Schedule of Values established as provided in the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no Schedule of Values, as provided elsewhere in the Contract.

1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Owner may withhold, including but not limited to liquidated damages, in accordance with the Contract
 - a. 95 percent of Work completed (with the balance being retainage); ~~If the Work has been 50 percent completed as determined by Engineer, and if the character and progress of the Work have been satisfactory to Owner and Engineer, then as long as the character and progress of the Work remain satisfactory to Owner and Engineer, there will be no additional retainage; and~~
 - b. 95 percent of cost of materials and equipment not incorporated in the Work (with the balance being retainage).
- B. Upon Substantial Completion, Owner shall pay an amount sufficient to increase total payments to Contractor to 100 percent of the Work completed, less such amounts set off by Owner pursuant to Paragraph 15.01.E of the General Conditions, and less 200 percent of Engineer's estimate of the value of Work to be completed or corrected as shown on the punch list of items to be completed or corrected prior to final payment.

6.03 *Final Payment*

- A. Upon final completion and acceptance of the Work in accordance with Paragraph 15.06 of the General Conditions, Owner shall pay the remainder of the Contract Price as recommended by Engineer as provided in said Paragraph 15.06.

ARTICLE 7 – INTEREST

- 7.01 All amounts not paid when due shall bear interest at the rate of 0 percent per annum.

ARTICLE 8 – CONTRACTOR'S REPRESENTATIONS

- 8.01 In order to induce Owner to enter into this Contract, Contractor makes the following representations:
- A. Contractor has examined and carefully studied the Contract Documents, and any data and reference items identified in the Contract Documents.
 - B. Contractor has visited the Site, conducted a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
 - C. Contractor is familiar with and is satisfied as to all Laws and Regulations that may affect cost, progress, and performance of the Work.
 - D. Contractor has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings, and (2) reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings.

ARTICLE 9 – CONTRACT DOCUMENTS

9.01 Contents

- A. The Contract Documents consist of the following:
1. This Agreement (pages 1 to 6, inclusive).
 2. Performance bond (pages 1 to 3, inclusive).
 3. Payment bond (pages 1 to 3, inclusive).
 4. Other bonds.
 - a. Bid Bond (pages 1 to 2, inclusive).

NOTE(S) TO USER:

Such other bonds might include maintenance or warranty bonds intended to manage risk after completion of the Work.

5. General Conditions (pages 1 to 67, inclusive).
 6. Supplementary Conditions (pages 0 to 0, inclusive).
 7. Specifications as listed in the table of contents of the Project Manual.
 8. Drawings (not attached but incorporated by reference) consisting of 20 sheets with each sheet bearing the following general title: **Schoolcraft County Transit Authority Existing Building Renovation and Addition** [or] the Drawings listed on the attached sheet index.
 9. Addenda (numbers ___ to ___, inclusive).
 10. Exhibits to this Agreement (enumerated as follows):
 - a. Contractor's Bid (pages 1 to , inclusive).
 11. The following which may be delivered or issued on or after the Effective Date of the Contract and are not attached hereto:
 - a. Notice to Proceed.
 - b. Work Change Directives.
 - c. Change Orders.
 - d. Field Orders.
- B. The documents listed in Paragraph 9.01.A are attached to this Agreement (except as expressly noted otherwise above).
- C. There are no Contract Documents other than those listed above in this Article 9.
- D. The Contract Documents may only be amended, modified, or supplemented as provided in the General Conditions.

ARTICLE 10 – MISCELLANEOUS

10.01 Terms

- A. Terms used in this Agreement will have the meanings stated in the General Conditions and the Supplementary Conditions.

10.02 *Assignment of Contract*

- A. Unless expressly agreed to elsewhere in the Contract, no assignment by a party hereto of any rights under or interests in the Contract will be binding on another party hereto without the written consent of the party sought to be bound; and, specifically but without limitation, money that may become due and money that is due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

10.03 *Successors and Assigns*

- A. Owner and Contractor each binds itself, its successors, assigns, and legal representatives to the other party hereto, its successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

10.04 *Severability*

- A. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon Owner and Contractor, who agree that the Contract Documents shall be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

10.05 *Contractor's Certifications*

- A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 10.05:
 - 1. "corrupt practice" means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process or in the Contract execution;
 - 2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of Owner, (b) to establish Bid or Contract prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;
 - 3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish Bid prices at artificial, non-competitive levels; and
 - 4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

10.06 *Other Provisions*

- A. Owner stipulates that if the General Conditions that are made a part of this Contract are based on EJCDC® C-700, Standard General Conditions for the Construction Contract, published by the Engineers Joint Contract Documents Committee®, and if Owner is the party that has furnished said General Conditions, then Owner has plainly shown all modifications to the standard wording of such published document to the Contractor, through a process such as highlighting or "track changes" (redline/strikeout), or in the Supplementary Conditions.

All terms and conditions in the Schoolcraft County Transit Authorities prime contract 2017-0125 (see attached) are incorporated in the subcontract. In the event of a conflict between the Terms and Conditions of the subcontract and the prime contract, the prime contract prevails.

IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement.

This Agreement will be effective on _____ (which is the Effective Date of the Contract).

OWNER:

CONTRACTOR:

Schoolcraft County Transit Authority

By: _____

By: _____

Title: **Director**

Title: _____

(If Contractor is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)

Attest: _____

Attest: _____

Title: _____

Title: _____

Address for giving notices:

Address for giving notices:

John Stapleton, Director

335N E Road

Manistique, MI 49854

License No.: _____

(where applicable)

(If Owner is a corporation, attach evidence of authority to sign. If Owner is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of this Agreement.)

NOTICE TO PROCEED

Owner:	Schoolcraft County Transit Authority	Owner's Contract No.:	
Contractor:		Contractor's Project No.:	
Engineer:	Bittner Engineering, Inc.	Engineer's Project No.:	21-99-2342
Project:	Existing Building Renovation and Addition	Contract Name:	Existing Building Renovation and Addition
		Effective Date of Contract:	

TO CONTRACTOR:

Owner hereby notifies Contractor that the Contract Times under the above Contract will commence to run on [_____, 20__]. *[see Paragraph 4.01 of the General Conditions]*

On that date, Contractor shall start performing its obligations under the Contract Documents. No Work shall be done at the Site prior to such date. In accordance with the Agreement, [the date of Substantial Completion is _____, and the date of readiness for final payment is _____] *or* [the number of days to achieve Substantial Completion is _____, and the number of days to achieve readiness for final payment is _____].

Before starting any Work at the Site, Contractor must comply with the following:
[Note any access limitations, security procedures, or other restrictions]

Owner: **Schoolcraft County Transit Authority**

Authorized Signature

By:

Title:

Date Issued:

Copy: **Bittner Engineering, Inc.**

PERFORMANCE BOND

CONTRACTOR *(name and address):*

SURETY *(name and address of principal place of business):*

OWNER: **Schoolcraft County Transit Authority, 335N E Road, Manistique, MI 49854**

CONSTRUCTION CONTRACT

Effective Date of the Agreement:

Amount:

Description *(name and location)*: **Existing Building Renovation and Addition – 335N E Road, Manistique, MI 49854**

BOND

Bond Number:

Date *(not earlier than the Effective Date of the Agreement of the Construction Contract)*:

Amount:

Modifications to this Bond Form: None See Paragraph 16

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL

SURETY

Contractor's Name and Corporate Seal *(seal)*

Surety's Name and Corporate Seal *(seal)*

By: _____
Signature

By: _____
Signature *(attach power of attorney)*

Print Name

Print Name

Title

Title

Attest: _____
Signature

Attest: _____
Signature

Title

Title

Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

2. If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Paragraph 3.

3. If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after:

3.1 The Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor, and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Paragraph 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor, and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;

3.2 The Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and

3.3 The Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

4. Failure on the part of the Owner to comply with the notice requirement in Paragraph 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

5. When the Owner has satisfied the conditions of Paragraph 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owners concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Paragraph 7 in excess of the Balance of

the Contract Price incurred by the Owner as a result of the Contractor Default; or

5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and with reasonable promptness under the circumstances:

5.4.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or

5.4.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

6. If the Surety does not proceed as provided in Paragraph 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Paragraph 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

7. If the Surety elects to act under Paragraph 5.1, 5.2, or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication for:

7.1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;

7.2 additional legal, design professional, and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Paragraph 5; and

7.3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

8. If the Surety elects to act under Paragraph 5.1, 5.3, or 5.4, the Surety's liability is limited to the amount of this Bond.

9. The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors, and assigns.

10. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.

11. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within

two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum periods of limitations available to sureties as a defense in the jurisdiction of the suit shall be applicable.

12. Notice to the Surety, the Owner, or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

14. Definitions

14.1 Balance of the Contract Price: The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made including allowance for the Contractor for any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

14.2 Construction Contract: The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

14.3 Contractor Default: Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

14.4 Owner Default: Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

14.5 Contract Documents: All the documents that comprise the agreement between the Owner and Contractor.

15. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

16. Modifications to this Bond are as follows:

PAYMENT BOND

CONTRACTOR *(name and address)*:

SURETY *(name and address of principal place of business)*:

OWNER: **Schoolcraft County Transit Authority, 335N E Road, Manistique, MI 49854**

CONSTRUCTION CONTRACT

Effective Date of the Agreement:

Amount:

Description *(name and location)*: **Existing Building Renovation and Addition**

BOND

Bond Number:

Date *(not earlier than the Effective Date of the Agreement of the Construction Contract)*:

Amount:

Modifications to this Bond Form: None See Paragraph 18

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL

SURETY

Contractor's Name and Corporate Seal *(seal)*

Surety's Name and Corporate Seal *(seal)*

By: _____
Signature

By: _____
Signature *(attach power of attorney)*

Print Name

Print Name

Title

Title

Attest: _____
Signature

Attest: _____
Signature

Title

Title

Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner to pay for labor, materials, and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.
2. If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies, and holds harmless the Owner from claims, demands, liens, or suits by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.
3. If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Paragraph 13) of claims, demands, liens, or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, and tendered defense of such claims, demands, liens, or suits to the Contractor and the Surety.
4. When the Owner has satisfied the conditions in Paragraph 3, the Surety shall promptly and at the Surety's expense defend, indemnify, and hold harmless the Owner against a duly tendered claim, demand, lien, or suit.
5. The Surety's obligations to a Claimant under this Bond shall arise after the following:
 - 5.1 Claimants who do not have a direct contract with the Contractor,
 - 5.1.1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
 - 5.1.2 have sent a Claim to the Surety (at the address described in Paragraph 13).
 - 5.2 Claimants who are employed by or have a direct contract with the Contractor have sent a Claim to the Surety (at the address described in Paragraph 13).
6. If a notice of non-payment required by Paragraph 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Paragraph 5.1.1.
7. When a Claimant has satisfied the conditions of Paragraph 5.1 or 5.2, whichever is applicable, the Surety shall

promptly and at the Surety's expense take the following actions:

- 7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and
- 7.2 Pay or arrange for payment of any undisputed amounts.
- 7.3 The Surety's failure to discharge its obligations under Paragraph 7.1 or 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Paragraph 7.1 or 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.
8. The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Paragraph 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.
9. Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.
10. The Surety shall not be liable to the Owner, Claimants, or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to or give notice on behalf of Claimants, or otherwise have any obligations to Claimants under this Bond.
11. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.
12. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Paragraph 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph

are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

13. Notice and Claims to the Surety, the Owner, or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.
14. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.
15. Upon requests by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

16. Definitions

16.1 **Claim:** A written statement by the Claimant including at a minimum:

1. The name of the Claimant;
2. The name of the person for whom the labor was done, or materials or equipment furnished;
3. A copy of the agreement or purchase order pursuant to which labor, materials, or equipment was furnished for use in the performance of the Construction Contract;
4. A brief description of the labor, materials, or equipment furnished;
5. The date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
6. The total amount earned by the Claimant for labor, materials, or equipment furnished as of the date of the Claim;
7. The total amount of previous payments received by the Claimant; and
8. The total amount due and unpaid to the Claimant for labor, materials, or equipment furnished as of the date of the Claim.

16.2 **Claimant:** An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials, or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms of "labor, materials, or equipment" that part of the water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the

Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.

16.3 **Construction Contract:** The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

16.4 **Owner Default:** Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

16.5 **Contract Documents:** All the documents that comprise the agreement between the Owner and Contractor.

17. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

18. Modifications to this Bond are as follows:

CERTIFICATE OF SUBSTANTIAL COMPLETION

Owner:	Schoolcraft County Transit Authority	Owner's Contract No.:	
Contractor:		Contractor's Project No.:	
Engineer:	Bittner Engineering, Inc.	Engineer's Project No.:	21-99-2342
Project:	Existing Building Renovation and Addition	Contract Name:	

This [preliminary] [final] Certificate of Substantial Completion applies to:

All Work The following specified portions of the Work:

Date of Substantial Completion

The Work to which this Certificate applies has been inspected by authorized representatives of Owner, Contractor, and Engineer, and found to be substantially complete. The Date of Substantial Completion of the Work or portion thereof designated above is hereby established, subject to the provisions of the Contract pertaining to Substantial Completion. The date of Substantial Completion in the final Certificate of Substantial Completion marks the commencement of the contractual correction period and applicable warranties required by the Contract.

A punch list of items to be completed or corrected is attached to this Certificate. This list may not be all-inclusive, and the failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract.

The responsibilities between Owner and Contractor for security, operation, safety, maintenance, heat, utilities, insurance, and warranties upon Owner's use or occupancy of the Work shall be as provided in the Contract, except as amended as follows: *[Note: Amendments of contractual responsibilities recorded in this Certificate should be the product of mutual agreement of Owner and Contractor; see Paragraph 15.03.D of the General Conditions.]*

Amendments to Owner's responsibilities: None
 As follows

Amendments to Contractor's responsibilities: None
 As follows:

The following documents are attached to and made a part of this Certificate: *[punch list; others]*

This Certificate does not constitute an acceptance of Work not in accordance with the Contract Documents, nor is it a release of Contractor's obligation to complete the Work in accordance with the Contract.

EXECUTED BY ENGINEER:		RECEIVED:		RECEIVED:	
By: _____	By: _____	By: _____	By: _____	By: _____	By: _____
(Authorized signature)	Owner (Authorized Signature)	Owner (Authorized Signature)	Owner (Authorized Signature)	Contractor (Authorized Signature)	Contractor (Authorized Signature)
Title: _____	Title: _____	Title: _____	Title: _____	Title: _____	Title: _____
Date: _____	Date: _____	Date: _____	Date: _____	Date: _____	Date: _____

This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by



Issued and Published Jointly by



Endorsed by



These General Conditions have been prepared for use with the Agreement Between Owner and Contractor for Construction Contract (EJCDC® C-520, Stipulated Sum, or C-525, Cost-Plus, 2013 Editions). Their provisions are interrelated and a change in one may necessitate a change in the other.

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ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

- A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
 2. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.
 3. *Application for Payment*—The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
 4. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
 5. *Bidder*—An individual or entity that submits a Bid to Owner.
 6. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.
 7. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.
 8. *Change Order*—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.
 9. *Change Proposal*—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.
 10. *Claim*—(a) A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein: seeking an adjustment of Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract; or (b) a demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision regarding a Change Proposal; or seeking resolution of a contractual issue that Engineer has declined to address. A demand for money or services by a third party is not a Claim.

11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to (a) the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. §§9601 et seq. (“CERCLA”); (b) the Hazardous Materials Transportation Act, 49 U.S.C. §§5101 et seq.; (c) the Resource Conservation and Recovery Act, 42 U.S.C. §§6901 et seq. (“RCRA”); (d) the Toxic Substances Control Act, 15 U.S.C. §§2601 et seq.; (e) the Clean Water Act, 33 U.S.C. §§1251 et seq.; (f) the Clean Air Act, 42 U.S.C. §§7401 et seq.; or (g) any other federal, state, or local statute, law, rule, regulation, ordinance, resolution, code, order, or decree regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.
12. *Contract*—The entire and integrated written contract between the Owner and Contractor concerning the Work.
13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.
14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents. .
15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.
16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.
17. *Cost of the Work*—See Paragraph 13.01 for definition.
18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.
19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.
20. *Engineer*—The individual or entity named as such in the Agreement.
21. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.
22. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated in the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, does not establish a Hazardous Environmental Condition.
23. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
24. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.
25. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date or by a time prior to Substantial Completion of all the Work.

26. *Notice of Award*—The written notice by Owner to a Bidder of Owner’s acceptance of the Bid.
27. *Notice to Proceed*—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.
28. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.
29. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor’s plan to accomplish the Work within the Contract Times.
30. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.
31. *Project Manual*—The written documents prepared for, or made available for, procuring and constructing the Work, including but not limited to the Bidding Documents or other construction procurement documents, geotechnical and existing conditions information, the Agreement, bond forms, General Conditions, Supplementary Conditions, and Specifications. The contents of the Project Manual may be bound in one or more volumes.
32. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative or “RPR” includes any assistants or field staff of Resident Project Representative.
33. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.
34. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer’s review of the submittals and the performance of related construction activities.
35. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor’s Applications for Payment.
36. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.
37. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands furnished by Owner which are designated for the use of Contractor.
38. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.
39. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.

40. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the Work refer to Substantial Completion thereof.
41. *Successful Bidder*—The Bidder whose Bid the Owner accepts, and to which the Owner makes an award of contract, subject to stated conditions.
42. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.
43. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.
44. *Technical Data*—Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (a) subsurface conditions at the Site, or physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) or (b) Hazardous Environmental Conditions at the Site. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then the data contained in boring logs, recorded measurements of subsurface water levels, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical or environmental report prepared for the Project and made available to Contractor are hereby defined as Technical Data with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06.
45. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including but not limited to those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, fiber optic transmissions, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
46. *Unit Price Work*—Work to be paid for on the basis of unit prices.
47. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.
48. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

1.02 Terminology

- A. The words and terms discussed in the following paragraphs are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.
- B. *Intent of Certain Terms or Adjectives*:
 1. The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,”

“acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.

C. *Day:*

1. The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.

D. *Defective:*

1. The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
 - a. does not conform to the Contract Documents; or
 - b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
 - c. has been damaged prior to Engineer’s recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 15.03 or 15.04).

E. *Furnish, Install, Perform, Provide:*

1. The word “furnish,” when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
2. The word “install,” when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.
4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words “furnish,” “install,” “perform,” or “provide,” then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.

- F. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 – PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

- A. *Bonds:* When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.

- B. *Evidence of Contractor's Insurance:* When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract), the certificates and other evidence of insurance required to be provided by Contractor in accordance with Article 6.
- C. *Evidence of Owner's Insurance:* After receipt of the executed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or otherwise), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

2.02 *Copies of Documents*

- A. Owner shall furnish to Contractor four printed copies of the Contract (including one fully executed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.
- B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications signed and sealed by Engineer and other design professionals. Owner shall make such original printed record version of the Contract available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.

2.03 *Before Starting Construction*

- A. *Preliminary Schedules:* Within 10 days after the Effective Date of the Contract (or as otherwise specifically required by the Contract Documents), Contractor shall submit to Engineer for timely review:
 - 1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;
 - 2. a preliminary Schedule of Submittals; and
 - 3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.04 *Preconstruction Conference; Designation of Authorized Representatives*

- A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.03.A, procedures for handling Shop Drawings, Samples, and other submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.
- B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.05 *Initial Acceptance of Schedules*

- A. At least 10 days before submission of the first Application for Payment a conference, attended by Contractor, Engineer, and others as appropriate, will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.03.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.
 - 1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.
 - 2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
 - 3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.

2.06 *Electronic Transmittals*

- A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may transmit, and shall accept, Project-related correspondence, text, data, documents, drawings, information, and graphics, including but not limited to Shop Drawings and other submittals, in electronic media or digital format, either directly, or through access to a secure Project website.
- B. If the Contract does not establish protocols for electronic or digital transmittals, then Owner, Engineer, and Contractor shall jointly develop such protocols.
- C. When transmitting items in electronic media or digital format, the transmitting party makes no representations as to long term compatibility, usability, or readability of the items resulting from the recipient's use of software application packages, operating systems, or computer hardware differing from those used in the drafting or transmittal of the items, or from those established in applicable transmittal protocols.

ARTICLE 3 – DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

- A. The Contract Documents are complementary; what is required by one is as binding as if required by all.
- B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents.
- C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic or digital versions of the Contract Documents (including any printed copies derived from such electronic or digital versions) and the printed record version, the printed record version shall govern.
- D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.
- E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.

3.02 *Reference Standards*

A. Standards Specifications, Codes, Laws and Regulations

1. Reference in the Contract Documents to standard specifications, manuals, reference standards, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard specification, manual, reference standard, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Contract if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.
2. No provision of any such standard specification, manual, reference standard, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the part of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the part of the Contract Documents prepared by or for Engineer.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies:*

1. *Contractor's Verification of Figures and Field Measurements:* Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.
2. *Contractor's Review of Contract Documents:* If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.
3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies:*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the part of the Contract Documents prepared by or for Engineer shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:

- a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); or
- b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Requirements of the Contract Documents*

- A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work thereunder.
- B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.
- C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly give written notice to Owner and Contractor that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

3.05 *Reuse of Documents*

- A. Contractor and its Subcontractors and Suppliers shall not:
 1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions, or reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer; or
 2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without Owner's express written consent, or violate any copyrights pertaining to such Contract Documents.
- B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

ARTICLE 4 – COMMENCEMENT AND PROGRESS OF THE WORK

4.01 *Commencement of Contract Times; Notice to Proceed*

- A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Contract or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Contract. In no event will the Contract Times commence to run later than the sixtieth day

after the day of Bid opening or the thirtieth day after the Effective Date of the Contract, whichever date is earlier.

4.02 *Starting the Work*

- A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to such date.

4.03 *Reference Points*

- A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.04 *Progress Schedule*

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 as it may be adjusted from time to time as provided below.
 - 1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.
 - 2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 11.
- B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

4.05 *Delays in Contractor's Progress*

- A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Times and Contract Price. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.
- C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:

1. severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;
 2. abnormal weather conditions;
 3. acts or failures to act of utility owners (other than those performing other work at or adjacent to the Site by arrangement with the Owner, as contemplated in Article 8); and
 4. acts of war or terrorism.
- D. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5.
- E. Paragraph 8.03 governs delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.
- F. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor.
- G. Contractor must submit any Change Proposal seeking an adjustment in Contract Price or Contract Times under this paragraph within 30 days of the commencement of the delaying, disrupting, or interfering event.

ARTICLE 5 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

5.01 *Availability of Lands*

- A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.
- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

5.02 *Use of Site and Other Areas*

- A. *Limitation on Use of Site and Other Areas:*
 1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.

2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.12, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or at law; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.
- B. *Removal of Debris During Performance of the Work:* During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.
 - C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.
 - D. *Loading of Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent structures or land to stresses or pressures that will endanger them.

5.03 *Subsurface and Physical Conditions*

- A. *Reports and Drawings:* The Supplementary Conditions identify:
 1. those reports known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site;
 2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities); and
 3. Technical Data contained in such reports and drawings.
- B. *Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:
 1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and

procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

5.04 *Differing Subsurface or Physical Conditions*

A. *Notice by Contractor:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site either:

1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate; or
2. is of such a nature as to require a change in the Drawings or Specifications; or
3. differs materially from that shown or indicated in the Contract Documents; or
4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

B. *Engineer's Review:* After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine the necessity of Owner's obtaining additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A above; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.

C. *Owner's Statement to Contractor Regarding Site Condition:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.

D. *Possible Price and Times Adjustments:*

1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, or both, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
 - a. such condition must fall within any one or more of the categories described in Paragraph 5.04.A;

- b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,
 - c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:
 - a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise; or
 - b. the existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or
 - c. Contractor failed to give the written notice as required by Paragraph 5.04.A.
 3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.
 4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.

5.05 *Underground Facilities*

- A. *Contractor's Responsibilities:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or adjacent to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:
 1. Owner and Engineer do not warrant or guarantee the accuracy or completeness of any such information or data provided by others; and
 2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
 - a. reviewing and checking all information and data regarding existing Underground Facilities at the Site;
 - b. locating all Underground Facilities shown or indicated in the Contract Documents as being at the Site;
 - c. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and
 - d. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.
- B. *Notice by Contractor:* If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, then Contractor shall, promptly after becoming

aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer.

- C. *Engineer's Review:* Engineer will promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the Underground Facility in question; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and advise Owner in writing of Engineer's findings, conclusions, and recommendations. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.
- D. *Owner's Statement to Contractor Regarding Underground Facility:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question, addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.
- E. *Possible Price and Times Adjustments:*
 - 1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, or both, to the extent that any existing Underground Facility at the Site that was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
 - a. Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated the existence or actual location of the Underground Facility in question;
 - b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03;
 - c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times; and
 - d. Contractor gave the notice required in Paragraph 5.05.B.
 - 2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.
 - 3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.

5.06 *Hazardous Environmental Conditions at Site*

- A. *Reports and Drawings*: The Supplementary Conditions identify:
1. those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and
 2. Technical Data contained in such reports and drawings.
- B. *Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:
1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or
 2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or
 3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.
- C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.
- D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.
- E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.
- F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related

- thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.
- G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off.
- H. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.
- I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.I shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 6 – BONDS AND INSURANCE

6.01 Performance, Payment, and Other Bonds

- A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of all of Contractor's obligations under the Contract. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by

Laws or Regulations, the Supplementary Conditions, or other specific provisions of the Contract. Contractor shall also furnish such other bonds as are required by the Supplementary Conditions or other specific provisions of the Contract.

- B. All bonds shall be in the form prescribed by the Contract except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in “Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies” as published in Circular 570 (as amended and supplemented) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual’s authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.
- C. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds in the required amounts.
- D. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or its right to do business is terminated in any state or jurisdiction where any part of the Project is located, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the bond and surety requirements above.
- E. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner’s termination rights under Article 16.
- F. Upon request, Owner shall provide a copy of the payment bond to any Subcontractor, Supplier, or other person or entity claiming to have furnished labor or materials used in the performance of the Work.

6.02 *Insurance—General Provisions*

- A. Owner and Contractor shall obtain and maintain insurance as required in this Article and in the Supplementary Conditions.
- B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.
- C. Contractor shall deliver to Owner, with copies to each named insured and additional insured (as identified in this Article, in the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Contractor has obtained and is maintaining the policies, coverages, and endorsements required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Contractor may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.
- D. Owner shall deliver to Contractor, with copies to each named insured and additional insured (as identified in this Article, the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Owner has obtained and is maintaining the policies, coverages, and endorsements required of Owner by the Contract (if any). Upon request by

Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Owner may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.

- E. Failure of Owner or Contractor to demand such certificates or other evidence of the other party's full compliance with these insurance requirements, or failure of Owner or Contractor to identify a deficiency in compliance from the evidence provided, shall not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.
- F. If either party does not purchase or maintain all of the insurance required of such party by the Contract, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage.
- G. If Contractor has failed to obtain and maintain required insurance, Owner may exclude the Contractor from the Site, impose an appropriate set-off against payment, and exercise Owner's termination rights under Article 16.
- H. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect to obtain equivalent insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and the Contract Price shall be adjusted accordingly.
- I. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests.
- J. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner and other individuals and entities in the Contract.

6.03 *Contractor's Insurance*

- A. *Workers' Compensation:* Contractor shall purchase and maintain workers' compensation and employer's liability insurance for:
 - 1. claims under workers' compensation, disability benefits, and other similar employee benefit acts.
 - 2. United States Longshoreman and Harbor Workers' Compensation Act and Jones Act coverage (if applicable).
 - 3. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees (by stop-gap endorsement in monopolist worker's compensation states).
 - 4. Foreign voluntary worker compensation (if applicable).
- B. *Commercial General Liability—Claims Covered:* Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against:
 - 1. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees.
 - 2. claims for damages insured by reasonably available personal injury liability coverage.
 - 3. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.

- C. *Commercial General Liability—Form and Content*: Contractor’s commercial liability policy shall be written on a 1996 (or later) ISO commercial general liability form (occurrence form) and include the following coverages and endorsements:
1. Products and completed operations coverage:
 - a. Such insurance shall be maintained for three years after final payment.
 - b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.
 2. Blanket contractual liability coverage, to the extent permitted by law, including but not limited to coverage of Contractor’s contractual indemnity obligations in Paragraph 7.18.
 3. Broad form property damage coverage.
 4. Severability of interest.
 5. Underground, explosion, and collapse coverage.
 6. Personal injury coverage.
 7. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 10 01 and CG 20 37 10 01 (together); or CG 20 10 07 04 and CG 20 37 07 04 (together); or their equivalent.
 8. For design professional additional insureds, ISO Endorsement CG 20 32 07 04, “Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured” or its equivalent.
- D. *Automobile liability*: Contractor shall purchase and maintain automobile liability insurance against claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle. The automobile liability policy shall be written on an occurrence basis.
- E. *Umbrella or excess liability*: Contractor shall purchase and maintain umbrella or excess liability insurance written over the underlying employer’s liability, commercial general liability, and automobile liability insurance described in the paragraphs above. Subject to industry-standard exclusions, the coverage afforded shall follow form as to each and every one of the underlying policies.
- F. *Contractor’s pollution liability insurance*: Contractor shall purchase and maintain a policy covering third-party injury and property damage claims, including clean-up costs, as a result of pollution conditions arising from Contractor’s operations and completed operations. This insurance shall be maintained for no less than three years after final completion.
- G. *Additional insureds*: The Contractor’s commercial general liability, automobile liability, umbrella or excess, and pollution liability policies shall include and list as additional insureds Owner and Engineer, and any individuals or entities identified in the Supplementary Conditions; include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds; and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby (including as applicable those arising from both ongoing and completed operations) on a non-contributory basis. Contractor shall obtain all necessary endorsements to support these requirements.
- H. *Contractor’s professional liability insurance*: If Contractor will provide or furnish professional services under this Contract, through a delegation of professional design services or otherwise, then Contractor shall be responsible for purchasing and maintaining

applicable professional liability insurance. This insurance shall provide protection against claims arising out of performance of professional design or related services, and caused by a negligent error, omission, or act for which the insured party is legally liable. It shall be maintained throughout the duration of the Contract and for a minimum of two years after Substantial Completion. If such professional design services are performed by a Subcontractor, and not by Contractor itself, then the requirements of this paragraph may be satisfied through the purchasing and maintenance of such insurance by such Subcontractor.

- I. *General provisions:* The policies of insurance required by this Paragraph 6.03 shall:
1. include at least the specific coverages provided in this Article.
 2. be written for not less than the limits of liability provided in this Article and in the Supplementary Conditions, or required by Laws or Regulations, whichever is greater.
 3. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed, or renewal refused until at least 10 days prior written notice has been given to Contractor. Within three days of receipt of any such written notice, Contractor shall provide a copy of the notice to Owner, Engineer, and each other insured under the policy.
 4. remain in effect at least until final payment (and longer if expressly required in this Article) and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract Documents.
 5. be appropriate for the Work being performed and provide protection from claims that may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable.
- J. The coverage requirements for specific policies of insurance must be met by such policies, and not by reference to excess or umbrella insurance provided in other policies.

6.04 *Owner's Liability Insurance*

- A. In addition to the insurance required to be provided by Contractor under Paragraph 6.03, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.
- B. Owner's liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner's liability policies for any of Contractor's obligations to the Owner, Engineer, or third parties.

6.05 *Property Insurance*

- A. *Builder's Risk:* Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the full insurable replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:
1. include the Owner and Contractor as named insureds, and all Subcontractors, and any individuals or entities required by the Supplementary Conditions to be insured under such builder's risk policy, as insureds or named insureds. For purposes of the remainder of this Paragraph 6.05, Paragraphs 6.06 and 6.07, and any corresponding

Supplementary Conditions, the parties required to be insured shall collectively be referred to as “insureds.”

2. be written on a builder’s risk “all risk” policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire; lightning; windstorm; riot; civil commotion; terrorism; vehicle impact; aircraft; smoke; theft; vandalism and malicious mischief; mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; flood; collapse; explosion; debris removal; demolition occasioned by enforcement of Laws and Regulations; water damage (other than that caused by flood); and such other perils or causes of loss as may be specifically required by the Supplementary Conditions. If insurance against mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; or flood, are not commercially available under builder’s risk policies, by endorsement or otherwise, such insurance may be provided through other insurance policies acceptable to Owner and Contractor.
 3. cover, as insured property, at least the following: (a) the Work and all materials, supplies, machinery, apparatus, equipment, fixtures, and other property of a similar nature that are to be incorporated into or used in the preparation, fabrication, construction, erection, or completion of the Work, including Owner-furnished or assigned property; (b) spare parts inventory required within the scope of the Contract; and (c) temporary works which are not intended to form part of the permanent constructed Work but which are intended to provide working access to the Site, or to the Work under construction, or which are intended to provide temporary support for the Work under construction, including scaffolding, form work, fences, shoring, falsework, and temporary structures.
 4. cover expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects).
 5. extend to cover damage or loss to insured property while in temporary storage at the Site or in a storage location outside the Site (but not including property stored at the premises of a manufacturer or Supplier).
 6. extend to cover damage or loss to insured property while in transit.
 7. allow for partial occupation or use of the Work by Owner, such that those portions of the Work that are not yet occupied or used by Owner shall remain covered by the builder’s risk insurance.
 8. allow for the waiver of the insurer’s subrogation rights, as set forth below.
 9. provide primary coverage for all losses and damages caused by the perils or causes of loss covered.
 10. not include a co-insurance clause.
 11. include an exception for ensuing losses from physical damage or loss with respect to any defective workmanship, design, or materials exclusions.
 12. include performance/hot testing and start-up.
 13. be maintained in effect, subject to the provisions herein regarding Substantial Completion and partial occupancy or use of the Work by Owner, until the Work is complete.
- B. *Notice of Cancellation or Change:* All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph

6.05 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured.

- C. *Deductibles*: The purchaser of any required builder's risk or property insurance shall pay for costs not covered because of the application of a policy deductible.
- D. *Partial Occupancy or Use by Owner*: If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide notice of such occupancy or use to the builder's risk insurer. The builder's risk insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy; rather, those portions of the Work that are occupied or used by Owner may come off the builder's risk policy, while those portions of the Work not yet occupied or used by Owner shall remain covered by the builder's risk insurance.
- E. *Additional Insurance*: If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.05, it may do so at Contractor's expense.
- F. *Insurance of Other Property*: If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, such as tools, construction equipment, or other personal property owned by Contractor, a Subcontractor, or an employee of Contractor or a Subcontractor, then the entity or individual owning such property item will be responsible for deciding whether to insure it, and if so in what amount.

6.06 *Waiver of Rights*

- A. All policies purchased in accordance with Paragraph 6.05, expressly including the builder's risk policy, shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any insureds thereunder, or against Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all Subcontractors, all individuals or entities identified in the Supplementary Conditions as insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.
- B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for:
 - 1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and
 - 2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial

occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06.

- C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 6.06.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them.
- D. Contractor shall be responsible for assuring that the agreement under which a Subcontractor performs a portion of the Work contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by builder's risk insurance and any other property insurance applicable to the Work.

6.07 *Receipt and Application of Property Insurance Proceeds*

- A. Any insured loss under the builder's risk and other policies of insurance required by Paragraph 6.05 will be adjusted and settled with the named insured that purchased the policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.
- B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.05 shall distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.
- C. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the money so received applied on account thereof, and the Work and the cost thereof covered by Change Order, if needed.

ARTICLE 7 – CONTRACTOR'S RESPONSIBILITIES

7.01 *Supervision and Superintendence*

- A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

7.02 *Labor; Working Hours*

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.

- B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

7.03 *Services, Materials, and Equipment*

- A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start up, and completion of the Work, whether or not such items are specifically called for in the Contract Documents.
- B. All materials and equipment incorporated into the Work shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.
- C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

7.04 *"Or Equals"*

- A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or equal" item is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment, or items from other proposed suppliers under the circumstances described below.
 - 1. If Engineer in its sole discretion determines that an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer shall deem it an "or equal" item. For the purposes of this paragraph, a proposed item of material or equipment will be considered functionally equal to an item so named if:
 - a. in the exercise of reasonable judgment Engineer determines that:
 - 1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;
 - 2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;
 - 3) it has a proven record of performance and availability of responsive service; and
 - 4) it is not objectionable to Owner.

- b. Contractor certifies that, if approved and incorporated into the Work:
 - 1) there will be no increase in cost to the Owner or increase in Contract Times; and
 - 2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.
- B. *Contractor's Expense*: Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.
- C. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an "or-equal", which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.
- D. *Effect of Engineer's Determination*: Neither approval nor denial of an "or-equal" request shall result in any change in Contract Price. The Engineer's denial of an "or-equal" request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents.
- E. *Treatment as a Substitution Request*: If Engineer determines that an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer consider the proposed item as a substitute pursuant to Paragraph 7.05.

7.05 *Substitutes*

- A. Unless the specification or description of an item of material or equipment required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment under the circumstances described below. To the extent possible such requests shall be made before commencement of related construction at the Site.
 - 1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of material or equipment from anyone other than Contractor.
 - 2. The requirements for review by Engineer will be as set forth in Paragraph 7.05.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.
 - 3. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:
 - a. shall certify that the proposed substitute item will:
 - 1) perform adequately the functions and achieve the results called for by the general design,
 - 2) be similar in substance to that specified, and
 - 3) be suited to the same use as that specified.

- b. will state:
 - 1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times,
 - 2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and
 - 3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.
 - c. will identify:
 - 1) all variations of the proposed substitute item from that specified, and
 - 2) available engineering, sales, maintenance, repair, and replacement services.
 - d. shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.
- B. *Engineer's Evaluation and Determination:* Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.
- C. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- D. *Reimbursement of Engineer's Cost:* Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.
- E. *Contractor's Expense:* Contractor shall provide all data in support of any proposed substitute at Contractor's expense.
- F. *Effect of Engineer's Determination:* If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.05.D, by timely submittal of a Change Proposal.

7.06 *Concerning Subcontractors, Suppliers, and Others*

- A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner.

- B. Contractor shall retain specific Subcontractors, Suppliers, or other individuals or entities for the performance of designated parts of the Work if required by the Contract to do so.
- C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against which Contractor has reasonable objection.
- D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable, during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within five days.
- E. Owner may require the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors, Suppliers, or other individuals or entities for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor, Supplier, or other individual or entity so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity.
- F. If Owner requires the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, or both, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.
- G. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.
- H. On a monthly basis Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.
- I. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions.
- J. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors, Suppliers, and all other individuals or entities performing or furnishing any of the Work.
- K. Contractor shall restrict all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed herein.
- L. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.
- M. All Work performed for Contractor by a Subcontractor or Supplier shall be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the

applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer.

- N. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor on account of Work performed for Contractor by the particular Subcontractor or Supplier.
- O. Nothing in the Contract Documents:
 - 1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier, or other individual or entity; nor
 - 2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

7.07 *Patent Fees and Royalties*

- A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.
- B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.
- C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

7.08 *Permits*

- A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work

7.09 *Taxes*

- A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

7.10 *Laws and Regulations*

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.
- B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work or other action. It shall not be Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.
- C. Owner or Contractor may give notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

7.11 *Record Documents*

- A. Contractor shall maintain in a safe place at the Site one printed record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, written interpretations and clarifications, and approved Shop Drawings. Contractor shall keep such record documents in good order and annotate them to show changes made during construction. These record documents, together with all approved Samples, will be available to Engineer for reference. Upon completion of the Work, Contractor shall deliver these record documents to Engineer.

7.12 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:
 - 1. all persons on the Site or who may be affected by the Work;
 - 2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and

3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify Owner; the owners of adjacent property, Underground Facilities, and other utilities; and other contractors and utility owners performing work at or adjacent to the Site, when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.
 - C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.
 - D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.
 - E. All damage, injury, or loss to any property referred to in Paragraph 7.12.A.2 or 7.12.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).
 - F. Contractor's duties and responsibilities for safety and protection shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 15.06.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).
 - G. Contractor's duties and responsibilities for safety and protection shall resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

7.13 *Safety Representative*

- A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

7.14 *Hazard Communication Programs*

- A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

7.15 *Emergencies*

- A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Engineer determines that a change in the

Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

7.16 *Shop Drawings, Samples, and Other Submittals*

A. *Shop Drawing and Sample Submittal Requirements:*

1. Before submitting a Shop Drawing or Sample, Contractor shall have:
 - a. reviewed and coordinated the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
 - b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
 - c. determined and verified the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
 - d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.
2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that submittal, and that Contractor approves the submittal.
3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be set forth in a written communication separate from the Shop Drawings or Sample submittal; and, in addition, in the case of Shop Drawings by a specific notation made on each Shop Drawing submitted to Engineer for review and approval of each such variation.

B. *Submittal Procedures for Shop Drawings and Samples:* Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals. Each submittal will be identified as Engineer may require.

1. *Shop Drawings:*

- a. Contractor shall submit the number of copies required in the Specifications.
- b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 7.16.D.

2. *Samples:*

- a. Contractor shall submit the number of Samples required in the Specifications.
- b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 7.16.D.

3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

- C. *Other Submittals*: Contractor shall submit other submittals to Engineer in accordance with the accepted Schedule of Submittals, and pursuant to the applicable terms of the Specifications.
- D. *Engineer's Review*:
1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
 2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction or to safety precautions or programs incident thereto.
 3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
 4. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will document any such approved variation from the requirements of the Contract Documents in a Field Order.
 5. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 7.16.A and B.
 6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, shall not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.
 7. Neither Engineer's receipt, review, acceptance or approval of a Shop Drawing, Sample, or other submittal shall result in such item becoming a Contract Document.
 8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.D.4.
- E. *Resubmittal Procedures*:
1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.
 2. Contractor shall furnish required submittals with sufficient information and accuracy to obtain required approval of an item with no more than three submittals. Engineer will record Engineer's time for reviewing a fourth or subsequent submittal of a Shop Drawings, sample, or other item requiring approval, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges.
 3. If Contractor requests a change of a previously approved submittal item, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner

may impose a set-off against payments due to Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

7.17 *Contractor's General Warranty and Guarantee*

- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on Contractor's warranty and guarantee.
- B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
 - 1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
 - 2. normal wear and tear under normal usage.
- C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:
 - 1. observations by Engineer;
 - 2. recommendation by Engineer or payment by Owner of any progress or final payment;
 - 3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
 - 4. use or occupancy of the Work or any part thereof by Owner;
 - 5. any review and approval of a Shop Drawing or Sample submittal;
 - 6. the issuance of a notice of acceptability by Engineer;
 - 7. any inspection, test, or approval by others; or
 - 8. any correction of defective Work by Owner.
- D. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract shall govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

7.18 *Indemnification*

- A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable.
- B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor

or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

- C. The indemnification obligations of Contractor under Paragraph 7.18.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:
1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or
 2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

7.19 *Delegation of Professional Design Services*

- A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable Laws and Regulations.
- B. If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.
- C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.
- D. Pursuant to this paragraph, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 7.16.D.1.
- E. Contractor shall not be responsible for the adequacy of the performance or design criteria specified by Owner or Engineer.

ARTICLE 8 – OTHER WORK AT THE SITE

8.01 *Other Work*

- A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may

also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.

- B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any utility work at or adjacent to the Site, Owner shall provide such information to Contractor.
- C. Contractor shall afford each other contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.
- D. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 8, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

8.02 *Coordination*

- A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:
 - 1. the identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;
 - 2. an itemization of the specific matters to be covered by such authority and responsibility; and
 - 3. the extent of such authority and responsibilities.
- B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

8.03 *Legal Relationships*

- A. If, in the course of performing other work at or adjacent to the Site for Owner, the Owner's employees, any other contractor working for Owner, or any utility owner for whom the Owner is responsible causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment shall take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final

negotiation of the terms of the Contract. When applicable, any such equitable adjustment in Contract Price shall be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

- B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due to Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this paragraph.
- C. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due to Contractor.
- D. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

ARTICLE 9 – OWNER'S RESPONSIBILITIES

9.01 *Communications to Contractor*

- A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

9.02 *Replacement of Engineer*

- A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer's status under the Contract Documents shall be that of the former Engineer.

9.03 *Furnish Data*

- A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

9.04 *Pay When Due*

- A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

9.05 *Lands and Easements; Reports, Tests, and Drawings*

- A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.
- B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.
- C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

9.06 *Insurance*

- A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.

9.07 *Change Orders*

- A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.

9.08 *Inspections, Tests, and Approvals*

- A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.

9.09 *Limitations on Owner's Responsibilities*

- A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

9.10 *Undisclosed Hazardous Environmental Condition*

- A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.

9.11 *Evidence of Financial Arrangements*

- A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents (including obligations under proposed changes in the Work).

9.12 *Safety Programs*

- A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed.
- B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

ARTICLE 10 – ENGINEER'S STATUS DURING CONSTRUCTION

10.01 *Owner's Representative*

- A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract.

10.02 *Visits to Site*

- A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.
- B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.08. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

10.03 *Project Representative*

- A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 10.08. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent, or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

10.04 *Rejecting Defective Work*

- A. Engineer has the authority to reject Work in accordance with Article 14.

10.05 *Shop Drawings, Change Orders and Payments*

- A. Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, are set forth in Paragraph 7.16.
- B. Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, are set forth in Paragraph 7.19.
- C. Engineer's authority as to Change Orders is set forth in Article 11.
- D. Engineer's authority as to Applications for Payment is set forth in Article 15.

10.06 *Determinations for Unit Price Work*

- A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.

10.07 *Decisions on Requirements of Contract Documents and Acceptability of Work*

- A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Proposals, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will

not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.

10.08 *Limitations on Engineer's Authority and Responsibilities*

- A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.
- B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
- D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 15.06.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.
- E. The limitations upon authority and responsibility set forth in this Paragraph 10.08 shall also apply to the Resident Project Representative, if any.

10.09 *Compliance with Safety Program*

- A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs (if any) of which Engineer has been informed.

ARTICLE 11 – AMENDING THE CONTRACT DOCUMENTS; CHANGES IN THE WORK

11.01 *Amending and Supplementing Contract Documents*

- A. The Contract Documents may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.
 - 1. *Change Orders:*
 - a. If an amendment or supplement to the Contract Documents includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order. A Change Order also may be used to establish amendments and supplements of the Contract Documents that do not affect the Contract Price or Contract Times.
 - b. Owner and Contractor may amend those terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, without the recommendation of the Engineer. Such an amendment shall be set forth in a Change Order.

2. *Work Change Directives:* A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.04 regarding change of Contract Price. Contractor must submit any Change Proposal seeking an adjustment of the Contract Price or the Contract Times, or both, no later than 30 days after the completion of the Work set out in the Work Change Directive. Owner must submit any Claim seeking an adjustment of the Contract Price or the Contract Times, or both, no later than 60 days after issuance of the Work Change Directive.
3. *Field Orders:* Engineer may authorize minor changes in the Work if the changes do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

11.02 *Owner-Authorized Changes in the Work*

- A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Such changes shall be supported by Engineer's recommendation, to the extent the change involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters. Such changes may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work shall be performed under the applicable conditions of the Contract Documents. Nothing in this paragraph shall obligate Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

11.03 *Unauthorized Changes in the Work*

- A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.

11.04 *Change of Contract Price*

- A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment of Contract Price shall comply with the provisions of Article 12.
- B. An adjustment in the Contract Price will be determined as follows:
 1. where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03); or

2. where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.04.C.2); or
 3. where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.04.C).
- C. *Contractor's Fee:* When applicable, the Contractor's fee for overhead and profit shall be determined as follows:
1. a mutually acceptable fixed fee; or
 2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
 - a. for costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor's fee shall be 15 percent;
 - b. for costs incurred under Paragraph 13.01.B.3, the Contractor's fee shall be five percent;
 - c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.04.C.2.a and 11.04.C.2.b is that the Contractor's fee shall be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.A.1 and 13.01.A.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of five percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted work the maximum total fee to be paid by Owner shall be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the work;
 - d. no fee shall be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;
 - e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and
 - f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 11.04.C.2.a through 11.04.C.2.e, inclusive.

11.05 *Change of Contract Times*

- A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment in the Contract Times shall comply with the provisions of Article 12.
- B. An adjustment of the Contract Times shall be subject to the limitations set forth in Paragraph 4.05, concerning delays in Contractor's progress.

11.06 *Change Proposals*

- A. Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; appeal an initial decision by Engineer concerning the

requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; contest a set-off against payment due; or seek other relief under the Contract. The Change Proposal shall specify any proposed change in Contract Times or Contract Price, or both, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents.

1. *Procedures:* Contractor shall submit each Change Proposal to Engineer promptly (but in no event later than 30 days) after the start of the event giving rise thereto, or after such initial decision. The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal. The supporting data shall be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event. Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal.
 2. *Engineer's Action:* Engineer will review each Change Proposal and, within 30 days after receipt of the Contractor's supporting data, either deny the Change Proposal in whole, approve it in whole, or deny it in part and approve it in part. Such actions shall be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.
 3. *Binding Decision:* Engineer's decision will be final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.
- B. *Resolution of Certain Change Proposals:* If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice shall be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.

11.07 Execution of Change Orders

- A. Owner and Contractor shall execute appropriate Change Orders covering:
1. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive;
 2. changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;
 3. changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.02, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters; and
 4. changes in the Contract Price or Contract Times, or other changes, which embody the substance of any final and binding results under Paragraph 11.06, or Article 12.

- B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of this Paragraph 11.07, it shall be deemed to be of full force and effect, as if fully executed.

11.08 *Notification to Surety*

- A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

ARTICLE 12 – CLAIMS

12.01 *Claims*

- A. *Claims Process:* The following disputes between Owner and Contractor shall be submitted to the Claims process set forth in this Article:
 - 1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;
 - 2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents; and
 - 3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters.
- B. *Submittal of Claim:* The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim shall rest with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, or both, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.
- C. *Review and Resolution:* The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim shall be stated in writing and submitted to the other party, with a copy to Engineer.
- D. *Mediation:*
 - 1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate shall stay the Claim submittal and response process.
 - 2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process shall resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim submittal and decision process shall resume as of the date of the conclusion of the mediation, as determined by the mediator.
 - 3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.

- E. *Partial Approval*: If the party receiving a Claim approves the Claim in part and denies it in part, such action shall be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.
- F. *Denial of Claim*: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim shall be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.
- G. *Final and Binding Results*: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim shall be incorporated in a Change Order to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

ARTICLE 13 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

13.01 *Cost of the Work*

- A. *Purposes for Determination of Cost of the Work*: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:
 - 1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or
 - 2. To determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.
- B. *Costs Included*: Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 13.01.C, and shall include only the following items:
 - 1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, and vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.
 - 2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash

discounts shall accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.

3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01.
4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.
5. Supplemental costs including the following:
 - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
 - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.
 - c. Rentals of all construction equipment and machinery, and the parts thereof, whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.
 - d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
 - e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
 - f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 6.05), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.
 - g. The cost of utilities, fuel, and sanitary facilities at the Site.
 - h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.

- i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.
- C. *Costs Excluded:* The term Cost of the Work shall not include any of the following items:
1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.
 2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
 3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
 4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
 5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.
- D. *Contractor's Fee:* When the Work as a whole is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 11.04.C.
- E. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

13.02 Allowances

- A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.
- B. *Cash Allowances:* Contractor agrees that:
1. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and
 2. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.
- C. *Contingency Allowance:* Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.

- D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

13.03 *Unit Price Work*

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.
- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.
- D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of the following paragraph.
- E. Within 30 days of Engineer's written decision under the preceding paragraph, Contractor may submit a Change Proposal, or Owner may file a Claim, seeking an adjustment in the Contract Price if:
 - 1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement;
 - 2. there is no corresponding adjustment with respect to any other item of Work; and
 - 3. Contractor believes that it is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price, and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 14 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

14.01 *Access to Work*

- A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction will have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply therewith as applicable.

14.02 *Tests, Inspections, and Approvals*

- A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.
- B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required

by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work shall be governed by the provisions of Paragraph 14.05.

- C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.
- D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:
 - 1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;
 - 2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;
 - 3. by manufacturers of equipment furnished under the Contract Documents;
 - 4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and
 - 5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

Such inspections and tests shall be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner and Engineer.

- E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.
- F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering shall be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to cover the same and Engineer had not acted with reasonable promptness in response to such notice.

14.03 *Defective Work*

- A. *Contractor's Obligation:* It is Contractor's obligation to assure that the Work is not defective.
- B. *Engineer's Authority:* Engineer has the authority to determine whether Work is defective, and to reject defective Work.
- C. *Notice of Defects:* Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.
- D. *Correction, or Removal and Replacement:* Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.
- E. *Preservation of Warranties:* When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

- F. *Costs and Damages*: In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs, losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

14.04 *Acceptance of Defective Work*

- A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work shall be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

14.05 *Uncovering Work*

- A. Engineer has the authority to require additional inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.
- B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.
- C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, and provide all necessary labor, material, and equipment.
1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.
 2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

14.06 *Owner May Stop the Work*

- A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

14.07 *Owner May Correct Defective Work*

- A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, then Owner may, after seven days written notice to Contractor, correct or remedy any such deficiency.
- B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.
- C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.
- D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

ARTICLE 15 – PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

15.01 *Progress Payments*

- A. *Basis for Progress Payments:* The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.
- B. *Applications for Payments:*
 - 1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for

Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens, and evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

C. *Review of Applications:*

1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:
 - a. the Work has progressed to the point indicated;
 - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and
 - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
 - a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or
 - b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.
4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
 - a. to supervise, direct, or control the Work, or
 - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or

- c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or
 - d. to make any examination to ascertain how or for what purposes Contractor has used the money paid on account of the Contract Price, or
 - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 15.01.C.2.
 6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:
 - a. the Work is defective, requiring correction or replacement;
 - b. the Contract Price has been reduced by Change Orders;
 - c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or
 - e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. Payment Becomes Due:

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended (subject to any Owner set-offs) will become due, and when due will be paid by Owner to Contractor.

E. Reductions in Payment by Owner:

1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:
 - a. claims have been made against Owner on account of Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages on account of Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;
 - b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;
 - c. Contractor has failed to provide and maintain required bonds or insurance;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;
 - e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;
 - f. the Work is defective, requiring correction or replacement;

- g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - h. the Contract Price has been reduced by Change Orders;
 - i. an event that would constitute a default by Contractor and therefore justify a termination for cause has occurred;
 - j. liquidated damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;
 - k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;
 - l. there are other items entitling Owner to a set off against the amount recommended.
2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed shall be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.
 3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 15.01.C.1 and subject to interest as provided in the Agreement.

15.02 *Contractor's Warranty of Title*

- A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than seven days after the time of payment by Owner.

15.03 *Substantial Completion*

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.
- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which shall fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons

therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.

- D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.
- E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.
- F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

15.04 *Partial Use or Occupancy*

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:
 - 1. At any time Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through E for that part of the Work.
 - 2. At any time Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
 - 3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.
 - 4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.05 regarding builder's risk or other property insurance.

15.05 *Final Inspection*

- A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

15.06 *Final Payment*

A. *Application for Payment:*

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, annotated record documents (as provided in Paragraph 7.11), and other documents, Contractor may make application for final payment.
2. The final Application for Payment shall be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents;
 - b. consent of the surety, if any, to final payment;
 - c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.
 - d. a list of all disputes that Contractor believes are unsettled; and
 - e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.
3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.

B. *Engineer's Review of Application and Acceptance:*

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the Application for Payment to Owner for payment. Such recommendation shall account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. At the same time Engineer will also give written notice to Owner

and Contractor that the Work is acceptable, subject to the provisions of Paragraph 15.07. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

- C. *Completion of Work:* The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment.
- D. *Payment Becomes Due:* Thirty days after the presentation to Owner of the final Application for Payment and accompanying documentation, the amount recommended by Engineer (less any further sum Owner is entitled to set off against Engineer's recommendation, including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions above with respect to progress payments) will become due and shall be paid by Owner to Contractor.

15.07 *Waiver of Claims*

- A. The making of final payment will not constitute a waiver by Owner of claims or rights against Contractor. Owner expressly reserves claims and rights arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 15.05, from Contractor's failure to comply with the Contract Documents or the terms of any special guarantees specified therein, from outstanding Claims by Owner, or from Contractor's continuing obligations under the Contract Documents.
- B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted or appealed under the provisions of Article 17.

15.08 *Correction Period*

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents, or by any specific provision of the Contract Documents), any Work is found to be defective, or if the repair of any damages to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas used by Contractor as permitted by Laws and Regulations, is found to be defective, then Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:
 - 1. correct the defective repairs to the Site or such other adjacent areas;
 - 2. correct such defective Work;
 - 3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and
 - 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting therefrom.
- B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others).

- C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
- D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.
- E. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

ARTICLE 16 – SUSPENSION OF WORK AND TERMINATION

16.01 *Owner May Suspend Work*

- A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension. Any Change Proposal seeking such adjustments shall be submitted no later than 30 days after the date fixed for resumption of Work.

16.02 *Owner May Terminate for Cause*

- A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:
 1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule);
 2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;
 3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or
 4. Contractor's repeated disregard of the authority of Owner or Engineer.
- B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) ten days written notice that Owner is considering a declaration that Contractor is in default and termination of the contract, Owner may proceed to:
 1. declare Contractor to be in default, and give Contractor (and any surety) notice that the Contract is terminated; and
 2. enforce the rights available to Owner under any applicable performance bond.
- C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.
- D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within seven days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.

- E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses, and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.
- F. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.
- G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond shall govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

16.03 *Owner May Terminate For Convenience*

- A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
 - 1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
 - 2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and
 - 3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.
- B. Contractor shall not be paid on account of loss of anticipated overhead, profits, or revenue, or other economic loss arising out of or resulting from such termination.

16.04 *Contractor May Stop Work or Terminate*

- A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.
- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The

provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

ARTICLE 17 – FINAL RESOLUTION OF DISPUTES

17.01 Methods and Procedures

- A. *Disputes Subject to Final Resolution:* The following disputed matters are subject to final resolution under the provisions of this Article:
1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full; and
 2. Disputes between Owner and Contractor concerning the Work or obligations under the Contract Documents, and arising after final payment has been made.
- B. *Final Resolution of Disputes:* For any dispute subject to resolution under this Article, Owner or Contractor may:
1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions; or
 2. agree with the other party to submit the dispute to another dispute resolution process; or
 3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

ARTICLE 18 – MISCELLANEOUS

18.01 Giving Notice

- A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:
1. delivered in person, by a commercial courier service or otherwise, to the individual or to a member of the firm or to an officer of the corporation for which it is intended; or
 2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the sender of the notice.

18.02 Computation of Times

- A. When any period of time is referred to in the Contract by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

18.03 Cumulative Remedies

- A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract. The provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

18.04 *Limitation of Damages*

- A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

18.05 *No Waiver*

- A. A party's non-enforcement of any provision shall not constitute a waiver of that provision, nor shall it affect the enforceability of that provision or of the remainder of this Contract.

18.06 *Survival of Obligations*

- A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract, as well as all continuing obligations indicated in the Contract, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

18.07 *Controlling Law*

- A. This Contract is to be governed by the law of the state in which the Project is located.

18.08 *Headings*

- A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

Date of Issuance:
 Owner: **Schoolcraft County Transit Authority**
 Contractor:
 Engineer: **Bittner Engineering, Inc.**
 Project: **Existing Building Renovation and Addition**

Effective Date:
 Owner's Contract No.:
 Contractor's Project No.:
 Engineer's Project No.: **21-99-2342**
 Contract Name:

The Contract is modified as follows upon execution of this Change Order:

Description:

Attachments: *[List documents supporting change]*

CHANGE IN CONTRACT PRICE	CHANGE IN CONTRACT TIMES <i>[note changes in Milestones if applicable]</i>
Original Contract Price: \$ _____	Original Contract Times: Substantial Completion: _____ Ready for Final Payment: _____ days or dates
[Increase] [Decrease] from previously approved Change Orders No. ___ to No. ___: \$ _____	[Increase] [Decrease] from previously approved Change Orders No. ___ to No. ___: Substantial Completion: _____ Ready for Final Payment: _____ days
Contract Price prior to this Change Order: \$ _____	Contract Times prior to this Change Order: Substantial Completion: _____ Ready for Final Payment: _____ days or dates
[Increase] [Decrease] of this Change Order: \$ _____	[Increase] [Decrease] of this Change Order: Substantial Completion: _____ Ready for Final Payment: _____ days or dates
Contract Price incorporating this Change Order: \$ _____	Contract Times with all approved Change Orders: Substantial Completion: _____ Ready for Final Payment: _____ days or dates

RECOMMENDED:	ACCEPTED:	ACCEPTED:
By: _____ Engineer (if required)	By: _____ Owner (Authorized Signature)	By: _____ Contractor (Authorized Signature)
Title: _____	Title: _____	Title: _____
Date: _____	Date: _____	Date: _____

Approved by Funding Agency (if applicable)

By: _____ Date: _____
 Title: _____

DIVISION 1

GENERAL REQUIREMENTS

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DIVISION 1

GENERAL REQUIREMENTS

01010 SUMMARY OF WORK

01011 WORK COVERED BY CONTRACT DOCUMENTS

- INDEX: -01- General
-02- Permits
-03- Special Site Conditions
-04- General Protection
-05- Contractor's Personnel

-01- GENERAL

- A. The CONTRACTOR engaged in this work shall be familiar with the General Conditions, these General Requirements, and all other Divisions of the Specifications, as well as the plans, and inform his employees and his subcontractors of items relating to or affecting their work. The General Conditions and these General Requirements apply to all CONTRACTORS engaged on the project. The CONTRACTOR shall furnish all materials, equipment, supervision, labor, transportation, construction equipment and machinery, tools and appliances, and all other facilities and incidentals necessary for the execution, testing, initial operation and completion of the Work.

-02- PERMITS

- A. Temporary permits and licenses necessary for the work shall be the responsibility of the CONTRACTOR. Permanent permits shall be secured by the OWNER.

-03- SPECIAL SITE CONDITIONS

- A. The CONTRACTOR shall confine his equipment, apparatus, storage of materials, and operations of his workmen to the areas within the limits of the project boundary lines as indicated on the drawings and as directed by the ENGINEER.
- B. The CONTRACTOR shall take particular care to effect a minimum of disturbance and hazard to existing buildings, structures, the site, and occupants.
1. Any interruption to services, (electricity, water, sewer, etc.) shall be made only

after consultation and scheduling with the OWNER, ENGINEER, local utility companies, and municipal offices.

2. Information pertaining to existing construction and other preliminary investigations, such as location of utilities, appear on the drawings. While such data has been collected with reasonable care, it is based on available records, there is no expressed or implied guarantee that conditions so indicated are entirely representative of those actually existing. They are merely given to assist the CONTRACTOR in determining the actual location and conditions.
 3. The CONTRACTOR and Subcontractors shall acquaint themselves with the location of all above ground and all underground services, utilities, structures, etc., which may be encountered or be affected by his work, and shall be responsible for any damage caused by neglect to provide proper precautions or protection. The OWNER shall not be held responsible, or liable for damages, repairs, etc.
 4. Cost of repairs and replacement of any structure or utility not scheduled for removal shall be paid by the CONTRACTOR.
- C. Parking of vehicles necessary for any demolition work and/or construction work should be confined to within the construction areas. The CONTRACTOR shall make his own arrangements for parking employees' cars and for vehicles that cannot be contained within the construction area.
- D. It shall be the responsibility of the CONTRACTOR to keep all streets and drives in the area free of mud, clay, gravel, debris, and any other materials which vehicles or equipment may track onto streets or drives. The frequency of cleaning of these surfaces shall be based on the amount of material deposited and shall not necessarily be done on a set schedule. The CONTRACTOR shall clean such streets and/or drives as required, or he shall clean them when instructed to do so by the OWNER. Cleaning shall always be continued to the end of the affected areas.
- E. Whether shown on the drawings or not, the CONTRACTOR shall contact all public utilities for the exact location of their underground structures such as sewers, water lines, ducts, mains or services, electric power, lighting, fiber optics, gas, telephone wires, cables, etc. If such utilities are damaged by the CONTRACTOR, he shall make settlement with the Owner(s) of the utility(ies).
- F. Where it is necessary to work under or near any existing railroad tracks or structures, the CONTRACTOR shall contact and arrange with the proper officers of the railway(s), which the work may cross or interfere with, as to the method of protecting said railway(s) during the work. All work shall be done as ordered by the railway officials. The CONTRACTOR shall bear all necessary expense for protecting the tracks or structures against possible loss or injury. He shall restore all structures removed by reason of the work to as good a condition as that existed prior to being disturbed.

-04- GENERAL PROTECTION

- A. Protect existing adjacent buildings, structures, and properties from any damage that could be caused by any operation under this contract at all times so as to maintain free from injury or damage.
- B. Protect adjacent parking areas and vehicles parked therein from any and all damage that could be caused by any operation within the scope of this project.
- C. Repair or have repaired at own expense any damage to existing street paving, curbs, gutters, walks, etc., not noted for removal and caused by any operation within the scope of this contract.
- D. Maintain unobstructed access to any neighboring buildings, structures, properties, adjacent parking areas, etc. not scheduled to be included in the work, at all times.
- E. Any damage by failure to provide proper and adequate protection shall be repaired to the satisfaction of the OWNER or removed and replaced with new work at the CONTRACTOR'S expense.
- F. Additional protection of workers, public, adjoining property, utilities and structures as outlined in applicable sections of the General Conditions shall be provided by this CONTRACTOR.

-05- CONTRACTOR'S PERSONNEL

- A. The CONTRACTOR shall provide competent, suitable qualified personnel to lay out the work and perform construction as required by the Contract Documents. The ENGINEER may judge the competency and qualifications of personnel and, upon his written request to the CONTRACTOR, cause the immediate dismissal from the work of any incompetent and unqualified personnel.

DIVISION 1

GENERAL REQUIREMENTS

01010 SUMMARY OF WORK

01013 WORK BY OTHERS

INDEX: -01- General

-01- GENERAL

- A. The OWNER reserves the right to let other contracts in connection with this project. All CONTRACTOR's employed on the project shall work in harmony and be of assistance to one another wherever necessary.
- B. In no case will the CONTRACTOR be permitted to exclude from the premises or work any other CONTRACTOR or his employees or interfere with any other CONTRACTOR in the execution or installation of his work.
- C. The CONTRACTOR shall examine all existing work and all work of other CONTRACTORS that will receive or come in contact with his work, and he shall report to the ENGINEER, in writing, any defects or discrepancies. Upon beginning his work he will be considered as having accepted all preceding work as in suitable condition to receive his work, and as having waived all claims to the contrary.

DIVISION 1

GENERAL REQUIREMENTS

01010 SUMMARY OF WORK

01016 WORK SEQUENCE

INDEX: -01- General

-01- GENERAL

- A. The CONTRACTOR shall schedule his work such that there will be no interruption to the normal operation of activities at the project site or adjacent sites. The CONTRACTOR shall cooperate and coordinate his work with that which will be performed under other contracts on this project. Demolition of existing equipment and structures shall not take place until replacement facilities are complete and in proper working order.
- B. If required by the Contract Documents, the CONTRACTOR shall provide a work schedule prior to commencing activities on the project.

DIVISION 1

GENERAL REQUIREMENTS

01010 SUMMARY OF WORK

01018 PARTIAL OWNER OCCUPANCY

INDEX: -01- General
-02- Terms of Occupancy

-01- GENERAL

- A. The OWNER may from time to time occupy any portion of the project as the work in connection therewith is completed to such a degree as will permit the use of the project for the purpose intended. The OWNER will, prior to such partial occupancy or use, give notice to the CONTRACTOR thereof.

-02- TERMS OF OCCUPANCY

- A. The occupancy or use of any part of the project shall not constitute an acceptance of work performed in accordance with the contract or relieve the contractor's liability to perform any work required by the contract but not completed at the time of said occupancy. Also see the General Conditions of the Contract.
- B. The CONTRACTOR shall be relieved of all maintenance costs on any buildings, structures, or equipment occupied or used under this agreement.
- C. The CONTRACTOR shall not be responsible for wear and tear or damage resulting from such occupancy.
- D. The OWNER shall assume risk of loss with respect to any buildings, structures, or equipment occupied by it under the terms of this agreement; provided the CONTRACTOR shall assume full responsibility for loss or damage traceable to his fault or negligence in the performance of his contract.
- E. The CONTRACTOR shall not be required to furnish heat, light, power and water used by the OWNER during such occupancy without proper remuneration therefore.

DIVISION 1

GENERAL REQUIREMENTS

01010 SUMMARY OF WORK

01030 FIELD ENGINEERING

INDEX: -01- General
-02- Contractor's Responsibility

-01- GENERAL

- A. The ENGINEER will establish a bench mark and base line on the construction site. The CONTRACTOR shall utilize this information to establish and maintain his own bench marks and base lines to be used to locate all structures, utilities, and facilities shown on the plans and be responsible for the accuracy of their placement as well as the continued maintenance of their accurate position throughout the construction period.

-02- CONTRACTOR'S RESPONSIBILITY

- A. The CONTRACTOR shall exercise proper care in the preservation of such stakes set for his use or the use of the ENGINEER, and if the CONTRACTOR displaces, loses, or removes them during his operations, they shall be reset at the CONTRACTOR'S expense.

DIVISION 1

GENERAL REQUIREMENTS

01010 SUMMARY OF WORK

01031 GRADES, LINES, LEVELS

- INDEX: -01- General
-02- Notification
-03- Contractor's Responsibility

-01- GENERAL

- A. The ENGINEER will provide construction control stakes to mark the general location, alignment, elevation and grade of the work.
- B. The CONTRACTOR shall transfer elevations and lines from ENGINEER'S reference points and report apparent errors immediately to the ENGINEER.
- C. CONTRACTOR is responsible for providing all staking necessary for establishing grades, layout, location, alignment and any other staking in reference to the base line and bench mark established by the ENGINEER necessary to execute the project in accordance with these contract documents.

-02- NOTIFICATION

- A. The CONTRACTOR shall notify the ENGINEER at least 24 hours in advance for his need for grades and lines.

-03- CONTRACTOR'S RESPONSIBILITY

- A. The CONTRACTOR shall exercise proper care in the preservation of such stakes set for his use or the use of the ENGINEER, and if the CONTRACTOR displaces, loses, or removes them during his operations, they shall be reset at the CONTRACTOR'S expense.

DIVISION 1

GENERAL REQUIREMENTS

01010 SUMMARY OF WORK

01050 COORDINATION

- INDEX: -01- General
-02- Mechanical and Electrical Subcontractors
-03- Existing Underground Utilities

-01- GENERAL

- A. The General CONTRACTOR, all other prime contractors, and all subcontractors shall coordinate their work and shall cooperate with all other trades so as to facilitate the progress of the work. Each trade shall afford all other trade every reasonable opportunity for the installation of their work and for the storage of their material.
- B. Each trade shall perform its work in proper sequence in relation to that of other Contractors or trades as directed by the CONTRACTOR.
- C. Each CONTRACTOR shall arrange his work and dispose of his materials so as not to interfere with the work or storage of materials of other contractors and each shall join his work to that of others in accordance with the intent of the drawings and specifications.
- D. No CONTRACTOR shall endanger any work of another by cutting, digging or otherwise, and shall not cut or alter such work of any other contractor without the consent of the ENGINEER and the other contractor.
- E. It shall be the responsibility of all contractors and all subcontractors to keep constant check on the progress of the work so that the particular trade can insure preparation for installation of that trade's work and not cause delay in the progress of the work.
- F. The CONTRACTOR shall give due notice and proper information to other contractors of any special provisions necessary for the placing or setting of his work coming in contact with work of other contractors. Failing to do so in proper time, he shall be held responsible and shall pay for any and all alterations and repairs necessitated by such neglect.
- G. Any cost caused by defective or ill-timed work shall be borne by the party responsible therefore.

-02- MECHANICAL AND ELECTRICAL SUBCONTRACTORS

- A. All mechanical and electrical contractors shall work in cooperation with the CONTRACTOR and with each other and fit their piping, duct work, conduit, etc., into the structures as job conditions demand. All final decisions as to the right-of-way and run of pipe, ducts, etc., shall be made by the ENGINEER or his representative at meetings with responsible representatives of mechanical trades contractors.

-03- EXISTING UNDERGROUND UTILITIES

- A. The CONTRACTOR shall coordinate his work with existing underground utilities and structures as outlined in Sections 01011 and 01050.

DIVISION 1

GENERAL REQUIREMENTS

01010 SUMMARY OF WORK

01070 CUTTING AND PATCHING

INDEX: -01- General

-01- GENERAL

- A. Each CONTRACTOR shall be responsible for his own cutting and patching, but the work must be performed by tradesmen experienced with the type of work involved. The CONTRACTOR shall do all cutting, fitting or patching of his work that may be required to make its several parts fit together or to receive the work of other contractors, shown upon or reasonably implied by the plans and specifications for the completed work, and he shall do all this work to the satisfaction of the OWNER and the ENGINEER. No cutting shall be done without approval of the ENGINEER nor shall any cutting be done in such a manner as to weaken or injure any part of the work or damage any finished work.

DIVISION 1

GENERAL REQUIREMENTS

01010 SUMMARY OF WORK

01080 APPLICABLE CODES

INDEX: -01- General
-02- Working Hours

-01- GENERAL

- A. The CONTRACTOR shall be aware of and comply with all laws, ordinances, rules, and regulations applicable to the Work.
- B. Any material or operation specified by reference to a Code (Federal, State, or Local), to publications, published specifications of a manufacturer, a Society, an Association, or other Published Standard, shall comply with requirements of the listed document (ie: Code, Standard, etc.) which is current on date of receipt of bids. In case of conflict between a referenced document and the Project Specifications, the referenced document shall govern.

-02- WORKING HOURS

- A. Except in the case of emergencies, or as approved by special permission from local officials, work will be restricted at night from 8:00 p.m. to 7:00 a.m.

DIVISION 1

GENERAL REQUIREMENTS

01010 SUMMARY OF WORK

01090 ABBREVIATIONS AND SYMBOLS

INDEX: -01- General
-02- Special Abbreviations

-01- GENERAL

- A. In general, abbreviations and symbols will be listed and defined on the Plans. Symbols will not be used in the specification text. Since the number of abbreviations which could be used might cover several pages, abbreviations used will be defined in that part of the specifications to which they apply unless the usage is so generally understood that definition is believed unnecessary.

-02- SPECIAL ABBREVIATIONS

- A. Abbreviations are as follows:

A.A.S.H.T.O.: American Association of State Highway and Transportation Officials

A.C.I.: American Concrete Institute

A.D.A.: Americans with Disabilities Act

A.N.S.I.: American National Standard Institute

A.S.A.: American Standard Association

A.S.T.M.: American Society for Testing and Materials

A.W.S.: American Welding Society

A.W.W.A.: American Water Works Association

C.R.S.I.: Concrete Reinforcing Steel Institute

C.S.I.: Construction Specifications Institute

M.D.E.Q.: Michigan Department of Environmental Quality

M.D.P.H.: Michigan Department of Public Health

M.D.O.T.: Michigan Department of Transportation

M.D.N.R.: Michigan Department of Natural Resources

N.E.C.: National Electrical Code

DIVISION 1

GENERAL REQUIREMENTS

01150 MEASUREMENT AND PAYMENT

01150 MEASUREMENT AND PAYMENT

- INDEX: -01- General
-02- Applications for Payment
-03- Change Order Procedures

-01- GENERAL

- A. Refer to the General Conditions for basic provisions of this subject.

-02- APPLICATIONS FOR PAYMENT

- A. Applications for payment for work performed on the Project shall be submitted to the ENGINEER by the tenth day of the month and shall include all work completed as of the last day of the previous month.
- B. Applications for payment shall be based on the percentage of completion of items listed on the Schedule of Values required in Section 01370 of this Division.
- C. Payment applications shall be on forms approved by the ENGINEER and any funding agencies that may be participating in the Project. The number of copies to be submitted will be confirmed during the preconstruction meeting.

-03- CHANGE ORDER PROCEDURES

- A. Refer to the General Conditions for basic provisions of this subject.

DIVISION 1

GENERAL REQUIREMENTS

01200 PROJECT MEETINGS

01210 PRECONSTRUCTION CONFERENCE

INDEX: -01- General

-01- GENERAL

- A. A preconstruction conference will be held prior to the start of work. All pertinent parties shall attend and discussion shall include responsibilities, contract terms, supervision, schedules, construction procedures, payments and estimates, and labor requirements.

DIVISION 1

GENERAL REQUIREMENTS

01200 PROJECT MEETINGS

01220 PROGRESS MEETINGS

INDEX: -01- General

-01- GENERAL

- A. Progress meetings will be held on a regular basis as established by the ENGINEER for the purpose of reviewing the work progress and construction schedule, reviewing the work performance, discussing work programs, and reviewing new business. Minutes will be prepared and distributed by the ENGINEER.

DIVISION 1

GENERAL REQUIREMENTS

01200 PROJECT MEETINGS

01230 JOB SITE ADMINISTRATION

- INDEX: -01- General
-02- Contractor's Responsibilities
-03- Engineer's Responsibility and Authority

-01- GENERAL

- A. Reference is made to the General Conditions regarding the CONTRACTOR'S and ENGINEER'S authority.

-02- CONTRACTOR'S RESPONSIBILITIES

- A. The CONTRACTOR shall be responsible for the general supervision and direction of the work in accordance with the General Conditions.
- B. The CONTRACTOR shall be responsible to assure all work is accomplished in conformance with the Contract Documents.
- C. The CONTRACTOR shall supervise all assembly of materials and all labor to complete project work.
- D. The CONTRACTOR shall proceed with the schedule established by him, in such a manner as to insure completion of the work within the time allotted.

-03- ENGINEER'S RESPONSIBILITY AND AUTHORITY

- A. The ENGINEER shall be responsible for interpretation of all Contract Documents and any changes thereto.
- B. The ENGINEER shall establish the standards of acceptability for materials and workmanship furnished by the CONTRACTOR.

- C. The ENGINEER shall observe work quality and quantity of the CONTRACTOR according to contract requirements.
- D. The ENGINEER shall have the authority to reject materials or workmanship which do not meet contract requirements.
- E. The ENGINEER shall act as the OWNER'S representative and have authorities as described in the General Conditions.

DIVISION 1

GENERAL REQUIREMENTS

01300 SUBMITTALS

01310 CONSTRUCTION SCHEDULES

- INDEX: -01- General
-02- Progress and Quality of Work

-01- GENERAL

- A. The CONTRACTOR shall submit a construction progress schedule as required by this section and the General Conditions. This progress schedule shall be submitted at the pre-construction meeting and will be reviewed by the ENGINEER within ten days following submittal. Upon approval of the schedule, the ENGINEER will request an appropriate number of copies of the schedule and distribute them. Progress schedules will be updated as the work proceeds.

-02- PROGRESS AND QUALITY OF WORK

- A. The OWNER, through his representative (Owner, Inspector, Engineer), shall have power to direct the order and sequence of the work. If at any time before the commencement or during the progress of the work the materials and appliances used or to be used appears to the OWNER'S representative as insufficient or improper for securing the quality of work required, or the required rate of progress, he may order the CONTRACTOR to increase his efficiency or improve the character of his equipment and the CONTRACTOR shall conform to such order; but failure of the OWNER'S representative to demand any increase of such efficiency or improvement shall not release the CONTRACTOR from his obligation to secure the quality of work or the rate of progress specified.

DIVISION 1

GENERAL REQUIREMENTS

01300 SUBMITTALS

01340 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

INDEX: -01- General

-01- GENERAL

- A. Shop drawings, product data, and/or samples of materials and equipment shall be submitted where required by the Specifications, requested by the ENGINEER or deemed necessary by the CONTRACTOR. The CONTRACTOR shall review and approve all shop drawings prior to submission. Approval by the ENGINEER shall not relieve the CONTRACTOR of his responsibilities under the contract. The total number of copies submitted will be the number required by the CONTRACTOR plus four for the ENGINEER.
- B. Data on shop drawings will be complete with respect to dimensions, design criteria, materials of construction, etc. to enable the ENGINEER to review the information as required.
- C. Shop Drawings shall be submitted for the following materials and equipment as applicable.
 - 1. All structural components (reinforcing steel, structural steel, prefabricated wood, etc.)
 - 2. All preassembled or manufactured building components (doors and windows, toilet partitions, hardware, etc.)
 - 3. All plumbing fixtures and accessory items.
 - 4. All heating equipment and accessory items.
 - 5. All electrical equipment, fixtures and controls.
 - 6. All process equipment items, valves, controls, etc.
 - 7. All finish materials, carpet, paints, floor tile, etc.

- D. All Shop Drawings shall be certified and shall bear the name of the manufacturer, the name of the Project, the name of the CONTRACTOR and the name of the ENGINEER.
- E. CONTRACTOR shall also submit to the ENGINEER for approval with such promptness as to cause no delay in Work, all samples required by the Contract Documents. All samples will have been checked by and stamped with the approval of CONTRACTOR, identified clearly as to material, manufacturer, any pertinent catalog numbers and the use for which intended.
- F. At the time of each submission, CONTRACTOR shall in writing call ENGINEER'S attention to any deviations that the Shop Drawing or sample may have from the requirements of the Contract Documents.
- G. The ENGINEER will review and approve with reasonable promptness Shop Drawings and samples, but his review and approval shall be only for conformance with the design concept of the Project and for compliance with information given in the Contract Documents. The approval of a separate item as such will not indicate approval of the assembly in which the item functions. CONTRACTOR shall make any corrections required by the ENGINEER and shall return the required number of corrected copies of Shop Drawings and resubmit new samples until approved. The CONTRACTOR shall direct specific attention in writing or on resubmitted Shop Drawings to revisions other than the corrections called for by the ENGINEER on previous submissions. CONTRACTOR'S stamp of approval on any Shop Drawing or sample shall constitute a representation to OWNER and ENGINEER that CONTRACTOR has either determined and verified all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar data or he assumes full responsibility for doing so, and that he has reviewed or coordinated each Shop Drawing or sample with the requirements of the Work and the Contract Documents.
- H. Where a Shop Drawing or sample submission is required by the Specifications, no related work shall be commenced until the submission has been approved by the ENGINEER. A copy of each approved Shop Drawing and each approved sample shall be kept in good order by CONTRACTOR at the site and shall be available to the ENGINEER.
- I. The ENGINEER'S approval of Shop Drawings or samples shall not relieve the CONTRACTOR from his responsibility for any deviations from the requirements of the Contract Documents unless CONTRACTOR has in writing called the ENGINEER's attention to such deviation at the time of submission and the ENGINEER has given written approval to the specific deviation, nor shall any approval by the ENGINEER relieve the CONTRACTOR from responsibility for errors or omissions in the Shop Drawings.
- J. Submit three copies of Shop Drawings and manufacturer's literature, which will be retained by the ARCHITECT/ENGINEER, plus the number to be returned.

DIVISION 1

GENERAL REQUIREMENTS

01300 SUBMITTALS

01360 LAYOUT DATA

INDEX: -01- General

-01- GENERAL

- A. Each CONTRACTOR and subcontractor shall lay out his own work and cooperate with each other to avoid interference and to secure fit. Where layout drawings are necessary, they shall be prepared by the CONTRACTOR at his own expense.
- B. The available areas allocated for rooms or other spaces shown on the ENGINEER'S drawings may not be sufficient to allow installation of every manufacturer's equipment of the required type which in general conforms with the specifications. It shall constitute sufficient reason for rejection if, in the opinion of the ENGINEER, the equipment submitted for approval does not fit the available space allowing adequate room and clearance for piping, conduit, duct work, associated equipment, aisles, inspection and maintenance. Any modifications to the site, building, other structures or other equipment necessitated by the equipment furnished by the CONTRACTOR shall be at no additional cost to the OWNER.

DIVISION 1

GENERAL REQUIREMENTS

01300 SUBMITTALS

01370 SCHEDULE OF VALUES

INDEX: -01- General

-01- GENERAL

- A. Within ten (10) days after award of contract, the CONTRACTOR shall submit for review, for lump sum contracts, three copies of a schedule of the estimated values of the components of the work. This breakdown will be in a format outlined in the specifications, or, if no such format is given, in a format mutually agreeable to the CONTRACTOR and ENGINEER. After approval by the ENGINEER, the schedule of values shall form the basis for progress payments.

DIVISION 1

GENERAL REQUIREMENTS

01300 SUBMITTALS

01380 CONSTRUCTION PHOTOGRAPHS

INDEX: -01- General

-01- GENERAL

- A. Contractor shall collect photographs to document the work in progress, beginning with site photographs prior to starting construction and continuing through construction completion. The digital photographs shall be provided on USB flash drives or CDs. Two complete sets of photos shall be provided prior to final payment.

DIVISION 1

GENERAL REQUIREMENTS

01400 QUALITY CONTROL

01410 TESTING LABORATORY SERVICES

INDEX: -01- General
-02- Basic Testing Requirements

-01- GENERAL

- A. Where the services of certified testing laboratories are required as a part of this Contract, they are specifically noted in the Division where the product, material or result of construction methods are to be tested (e.g. Division 2 - SITE WORK, Division 3 - CONCRETE MATERIALS, Division 15 - MECHANICAL).
- B. Where inspection services are required in association with work to be performed or materials to be furnished on this project, they are specifically called for under the Division where said work and/or materials are specified (e.g. Underwriters Laboratory, ASME and ASTM certifications).

-02- BASIC TESTING REQUIREMENTS

1. Aggregates: Certification of quality by producer.
2. Asphalt mix: Sample as per ASTM D979 and AASHTO T168; Extraction test as per AASHTO T30 and ASTM D2172; 1 test for each 500 ton placed.
3. Asphalt pavement density: Sample as per ASTM D979; Density tests as per ASTM D7113 or ASTM D4125; 1 test for each 2,500 square yards placed.
4. Precast Manholes: Certification of quality by producer.
5. Gravity Pipe: Test 1/2 percent of total item with minimum 3 pieces of each size, material, and class. Certification of quality by producer acceptable.
6. Concrete: Cylinder compressive strength specimen as per ASTM C31, 3 cylinders for each 50 cubic yards or less placed; Slump test as per ASTM C143; Air test as per ASTM C231.

DIVISION 1

GENERAL REQUIREMENTS

01500 TEMPORARY FACILITIES AND CONTROLS

01510 TEMPORARY UTILITIES

INDEX:

- 01511 - Temporary Electricity
- 01512 - Temporary Lighting
- 01513 - Temporary Heat and Ventilation
- 01514 - Temporary Telephone Service
- 01515 - Temporary Water
- 01516 - Temporary Sanitary Facilities
- 01517 - Temporary First Aid Facilities
- 01518 - Temporary Fire Protection

01511 - TEMPORARY ELECTRICITY

- A. Temporary Electricity shall be provided by the CONTRACTOR. When there is more than one prime CONTRACTOR on a project, the arrangements for and the cost of a temporary single phase three wire electric service hook-up is to be paid for by the General Contractor. The cost of all single phase electric energy used on the project during construction is to be paid for by the General Contractor regardless of whether obtained from a temporary service or the permanent service. Each CONTRACTOR requiring three phase power shall make his own arrangements for such service and shall pay all costs of wiring and current. CONTRACTOR must have OWNER'S permission to connect his three phase equipment to OWNER'S permanent service. Whenever during the course of the work, but before acceptance of the project, consumption of three phase power shall commence by the OWNER through the permanent service due to any cause, the meter shall be read and the OWNER shall pay for all electric energy supplied by the permanent service after this reading.

01512 - TEMPORARY LIGHTING

- A. The CONTRACTOR shall install his own fixtures, wiring and outlets for temporary lighting. He shall also follow all OSHA requirements for ground fault interrupting equipment.

01513 - TEMPORARY HEAT AND VENTILATION

- A. If temporary heat is required for any reason during construction, and/or when directed by the ENGINEER, before the new building or portions thereof are properly enclosed, the CONTRACTOR shall provide such heat at his own expense using portable heating units intended for this purpose.
- B. Any temporary heaters used shall meet applicable codes and shall be operated by the General Contractor. He shall have full responsibility for such heaters, and shall pay for all fuel consumed by them. A temperature of 50 degrees shall be maintained in all working areas.
- C. Permanent heating units may be used to supply temporary heat only after the building is entirely enclosed, the installation of the units and controls has been completed, all safety regulations have been complied with, the permission of the Contractor who installed the units and the OWNER is obtained. The cost of fuel for the use of the permanent units shall be paid for by the CONTRACTOR.
- D. Adequate ventilation shall be supplied by the CONTRACTOR to dry out the building. Care shall be exercised to waste as little heat as possible.
- E. It shall be the responsibility of the General CONTRACTOR to supply sufficient heat to keep concrete, plaster, water pipes, and all other work from freezing.
- F. After the building is declared to be substantially complete by the ENGINEER, the OWNER shall operate the heating and ventilating system and pay all fuel costs.

01514 - TEMPORARY TELEPHONE SERVICE

- A. If a phone is required for the ENGINEER by Section 01590, the General CONTRACTOR shall pay for the cost of installation and the monthly service charge. However, toll charges will be paid for by the ENGINEER.

01515 - TEMPORARY WATER

- A. If there is an existing building or hydrant on the site from which water can be taken, the Contractor responsible for plumbing work shall provide hose bibs from which Contractors can obtain an adequate supply of water. Each user shall supply his own hose. The OWNER shall pay for the water.
- B. If water cannot be obtained as above, but the water main from which the permanent water service will be taken is in place, the CONTRACTOR responsible for the plumbing work shall arrange with the local water utility to have the

permanent tap made and run the new service as required by the Contract Documents to the building or buildings and provide hose bib connections for use by all Contractors. Each CONTRACTOR shall furnish his own hoses. The OWNER shall pay for the water.

- C. If the OWNER has a water works system but water is not available at the site of the work, the OWNER shall provide a source of supply for all Contractors and pay for the water. Each CONTRACTOR which will use the water shall pay for getting it to the site of the work.
- D. If the OWNER does not have a water supply, each CONTRACTOR requiring water shall make his own arrangements to obtain water and shall pay for it.

01516 - TEMPORARY SANITARY FACILITIES

- A. The General CONTRACTOR shall provide and maintain an approved chemical toilet for the use of all workmen of all trades. The toilet shall be kept clean and removed when the buildings permanent sanitary facilities are usable.

01517 - TEMPORARY FIRST AID FACILITIES

- A. All CONTRACTORS shall comply with the requirements of "Manual of Accident Prevention in Construction" - Associated General Contractors of America, Inc., latest edition and have on the site a first aid kit, dustproof, protected from heat and moisture and containing at a minimum the first aid items listed according to the number of employees.

01518 - TEMPORARY FIRE PROTECTION

- A. CONTRACTORS shall comply with the requirements of "Manual of Accident Prevention in Construction" - Associated General Contractors of America, Inc., latest edition. Do not block access to any fire hydrants, valves, manholes, fire alarm or police call boxes. Post fire department telephone numbers on jobsite and keep fire extinguisher on jobsite. Electrical Contractor should have carbon dioxide extinguisher available.

DIVISION 1

GENERAL REQUIREMENTS

01500 TEMPORARY FACILITIES AND CONTROLS

01522 TEMPORARY ENCLOSURES

INDEX: -01- General

-01- GENERAL

- A. Provide temporary weather tight enclosures for all exterior door and window openings and openings through roof. Provide sufficient doors for convenient access to the building for all trades. At the end of the day's work, all temporary enclosures shall be securely closed and all exterior doors locked.

DIVISION 1

GENERAL REQUIREMENTS

01500 TEMPORARY FACILITIES AND CONTROLS

01531 FENCES

INDEX: -01- General

-01- GENERAL

- A. New fences are covered in Division 2 of the specifications. Existing fences which interfere with the work shall be removed by the CONTRACTOR and restored to their original condition when the work is done, unless the plans indicate otherwise.
- B. Provide temporary fencing as indicated on the plans to restrict access to the site.

DIVISION 1

GENERAL REQUIREMENTS

01500 TEMPORARY FACILITIES AND CONTROLS

01532 TREE AND PLANT PROTECTION

INDEX: -01- General

-01- GENERAL

- A. It is the responsibility of the CONTRACTOR to protect all trees, shrubs, lawns, etc., not specifically designed for removal by the ENGINEER.
- B. Any damaged vegetation shall be replaced by the CONTRACTOR at no cost to the OWNER.

DIVISION 1

GENERAL REQUIREMENTS

01500 TEMPORARY FACILITIES AND CONTROLS

01533 BARRICADES, GUARDRAILS, SIGNS, AND WARNING DEVICES

- INDEX: -01- General
-02- Barricades and Warning Devices
-03- OSHA Requirements
-04- Owner's Rights

-01- GENERAL

- A. The devices and materials and provisions, as specified herein, are minimum requirements and do not relieve the CONTRACTOR from compliance with Federal, State and local requirements. Prior to the placement of devices intended to close an alley, street, highway, thoroughfare, traffic lane or public or private way, the CONTRACTOR shall obtain written permission from the authorized official of the municipality and, if applicable, the appropriate County or State highway official or property owner. The CONTRACTOR shall notify the Chiefs of the Fire and Police Departments of the municipalities concerned prior to any such closure.

-02- BARRICADES AND WARNING DEVICES

- A. The CONTRACTOR shall be responsible for the erection and maintenance of all barricades, guardrails, lights and signs necessary for public safety and convenience. All hazards within the limits of the work or on detour around the work must be marked with well-painted well-maintained barricades, lanterns, torches, flares reflectors, electric lights, flashers, and caution warning and directional signs in sufficient quantity and size adequately to protect life and property. These safeguards shall be moved, changed, increased or removed as required during the progress of the work to meet changing conditions.
- B. Barricades shall be placed in front of and around all excavations, obstructions, or construction areas so as clearly to define such areas to both drivers of vehicles and pedestrians. Whenever practical, the barricades shall be placed within three to six feet of the excavation or obstruction, and so placed that headlight beams of approaching vehicles will strike the barricades and reflecting devices head on. Where trenches are in the roadway or within five feet of the edge of the roadway, barricades shall be placed between the traffic lanes and the trench and spaced at intervals no greater than 30 feet.

- C. When a street is closed to through traffic, barricades shall be placed at the adjacent intersection as well as at the location of the obstruction, unless both are at the same location, and a black and white sign not less than 30" x 24" attached thereto, adequately illuminated and/or reflectorized reading "Street Closed-Detour" in letters not less than four inches high.
- D. All barricades shall be of the single bar type, either single "A" frame or double "A" frame mounting.
- E. Barricades shall be maintained in rigidly assembled condition. They shall be kept clean and the reflecting strips in good repair so as to be readily discernible at all times.
- F. Proper provisions shall be made for handling of materials for the protection of all traffic and the public. Reasonable and satisfactory provisions shall be made for travel on sidewalks, cross-walks, streets, roads, railroads and private ways.

-03- OSHA REQUIREMENTS

- A. The CONTRACTOR shall follow "Occupational Safety and Health Act" requirements issued by the State and local laws, rules, and regulations, as they apply.

-04- OWNER'S RIGHTS

- A. The OWNER reserves the right to remedy any neglect on the part of the CONTRACTOR as regards to the protection of the work and public after twenty-four hours notice in writing, except in case of emergency when it shall have the right to remedy any neglect without due notice, and in either case to deduct the cost of such remedy from any money to or to become due the CONTRACTOR.

DIVISION 1

GENERAL REQUIREMENTS

01500 TEMPORARY FACILITIES AND CONTROLS

01545 PROTECTION OF WORK AND PROPERTY

INDEX: -01- General

-01- GENERAL

- A. The OWNER will not be responsible for security on the site of the work. Each CONTRACTOR will be held responsible for loss or injury to persons or property where his work is involved and shall provide (if he deems it necessary) such watchmen and take such other precautionary measures as he may deem necessary to protect his own interests.

DIVISION 1

GENERAL REQUIREMENTS

01500 TEMPORARY FACILITIES AND CONTROLS

01550 ACCESS ROADS AND PARKING AREAS

- INDEX: -01- General
-02- Owner's Responsibilities
-03- Contractor's Responsibilities

-01- GENERAL

- A. This section covers temporary access roads and parking. Permanent access and parking areas are covered under Division 2 of the specifications.

-02- OWNER'S RESPONSIBILITIES

- A. The OWNER shall provide a place of ingress and egress for the CONTRACTOR to the site of the work. If an easement is required, it shall be obtained by the OWNER.

-03- CONTRACTOR'S RESPONSIBILITIES

- A. The CONTRACTOR shall provide and maintain a temporary road for his equipment on the land provided by the OWNER.
- B. If the site is large enough, the OWNER shall permit the CONTRACTOR to park his own and employees' vehicles on the site without charge. If the site is not large enough, the CONTRACTOR shall make his own parking arrangements.

DIVISION 1

GENERAL REQUIREMENTS

01500 TEMPORARY FACILITIES AND CONTROLS

01560 SPECIAL CONTROLS

- INDEX: -01- Dust Control
-02- Pollution Control
-03- Soil Erosion and Sedimentation Control

-01- DUST CONTROL

- A. The CONTRACTOR shall control dust by sweeping the street surfaces, sprinkling and/or applying calcium chloride. The ENGINEER may specifically require the use of calcium chloride, if in his opinion, it is necessary to control the dust problem. Calcium chloride shall be applied at a rate of one-half pound per square yard to all areas including detours that require dust control due to construction and/or heavy construction traffic. All materials and labor necessary for controlling dust will be incidental to construction.

-02- POLLUTION CONTROL

- A. The CONTRACTOR shall comply with all Federal, State and local requirements covering pollution control.

-03- SOIL EROSION AND SEDIMENTATION CONTROL

- A. General

The CONTRACTOR shall prepare a Soil Erosion and Sedimentation Control (SESC) Program for submittal to and approval by Local Soil Erosion and Sedimentation Agent prior to start of construction.

The CONTRACTOR, after award, but prior to the preconstruction conference, together with the local soil erosion enforcing agent, shall identify all potential soil erosion problem areas and prepare a detailed soil erosion and sedimentation control program satisfying the CONTRACTOR'S specific method of operation, but not necessarily be limited to, the following:

1. Identify on a separate set of plans all soil erosion problem areas.
2. Identify specific control methods using MDNR United Keying System from the Michigan Soil Erosion and Sedimentation Control Guidebook to control erosion and to prevent soil from entering storm water sewers and streams.
3. Indicate timing of placement and removal of structures both in relationship to time of year and to sequence of construction.
4. Indicate timing of completion of cleanup and surface restoration after control structures are removed.

The erosion control program prepared by the CONTRACTOR shall be reviewed and have received at least preliminary concurrence from the local enforcing agent before it will be presented and discussed at the preconstruction meeting, at which time final revisions may be made. Copies of the final agreed program shall be made available for the ENGINEER and the local enforcing agent. Should the local regulatory agency determine at any time during construction that the construction operation is in violation of the SESC Program or applicable laws, the CONTRACTOR shall take immediate action to ensure compliance with the SESC Program and applicable laws.

B. Dewatering Trenches and Disposal of Excess Excavated Material

Pumping or draining from trench excavations shall be made on either side of the trench and not into the waters of the State. It shall be the CONTRACTOR'S responsibility to secure the necessary approval of private land owners before discharging water from the trench excavation onto private lands. Water shall be discharged in such a manner as to cause no pollution or erosion problems. The CONTRACTOR shall dewater to existing storm sewer systems wherever possible (method of disposal to be approved by the OWNER and governing agencies). All discharge from dewatering wells discharged onto the ground ahead of being piped to a natural water-course or lake via an existing storm sewer system or by a temporary piping system shall have built at the point of entry into such storm sewer a silt retention structure. This silt retention structure may consist of several straw bales adequately anchored and placed, as directed by the ENGINEER. Any eventual silt or solids retained in the area of these structures shall be removed prior to removal of the structure. At no time will silt or similar materials be permitted to filter into a lake or natural water-course. There shall be no side castings of any excavated material into any waterway. Excess excavated material from stream crossings and excavation near streams shall be removed and disposed of elsewhere and not within the flood plain.

C. Stream Bank Protection

The banks of streams shall not be left unprotected for more than one (1) day where possible, but never more than seven (7) days after the stream crossing is completed.

Replacing a bank plug and grading of stream banks within 50 feet of the stream shall be accomplished immediately following completion of the Work. Construction will not be allowed to continue at the expense of not providing stream bank protection.

All disturbed stream banks shall be finished with a slope not steeper than 2:1 (two horizontal to one vertical). The 2:1 slope shall be graded up and back to the high water line. If the top of the natural bank is more than 3 feet above the high water line, a minimum 10 foot berm shall be constructed at this level and the remaining slope constructed upward parallel with or on a flatter slope than the original natural bank, provided sufficient adjoining property is available. If such property is not available, permanent riprap shall be placed to the top of the bank. Permanent riprap material shall be placed from the bed of the channel to 3 feet above the normal high water line or to the top of the bank. If riprap is placed to the top of the bank, a berm will not be required. Permanent riprap shall be five (5) to one (1) mix of sand to cement in burlap or canvas bags, broken concrete (with no exposed reinforcing rod or mesh), large rock, or other material approved by the ENGINEER. All raw soil exposed above the riprap shall be either sodded or seeded, fertilized, and mulched. On slopes greater than 10 percent, sod shall be pegged for stability.

D. Slope Protection Adjacent to Stream Crossings

In clearing and grubbing of right-of-way, a 20 foot deep strip of natural vegetation the full width of the right-of-way shall be left on both sides of the streams or drains to be crossed. Deflection dikes consisting of gravel or other suitable material, reinforced by one (1) row of sandbags, shall be used to divert runoff from the steep slopes adjacent to water crossings where contributing runoff could be great enough to cause slope erosion and resulting sedimentation at the stream crossing. Diversion berms, filter berms, diversion ditches, or terracing may be appropriate. On slopes greater than 20 percent, such diversion structures shall be placed along the top of the stream bank where the entire slope is not protected with riprap. Water shall be diverted to undisturbed areas adjacent to the right-of-way.

A pipe trench excavation shall stop some distance from the stream to leave a protective plug of 10 to 20 feet of unexcavated material at each bank. The plugs shall be left in place until Work near the stream has begun. Bypassing of water in the trench to the side by diversion ditches or by pumping may be required. The water shall be diverted to undisturbed areas adjacent to the right-of-way. Replacing of bank plug and grading of stream banks within 50 feet of the stream shall be accomplished immediately following completion of the Work. Clearing and the removal of protective vegetation shall be kept at a minimum distance ahead of the trenching unit.

Any unforeseen situations that may be encountered during the course of construction that may cause accelerated erosion and deposition of sediment into waterways and/or lakes shall be controlled by methods that may include sediment traps, sediment basins, or holding ponds. Any slope failures or development of gullies after construction has been

completed shall be corrected immediately.

E. Surface Restoration

In addition to the aforementioned specific requirements for stream crossings, stream-bank protection, and slope stabilization adjacent to streams, the following surface restoration shall be done by the CONTRACTOR:

1. When final topography has been established, all bared soil shall be seeded, fertilized, and mulched in an effort to restore to a protected condition: exception flat, active farm fields. Critical areas shall be sodded as specified hereinafter under Restoration.
2. Seed shall be at least, per acre, 10 pounds Kentucky, 31 pounds fescue, 3 pounds Birdsfoot Trefoil, and 3 pounds white clover, unless indicated otherwise.
3. Fertilizer shall be at least 200 pounds per acre 12:12:12, or equivalent.
4. Mulch shall be 2-tons/acre of straw or hay. A chemical mulch or other approved material may be used.
5. On slopes greater than 20 percent, but not immediately adjacent to stream crossings, mulch shall be anchored with a spray of Type SS-1 emulsion mixed with an equal amount of water at a rate of 200/gal/acre. A chemical self-adhering mulch may be used. Mulch shall be anchored on slopes greater than 10 percent if immediately adjacent to stream crossings. Mulch may also be held in place by discing with a farm disc. If mulch materials such as netting or excelsior blankets are used, they staked per the manufacturers recommendations.

The aforementioned permanent protection measures (1-5) shall be in effect not more than 30 days after the earth change is completed, except at tie-in areas at both sides of the stream where temporary measures will be installed within three (3) days following completion of the Work. Temporary measures may include a row of sand bags at the top of the bank, a row of pegged bales of straw, or an earth berm of diversion ditch. These temporary measures shall be maintained until permanent measures are installed.

Where construction involves placing sewers in roadways or under other impervious materials, special care shall be provided by the CONTRACTOR.

1. Provide control measures at all storm sewer catch basins by providing non-woven geotextiles, straw, or other types of filters or construct sediment traps adjacent to inlets.
2. If a roadway has a grass ditch area, minimize disturbance and provide filter berms (straw or gravel) or sediment traps as appropriate.

3. Provide proper down drain structures to control increased runoff to streams and drains.
4. Stabilize the roadway as soon as possible after completion of the Work. Temporary erosion control measures shall be instituted until final paving is complete. Such measures may include a subbase surfacing application or gravel surfacing. Compaction of soil may suffice if approved by the ENGINEER.

DIVISION 1

GENERAL REQUIREMENTS

01500 TEMPORARY FACILITIES AND CONTROLS

01570 TRAFFIC REGULATION

INDEX: -01- Flagmen
-02- Flares and Lights

-01- FLAGMEN

- A. When the work involves active streets or highways, the CONTRACTOR shall have flagmen on the site to provide safe passage of vehicles.

-02- FLARES AND LIGHTS

- A. Flares and lights have been included as a requirement in Section 01533. In addition, the CONTRACTOR shall delegate the responsibility of placing and maintaining flares, lights, guardrails and barricades to specific employees.

DIVISION 1

GENERAL REQUIREMENTS

01500 TEMPORARY FACILITIES AND CONTROLS

01580 PROJECT IDENTIFICATION

INDEX: -01- General

-01- GENERAL

- A. Project signs, if required, will be provided by the CONTRACTOR in accordance with the requirements of the Special Provisions.

DIVISION 1

GENERAL REQUIREMENTS

01500 TEMPORARY FACILITIES AND CONTROLS

01590 FIELD OFFICES AND SHEDS

INDEX: -01- General
-02- Office for Engineer

-01- GENERAL

- A. The CONTRACTOR and his subcontractors may maintain such temporary field offices and sheds on the site as may be necessary to properly conduct the Work. These shall be located so as to cause no interference to any work to be performed on the site. Such structures and facilities are to be the property of the CONTRACTOR. Upon completion of the project, the CONTRACTOR shall remove such temporary structures and facilities from the site.

-02- OFFICE FOR ENGINEER

- A. In addition to his own requirements, the CONTRACTOR shall provide office space for the ENGINEER at the project site. This may be either a separate structure or a separate room with an outside door in the CONTRACTOR'S office building. The office shall be weather tight and of sufficient size (minimum of 150 square feet) to accommodate the furniture listed below without crowding. The office shall have at least two operable windows with storm sash and screens. The door or doors shall be provided with a lock and two keys.
- B. The CONTRACTOR shall furnish the office with the following furniture and equipment which shall remain the property of the CONTRACTOR and be claimed by him at the completion of the work.
1. One sloping top plan table or drafting table with suitable stool.
 2. One 30" x 60" desk with at least one lockable file drawer with keys for 8-1/2" x 11" files and a suitable chair.
 3. Telephone.
 4. Appropriate lighting and heating.

- C. The CONTRACTOR shall pay for heat, light, janitorial service and telephone service for the ENGINEER'S office. The ENGINEER will pay for any long distance calls.

DIVISION 1

GENERAL REQUIREMENTS

01600 MATERIAL AND EQUIPMENT

01610 QUALITY

INDEX: -01- General

-01- GENERAL

- A. In order to establish standards of quality, the ENGINEER has, in the Project Specifications and/or on the Plans, referred to certain products by name and catalog number. This procedure is not to be construed as eliminating from competition other products of equal or better quality which are fully suitable in design. The specific article, material, or equipment mentioned shall be understood as indicating the type, function, minimum standard of design, efficiency and quality desired and shall not be construed in such a manner as to exclude manufacturers' products of comparable quality, design and efficiency.
- B. All materials and equipment incorporated in the Work shall be new, unless otherwise specifically provided for in the specifications.

DIVISION 1

GENERAL REQUIREMENTS

01600 MATERIAL AND EQUIPMENT

01620 TRANSPORTATION AND HANDLING

INDEX: -01- General

-01- GENERAL

- A. It shall be the responsibility of the CONTRACTOR to furnish all material and equipment to the jobsite.
- B. Products received by railroad freight shall be unloaded from cars at the siding by the CONTRACTOR. Products received by truck shall be unloaded on the site of the work by the CONTRACTOR. All hauling costs incidental to the installation of products shall be paid by the CONTRACTOR.

DIVISION 1

GENERAL REQUIREMENTS

01600 MATERIAL AND EQUIPMENT

01630 STORAGE AND PROTECTION

INDEX: -01- General

-01- GENERAL

- A. Provide protection against rain, wind, dust, dirt, storms, cold, or heat so as to maintain all work, materials, apparatus, equipment, and fixtures, incorporated in the work or stored on the site, free from injury or damage. At the end of the day's work, cover all new work likely to be damaged. Items which required dry storage, such as electrical controls and motors, shall be stored in a dry building and not under tarps.

DIVISION 1

GENERAL REQUIREMENTS

01600 MATERIAL AND EQUIPMENT

01640 SUBSTITUTIONS AND PRODUCT OPTIONS

INDEX: -01- General
-02- Procedures

-01- GENERAL

- A. The bid form may carry the following note: "The above bid shall be based on the equipment specified and not substitute items. If the CONTRACTOR desires to propose other equipment in lieu of that specified, it shall be listed on the following page. All substitutions will be evaluated in establishing the low bid". Substitutions and product options will be given consideration in the following manner:
- B. Where material is listed by manufacturer and/or trade name and catalog number, with no qualifying statement, such material shall be included in the bid as stated above without substitution; but the bidder has the privilege of submitting with his bid, the name of substitute product as provided in (A) above.

-02- PROCEDURES

- A. Where material or equipment is listed by manufacturer's name or trade name and such name is preceded by words "as" or "similar to" or followed by words, "or equal" or "approved equal", CONTRACTOR shall have the option of submitting for approval substitute material which he considers equal to that specified. The request to use such materials shall be submitted during the submittal of Shop Drawings. The burden of proof that materials are equal shall be upon the CONTRACTOR requesting their use. Therefore, the CONTRACTOR shall furnish, with his request for approval of substitute products, such engineering and catalog data necessary for the ENGINEER to determine the suitability and equality of the products.
- B. Where more than one manufacturer is named, the CONTRACTOR has the option of selecting any one of the manufacturers of materials or products named.

- C. Where material is listed only by description or by ASTM or Federal Specification numbers, any product meeting or exceeding requirements of such specification is acceptable. If requested by the ENGINEER, evidence shall be furnished showing that material meets the requirements of the specifications.
- D. Some items may be specified on Plans only. The CONTRACTOR shall check Plans for such items.
- E. When substituting mechanical equipment, the CONTRACTOR assumes a responsibility for any changes in the system and for modifications required in other work to accommodate such substitution. Carefully read Section 01300, Subsection 01360, Subparagraph "B". The ENGINEER'S approval of substituted equipment will not relieve the CONTRACTOR of the requirements of the above referenced paragraph.
- F. The ENGINEER'S judgment on the suitability of a substitute product shall be final.

DIVISION 1

GENERAL REQUIREMENTS

01700 PROJECT CLOSEOUT

01710 CLEANING

INDEX: -01- General
-02- Special Cleaning

-01- GENERAL

- A. The General CONTRACTOR shall be responsible for the removal of all interior and exterior temporary protection structures, devices, etc. Patch all points or surfaces marred or otherwise damaged by the attachment of such structures and devices.

-02- SPECIAL CLEANING

- A. Remove putty or glazing compound stains and paint from all glass and wash glass. Replace broken glass.
- B. Remove all marks, stains and dirt from painted, varnished and other coated surfaces.
- C. Remove all stains, dust, dirt, paint, etc. from hardware, ornamental iron, miscellaneous metal and polish hardware.
- D. The CONTRACTOR shall remove all rubbish caused by his operations and the operations of his subcontractors. The entire project shall be left "broom-clean".

DIVISION 1

GENERAL REQUIREMENTS

01700 PROJECT CLOSEOUT

01720 PROJECT RECORD DOCUMENTS

INDEX: -01- General

-01- GENERAL

- A. CONTRACTOR shall keep one record copy of all Specifications, Drawings, Addenda, Modifications, and Shop Drawings at the site in good order and annotated to show all changes made during the construction process. These shall be available to the ENGINEER and shall be delivered to him for the OWNER upon completion of the Project.
- B. Drawings of record will be the "Project Record Drawings". At the completion of the Work and prior to final payment, the CONTRACTOR responsible for each division of the Work shall provide the ENGINEER with a marked-up set of drawings showing all changes or variations from the original drawings. These changes shall be made on a set of field drawings as the work is done. This set of drawings should be kept clean in a location at the site where ENGINEER or Inspector may examine it when desired.
- C. The marked-up drawings shall be accurate. Arbitrary markings are of no value. Careful measurements shall be made to locate underground exterior and underground interior sewers, gas lines, water lines, electrical conduit, underground telephone cable, miscellaneous piping.

DIVISION 1

GENERAL REQUIREMENTS

01700 PROJECT CLOSEOUT

01730 OPERATIONS AND MAINTENANCE DATA

INDEX: -01- General

-01- GENERAL

- A. The CONTRACTOR shall require each manufacturer of equipment and instruments to furnish four (4) sets of manuals covering the operation of the equipment and instructions for maintenance. Manuals shall be complete, detailed guides for the maintenance and operation of equipment. They shall include complete information necessary for starting, adjusting, maintaining in continuous operation for long periods of time and dismantling and reassembling of the complete units and subassembly components. Manuals shall include an index covering all component parts clearly cross-referenced to diagrams and illustrations. This material shall be submitted directly to the ENGINEER within sixty (60) days after Shop Drawing approval for the ENGINEER'S review. The ENGINEER shall not approve said material unless, in his judgment, said material adequately addresses operation and maintenance of the respective equipment or instrument item. The ENGINEER may require revisions and/or re-submittal of operation and maintenance material by a manufacturer. All re-submittals or revisions of said material shall be prepared and delivered to the ENGINEER within thirty (30) days of the time the ENGINEER notifies the manufacturer of the need for the same. No payment requests for an equipment or instrument item will be processed by the ENGINEER unless the operation and maintenance material for that item is approved by the ENGINEER. This material in final form will be incorporated into a comprehensive manual of plant operation and maintenance for the OWNER'S use.

DIVISION 1

GENERAL REQUIREMENTS

01700 PROJECT CLOSEOUT

01740 GUARANTEES, WARRANTIES, AND BONDS

INDEX: 1.0 General

1.0 GENERAL

A. The CONTRACTOR shall guarantee all materials and equipment furnished and work performed for a period of one (1) year from the date of substantial completion. The CONTRACTOR warrants and guarantees for a period of one (1) year from the date of substantial completion of the system that the completed system is free from all defects due to faulty materials or workmanship and the CONTRACTOR shall promptly make such corrections as may be necessary by reason of such defects including the repairs of any damage to other parts of the system resulting from such defects. The OWNER will give notice of observed defects with reasonable promptness. In the event that the CONTRACTOR should fail to make such repairs, adjustments, or other Work that may be made necessary by such defects, the OWNER may do so and charge the CONTRACTOR the cost thereby incurred. The Performance Bond shall remain in full force and effect through the guarantee period.

1.1 CLOSEOUT PROCEDURES

- A. Submit written certification that Contract Documents have been reviewed, work has been inspected by appropriate trade inspectors, and that the work is complete in accordance with the Contract Documents and ready for Engineer's review.
- B. Provide submittals to the Owner that are required by governing authorities.
- C. Submit to the Engineer six copies of:
 - 1. Balancing Change Order Information.
 - 2. Application for Final Payment.
 - 3. Final Waiver of Lien from major suppliers and subcontractors.

1.2 PROJECT RECORD DOCUMENTS

- A. Maintain on site, one set of the following record documents; record actual revisions to the work for submittal to the Engineer:

1. Drawings
 2. Specifications
 3. Addenda
 4. Change Orders and other modifications to the Contract
 5. Reviewed shop drawings, product data, and samples
- B. The Engineer will survey all surface features of the project when construction is complete. The Contractor shall make sure that he provides to the Engineer records of all changes to underground items that cannot be verified from the surface.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction.
- E. Record documents and shop drawings: mark each item to record actual construction including:
1. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 2. Field changes of dimension and detail.
 3. Details not on original Contract drawings.

1.3 WARRANTIES/GUARANTEES

- A. The Contractor shall guarantee all materials and equipment furnished and work performed for a period of one (1) year from the date of substantial completion unless extended guarantee period is specified for certain products or systems.
- B. The Contractor warrants and guarantees for a period of one (1) year from the date of final acceptance of the system, unless otherwise stated in any substantial completion certifications, that the completed system is free from all defects due to faulty materials or workmanship and the Contractor shall promptly make such corrections as may be necessary by reason of such defects including the repairs of any damage to other parts of the system resulting from such defects.
- C. The Contractor shall obtain all warranties/guarantees on behalf of the Owner. In the event that the Contractor by omission, negligence, or oversight fails to properly submit the required warranty information to the Manufacturer causing a void in said Manufacturer's warranty, the Contractor shall be responsible for honoring that warranty as the Manufacturer would, had the information been properly submitted by the Contractor.
- D. The Owner will give notice of observed defects with reasonable promptness.

- E. In the event that the Contractor should fail to make such repairs, adjustments, or other work that may be made necessary by such defects, the Owner may do so and charge the Contractor the cost thereby incurred.
- F. The Performance Bond shall remain in full force and effect through the guarantee period.

1.4 SPARE PARTS AND MAINTENANCE MATERIALS

- A. Provide products, spare parts, maintenance, and extra materials in quantities specified in the individual sections.
- B. Deliver to the Owner bound copies of O&M data; obtain receipt prior to final payment.

END OF SECTION

DIVISION 1

GENERAL REQUIREMENTS

01700 PROJECT CLOSEOUT

01750 SPARE PARTS AND MAINTENANCE MATERIAL

INDEX: -01- General

-01- GENERAL

- A. When spare parts and maintenance materials are requested by the OWNER or considered necessary by the ENGINEER, they will be included in the specifications for the equipment for which they are wanted.

DIVISION 2

SITE WORK

SECTION 02100 - SITE PREPARATION

02120 - Clearing and Grubbing 02120-1

SECTION 02200 - EARTH WORK

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DIVISION 2

SITE WORK

02100 - SITE PREPARATION

02120 - CLEARING AND GRUBBING

- INDEX: -01- General
-02- Methods
-03- Disposal
-04- Environmental Requirements

-01- GENERAL

- A. Clearing and grubbing shall consist of cutting and clearing of trees, brush, stumps, roots, vines, and other vegetation occurring within the clearing limits and disposing of the same at an approved location, including those trees or bushes requiring removal for construction of sanitary sewers, force mains, and utilities.
- B. For the construction of buildings, other types of general construction, and work confined to a single site, the clearing limits shall be the site of the work indicated on the Plan.
- C. For water mains, sewer mains, utilities, and force mains, the clearing limits shall be the minimum distance within the limits of the right-of-way to do the work, including grade staking.
- D. Contractor shall verify that all quantities listed on the plans reflect the actual quantities needed for the work. Contractor's bid shall include all labor, materials, and quantities necessary to complete the project, as intended.

-02- METHODS

- A. The Contractor may use whatever methods for clearing and grubbing best suited to the site of the work and which will not damage property adjacent to the site of the work.
- B. When so designated on the Plans or directed by the Owner or the Engineer, trees or shrubs located within clearing areas, which are desirable for beautification, shall be preserved and protected by the Contractor from damage or injury.

-03- DISPOSAL

- A. The Contractor shall make his own arrangements for disposal of materials resulting from clearing and grubbing. Unless otherwise indicated on the Drawings, disposal shall be off the site and/or right-of-way and written permits for such disposal shall be obtained by the Contractor from the Owner of the property on which the material is placed.

-04- ENVIRONMENTAL REQUIREMENTS

- A. The Contractor shall comply with all permit requirements of the Michigan Department of Natural Resources Air Pollution Control Rules which regulates the open burning of weeds, brush, logs, limbs, stumps, roots, and other debris which results from clearing and grubbing.
- B. Special care shall be taken not to disturb any designated wetlands or areas of environmental concern.

END OF SECTION

DIVISION 2

SITE WORK

02200 - EARTHWORK

02210 - SITE GRADING

- INDEX: -01- General
-02- Rough Grading
-03- Finished Grading

-01- GENERAL

- A. Remove topsoil to its full depth where construction will occur and elsewhere if so indicated on the Drawings.
- B. Stockpile topsoil carefully in areas approved by the Engineer or Owner.
- C. Contractor shall verify that all quantities listed on the Drawings reflect the actual quantities needed for the work. Contractor's bid shall include all labor, materials, and quantities necessary to complete the project, as intended.

-02- ROUGH GRADING

- A. Contractor's responsibility shall include general exterior grading, cutting, and filling required to modify existing grades to grades and contours shown on Drawings to limits of areas to be seeded, including furnishing, hauling, and placing of any extra material required with allowance for the topsoil depth.
- B. Cutting and/or filling to subgrades indicated for roads, driveways, turnarounds, ramps, walks, and parking areas is not included in this Section. This work shall be included with each item.

-03- FINISHED GRADING

- A. Furnish, haul, and place topsoil to establish the finished grades and contours shown on the Drawings. The topsoil shall be free of organic material, frozen material, large stones, and any other materials which may be harmful to the establishment of lawn. The depth of topsoil shall be 3" minimum or as otherwise indicated on the Drawings. If stripped topsoil,

which meets the indicated requirements, is available, it shall be used. Furnish any extra required, stockpile any excess in an area approved by the Owner or Engineer.

- B. Topsoil shall not be placed when the subgrade is frozen, excessively wet, extremely dry, or in a condition otherwise detrimental to the proper grading and seeding of the lawn.
- C. Irregularities in the surface resulting from damage, rutting, or topsoil placement shall be corrected in order to prevent the formations of depressions where water will stand. Rake lightly to even the surface for seeding.

END OF SECTION

DIVISION 2

SITE WORK

02200 - EARTHWORK

02211 - ROCK REMOVAL

- INDEX: -01- General
-02- Measurements for Payment
-03- Limits of Payment
-04- Removal by Blasting

-01- GENERAL

- A. Rock excavation shall include such solid or ledge rock, including shale and slate, sandstone, or other hard materials, that are not decomposed, weathered, loose, layered or shattered, and require the continuous use of pneumatic tools, drilling and blasting, or heavy ripping. Boulders and pieces of concrete or masonry exceeding one-half cubic yard in volume shall be classified as rock. The opinion of the ENGINEER shall be final in determining whether the above criteria has been met. All excavation, which is not classified as rock, shall be included in the unit price for the unit being constructed, unless otherwise noted.
- B. Contractor shall verify that all quantities listed on the plans reflect the actual quantities needed for the work. Contractor's bid shall include all labor, materials, and quantities necessary to complete the project, as intended.

-02- MEASUREMENTS FOR PAYMENT

- A. Prior to removal of rock, the CONTRACTOR shall give the ENGINEER sufficient notice (at least twenty-four hours) in order that he may make the measurements necessary for volume computation. Payment for rock excavation will not be authorized unless the ENGINEER or his representative has taken the necessary measurements.

-03- LIMITS OF PAYMENT

- A. In rock excavation for manholes one (1) foot will be allowed outside of the wall lines. In open trench rock excavation a thirty (30) inch width will be allowed for pipe sized up to and including 12" pipe. For larger pipe sizes, the width shall be the nominal outside

diameter of the pipe plus twenty-four inches. In rock trench, the CONTRACTOR shall remove enough rock to provide a sand bed for the pipe. Payment will be allowed to a maximum depth of 6" below the outside bottom of the pipe barrel. In rock excavation for foundation walls, one (1) foot will be allowed outside of the outside wall surfaces of the structures when they go down to a depth of four (4) feet below the final surface of the ground and thirty (30) inches will be allowed when structures are of depths greater than four (4) feet. No allowance will be made for additional rock removed for the convenience of the CONTRACTOR. Payment for rock excavation shall be at the unit price bid in the contract.

-04- REMOVAL BY BLASTING

- A. Blasting will only be allowed with the approval of the Owner, Engineer, and all regulating agencies.
- B. When blasting is necessary, before starting work, secure insurance coverage with limits as specified in "General Conditions".
- C. In case injury occurs through blasting to any portion of the existing or new equipment, materials, structures, or to the materials surrounding or supporting the same, the CONTRACTOR at his own expense shall remove such injured work and shall rebuild the same, or shall furnish such material and perform such work or repairs or replacements as the ENGINEER may order. Any damage whatever to any existing structures and utilities due to blasting shall be promptly completed and satisfactorily repaired by the CONTRACTOR at his own expense.
- D. All blasting necessary on this contract shall be done with the express provision that the CONTRACTOR shall be and is hereunder responsible for any and all damages and claims arising from such blasting or by accidental explosions, and for the defense of all actions arising from such causes.

END OF SECTION

DIVISION 2

SITE WORK

02200 - EARTHWORK

02221 - TRENCHING, BACKFILLING, AND COMPACTING

- INDEX: -01- General
-02- Lines and Grades
-03- Pipe Bedding
-04- Compaction of Backfill
-05- Unstable Foundation
-06- Special Considerations - Gravity Sewer Mains
-07- Special Considerations - Water Mains
-08- Special Considerations - Sewer Force Mains

-01- GENERAL

- A. No variation from the price named in the contract will be made or allowed, whether the material through which the trenches are excavated is hard or soft, or whether composed of rocks, boulders, or common earth. Furthermore, no compensation for trenching done in excess of the amount shown by Drawings, Contract, and Specifications will be allowed.
- B. The time elapsed before backfilling begins shall be subject to the approval of the ENGINEER for the type of construction used. All backfilling shall be carried along as speedily as possible as the Work progresses. Wherever the ENGINEER shall so order, the backfilling shall not be left unfinished more than 100 feet behind the completed trench work. New trenching will not be permitted when earlier trenches need backfilling or labor is needed to restore the surfaces of streets or other areas to a safe and proper condition. After each portion of the backfilling has been completed as specified herein, it shall be allowed to stand for such period of time as the ENGINEER may direct. If, in the opinion of the OWNER, backfilling and cleanup work is not being performed as indicated above, said OWNER may order work on the project stopped until cleanup is brought up to date, may withhold amounts of money for this work, or may proceed to rectify the situation using his own labor and equipment and deduct his cost from the amount of the contract.
- C. CONTRACTOR shall verify that all quantities listed on the Drawings reflect the actual quantities needed for the work. CONTRACTOR'S bid shall include all labor, materials, and quantities necessary to complete the project, as intended.

-02- LINES AND GRADES

- A. Batter Boards: The following procedure shall be used for setting lines and grades in open-cut construction for sewers, and can be used for alignment and grade when constructing other conduit systems. The CONTRACTOR shall furnish and set the line and grade boards. A stake shall be driven on each side of the trench on a line at right angles to each stake of primary line. A straight and even-edged board shall be fastened to these stakes in a level position and at some even foot height above the grade of the proposed sewer. The centerline of the proposed sewer shall be located and marked upon the board. Not less than three such line and grade boards shall be set initially and immediately checked visually for error in line and grade. As each additional board is placed, it shall be checked visually with the last two set. At least three consecutive boards shall be maintained at all times. During the laying of the pipe, a line shall be fastened to the boards at the center marks and pulled sufficiently tight to remove any measurable sag. The alignment of each pipe shall be obtained by plumbing from the line, and the grade shall be obtained by measuring down from the line with an approved type of grade pole. If the visual inspection of grade boards discloses an apparent error, the setting of each shall be rechecked and if the apparent error still exists, the ENGINEER shall immediately be notified.
- B. Laser Beam: Line and grade controls will be established by the OWNER at each laser set-up and at 50-foot and 100-foot points, and thereafter at 100-foot intervals to the next manhole. All other lines and grades necessary for the location and construction of the work shall be the responsibility of the CONTRACTOR. When using "in-the-pipe" units, care must be taken to maintain proper atmospheric conditions. If bending of the beam becomes apparent, a fan shall be provided to circulate the air.
- C. The laser beam method selected must be approved by the ENGINEER, and is to be operated by competent personnel employed and paid by the CONTRACTOR. If, in the opinion of the ENGINEER, the equipment is not being properly used, or if the beam cannot be properly controlled, this method of line and grade control shall not be permitted.

-03- PIPE BEDDING

- A. When pipe bedding is called for, pipe shall be bedded with sand, crushed pit run gravel or other granular material approved by the ENGINEER. Refer to Section -06-, -07-, and -08- for specific requirements for bedding materials relative to the different types of utility construction. The bedding shall be placed in 6-inch layers and solidly tamped into place until it is up to the pipe diameter after compaction. It is important that the fine granular material is in the bedding in order to get the proper compaction. If the pipe sections used employ a bell or modified tongue-and-groove design, bell holes shall be shaped in the bedding. The cost of furnishing, hauling, placing and tamping of the

bedding shall be included by the CONTRACTOR in his price bid per lineal foot of sewer or water main.

-04- COMPACTION OF BACKFILL

- A. Backfill in trenches may be compacted by mechanical equipment and/or water settling as required.
- B. See Section 02230 for compaction requirements for various types of construction and situations.

-05- UNSTABLE FOUNDATION

- A. All undesirable material below the trench bottom, such as organic soils, etc., which cannot adequately support the sewer, shall be re-moved and replaced with special bedding subbase material. The first three inches of bedding material below the bottom of the pipeline shall be placed and included in the cost of the standard sections as shown in Part 8. All additional subbase material will be paid for as defined in Section 01150-04, Special Pipe Foundation, and in accordance with the prices listed in the Proposal. Where the distance to stable ground is excessive, the ENGINEER reserves the right to order, in writing, as an extra, such other types of foundation as he shall deem necessary.
- B. Special bedding subbase material for Class III bedding shall be crushed stone and shall have the ENGINEER'S approval prior to installation. Crushed stone use for subbase stabilization greater than three inches below the pipeline bottom will be measured and paid for as defined in Section 01150-04.

-06- SPECIAL CONDITIONS -- GRAVITY SEWER MAINS

- A. Trenching
 - 1. All trenching shall be by open cut unless otherwise shown or specified; except that the CONTRACTOR shall have the option of construction in tunnel if it will result in a saving to the OWNER and approval of the same is given by the ENGINEER or his authorized representative.
 - 2. Sides of trenches shall be kept as nearly vertical as possible and shall be properly sheeted and braced.
 - 3. Trenches shall be sufficiently straight between designated angle points to permit the pipe to be laid straight and true to line and grade.
 - 4. The maximum width of trench for that portion of the trench between the trench bottom and the outside top of the pipe barrel shall be the width shown in the table below for the size of pipe used.

Pipe Size (Inches)	Max. Trench Width at Top of Pipe (Inches)
08	30
10	30
12	33
14	33
15	42
16	42
18	42
20	42
21	48
24	50
27	54
30	56
33	60
36	63
42	70
48	96
54	102
60	109
66	117
72	124
78	130
84	138
90	144
96	150

- Where the width of trench used above the outside top of the pipe barrel is in excess of the allowable maximum width permitted below that point and such allowable width below that point cannot be otherwise maintained, sheathing shall be set in at

this point and driven so as to maintain the required width of trench throughout the lower depth.

6. Where the trench width for that portion of trench between the trench bottom and the outside top of the pipe barrel for any reason exceeds the width shown in the table, the CONTRACTOR at his own expense shall furnish a stronger section, adequate for the actual trench width.
7. In Earth Excavation, the trench shall be excavated to a point at least three inches below the pipe when bedding is called for. In Rock Excavation, the trench shall be excavated to a point at least three inches below the pipe joint such that this three inch depth is free of projecting rock and to provide for bedding.

B. Pipe Bedding

1. The pipe bedding shall be either Class I, II, or III bedding as specified on the Drawings. The pipe bedding shall be either bedding sand, crushed pit run gravel, pea gravel or crushed stone chips or a material approved by the ENGINEER.
2. Bedding sand shall conform substantially to the requirements listed for force mains and water mains.
3. Crushed pit run gravel, pea gravel, or crushed stone chips shall conform substantially to the grading requirements listed below:

Sieve Size	Percentage Passing by Weight
1 inch	100
3/4 inch	95 - 100
3/8 inch	30 - 55
No. 4	0 - 10
No. 8	0 - 5

4. The bedding shall be solidly compacted with bell holes excavated prior to pipe installation. Class I, II and III bedding material shall be carefully placed and compacted for a minimum distance of one foot above the top of the pipe. Class I bedding shall consist of approved excavated backfill material. Class II and III bedding shall consist of approved granular bedding material.
5. If the pipe sections used employ a bell or modified tongue-and-groove design, bell holes shall be shaped in the bedding. The cost of furnishing, hauling, placing and

compacting all pipe bedding shall be included by the CONTRACTOR in his unit price bid per lineal foot of the sewer.

6. All bedding material proposed for use in this contract shall be inspected and approved for use by the ENGINEER prior to the beginning of construction.

C. Backfilling

1. All sewers to be laid under the contract contained in this project shall be backfilled with approved material, other than rock excavated from the sewer trenches. From the bottom of the trench to one foot above the top of the pipe, the trench shall be backfilled with sand, gravel, or other approved granular material, and compacted. The cost of furnishing, hauling and placing this backfill shall be included in the cost per lineal foot of sewer.
2. After granular material has been placed and compacted to the proper depth over the pipe, the remainder of the trench shall be backfilled with approved material. It is anticipated that most material excavated from the sewer trench will be suitable for backfill. However, if in the opinion of the ENGINEER, the excavated material is not suitable for backfill, he may direct the CONTRACTOR to backfill with an approved granular material, either sand, crushed pit run gravel, or stone. The cost of furnishing, hauling, placing, and compacting this special backfill, as well as hauling away the excavated material shall be as listed in the supplemental unit prices, unless otherwise noted.
3. No rock shall be used for backfill within five (5) feet of any manholes.
4. All trenches or excavations shall be backfilled to original surface of the ground or to such other grade as may be shown on the Drawings or directed by the ENGINEER.
5. In backfilling the sewer or other pipe trenches, no stones shall be placed nearer than two feet away from the pipe at any point. The backfilling around and over the pipe shall be carefully done by approved means to a point one foot above the top of the pipe. The remainder of the trench may be backfilled with material approved by the ENGINEER by machine or by accepted methods, but the Work shall be done in such a way as to prevent dropping of material directly on top of the pipe through any great vertical distance. Material shall be deposited in horizontal layers. In no case will backfilling material from a bucket be allowed to fall directly on a sewer and in all cases the bucket must be lowered so that the shock of the falling earth will not damage the sewer structure. The time elapsed before backfilling begins shall be subject to the approval of the ENGINEER for the type of construction used. All backfilling shall be carried along as speedily as possible, the trench being filled as soon as the mortar and masonry are sufficiently set, if applicable. Wherever the ENGINEER shall so order, the backfilling shall not be left unfinished more than 100 feet behind the completed masonry or pipe work. New trenching will not be

permitted when earlier trenches need backfilling or labor is needed to restore the surfaces of streets or other areas to a safe and proper condition.

6. After each portion of this backfilling has been completed as specified herein, it shall be allowed to stand for such period of time as the ENGINEER may direct. Immediately after the expiration of this time, the CONTRACTOR shall gather up and remove all surplus material lying above the final grade and shall dispose of this material in a satisfactory manner at his own expense. He shall thoroughly clean the whole site of his Work, make all repairs or replacements, and leave the whole line of work in a condition satisfactory to the ENGINEER.
7. In backfilling around structures, all lumber, rubbish, braces and refuse shall be removed from behind the walls before backfilling is started. This backfilling shall be made in compacted lifts in a manner to prevent later settlement and shall be wet down if directed and left at the proper grade with a smooth, even surface.

-07- SPECIAL CONSIDERATIONS - WATER MAINS

A. Trenching

1. Check the plans for fittings required.
2. If water main is not to be in center of the trench, because water main and sewer main are both to be in a common trench, Drawings will so indicate. Common trench construction will not be shown on the Drawings unless it has been approved by the Michigan Department of Environmental Quality; otherwise minimum sewer and water main separation is ten feet.
3. Water mains shall be located on the lines as shown on the plans or as given by the ENGINEER. All pipe lines shall be installed to provide a depth of cover between the top of the pipe barrel and the finished grade of not less than six (6) feet; make allowance for bedding if called for, and, if in rock, excavate an additional six inches below the pipe barrel such that this six inch depth is free of projecting rock and to provide for bedding.
4. Trenches shall be not over thirty (30) inches in width unless greater width is necessary. Bottoms of trenches shall be accurately graded to provide uniform bearing and support for the pipe on the trench bottoms at every point along its entire length between bell holes.
5. The grade and elevation of all pipe shall be determined by the grade of the trench bottom, and no pipe shall be raised off the sub-grade to obtain the proper pipe elevations, to center the pipe spigots in the bells, or for any other purpose.

6. Bell holes shall be dug after the trench bottom has been graded. Bell holes shall be 12 inches in depth below the trench bottom, and shall extend from a point at least six inches (6") in front of the face of the bell. Such bell holes shall be of sufficient width to provide ample room for sealing, if sealing is required, and in no case shall the sides of the bell holes be closer to the pipe than 12 inches.

B. Pipe Bedding

1. The pipe bedding shall be either Class I, II, or III depending on the type of pipe material used.
2. Bedding material for water main shall be bedding sand. Bedding sand shall consist of material ranging in size from fine to coarse in a substantially uniform combination. Unwashed bank-run sand, rejected concrete sand, and crushed bank-run gravel will be considered generally acceptable under this specification. The presence of approximately 6% of fine clay or loam particles is desirable, but clay or loam lumps are not permitted. The maximum moisture content shall be as determined by a Modified Proctor. Bedding sand shall conform substantially to the grading requirements listed below.

Grading Requirements for Bedding Sand	
Sieve Size	Percentage Passing by Weight
1 inch	100
No. 16	45 - 80
Material Finer than No. 200	2 - 10

C. Backfilling

1. After pipes have been tested and approved, trenches shall be backfilled with sand, gravel, or other approved granular material, and compacted to a depth of one foot above the top of the pipe. The cost of furnishing, hauling, and placing this backfill shall be included in the cost per lineal foot of water main.
2. It is anticipated that excavated material will be approved for backfilling from one foot above the top of the pipe to the top of the trench. However, in the opinion of the ENGINEER, if the excavated material is not suitable for backfill, he may direct the CONTRACTOR to backfill with an approved granular material, either sand, crushed pit run gravel, or stone. The cost of furnishing, hauling, placing, and compacting this special backfill, as well as hauling away the excavated material shall be as listed in the supplemental unit prices, unless otherwise noted.

-08- SPECIAL CONSIDERATIONS - SEWER FORCE MAINS

A. Trenching

1. Check plans for fittings required.
2. If force main is not to be in center of trench, because force main and sewer main are both to be in a common trench, the Drawings will indicate so.
3. Force main shall be located on the line as shown on the Drawings or given by the ENGINEER. All pipe shall be installed to provide a depth of cover between the top of the pipe barrel and the finished grade of not less than (6) feet; make allowance for bedding if called for, and if in rock, excavate an additional six inches below the pipe barrel such that this six inch depth is free of projecting rock and to provide for bedding.
4. Trench shall be not over thirty (30) inches in width unless greater width is necessary. Bottom of trench shall be accurately graded to provide uniform bearing and support for the pipe on the trench bottom at every point along its entire length.
5. The grade and elevation of all pipe shall be determined by the grade of the trench bottom, and no pipe shall be raised off the sub-grade to obtain the proper pipe elevations or for any other purpose.

B. Pipe Bedding

1. The pipe bedding shall be either Class I, II or III depending on the existing soil conditions.
2. Bedding material for force main shall be bedding sand. Bedding sand shall consist of material ranging in size from fine to coarse in a substantially uniform combination. Unwashed bank-run sand, rejected concrete sand, and crushed bank-run gravel will be considered generally acceptable under this specification. The presence of approximately 6% of fine clay or loam particles is desirable, but clay or loam lumps are not permitted. The maximum moisture content shall be as determined by a Modified Proctor. Bedding sand shall conform substantially to the grading requirements listed below.

Grading Requirements for Bedding Sand	
Sieve Size	Percentage Passing by Weight
1 inch	100
No. 16	45 - 80
Material Finer than No. 200	2 - 10

C. Backfilling

1. After pipe has been tested and approved, trench shall be back-filled with fine, loose earth free from large clods or stones, carefully deposited on both sides of pipe and thoroughly and carefully compacted until enough fill has been placed to provide a cover of at least 18 inches above the top of the pipe. The remainder of the backfilling may be done by hand or machine. Water settling will be permitted and may be required. Whenever the trench has not been properly filled or where settlement occurs, it shall be refilled, compacted, smoothed off, and made to conform to the surface of the final grade.

END OF SECTION

DIVISION 2

SITE WORK

02200 - EARTHWORK

02222 - STRUCTURAL EXCAVATION, BACKFILL, AND COMPACTION

INDEX: -01- General
-02- Excavation
-03- Backfilling

-01- GENERAL

- A. Earth excavation shall include removal of all soil, sand, clay, loam, gravel, slate, hard pan, pavements of all kinds, soft sandstone, loose stone in masses and all boulders measuring less than one-half (1/2) cubic yard in volume and all material which is not included in the specifications for "Rock Excavation".
- B. Excavation, filling, and grading for roads, driveways, turnarounds, ramps, walks, parking areas, site grading, subsurface drainage, and excavation for building utilities beyond a point five feet outside the building lines are not included under this section of the specifications. Trenching, backfilling, and compacting with reference to sewer mains, water mains, and force mains are covered under Section 02200, Subsection 02221.
- C. CONTRACTOR shall verify that all quantities listed on the Drawings reflect the actual quantities needed for the work. CONTRACTOR'S bid shall include all labor, materials, and quantities necessary to complete the project, as intended.

-02- EXCAVATION

- A. The excavation shall conform to the dimensions and elevations of the structures indicated on the Drawings, except as specified below, and shall include trenching for utility systems to a point five feet beyond all building lines. In conditions where suitable bearings are encountered at different elevations from those indicated on the Drawings, the ENGINEER may direct in writing that the excavation be carried to elevations above or below those indicated on the Drawings, and in such event, an equitable adjustment will be made in accordance with the "General Conditions of the Construction Contract". Unless so directed by the ENGINEER, excavation shall not be carried below the elevations indicated on the Drawings. Where the excavation is made below the elevations indicated on the Drawings or directed by the ENGINEER due to fault of the CONTRACTOR, the excavations, if under slabs, shall be restored to the proper elevation; if under footings, the heights of the walls or footings shall be increased

and the cost of such additional work shall be borne by the CONTRACTOR. Excavation shall extend a sufficient distance from walls and footings to allow for placing and removal of forms, installation of services, water proofing, when called for, and for inspection, except where the concrete for walls and footings is authorized to be deposited directly against the excavated surface. Excavate necessary trenches to the extent shown on Drawings, for sewer, water, and any such other required underground utilities. This shall include trench excavation within a building and to a point five feet outside the building lines.

- B. Wall footings shall not be poured without forms unless so permitted by the ENGINEER. When so permitted, soil must stand firm and CONTRACTOR shall cut trench sides sharp and true.

-03- BACKFILLING

- A. After completion of foundation footings and walls and other construction below the elevation of the finished grades, and prior to backfilling, all forms shall be removed and the excavation shall be cleaned of all trash and debris. Material for backfilling shall consist of the excavated material, or borrow, of sand, gravel, or other approved materials and shall be free of trash, wood, or other debris. Backfill shall be placed in horizontal layers not in excess of nine inches in thickness, loose measurement, and the moisture content shall be such that the required degree of compaction by hand or machine tampers or by other suitable equipment to a density equal to that of the adjacent undisturbed soil. Backfilling shall be done simultaneously on both sides of foundation walls so that the levels of backfills are equal on each side of the walls at all times. Backfill under concrete floor slabs shall be compacted to the same density as specified for "Filling". Backfill shall be brought to a suitable elevation above grade to provide for anticipated settlement and shrinkage thereof.
- B. Any fill material required in excess of that produced by normal grading and excavation operations under this contract shall be obtained by the CONTRACTOR at his own expense. It shall also be the responsibility of the CONTRACTOR to obtain a source for borrow (fill) material. Fill material shall be approved by the ENGINEER before being placed in the Work.
- C. Filling shall consist of approved material free from loam, organic material, frozen material, trash, wood, or other debris and shall be placed in horizontal layers not exceeding nine inches in depth, loose measurement. Each layer shall be uniformly spread, moistened as required, and then thoroughly compacted to 95% for all fine-grained soils such as clays, and 95% for coarse-grained soils, such as sands and gravels. The above mentioned percentages are percentages of maximum density obtained at optimum moisture content as determined by ASTM D698 or ASTM D1557. Compaction shall be done by a power roller or other suitable equipment. The subgrade shall be brought to a reasonably true and even plane.

- D. Special care shall be taken when filling to prevent any wedging action or eccentric loading against the walls of structures. Care shall be exercised that equipment used in compacting fill will not overload the walls. Fill immediately adjacent to such walls shall be hand-tamped.
- E. Leveling Off: Level off all backfill and filling for work herein as required to bring work to finished grades with allowance for topsoil where topsoil will be placed.
- F. In case the materials encountered when excavating for foundations, piers, footings, or other structures are not suitable or in case it is found desirable or necessary to go to an additional depth, the excavation shall be carried to such additional depth as the ENGINEER may direct.
- G. Additional depth of excavation so ordered shall be refilled with concrete, crushed stone, gravel, sand or other selected material, as approved by the Engineer, to secure a proper foundation for structures. When concrete is furnished and placed as ordered, it will be paid for at the unit price bid. Where selected materials are furnished and placed as ordered, except that which is available from excavation performed in connection with the work, the CONTRACTOR shall receive as an extra the cost determined in the change of contract price in the General Conditions of the contract. The CONTRACTOR shall furnish delivery slips to the ENGINEER for such materials so furnished.

END OF SECTION

DIVISION 2

SITE WORK

02200 - EARTHWORK

02223 - ROADWAY EXCAVATION, BACKFILL, AND COMPACTION

- INDEX: -01- General
-02- Excavation
-03- Embankment
-04- Trimming and Finishing

-01- GENERAL

- A. This Work shall consist of constructing earth grades by excavating soil or rock and by placing embankments or fills, including the salvaging and stockpiling of selected material, disposing of surplus or unsuitable material, trimming the earth grade, and maintaining the Work in a finished condition until acceptance.
- B. Payment for earth excavation will be determined by utilizing the as-built survey method.
- C. Payment for embankment will be determined by measuring the volume of fill, compacted in place, based on the grade and cross section shown on the Drawings or authorized in the field, utilizing the as-built survey method. No allowance will be made for possible increase in quantity of fill required due to normal consolidation of the natural ground under the embankment.
- D. In cases where the as-built survey method is not used, volumes will be computed by average end areas utilizing cross sections determined from original and final elevation measurements.
- E. In addition to particular specifications in this section, all construction shall conform to the MDOT Specifications for Highway Construction, current edition.
- F. CONTRACTOR shall verify that all quantities listed on the Drawings reflect the actual quantities needed for the work. CONTRACTOR'S bid shall include all labor, materials, and quantities necessary to complete the project, as intended.

-02- EXCAVATION

- A. All excavation shall conform to the elevations indicated on the Drawings, and unless otherwise on the Drawings, the subgrade shall be compacted to not less than 95% of maximum density to a depth of 12 inches.
- B. Should undercutting of the subgrade be required, it will be so indicated on the Drawings or as determined by the ENGINEER. Construction methods for this work shall conform to MDOT Specifications, Section 205.03.
- C. The roadbed and ditches shall be maintained in such condition that the Work will be well drained at all times. The grading shall be so conducted as to avoid removing or loosening any material outside of the required slopes.
- D. The CONTRACTOR shall be responsible for the disposal of surplus and unsuitable material. When approved by the ENGINEER, the CONTRACTOR may dispose of this material within the right-of-way to fill low areas or flatten slopes.

-03- EMBANKMENTS

- A. For new roadways, the topsoil shall be removed from the area within limits of 1 on 1 slopes, spreading outward from the finished shoulders, as approved by the ENGINEER. The depth of removal shall be as shown on the Drawings or as directed by the ENGINEER. The area shall then be compacted to not less than 95% of maximum density.
- B. Embankments shall be constructed with sound earth, consisting of natural or other approved material which can be compacted to the required density, contains no organic material, woody material, excessive moisture, and shall have a maximum unit weight of at least 95 pounds per cubic foot. The materials shall be deposited and compacted by the Controlled Density Method unless some other method is authorized by the ENGINEER. Material containing more than 50% silt shall not be placed in the top 3 feet of embankment below the subbase.

-04- TRIMMING AND FINISHING

- A. After the earth grade has been constructed to the required grade, all stones and rocks more than 3 inches in diameter appearing on the surface shall be removed.
- B. The subgrade shall be trimmed to the grade called for on the Drawings within ± 0.1 foot. The earth grade outside the subgrade shall be trimmed, all irregularities made smooth and the entire roadway completed to the required lines, grades, and cross sections.

END OF SECTION

DIVISION 2

SITE WORK

02200 - EARTHWORK

02230 - SOIL COMPACTION CONTROL

- INDEX: -01- General
-02- Sites Other Than Lagoons

-01- GENERAL

- A. Place all fills and backfills in layers not over 12 inches thick. Perform this work when soil moisture will permit proper compaction or when the addition of water spraying will approach optimum percentage of water.
- B. The ENGINEER shall perform all soil compaction tests as required to verify that the CONTRACTOR is meeting the requirements of the Specifications. The CONTRACTOR shall make accessible to the ENGINEER those areas which the ENGINEER deems it necessary to make a compaction test.
- C. CONTRACTOR shall verify that all quantities listed on the plans reflect the actual quantities needed for the work. CONTRACTOR'S bid shall include all labor, materials, and quantities necessary to complete the project, as intended.

-02- GENERAL SITE COMPACTION

- A. Compact bedding, fills, and backfills to the following minimum densities, expressed as percentages of maximum densities as determined by either ASTM D698 or ASTM D1557:
 - 1. Pipe bedding and trench backfill - 95%
 - 2. Under permanent pavement, floors, parking areas, gutters, curbs, walls, terraces, steps, footings, slabs, etc. - 95%
 - 3. Unpaved rights-of-way - 90%
- B. Backfill or fill around underground pipes within building and to five feet outside wall lines with hand tools to a point one foot above pipes. Compact such fill with small tools such as small power tampers and plate vibrators to suit fill materials.
- C. Keep power-driven, rider-operated spreading, compacting, and other heavy equipment

away from walls at least a distance equal to the height of fill above footings.

- D. All Work shall be done in such a manner that damage to existing construction and to damp-proofing, waterproofing, or any other protective covering is avoided. Repair damage, if it occurs, at no cost to OWNER.

END OF SECTION

DIVISION 2

SITE WORK

02200 - EARTHWORK

02260 - MACHINE GRADING

- INDEX: -01- General
-01- Pavement Removal
-02- Grading

-02- GENERAL

- A. CONTRACTOR shall verify that all quantities listed on the plans reflect the actual quantities needed for the work. CONTRACTOR'S bid shall include all labor, materials, and quantities necessary to complete the project, as intended.

-02- PAVEMENT REMOVAL

- A. This work shall consist of removing all of the existing bituminous pavement as shown on the Drawings or as directed by the ENGINEER.
- B. The CONTRACTOR shall dispose of the removed material to a site designated by the OWNER.

-03- GRADING

- A. This work shall consist of all necessary scarifying, plowing, disking, moving and shaping the earth to develop the cross section shown on the Drawings. The roadbed shall be finished to grade with a blade grader or equivalent equipment. All intersections, approaches, entrances, and driveways shall be graded as shown on the Drawings or as directed by the ENGINEER.

END OF SECTION

DIVISION 2

SITE WORK

02200 EARTHWORK

02275 - SEDIMENTATION AND EROSION CONTROL

INDEX: -01- General
-02- Construction Approval

-01- GENERAL

- A. Temporary controls shall be placed prior to construction in order to minimize the transport of sediment by surface water to natural waterways and wetlands.
- B. The CONTRACTOR shall be responsible for maintaining the controls during the course of construction.
- C. CONTRACTOR shall verify that all quantities listed on the Drawings reflect the actual quantities needed for the work. CONTRACTOR'S bid shall include all labor, materials, and quantities necessary to complete the project, as intended.

-02- CONSTRUCTION APPROVAL

- A. Silt fencing shall be installed in accordance with the design and specifications.
- B. The ENGINEER shall inspect the silt fencing after installation and periodically during construction to ensure no sediment is being transported from the site. The CONTRACTOR shall correct any problems.

END OF SECTION

DIVISION 2

SITE WORK

02200 EARTHWORK

02280 MISCELLANEOUS EMBANKMENT

- INDEX: -01- General
-02- Embankment
-03- Trimming and Finishing

-01- GENERAL

- A. This Work shall consist of constructing earth embankments or fills over miscellaneous areas where shown on the Drawings.
- B. Payment for embankment will be determined by measuring the cubic yard volume of fill compacted in place, based on the grade and cross section shown on the Drawings or authorized by the ENGINEER utilizing the as-built survey method, or average end areas utilizing cross sections determined by the ENGINEER from original and final elevation measurements.
- C. CONTRACTOR shall verify that all quantities listed on the Drawings reflect the actual quantities needed for the work. CONTRACTOR'S bid shall include all labor, materials, and quantities necessary to complete the project, as intended.

-02- EMBANKMENT

- A. Embankment material shall be suitable surplus excavated material from the Work and approved material furnished by the CONTRACTOR.
- B. Embankment shall be compacted to the required density. The material shall be deposited and compacted by the controlled density method unless some other method is authorized by the ENGINEER.

-03- TRIMMING AND FINISHING

- A. After the embankment has been constructed, it shall be trimmed to the grade called for on the Drawings or directed by the ENGINEER. All irregularities shall be made smooth in preparation for either topsoil or aggregate, as shown on the Drawings. Topsoil and aggregate to be paid for separately, as shown in the Specifications.

DIVISION 2

SITE WORK

02550 SITE UTILITIES

02555 WATER DISTRIBUTION SYSTEMS

- INDEX:
- 01- General
 - 02- Water Main Installation
 - 03- Chambers
 - 04- Hydrants
 - 05- Valves
 - 06- Service Connection
 - 07- Polyethylene Encasement
 - 08- Reaction Backing
 - 09- Testing
 - 10- Chlorination

-01- GENERAL

- A. Pipe and fittings are included in Section 15050.
- B. The CONTRACTOR shall obtain approval from the ENGINEER as to his schedule of construction, such that there will be as little inconvenience from interruption of service as possible. If there is to be any interruption of water service, the affected occupants shall be given 8 hours notice. Fire Departments shall be given 24 hours notice. The outage shall not exceed 4 hours, without the approval of the OWNER.
- C. Operation of existing valves shall be by the OWNER'S employees only, unless previous approval to do same is given to the CONTRACTOR by the OWNER.
- D. When received from the carrier and at the time of unloading, the CONTRACTOR shall check all pipe and accessories for loss or damage in transit. No shipment of material shall be accepted by the CONTRACTOR unless proper exceptions are made on the receipt obtained by the carrier, at the time of delivery, as to loss and/or damage.
- E. Haul, unload, and distribute pipe and accessories along the site of the work. Place material in storage, if necessary, and then distribute. Handle all materials with care to avoid damage. All material found during the progress of the work to have cracks, flaws, or other deficiencies shall be brought to the attention of the ENGINEER, or authorized inspector, and the CONTRACTOR shall then remove such defective materials from the site.

- F. The CONTRACTOR shall provide adequate and proper equipment and carefully lower all pipe, fittings and accessories into the trench in such a manner as to prevent damage to the materials being lowered. Under no circumstances shall pipe and fittings be dropped or dumped into the trench. Clean out all foreign matter or dirt within the pipe before lowering.
- G. CONTRACTOR shall verify that all quantities listed on the Drawings reflect the actual quantities needed for the work. CONTRACTOR'S bid shall include all labor, materials, and quantities necessary to complete the project, as intended.

-02- WATER MAIN INSTALLATION

A. General

1. All water main shall have a depth of cover as stated in Section 02221, -07-, paragraph 3.
2. Keep pipe clean during laying operations by means of plugs or other approved methods. Do not permit trench water to enter pipe or fittings. At all times when work is not in progress, all open ends of pipe and fittings shall be securely closed.
3. Pipe lines or runs intended to be straight shall be so laid. Deflections from a straight line or grade, made necessary by vertical curves or horizontal curves or offsets, shall not exceed $6/D$ inches per lineal foot of pipe (where D represents the nominal internal diameter of the pipe expressed in inches) between the center lines, extended, of any two connecting pipes. If the specified or required alignment requires deflection in excess of those stipulated above, the CONTRACTOR shall either provide special bends, as approved by the ENGINEER, or pipes in shorter lengths, in such length and number that the angular deflections at any joint, as represented by the specified maximum deflections, is not exceeded.
4. Valves and fittings shall be set plumb and as per details. Valve boxes shall be set with base section centered and plumb over operating nut and 2 inches above bonnet joint. Upper section shall be flush with finished grade.

B. Mechanical Joint Cast Iron Pipe

1. Clean all dirt or foreign material off of spigot and out of socket, use a wire brush, if necessary. Slip gland on pipe for a distance of about twelve inches with the gland tip toward the joint. Place gasket about six inches from the end of the pipe with the small end toward the joint.

2. Insert spigot all the way into socket, the two pipes should be substantially in alignment while the joint is being assembled. Center spigot in socket. Wet gasket and joint surfaces thoroughly with soapy water.
3. Slide gasket along the pipe into socket. Hand caulk into place until it is evenly seated in the socket. Always begin seating the gasket at the bottom of the joint and do not apply the gland and bolts until the gasket is definitely in place, especially in the lower half of the joint. The placing of the gasket in the socket serves to center the spigot end of the pipe in the socket which is essential to the making of a first class joint.
4. Slide gland into position with gland lip bearing on face of gasket. Insert bolts with head bearing on the pipe flange and nuts on the gland. Beginning at the lower half of the joint, run up all nuts with the fingers. Before starting to tighten bolts with wrench, be sure that the gland lip is centered on the face of the gasket.
5. In tightening the bolts, it is essential that the gland be brought up toward the pipe flange evenly maintaining approximately the same distance between the flange and the gland at all points around the socket. Partially tighten the bottom bolts first, then the top bolt, next the two bolts on each side (90 degrees) from top and bottom. Partially tighten the remaining bolts, maintaining approximately the same space between pipe flange and gland.
6. Continue tightening in steps, as above, until each bolt has been tightened to approximately 90 foot lbs. torque or about as tight as an average 150 lb. man will pull with a 10 inch wrench.

C. Push-On Joint Ductile Iron Pipe

1. Bell must be clean and free of all foreign matter. Brush coat gasket retaining groove and inner shoulder with joint lubricant.
2. Insert gasket with solid face toward installer. Use one hand to hold a loop in gasket, the other to tuck remaining portion into its groove. Press gasket firmly into lubricated groove.
3. Pull gasket forward against bell lip to be sure the gasket is completely seated. Then apply generous coating of lubricant to the exposed gasket surface.
4. Clean the plain end of pipe, and grind or file sharp edges which might damage the gasket. Lubricant may be applied to the beveled nose of the plain end.

-03- CHAMBERS

- A. Chambers for valves, meters, etc., when shown on the Drawings, shall have precast bottoms and sections complying with ASTM C478, "Precast Reinforced Concrete Manhole Sections".
- B. Pipe openings shall be a maximum of pipe diameter plus 6 inches.
- C. Chamber steps shall be cast iron, 10 inch deep by 10 inch wide, 5 inch tread depth, 1 inch by 1 inch tread section with 2 inch rail height, or plastic, reinforced with 3/8 inch steel rod and dimensioned as cast iron.
- D. Chamber castings shall be East Jordon 1120, A cover, Neenah 1764 two hole cover with letter W, or approved equal.

-04- HYDRANTS

- A. Hydrant specifications are included in Section 15050.
- B. Hydrants shall be set where indicated on the Drawings or as directed by the ENGINEER. All hydrants shall be set plumb on a minimum of 6 inches of compacted gravel, 18 inches square. The ENGINEER may require a stone or concrete base if, in his opinion, unstable conditions so warrant. At least 3/4 cubic yards of crushed stone or gravel shall be placed under and around hydrants after they have been set to act as a hydrant drain. All hydrant connections shall be with cast or ductile iron pipe and auxiliary valve. The cost of all work and materials required to set hydrants shall be included in the CONTRACTOR'S unit price for this item. Hydrant leads and auxiliary valves will be listed as separate bid items.

-05- VALVES

- A. Valve specifications are included in Section 15050.
- B. Valves will be set in valve manholes or be installed with valve boxes, as indicated on the Drawings. The base section of valve boxes shall be center and plumb over the operating nut and 2 inches above the bonnet joint. The upper section shall be flush with the finished grade. All valve boxes shall be witnessed by 3 measurements to permanent surface features.

-06- SERVICE CONNECTIONS

- A. Material specifications are included in Section 15050.
- B. Service connections to existing water lines shall be made with a solid or cutting-in sleeve if the pressure is off, and with a tapping sleeve or saddle and valve if the pressure is on. The installation shall be disinfected by swabbing the pipe, valves, and fittings with a 4 percent chlorine solution.
- C. New service lines shall be installed at right angles to the street centerline at locations indicated on the Drawings or as directed by the ENGINEER. The minimum depth for the service shall be the same as for the mainline pipe. Tapping shall be 30 to 45 degrees above center and a horizontal loop shall be provided at the corporation stop. Curb boxes shall be set plumb and be located at the property line unless otherwise shown on the Drawings or directed by the ENGINEER. All curb boxes shall be witnessed by 3 measurements to permanent surface features.

-08- REACTION BACKING

- A. Placement of reaction backing shall be as detailed. Bearing area shall be as follows: (Square feet against trench wall in sand.)

Pipe Size	Tees/Plugs	90° Els.	45° Els.	22 ½ ° Els.	11 1/3 ° Els.
4"	1	2	1	1	1
6"	3	3	2	1	1
8"	4	6	3	2	1
10"	7	9	5	3	2
12"	9	11	6	3	2
14"	11	15	8	5	3
16"	13	20	10	6	3
18"	16	25	12	7	4
20"	20	28	14	8	4
24"	28	40	20	11	6

Other soil conditions:

Cemented sand or hardpan - Multiply above by 0.5

Gravel - Multiply above by 0.7

Hard dry clay - Multiply above by 0.7

Soft clay - Multiply above by 2.0

Muck - Secure all fittings with the rod clamps with concrete reaction backing the same as for sand conditions as required by Section 02200.

- B. When approved by the ENGINEER, locked joint pipe, joint retainer glands, joint anchoring systems, or rod fitting types may be used instead of concrete thrust blocks.

-09- TESTING

- A. The water main shall be tested by the CONTRACTOR either in segments or after the entire water main is in place. Testing shall be completed before connecting to the existing system. CONTRACTOR shall clean, pre-test, and arrange with ENGINEER for actual inspection and test. CONTRACTOR shall provide all equipment and assistance necessary for carrying out the test.
- B. Before testing, the CONTRACTOR shall make sure that all turns, intersections, ends and reductions have been restrained by proper thrust blocking.
- C. The hydrostatic testing of the completed water main shall conform to the conditions and requirements of AWWA Standard C600. Air or air-water methods of applying pressure are prohibited. The system shall be tested with water at 140 to 150 psi at the lowest elevation. The test shall last for a minimum of one hour or until the complete line can be inspected. The system shall be filled slowly, allowing air to expel through the air release valve connection at the high points. CONTRACTOR shall repair defects and repeat test until acceptable.
- D. System shall be tested for leakage following the pressure test. The average pressure shall be 140 to 150 psi at the lowest point in the system. The test shall last for 2 hours. The line shall be filled as in the pressure test and the quantity of water needed to maintain the test pressure shall be monitored. The allowable leakage shall be a maximum of:

$$L = [ND(P)^{-5}]/7400, \text{ Where}$$

L = leakage (gallons per hours)

N = number of joints

D = nominal pipe diameter (inches)

P = average test pressure (psi gauge)

NOTE: Formula equals 1.0 gallons per hour per mile per inch diameter at 140 psi for 18 foot lengths.

CONTRACTOR shall correct defects and repeat test until acceptable.

- E. Cast and ductile iron pipe shall be tested for electrical continuity. Breaks shall be repaired and the test shall be repeated until acceptable.

-10- CHLORINATION

- A. After the pressure testing, but prior to chlorination, the CONTRACTOR shall flush the system at maximum intervals of one quarter mile. Flushing shall result in a minimum velocity of 2.5 feet per second at the pipe wall.
- B. Following flushing of the mains and before placing into service, all water mains installed as part of this contract shall be chlorinated according to the "Standard for Disinfecting Water Mains", prepared by the American Water Works Association, C601-54. Chlorine solution shall be injected at a constant rate to produce a chlorine concentration of 50 to 100 ppm residual free chlorine in the pipe. The retention time is 16 to 24 hours for 50 ppm, and 8 to 12 hours for 100 ppm. After the retention time, clear the line of residual chlorine by flushing. The CONTRACTOR shall then send a sample to the Michigan Department of Public Health for a bacteriological test. Any sections of line not meeting the MDPH requirements shall be re-chlorinated and retested. This procedure shall be repeated until a safe sample is reported.

END OF SECTION

DIVISION 2

SITE WORK

02550 SITE UTILITIES

02570 SANITARY SEWERS

- INDEX: -01- General
-02- Sewer Installation
-03- Manholes
-04- Manhole Steps
-05- Manhole Joints and Gaskets
-06- Manhole Frames and Covers
-07- Infiltration Testing
-08- Low Pressure Air Test
-09- Final Inspection

-01- GENERAL

- A. Pipe and fittings are included in Section 15050.
- B. When received from the carrier and at the time of unloading, the CONTRACTOR shall check all pipe and accessories for loss or damage in transit. No shipment of material shall be accepted by the CONTRACTOR unless proper exceptions are made on the receipt obtained by the carrier, at the time of delivery, as to loss and/or damage.
- C. Haul, unload, and distribute pipe and accessories along the site of the work. Place material in storage, if necessary, and then distribute. Handle all materials with care to avoid damage. All material found during the progress of the work to have cracks, flaws, or other deficiencies shall be brought to the attention of the ENGINEER, or authorized inspector, and the CONTRACTOR shall then remove such defective materials from the site.
- D. The CONTRACTOR shall provide adequate and proper equipment and carefully lower all pipe, fittings and accessories into the trench in such a manner as to prevent damage to the materials being lowered. Under no circumstances shall pipe and fittings be dropped or dumped into the trench. Clean out all foreign matter or dirt within the pipe before lowering.
- E. CONTRACTOR shall verify that all quantities listed on the Drawings reflect the actual quantities needed for the work. CONTRACTOR'S bid shall include all labor, materials, and quantities necessary to complete the project, as intended.

-02- SEWER INSTALLATION

- A. In general, the cost of furnishing and placing all fittings shall be included in the price bid per lineal foot for laying all sizes of pipe.
- B. Keep all water out of trench until masonry and jointing material has hardened, if applicable.
- C. Pipe shall be laid true to the grades shown on the Drawings or established by the ENGINEER. Follow line set by ENGINEER in field. Check offset with ENGINEER.
- D. Pipe laying shall proceed upgrade with spigot ends pointing in direction of flow. Pipe shall be laid so that each pipe shall rest upon the full length of its barrel with holes excavated to accommodate bells where bell and spigot pipe is used. Except by special permission, no pipe shall be laid except in the presence of an inspector. Any defective pipe laid or any pipe which has had its grade or joint disturbed after laying shall be taken up and replaced. All openings along the line of the sewer shall be securely closed, as directed, and suitable stoppers shall be placed to prevent earth or other substances entering the sewer at any time.
- E. Wye branches for service connections shall be inserted at intervals along the line of sanitary sewers only when directed by the ENGINEER or inspector. The basis of payment for the installation of wyes is given in the proposal form. All wye branches installed, but not immediately used, are to be provided with lids and sealed with jointing compound as directed by and to the satisfaction of the ENGINEER.
- F. A hardwood stake not less than 4" square and 3' long shall be placed at the street line opposite each wye or the location marked on cement walks or curbs. The CONTRACTOR shall not backfill any sewer trench until the ENGINEER or inspector has taken a record of the wye location. The CONTRACTOR shall be responsible for maintaining a duplicate record of the exact location of all wye branches.
- G. Where sewers are laid at depths greater than 12 feet, wye branches, long radius bends, concrete, etc., shall be used for risers as shown on the Drawings. The CONTRACTOR shall be paid for all risers in accordance with the price bid per lineal foot. Measurements are to be made from the invert of the main to the top of the riser. All concrete used for risers shall be 1:2:4 mix using clean washed aggregates and clear water. The cost of the concrete shall be included in the price bid per lineal foot for risers. See bid items for size and type of pipe to be used.
- H. Service connections shall be 4" or 6" building sewer pipe, as called for in the bid items. All service connections shall rise from the wye at the main sewer on a slope which will assure the drainage from all structures. Minimum slope shall be 1/8 inch per foot. Where the main sewer is deeper than necessary to drain the structure, the CONTRACTOR shall furnish all material and install 4" or 6" pipe risers to a depth which

will allow proper drainage. When there is a question of depth of the service connection at the property line, the CONTRACTOR shall consult the ENGINEER.

- I. Sewer pipe with less than five feet of backfill material over the pipe shall require the installation of insulating material. Insulation shall be the water resistant type with an "R" value of 5.4 for one inch thickness, or as indicated on the Drawings. Sheets of insulation shall be laid according to the detail in the Drawings. The CONTRACTOR shall furnish the ENGINEER with the technical specifications of the material he proposes to use.

-03- MANHOLES

- A. All manholes shall be constructed with flexible waterproof joints at the pipe to manhole connection. This joint shall meet the physical and performance requirements of ASTM C-443 or ASTM C923, whichever is applicable. In the instance that concrete pipe is used, the annular space between the pipe and the manhole wall shall be filled with a flexible material prior to pouring the manhole invert to maintain the seal flexibility. The invert channels, where not consisting of the pipe passing through the manhole, shall be smooth and accurately shaped to a semi-circular bottom conforming to the inside of the adjacent sewer section.
- B. Manhole bottoms and manholes shall be precast and shall comply with ASTM-C478, "Precast Reinforced Concrete Manhole Sections", and the following:
 1. The minimum compressive strength of the concrete in manhole riser and top sections shall be 4,000 psi. The minimum shell thickness shall be one-twelfth of the internal diameter of the riser or largest cone diameter.
 2. The circumferential reinforcement in grade rings shall have an equivalent area of not less than 0.07 square inch per lineal foot, but not less than 0.024 square inch in any one grade ring and in riser and conical top sections as per ASTM C478.
 3. Each line of circumferential reinforcement shall be assembled into a cage which shall contain sufficient longitudinal bars or members, extending through the barrel of the manhole risers and conical tops to maintain the reinforcement rigidly in shape and correct position within the form.
 4. Manhole sections shall be marked as specified either by impression or painting.
 5. Manhole sections shall be subject to rejection on account of failure to conform to any of the specification requirements.

- C. The price bid per lineal foot for constructing manholes shall include the furnishing of all equipment, tools, transportation, materials and labor necessary for the bottom section, side walls, cast iron steps, breaking out of pipe, construction of bench, adjustment rings, manhole frame and cover, and excavation. Where drop manholes are shown, the price bid shall include all items listed above and the additional tile, concrete and labor necessary to construct the drop outside the manhole walls.
- D. The CONTRACTOR shall construct all manhole tops to the elevations shown on the Drawings or as directed by the ENGINEER or inspector.

-04- MANHOLE STEPS

- A. Manhole steps shall be constructed of co-polymer polypropylene conforming to ASTM D4101-82, and Grade 60 steel conforming to ASTM A-615. The plastic must completely enclose a 1/2 inch steel reinforcing rod. Manhole steps shall conform to ASTM C-478. Steps shall be installed in accordance with manufacturer's recommendations.

-05- MANHOLE JOINTS AND GASKETS

- A. Manhole joints shall be rubber gaskets and conform to ASTM C443-12.
- B. Gaskets shall be subject to rejection whenever they show surface checking, weathering, or other deterioration prior to installation in the work.
- C. When it is necessary to make connections to existing manholes, this shall be done by cutting a hole in the wall of the manhole, shaping the bottom of the manhole to fit the invert of the connection, inserting a length of sewer pipe through the opening and filling around the pipe with a 1:2 cement mortar, and troweling the cement mortar inside and outside of the manhole to a neat finish.

-06- MANHOLE FRAMES AND COVERS

- A. Manhole frames and covers shall be cast iron with self-sealing lids and concealed watertight pick holes. Weight of frame and cover shall be 360 pounds. Bearing surfaces of frames and covers or lids to be machined.

-07- INFILTRATION TESTING

- A. Sewers and manholes below the ground water table shall be tested for infiltration by measuring the infiltrated flow of water over a measured weir set up in the invert of the sewer a known distance from a temporary bulkhead or other limiting point of infiltration. After the sewer has been pumped out, if necessary, no test shall be started until normal infiltration conditions are established in the work to be tested. If the ground water level at the time of testing is below the centerline of the sewer, the sewer will be tested for leakage by bulkheading the manhole at the lower end of the section under test, and filling the sewer with water until it is up to four feet above the crown at the section. Leakage will be measured by the amount of water added to maintain the water at that level. Tests shall be carried for a minimum of four hours with readings at thirty minute intervals. The CONTRACTOR shall furnish all labor, material and equipment necessary to make these leakage tests.
- B. The allowable maximum amount of infiltration shall be 100 gallons per inch of diameter, per mile of pipe, per twenty-four hours.
- C. When infiltration or leakage occurs in excess of the specified amount, defective pipe, pipe joints and manholes shall be located and repaired at the expense of the CONTRACTOR. If the defective work cannot be located, the CONTRACTOR, at his own expense, shall remove and reconstruct as much of the original work as necessary to obtain a sewer within the allowable infiltration (leakage) limit upon retesting, as necessary.

-08- LOW PRESSURE AIR TEST

- A. There are two categories of air test procedure. For diameters of sewer pipe, between 4 inches and 24 inches inclusive, the pipe shall be tested between adjacent manholes. The test time for the air pressure to drop the specified one pound shall be in accordance with the Table on page 02570-7. For diameters of sewer pipes between 27 inches and 36 inches inclusive, the pipe line shall be tested manhole to manhole or segmentally. The test time shall be in accordance with the following formula which is based on the maximum air loss of 4.5 cubic feet per minute.

$$T = .00493 (D) (D) (L)$$

Where: T = Test Time, Seconds

D = Diameter, Inches

L = Length of Test Section, Feet

Pipe diameters above 36 inches will not be accepted by means of the low pressure air test. In all cases, the length of laterals shall be ignored.

Only after the sanitary sewers, including appurtenances and sanitary laterals, have been installed, backfilled and cleaned, shall the CONTRACTOR proceed with an air test on the installed facilities.

B. Low Pressure Air Test Procedure:

1. The section of sewer line to be tested should be flushed and cleaned prior to conducting the low pressure air test. This serves to clean out any debris, wet the pipe, and produces more consistent results.
2. Isolate the section of sewer line to be tested by means of inflatable stoppers or other suitable test plugs. One of the plugs should have an inlet tap; or other provision for connecting a hose to the portable air control source.
3. If the test section is below the ground water level, determine the height of the ground water above the spring line of the pipe at each end of the test section and compute the average. For every foot of ground water above the pipe spring line, increase the gage test pressures by 0.43 pounds per square inch.
4. Connect the air hose to the inlet tap and a portable air control source. The air equipment should consist of necessary valves and pressure gages to control the rate at which air flows into the test section and to enable monitoring of the air pressure within the test section. Also, the testing apparatus should be equipped with a pressure relief device to prevent the possibility of loading the test section with the full capacity of the compressor.
5. Add air slowly to the test section until the pressure inside the pipe is raised to 4.0 psig greater than the average back pressure of any ground water that may be over the pipe. The pressure in the pipe shall not exceed that recommended by the pipe manufacturer.
6. After a pressure of 4.0 psig is obtained, regulate the air supply so that the pressure is maintained between 3.5 and 4.0 psig (above the average ground water back pressure) for a period of two minutes. This allows the air temperature to stabilize in equilibrium with the temperature of the pipe walls. The pressure will normally drop slightly until temperature equilibrium is obtained. During this period all plugs should be checked with a soap solution to detect any plug leakage.
7. Determine the rate of air loss by the time pressure drop method. After the two minute air stabilization period, the air supply is disconnected and the test pressure allowed to decrease to 3.5 psig. The time required for the test pressure to drop from 3.5 psig to 2.5 psig is determined by means of a stop watch and this time interval is then compared to the required time in the tables to determine if the rate of air loss is within the allowable time limit. If the time is equal to or greater than the times indicated in the following table, the pipe line shall be deemed acceptable.

LOW PRESSURE AIR TEST TIME (MANHOLES TO MANHOLE)

Specification time (Min:Sec) required for loss of air pressure from 3.5 psig to 2.5 psig for size and length of pipe indicated (Based on 0.003 cfm per sq. ft. with a minimum loss of 2.0 cfm).

L	<u>Pipe Diameter "D" in Inches</u>								
	4	6	8	10	12	15	18	21	24
25	0:04	0:10	0:18	0:28	0:40	1:02	1:29	2:01	2:38
50	0:09	0:20	0:35	0:55	1:19	2:04	2:58	4:03	5:17
75	0:13	0:30	0:53	1:23	1:59	3:06	4:27	6:04	7:55
100	0:18	0:40	1:11	1:50	2:38	4:08	5:56	8:05	10:39
125	0:22	0:50	1:28	2:18	3:18	5:09	7:26	9:55	11:20
150	0:26	0:59	1:46	2:45	3:58	6:11	8:30	9:55	11:20
175	0:31	1:09	2:03	3:13	4:37	7:05	8:30		
200	0:35	1:19	2:21	3:40	5:17	7:05			
225	0:40	1:29	2:38	4:08	5:40				
250	0:44	1:39	2:56	4:35	5:40				
275	0:48	1:49	3:14	4:43					
300	0:53	1:59	3:31	4:43					
325	0:57	2:09	3:47						
350	1:02	2:19	3:47						
375	1:06	2:29							
400	1:10	2:38							
425	1:15	2:48							
450	1:19	2:50							
475	1:24	2:50							
500	1:28	2:50	3:47	4:43	5:40	7:05	8:30	9:55	11:20

*Length of Test Section L in Feet

8. Upon completion of the test, the bleeder valve is opened and all air is allowed to escape. Plugs should not be removed until all air pressure in the test section has been released. During this time no one should be allowed in the trench or manhole while the pipe is being decompressed.
9. The CONTRACTOR shall be responsible for maintaining an accurate log of test results. All entries in the log shall be dated and signed by the supervisor of the air test.

C. Sewers tested shall include main line sewers and laterals to the property line, if installed as part of this contract.

-09- FINAL INSPECTION

A. During construction, due care shall be taken to thoroughly clean every sewer, manhole, inlet or other accessory and to prevent any earth, sand, brick, concrete or other foreign substance from entering, obstructing or remaining in any part of the work. As the work approaches completion and before the final estimate, the CONTRACTOR shall systematically go over the entire work and prepare it for final inspection. All sewers, large enough to be cleaned by hand, shall have all lumps of cement, protruding gaskets, rubbish and improper objects removed, and the sewer shall be flushed and left with a wholly clean and smooth surface. The sewer shall be left properly aligned as herein specified, and entirely clean, free and ready for use. Each section of sewer is to show, from either end on examination, a full circle of light. Infiltration shall meet the requirements previously specified. Each manhole, flush tank, or other appurtenance to the system shall have the specified size and form, with the top set permanently to exact position and grade, be neatly and substantially made to serve well, at the expense of the CONTRACTOR, so as to conform strictly to the terms of the contract, and to be satisfactory to the ENGINEER.

END OF SECTION

DIVISION 2

SITE WORK

02600 - PAVING AND SURFACING

02610 - PAVEMENT REMOVAL

INDEX: -01- General
-02- Pavement Removal

-01- GENERAL

- A. Work in Sections under 02600, and defined as pavement include all improved surfaces of streets, highways, shoulders, parking lots, alleys, sidewalks, curb and gutter, driveways, and supporting foundations of above items.
- B. Aggregate base restoration thickness shall be 6 inches or as noted on the Drawings.
- C. Restoration of gravel shoulders shall be 4 inches or as noted on the Drawings.
- D. Shoulder areas other than gravel shall be stabilized to 4 inches of depth with gravel, clay, or topsoil.
- E. Inspection and approval of the base and subbase by the ENGINEER is required.
- F. Restoration of pavement shall occur within 30 days of utility installation unless otherwise approved by the ENGINEER. Final clean up shall immediately follow pavement restoration.
- G. CONTRACTOR shall verify that all quantities listed on the Drawings reflect the actual quantities needed for the work. CONTRACTOR'S bid shall include all labor, materials, and quantities necessary to complete the project, as intended.

-02- PAVEMENT REMOVAL

- A. Pavement shall be removed to edge or joint where remaining dimension is 3 feet or less. Remove curb, gutter, and sidewalk to nearest joint.

- B. Bituminous surface removal shall be by the saw cut method, cutting vertically in straight lines at any angle with the pavement centerline. The pavement shall then be carefully removed without disturbing the remaining pavement.
- C. Concrete surface removal shall be by cutting vertically at right angles or parallel to pavement centerline. The concrete shall then be removed by use of a pneumatic or hydraulic pavement breaker without damage to the remaining concrete or pavement.

END OF SECTION

DIVISION 2

SITE WORK

02600 - PAVING AND SURFACING

02611 - AGGREGATE BASE COURSE 22A

INDEX: -01- General

-01- GENERAL

- A. The CONTRACTOR shall furnish, transport, and place crushed stone aggregate where shown on the Drawings. The aggregate shall be crushed material of good quality and shall conform to Section 302 and 306, Aggregate Base--Courses and Surface Courses of the current Standard Specifications published by the Michigan Department of Transportation, and the aggregate shall be of proper gradation and depths as shown in the details. Compaction shall be 95%.
- B. The depth of aggregate base shown on the Drawings is the dimension required after compaction of the material. The CONTRACTOR is to furnish sufficient material to provide the compacted thickness shown.
- C. All earthwork to prepare aggregate surface and/or pavement subgrade and subbase shall be done in accordance with the requirements of the Michigan Department of Transportation Specifications for Construction, current edition, Section 301, and these specifications.
- D. CONTRACTOR shall verify that all quantities listed on the Drawings reflect the actual quantities needed for the work. CONTRACTOR'S bid shall include all labor, materials, and quantities necessary to complete the project, as intended.

END OF SECTION

DIVISION 2

SITE WORK

02600 - PAVING AND SURFACING

02612 - BITUMINOUS AGGREGATE SURFACE COURSE

- INDEX: -01- General
-02- Roadbed Preparation
-03- Tack Coat
-04- Bituminous Aggregate Surface Course

-01- GENERAL

- A. All roadbed preparation, prime coating, asphalt paving, compaction and all related work shall be done in accordance with requirements of the MDOT Standard Specifications for Construction, current edition, and these specifications.
- B. CONTRACTOR shall verify that all quantities listed on the Drawings reflect the actual quantities needed for the work. CONTRACTOR'S bid shall include all labor, materials, and quantities necessary to complete the project, as intended.

-02- ROADBED PREPARATION

- A. The roadbed shall be prepared by doing any necessary scarifying, shaping and compaction of aggregate base course required to restore the surface to the proper contour and provide a surface free from pits, holes, sags, depressions or other irregularities. All base course material shall be furnished by the CONTRACTOR and shall be included in his price for pavement. Before paving, the surface shall be cleaned of all debris and other foreign matter. The cost of this work shall be included in the price bid for bituminous asphalt.

-03- TACK COAT

- A. If required, the prime coat shall be Asphalt, Type MC-70 and shall be applied at the rate of 0.1 gallons per square yard. Based on actual field conditions, the ENGINEER shall determine whether or not the prime coat is required, and if so, it will be considered incidental to the price of bituminous aggregate surface course.

-04- BITUMINOUS AGGREGATE SURFACE COURSE

- A. Unless otherwise indicated on the Drawings, pavement thickness shall be 3 inches HMA 13A. Construction methods shall be MDOT 501 through 504 for paving. Base shall be 8 inch gravel (MDOT 22A) or as indicated on the Drawings.
- B. Bituminous surface shall be as indicated on the Drawings.
- C. Minimum density of in place course material shall be 97% of the laboratory density when the course thickness is greater than 3 inches, and 95% when the course thickness is less than 3 inches.
- D. The asphalt pavement shall be of required crown thickness and number of courses as shown on the typical pavement detail. All manholes and water valves not part of the project shall be adjusted by the OWNER.

END OF SECTION

DIVISION 2

SITE WORK

02600 - PAVING AND SURFACING

02613 - AGGREGATE SURFACE COURSE 23A

INDEX: -01- General

-01- GENERAL

- A. The CONTRACTOR shall furnish, transport, and place crushed stone aggregate where shown on the Drawings. The aggregate shall be crushed material of good quality and shall conform to Section 306, Aggregate Surface Courses of the current edition of Standard Specifications published by the Michigan Department of Transportation, and the aggregate shall be of proper gradation and depths as shown in the details. Compaction shall be 95%.
- B. The depth of aggregate surface shown on the Drawing is the dimension required after compaction of the material. The CONTRACTOR is to furnish sufficient material to provide the compacted thickness shown.
- C. All earthwork to prepare aggregate surface and/or pavement subgrade and subbase shall be done in accordance with the requirements of the Michigan Department of Transportation Specifications for Construction, current edition, Section 301, and these specifications.
- D. CONTRACTOR shall verify that all quantities listed on the Drawings reflect the actual quantities needed for the work. CONTRACTOR'S bid shall include all labor, materials, and quantities necessary to complete the project, as intended.

END OF SECTION

DIVISION 2

SITE WORK

02600 - PAVING AND SURFACING

02614 - CONCRETE PAVEMENT

- INDEX: -01- General
-02- Cement and Aggregates
-03- Water
-04- Concrete Proportioning
-05- Placing Concrete
-06- Curing
-07- Pavement Protection
-08- Joints

-01- GENERAL

- A. All roadbed preparation, concrete paving, compaction and all related work shall be done in accordance with requirements of the Michigan Department of Transportation Standard Specification for Construction, current edition, and these specifications.
- B. CONTRACTOR shall verify that all quantities listed on the Drawings reflect the actual quantities needed for the work. CONTRACTOR'S bid shall include all labor, materials, and quantities necessary to complete the project, as intended.

-02- CEMENT AND AGGREGATES

- A. Cement shall be Air-Entrained Portland Cement conforming to the tentative specifications for Air-Entrained Portland Cement for Concrete Pavements ASTM C-150 (Type 1A). All cement shall be properly protected from dampness and no cement shall be used which has become contaminated or compromised.
- B. Aggregates for concrete shall comply with standard specifications for concrete aggregates ASTM C33.
1. Fine aggregates shall consist of natural sand or screenings from crushed rock. The amount of deleterious materials shall not exceed the limits in the following table and the sum of the percentages shall not exceed 6% by weight.

<u>Percent by Weight</u>	
Removed by Decantation	3
Shale	1
Coal	1
Clay	1

Other Deleterious Materials
(such as alkali, mica, soft and flaky particles)

2. Coarse aggregate shall consist of at least two separate and separated sizes to insure uniformity. The separate sizes shall range from a maximum size of 2" to a minimum retained on a #4 sieve and shall be proportioned so that the resulting coarse aggregate mixture shall have a uniform gradation.

-03- WATER

- A. Water shall be clean, free from oil, acid, alkali, organic matter and other deleterious substances. No charge shall be made to the CONTRACTOR for the use of water from a city, village, township, or sanitary district having a waterworks system.

-04- CONCRETE PROPORTIONING

- A. The CONTRACTOR shall submit to the ENGINEER, for approval, a mix design for the class of concrete that will be used on the project.
- B. All concrete to be placed under these specifications, whether for concrete curb and gutter, concrete pavement, or concrete walks and driveways, shall be of the proportions and strength specified in the approved mix design.
- C. All materials shall be separately weighed into the hoppers in the amounts approved by the ENGINEER. Cement shall be measured by the bag or, if bulk cement, by weight with scales and hoppers approved by the ENGINEER. Batches involving fractional bags will not be allowed, unless the fractional portion is carefully weighed. Approved weights shall include the weights of moisture content of aggregates. If moisture has changed, the batch weights shall be altered accordingly.
- D. The concrete shall consist of a designed mixture of Portland Cement, fine aggregate, coarse aggregate, and water so proportioned as to produce a workable and plastic concrete free from segregation, rock pockets, or honey-combing. Unless indicated otherwise, the concrete shall have a unit cement content of 6 bags of cement per cubic yard and shall test at least 3500 lbs. per square inch in compression when tested as specified in the following paragraph. With the usual aggregates (Sp. gravity 2.65) the approximate proportions will be: Cement 6.0 bags (564 lbs.); Water 33.0 gals.; dry fine aggregate 1,245 lbs.; dry stone 1,980 lbs. or cement 6.0 bags (564 lbs.); Water 33.0 gals.;

dry fine aggregate 1,155 lbs.; dry gravel 2,070 lbs. The proportions of fine and coarse aggregate may be varied if approved by the ENGINEER to give a dense and workable concrete. The smallest quantity of mixing water producing a plastic workable mixture shall be required and the consistency shall be uniform. A slump of not less than 1" and not more than 2" shall be maintained for machine finishing and not less than 2" or more than 3" where hand finishing is used when tested according to the Standard Method of Slump Test ASTM C-143. The use of ready mixed concrete will be permitted, but the proportions as specified in the foregoing shall be strictly maintained. No decrease in the unit cement content of 6.0 bags per cubic yard or in the aggregate weights set by the ENGINEER will be allowed. No change in the amount of water, except as ordered by the ENGINEER, will be permitted. All proportioning shall be controlled at the ready-mix plant, and on no account shall it be permissible to add water to the concrete enroute or at the jobsite without approval of the ENGINEER.

- E. One set of standard test cylinders shall be cast between each longitudinal joint and for at least each 100 lineal feet of pavement. One cylinder will be tested at 7 days, one at 28 days and the final will be used only as a spare and broken if either of the other two tests fails, as direct by the ENGINEER. One set cylinders shall be cast for at least each 500 lineal feet of curb and gutter or sidewalk. Additional cylinders shall be cast if, in the opinion of the ENGINEER, they are required. These cylinders shall be cured in the field and under the same conditions as the concrete construction for 24 hours, and then shall be shipped to an approved testing laboratory for the remainder of the curing process, and shall be then laboratory tested for the compressive strength specified at the age of 7 and 28 days. The tests shall be regarded as a measure of the ability of the CONTRACTOR to produce concrete of the strength specified. The costs for preparing, curing, transporting and testing the concrete cylinders shall be borne by the CONTRACTOR.
- F. Re-tempering of mortar or concrete which has partially hardened, such as remixing with or without additional materials or water, shall not be permitted.

-05- PLACING CONCRETE

- A. Immediately prior to placing the concrete, the sub-grade shall be thoroughly rolled and brought to an even surface. If the sub-grade is dry, it shall be sprinkled with as much water as will be readily absorbed.
- B. After mixing, the concrete shall be deposited rapidly upon the sub-grade to the required depth, and for the entire width of the section or slab in successive batches and in a continuous operation.
- C. The use of intermediate forms or bulkheads between expansion joints shall not be permitted.

- D. Whenever an interval of more than thirty (30) minutes shall elapse between batches, an expansion joint shall be provided and installed in the same manner as other joints but no section shall be less than fifteen (15) feet in length.
- E. After the concrete has been deposited, it shall be leveled off, thoroughly tamped and brought to the established grade by means of a heavy strikeboard or lute, or automatic tamping machine, until all voids are removed and the concrete is thoroughly compacted. The concrete shall then be scraped with a straight-edge 10 feet long equipped with a handle to permit operation from the edge of the pavement. The straight-edge shall be operated parallel to the centerline of the pavement and shall be moved forward one-half its length after each pass. Irregularities shall be corrected by adding or removing concrete.
- F. After the concrete has received its initial set and all surface free water has disappeared, the slab shall be given a broom finish. The strokes of the broom shall be continuous from one side to the other and normal to the centerline. The type of broom used in this operation is subject to the approval of the ENGINEER.
- G. To furnish proper protection to the soft concrete during finishing, a suitable bridge shall be provided so that workmen may get out over the surface of the work without walking upon it or marring it.

-06- CURING

- A. When directed by the ENGINEER, immediately after finishing operations are completed and while the concrete is still plastic, the surface of the concrete shall be covered uniformly with a water impermeable coating applied as a fine spray. The material used shall, when tested in accordance with ASTM C-156, provide a film which will retain within the specimen at the end of 72 hours at least 85 percent of the water used in the concrete mix. It shall be applied to the concrete surface at a rate sufficient to affect the required water retention and shall form a continuous, coherent water impermeable film without breaks or pinholes. The material shall be of such nature as not to react deleteriously upon the concrete. It shall produce no darkening of color of the concrete, but shall be of such nature or so treated that the coating will be distinctly visible for at least four hours after application.

- B. Burlap Curing: Immediately after the finishing operations have been completed, the concrete shall be covered with a wet burlap blanket, care being taken to prevent marring the surface of the concrete. The blanket shall be kept saturated with water by light sprinkling and shall remain in place for at least 48 hours. The burlap shall consist of one layer weighing 10 to 18 ounces per square yard or of two layers weighing not less than 7 ounces per square yard per layer.
- C. Cotton Mat Curing: Cotton mats may be used similarly to the procedure specified above for burlap blankets. Cotton mats shall contain not less than 12 oz. of batting per square yard.
- D. Waterproof Paper Curing: In lieu of the burlap blanket or cotton mats, waterproof paper may be used and shall remain in place for 48 hours. The waterproof paper covering shall consist of two sheets of plain Kraft paper cemented together with bituminous material in which are embedded cords or strand of fiber, not more than 1-1/4 inches apart, running in both directions of the paper. The paper shall be light in color, shall be free from visible defects and shall be uniform in appearance. The covering shall be sufficiently strong and tough to permit its use under the conditions existing on pavement work without tearing or becoming unfit for the use for which it is intended. The paper shall conform to ASTM C-171. At least 85 percent of the water used in the concrete mix shall be retained.

-07- PAVEMENT PROTECTION

- A. The CONTRACTOR shall erect and maintain suitable and substantial barriers to protect the concrete from all traffic and any part of the pavement damaged from traffic or other causes occurring prior to its official acceptance shall be repaired or replaced by the CONTRACTOR at his expense, in a manner satisfactory to the ENGINEER. Before the pavement is open to traffic, the covering shall be removed and disposed of as directed by the ENGINEER.
- B. The roadway shall be kept closed to traffic for a period of fourteen (14) days or longer if, in the opinion of the ENGINEER, weather conditions or results of strength tests make it advisable.
- C. Concrete shall not be mixed or deposited when the temperature is below freezing. If at any time during the progress of the work the temperature is, or in the opinion of the ENGINEER, will within 24 hours drop to 35° F, the water and aggregates shall be heated and precautions taken to protect the work from freezing for at least ten days. In no case shall concrete be deposited upon a frozen sub-grade.

-08- JOINTS

- A. Longitudinal Joints: A longitudinal joint shall be constructed along the centerline of the pavement when, in the opinion of the ENGINEER, the width of the pavement warrants such a joint. The longitudinal joint shall be of a size and shape approved by the ENGINEER. Each edge along the longitudinal joint shall be rounded with an edging tool having a radius of not less than one-half (1/2) inch. At least five (5) days shall elapse before the concrete in adjoining sections of a pavement shall be placed. After the concrete has set sufficiently, the longitudinal joint shall be sealed with an approved bituminous joint filler.
- B. Expansion Joints: Expansion joints 3/4" in width shall be placed normal to the centerline of the pavement and at the locations shown on the Drawings. Joint material shall be of proper thickness, shall be cut to the crown of the pavement and shall be of sufficient width to extend through the entire thickness of the slab and to within 1/2" of the top of the pavement which 1/2" shall be filled with a rubberized asphalt joint. The edges of the slab adjoining the expansion joint shall be rounded with an edging tool having a radius of not less than 1/2". The surface of the pavement adjoining an expansion joint shall be finished with a divided wood float which shall span the joint and shall have a width sufficient to cover at least 6" each side of the joint. Expansion joints may be of a asphalt impregnated fiber matrix or similar material of approved quality or may be formed during the concreting operation in an approved manner and subsequently filled with an approved bituminous joint filler.
- C. Joints at Structures: All structures projecting into or through the pavement shall be separated from the pavement by an expansion joint 1/2" thick.
- D. Transverse Contraction Joints: Transverse contraction joints shall consist of planes of weakness created by forming or cutting grooves in the surface of the pavement. They shall be equal to at least one-fourth (1/4) the depth of the slab.
1. Transverse strip contraction joints shall be formed by installing a parting strip to be left in place.
 2. Formed grooves shall be made by depressing an approved tool or device into the plastic concrete. The tool or device shall remain in place until the concrete has attained its initial set and shall then be removed without disturbing adjacent concrete.
 3. Sawed contraction joints shall be created by sawing grooves in the surface of the pavement with an approved concrete saw. After each joint is sawed, the saw cut and adjacent concrete surface shall be thoroughly cleaned.

Sawing of the joints shall begin as soon as the concrete has hardened sufficiently to permit sawing without excessive raveling, usually 4 to 24 hours. All joints shall be

sawed before uncontrolled shrinkage cracking occurs. If necessary, the sawing operations shall be carried on both day and night, regardless of weather conditions. A standby saw shall be available in the event of breakdown.

The sawing of any joint shall be omitted if a crack occurs at or near the joint location before the time of sawing. Sawing shall be discontinued if a crack develops ahead of the saw. In general, all joints shall be sawed in sequence. All contraction joints in lanes adjacent to previously constructed lanes shall be sawed before uncontrolled cracking occurs. If extreme conditions make it impracticable to prevent erratic cracking by early sawing, the contraction joint groove shall be formed before initial set of concrete, as provided above.

4. Transverse formed contraction joints shall consist of a groove or cleft extending downward from and normal to the surface of the pavement. These joints shall be made while the concrete is plastic by an approved mechanically or manually operated device to the dimensions indicated in the plans.
- E. Transverse Construction Joints: Transverse construction joints of the type shown in the Drawings shall be placed whenever the placing of concrete is suspended for more than 30 minutes. A butt joint with dowels or a thickened-edge joint shall be used if the joint occurs at the location of a contraction joint. Keyed joints with tie bars shall be used if the joint occurs at any other location.
- F. Sealing Joints: Joints to be sealed shall be filled with joint-sealing material before the pavement is opened to traffic and as soon after completion of the curing period as is feasible. Just before sealing, each joint shall be thoroughly cleaned of all foreign material, including membrane curing compound, and joint faces shall be clean and surface dry when seal is applied. Material for seal applied hot shall be stirred during heating to prevent localized over-heating.

The sealing material shall be applied to each joint opening in accordance with the details shown in the plans or as directed by the ENGINEER. The joint filling shall be done without spilling material on the exposed surfaces of the concrete. Any excess material on the surface of the concrete pavement shall be removed immediately and the pavement surface cleaned. The use of sand or similar material to cover the seal shall not be permitted. Joint sealing material shall not be placed when the air temperature in the shade is less than 50 degrees F., unless approved by the ENGINEER.

END OF SECTION

DIVISION 2

SITE WORK

02600 - PAVING AND SURFACING

02616 - REPAIR AND RESURFACING

INDEX: -01- General
-02- Repair of Streets

-01- GENERAL

- A. All gutters, curbs, crosswalks, sidewalks, driveways, culverts, etc., that are not scheduled for removal or replacement, but are removed or damaged by the CONTRACTOR, at his own negligence, shall be replaced or repaired by the CONTRACTOR without delay or extra cost to the OWNER, as soon as the work immediately adjacent is completed. All such repairs and replacements shall be carried out in accordance with the OWNER'S standard specifications for the construction of gutter, curbs, crosswalks, sidewalks, etc.
- B. CONTRACTOR shall verify that all quantities listed on the Drawings reflect the actual quantities needed for the work. CONTRACTOR'S bid shall include all labor, materials, and quantities necessary to complete the project, as intended.

-02- REPAIR OF STREETS

- A. Where streets, highways, alleys, pavements or surfacings of all kinds, highway shoulders or ditches, or other properties, public or private, are disturbed during the execution of the work described in this contract, they shall be restored to their original condition by the CONTRACTOR without delay or extra cost to the OWNER. Restoration to original condition only applies if materials, methods, thicknesses, etc. are not detailed in the Drawings and specifications. The CONTRACTOR shall see to it that the backfill in all trenches has been firmly compacted and settled before he replaces the surfacing. During the construction period, but before the original surface is restored by the CONTRACTOR, he shall keep all trenches and holes filled and maintain all disturbed areas. The OWNER shall be held free from any liability or damage resulting from the CONTRACTOR'S negligence in keeping all holes in streets filled, surplus dirt removed, barricades erected and flares or lanterns in place at traffic hazards to both vehicles and pedestrians during the period of construction and until acceptance by the OWNER. The CONTRACTOR shall not be responsible for the maintenance of streets after the acceptance by the OWNER.

- B. All repairs to streets, highways, alleys, highway shoulders, ditches or other surfaces that occur on county or state highways or property must receive the approval of the County or State Highway Departments before the work will be accepted by the OWNER. When special backfill, such as sand or pit-run gravel, is required by the County or State Highway Departments, the CONTRACTOR shall include the cost of hauling away the surplus material removed from the trench and the cost of furnishing, hauling, and placing the sand or pit run gravel backfill in his unit price bid for the items in which such backfill is required.
- C. It shall be the responsibility of the CONTRACTOR to contact State and County Highway Departments before preparing his bid to determine their requirements.

END OF SECTION

DIVISION 2

SITE WORK

02600 - PAVING AND SURFACING

02620 - CURBS AND GUTTERS

- INDEX: -01- General
-02- Metal Forms and Separator Plates
-03- Radius
-04- Expansion Joins

-01- GENERAL

- A. The concrete curb and gutter shall consist of a curb and gutter built in accordance with the Drawings and these specifications. The dimensions, as shown on the Drawings, shall be used in all cases unless changed by the ENGINEER to meet conditions.
- B. The CONTRACTOR for the price bid shall properly backfill with earth in back of the curb as the forms are removed. All backfill to be left even with the top of the curb and must be done in accordance with the instruction of the ENGINEER.
- C. CONTRACTOR shall verify that all quantities listed on the Drawings reflect the actual quantities needed for the work. CONTRACTOR'S bid shall include all labor, materials, and quantities necessary to complete the project, as intended.

-02- METAL FORMS AND SEPARATOR PLATES

- A. Forms shall be of a height equal to the prescribed thickness of the concrete immediately in contact. They shall be free from warps and kinks and of sufficient strength and rigidity, when staked, to resist any pressure or load to which they may be subjected. The CONTRACTOR shall have sufficient quantity of forms to set at least 200 feet in advance of placing concrete.
- B. Metal forms shall be used upon all standard work. Only in special cases, such as irregular shapes and short sections, will wood forms be permitted.
- C. Metal forms shall be of substantial section, having a flat top surface not less than 1-3/4" wide, and shall be equipped with devices to hold them to proper grade and alignment during the consolidation and finishing of the concrete. Form sections shall be tightly joined by a locking device to prevent movement in any direction.

- D. Separator plates for walk, curbs and gutters shall be of metal 3/16" thick. They shall be cut to the cross section of the work upon which they are used. Only straight plates shall be used.

-03- RADIUS

- A. At street corners, the curb and gutter shall be rounded to a radius as shown on the Drawings or as directed by the ENGINEER.

-04- EXPANSION JOINTS

- A. At approximately every 50', the CONTRACTOR shall place a 1/2" expansion joint in the curb and gutter as directed by the ENGINEER.

END OF SECTION

DIVISION 2

SITE WORK

02600 - PAVING AND SURFACING

02630 - WALKS

- INDEX: -01- General
-02- Forms
-03- Concrete Proportioning
-04- Expansion Joints
-05- Finish

-01- GENERAL

- A. CONTRACTOR shall excavate a minimum of 6 inches, as necessary, and shall include such excavation in his price bid for sidewalk construction.
- B. All tree roots shall be removed to a sufficient depth so that no injury by upheaval can result from them. Sidewalks shall rest on excavated bottom. All excavations below grade shall be brought to grade by filling with compacted sand.
- C. After the forms are removed earth backfilling shall be placed on each side of the sidewalk up to the level of the finished grade for a distance of one foot on each side of the sidewalks. The cost of this item shall be included in the price bid for sidewalk.
- D. Across driveways, alleys or streets, sidewalks shall be 6 inches thick. All other sidewalks shall be 4 inches thick. Width will be 5 feet unless otherwise indicated.
- E. A layer of 6 x 6 10/10 WWF shall be installed in the sidewalks or driveways.
- F. CONTRACTOR shall verify that all quantities listed on the Drawings reflect the actual quantities needed for the work. CONTRACTOR'S bid shall include all labor, materials, and quantities necessary to complete the project, as intended.

-02- FORMS

- A. Wood or steel forms may be used. Wood forms shall consist of 2" x 4" or 2" x 6" lumber set in place and securely staked.
- B. All forms shall be free from dirt and mortar and shall be oiled each time they are used.

-03- CONCRETE PROPORTIONING

- A. The concrete shall consist of a designed mixture of Portland Cement, fine aggregate, coarse aggregate, and water so proportioned as to produce a workable and plastic concrete free from segregation, rock pockets, or honeycombing. The concrete shall have a unit cement content of 6 bags of cement per cubic yard and shall test at least 3500 lbs. per square inch in compression when tested as specified in the following paragraph. With the usual aggregates (Sp. gravity 2.65) the approximate proportions will be: Cement 6.0 bags (564 lbs.); Water 33.0 gals.; dry fine aggregate 1,245 lbs.; dry stone 1,980 lbs. or cement 6.0 bags (564 lbs.); Water 33.0 gals.; dry fine aggregate 1,155 lbs.; dry gravel 2,070 lbs. The proportions of fine and coarse aggregate shall be varied by the ENGINEER to give a dense and workable concrete. The smallest quantity of mixing water producing a plastic workable mixture shall be required and the consistency shall be uniform. A slump of not less than 1" and not more than 2" shall be maintained for machine finished and not less than 2" nor more than 3" where hand finishing is used when tested according to the Standard Method of Slump Test ASTM C-143. The use of ready-mixed concrete will be permitted, but the proportions, as specified in the foregoing, shall be strictly maintained. No decrease in the unit cement content of 6.0 bags per cubic yard, nor in the aggregate weights set by the ENGINEER, nor any changes in the amount of water except as ordered by the ENGINEER, will be permitted. All proportioning shall be controlled at the ready-mix plant, and on no account shall it be permissible to add water to the concrete enroute or at the job site. The concrete mix shall be certified by the ready-mix plant. Fly ash may be substituted for cement on a pound for pound basis up to 75lbs.

-04- EXPANSION JOINTS

- A. Expansion joint 1/2" wide of materials to be approved by the ENGINEER shall be placed every 50 feet. Dummy joints shall be placed every five feet. If sidewalk runs to the curb, the CONTRACTOR shall place an expansion joint 1/2" wide between the curb and the sidewalk.
- B. A 1/4" expansion joint shall be placed between the sidewalk and buildings.

-05- FINISH

- A. Sidewalk shall have a slightly rough finish obtained by using a wooden float. Excess water should be avoided, also excessive troweling, which brings the cement and water to the surface.

END OF SECTION

SECTION 2642

CORRUGATED STEEL PIPE CULVERTS

1.0 GENERAL

1.01 WORK INCLUDED

- A. Supply and installation of corrugated steel pipe culverts, end sections, and appurtenances as indicated on the Engineering Plans.

1.02 RELATED SECTIONS

- A. Section 2319 – Excavation and Backfill.
- B. Section 2320 – Granular Fill.

1.03 MEASUREMENT AND PAYMENT

- A. Where indicated on the Engineering Plans or as directed by the Engineer, provide piping complying with this Section. Payment for this piping, installed complete, shall be made for the Contract unit price for:

" CMP Culvert" by the "LINEAR FOOT"

For each nominal diameter shown on the Engineering Plans, the unit price shall include all costs for providing, joining, installing, cleaning, and all incidentals necessary to complete the Work under this Section, including all necessary fittings.

1.04 SUBMITTALS

- A. Submit manufacturer's product data and installation instructions for piping and fittings.

2.0 MATERIALS

2.01 PIPE AND FITTINGS

- A. Supply corrugated steel culvert pipe, end sections, and appurtenances conforming to AASHTO M36 and as indicated on the Engineering Plans.
- B. Materials shall be handled and stored in a manner that does not damage the pipe.
- C. Any damaged materials shall be repaired or replaced at the direction of the Engineer. No additional costs shall be incurred by the Owner.

3.0 EXECUTION

3.01 INSTALLATION

- A. Provide all temporary drainage facilities necessary to protect the work and adjacent properties or natural waterways. Temporary facility shall be removed when the work is completed.
- B. Trench, backfill, and compact in accordance with Section 02221.
- C. Trench excavation should allow for a minimum of 12-inches of bedding material all around pipe. Pipe haunches shall be completely supported by bedding.
- D. Bedding shall be installed and compacted in lifts not to exceed 12-inches.
- E. No pipe shall be installed on bedding material that has not been approved by the Engineer.
- F. Care shall be taken not to damage the pipe, bedding, or adjacent work during installation.
- G. Install pipe to the line and invert elevations indicated on the Engineering Plans.
- H. Complete backfill with approved materials as indicated on the Engineering Plans. Backfill lifts shall not exceed 12-inches.
- I. Protect all pipe, end sections, and appurtenances until final acceptance of the work.

END OF SECTION

DIVISION 2

SITE WORK

02700 SITE IMPROVEMENTS

02711 CHAIN LINK FENCES

INDEX: -01- General
-02- Materials
-03- Installation

-01- GENERAL

- A. The CONTRACTOR shall furnish all labor, materials, tools, equipment, etc. to erect an aluminum-coated steel fabric chain link fence as shown on the Drawings, including gates.
- B. CONTRACTOR shall verify that all quantities listed on the Drawings reflect the actual quantities needed for the work. CONTRACTOR'S bid shall include all labor, materials, and quantities necessary to complete the project, as intended.

-02- MATERIALS

- A. Fabric shall be aluminum-coated steel fence fabric woven of No. 9 gauge wire into diamond pattern mesh, have top selvage twisted and bottom selvage shall be knuckled.
- B. The tensile strength of fabric wire pickets shall be 80,000 psi based on cross sectional area of coated wire.
- C. Bottom tension wire to be No. 7 gauge aluminum spring coil tension wire coated to 0.40 ounce per square foot of wire surface. Attach tension wire to fabric with 9 gauge hog rings at 18" centers.
- D. Hot dip galvanize all posts and appurtenances, after fabrication, with a minimum zinc coating of 2.0 ounces per square foot of surface per ASTM A120, A123, or A153, whichever is applicable.
- E. Intermediate posts to be H column, 1.875" x 1.625", or 2.5" O.D. Schedule 40 pipe, weight 2.72 pounds per foot, minimum carbon content 0.35% minimum yield strength 48,000 psi.

- F. End, corner, and pull posts shall be 3-1/2" x 3-1/2" roll form or 3" O.D. pipe, weight 5.79 lbs./ft., minimum yield strength 35,000 psi.
- G. Posts for swing gates, if applicable, shall be standard weight pipe of the following nominal sizes and weights for single swing gates or one leaf of double gates.

		# Per Lineal Foot
Gates up to 6' Wide	3-1/2" x 3-1/2" roll form or 3" O.D. pipe	5.79
Gates over 6' to 13' Wide	4" O.D. Pipe	9.11
Gates over 13' to 18' Wide	6-5/8" O.D. Pipe	18.97
Gates over 18' Wide	8-5/8" O.D. Pipe	28.55

When barbed wire extension arms are specified for the fence, the gate posts shall be extended 12" minimum above the top of the fence fabric for terminating the barbed wire. Barbed wire to be fastened with bands, clips, or eyebolts.

- H. Top rail to be 1-5/8" x 1-1/4", or 1-5/8" O.D. Schedule 40 pipe, weight 1.35 pounds per lineal foot; provide outside sleeve type couplings at least 6" long with one coupling in five to have expansion spring. Top rail must pass through base of line posts and form a continuous brace from end to end of each stretch of fence. Provide means for attaching top rail securely to each gate, corner, pull and end posts, and design intermediate posts to hold top rail.
- I. Brace assembly to match top rail, 1-5/8", weight 1.35 pounds per lineal foot for horizontal braces and 3/8" diameter with adjustable take-up for diagonal truss.
- J. Tubular posts shall be equipped with malleable iron or pressed steel ornamental tops designed to exclude moisture from the post.
- K. Stretcher bars for tubular end, corner, pull or gate posts only to be one piece lengths equal to full height of fabric with a minimum cross-section of 3/16" x 3/4". Provide one stretcher bar for each gate and end post, and two for each corner and pull post.
- L. Stretcher bar bands shall be heavy pressed steel, spaced not over 15" o.c. to secure stretcher bars to tubular end, corner pull and gate post.
- M. Gate frames shall be as required by the manufacturer with heavy malleable iron or pressed steel corner fittings securely riveted. Fabric to match the fence shall be installed in the frame by means of tension bars and hook bolts. Each frame to be equipped with 3/8" diameter adjustable truss rods. If applicable, bottom hinges to be ball and socket

type designed to carry the weight of the gate on the post footing. Upper hinge to be wrap-around adjustable type. All gates to be equipped with a positive type latching device with provisions for pad-locking. All drive gates to be provided with center plunger rod, catch and semi-automatic outer catches to secure gates in opened position. Hinges to permit gate to swing back against fence 180 degrees.

When barbed wire top is specified, the gate frame end members shall be extended 12" above top horizontal section of the gate frame. Three strands of barbed wire, uniformly spaced, shall be attached by bands, clips, or eyebolts. Frame extensions shall be capped to exclude moisture from frame (malleable iron or pressed steel).

- N. Barbed wire shall be two strand twisted steel of No. 122 minimum wire gauge, with four point barbs of No. 14 minimum wire gauge, coated to match the fence fabric.
- O. Metal arms for three strands of barbed wire shall be 45 degrees offset and provide for 6" spacing between strands of barbed wire. Metal arms to be coated to match fence posts and be designed to exclude moisture from tubular posts.
- P. Standard mill tolerances on all framework members and chain link fabric shall apply.

-03- INSTALLATION

- A. Do not begin fence work until final grading is completed. Space posts on maximum ten foot centers evenly in the line of the fence. Drill holes for post footings in firm, undisturbed or compacted soil. Holes shall have a diameter as indicated on the Drawings. Excavate hole depths approximately 6" deeper than post bottom, with bottom of posts set not less than 36" below surface for intermediate posts, 42" for corner or termination posts, and 54" for gate posts when in firm, undisturbed soil. Excavate deeper as required for adequate support in soft and loose soils, and for posts with heavy lateral loads. In loose soils, the CONTRACTOR shall use forms for pouring post footings when so ordered by the ENGINEER. Whenever the excavation for the footing has been carried too deep, the same shall be backfilled with concrete. In case of excavating the hole for the footing too large, the CONTRACTOR shall either fill the empty hole with concrete or use forms. Extra concrete shall be at no extra cost to the OWNER.
- B. Provide concrete consisting of Portland cement complying with ASTM C150, aggregates complying with ASTM C33, and clean potable water. Mix materials to obtain concrete with a minimum 28 day compressive strength of 2,500 psi, using at least four bags of cement per cubic yard, 1" maximum size aggregate, maximum 3" slump, and 2% to 4% entrained air. Prepare to conform to ASTM C94. Place concrete around posts in a continuous pour, tamp for consolidation. Check each post for vertical and top alignment, and hold in position during placement and finishing operations. Trowel finish tops of footings, and slope or dome to direct water away from posts. Extend

footings for gate posts to the underside of bottom hinge. Set keepers, stops, sleeves and other accessories into concrete as required.

- C. Install braces so posts are plumb where diagonal rod is under proper tension.
- D. Install tension wires before stretching fabric and tie to each post with ties or clips.
- E. Connect fabric to line posts with 9 gauge wire clips every 12"; to terminal, corner, and gate posts by tension bands tied to the post every 12"; to tension wire with 9 gauge hog rings every 18"; to top rail with nine gauge wires every 18". Leave approximately 2" between finish grade and bottom selvage, except where bottom of fabric extends into concrete. Pull fabric taut and tie to posts, rails, and tension wires. Anchor fabric to framework so that fabric remains in tension after pulling force is released.
- F. Thread stretcher bars through fabric and secure to posts with metal bands spaced not over 15" o.c.
- G. Install gates plumb, level, and secure for full opening without interference. Install ground-set items in concrete for anchorage, as recommended by the fence manufacturer. Adjust hardware for smooth operation and lubricate where necessary.
- H. Tie wires shall be U-shaped, clip or wire, securely fastened around pipe to which attached, clasping pipe and fabric firmly. Bend ends of wire to not be a hazard to persons or clothing.
- I. Install units for tension band and hardware bolts on side of fence opposite fabric side.
- J. Fence shall follow ground line unless otherwise provided for in this specification.

END OF SECTION

DIVISION 2

SITE WORK

02800 - LANDSCAPING

02820 - TOPSOIL

- INDEX: -01- General
-02- Preparation and Placement

-01- GENERAL

- A. This work shall consist of preparing the foundation and topsoil placement in the areas disturbed and any other areas designated by the ENGINEER or as noted on the Drawings. The work of topsoil placement consists of the preparation of the foundation and furnishing and placing the topsoil.
- B. Topsoil shall consist of the dark, organic, natural surface soil encountered on the project, exclusive of any peat or muck. Topsoil furnished from outside the project limits shall be approved by the ENGINEER.
- C. CONTRACTOR shall verify that all quantities listed on the Drawings reflect the actual quantities needed for the work. CONTRACTOR'S bid shall include all labor, materials, and quantities necessary to complete the project, as intended.

-02- PREPARATION AND PLACEMENT

- A. The earth bed upon which the topsoil is to be placed shall be at the required grade and properly trimmed. Prior to placing the topsoil, the earth bed shall be in friable condition for a depth of approximately 3 inches, including areas previously mulched or rye seeded for temporary erosion control. Areas to be sodded shall be graded uniform and parallel to the finished grade. The tops and bottoms of all slopes shall be rounded to blend into the natural ground or adjacent slopes by vertical curves.
- B. All areas which are to be seeded or sodded shall be covered with topsoil, except where slopes are constructed of topsoil, muck, or peat, topsoil surface will not be required. The topsoil shall be spread on the prepared areas to a depth of not less than 4 inches. After spreading, any large clods and lumps shall be broken up; and all stones and rocks over 2 inches in diameter, roots, litter or any foreign matter shall be raked up and disposed of by the CONTRACTOR. The topsoil shall be in reasonably close conformity to the surrounding area. If there is an excess of topsoil from salvaging and stockpiling topsoil, the stockpiles of surplus topsoil shall be trimmed to be safe and have an aesthetically pleasing appearance, as directed by the ENGINEER.

- C. A soil in a "friable" condition is defined as a surface which is in a crumbled, pulverized, worked-up, loosened, or cultivated state, free of lumps and clods detrimental to seeding and sodding operations.

END OF SECTION

DIVISION 2

SITE WORK

02800 - LANDSCAPING

02821 - SEEDING

- INDEX: -01- General
-02- Fertilizer and Application
-03- Lawn Seed and Application
-04- Mulching

-01- GENERAL

- A. The CONTRACTOR shall restore all disturbed areas and any other areas designated on the Drawings by seeding. Restoration shall promptly follow construction.
- B. Damage resulting from erosion, gullies, washouts, or other causes shall be repaired by filling with topsoil, tamping, re-fertilizing and reseeded by the CONTRACTOR without extra cost to the OWNER.
- C. CONTRACTOR shall verify that all quantities listed on the Drawings reflect the actual quantities needed for the work. CONTRACTOR'S bid shall include all labor, materials, and quantities necessary to complete the project, as intended.

-02- FERTILIZER AND APPLICATION

- A. Commercial fertilizer shall be formula 12-12-12 non-burnable type, or other approved formula, and shall conform to state fertilizer laws. It shall be uniform in composition, dry and free flowing, and shall be delivered to the site in the original, unopened containers, and bearing the manufacturer's guaranteed analysis. Any fertilizer which becomes caked or otherwise damaged, making it unsuitable for use, will not be accepted.
- B. For areas to be seeded, chemical fertilizer shall be evenly applied on the prepared topsoil surface at a rate which will provide 350#/acre of chemical fertilizer nutrients, in equal proportions of Nitrogen, Phosphoric Acid and Potash, or as directed by the ENGINEER. Fertilizer spread by drill or broadcast methods will be placed or worked into the soil to a depth of one to two inches. Fertilizer and fertilizer-seed slurries spread hydraulically shall be incorporated into the soil as described under Sowing.

-03- LAWN SEED AND APPLICATION

A. Grass seed shall be mixed and guaranteed by the dealer to be as follows:

<u>Common Name</u>	<u>Proportion by Weight</u>	<u>Germination</u>
Kentucky Blue	50%	85%
Red Top	7%	90%
Creeping Red Fescue	20%	87%
Chewing's Fescue	15%	70%
Perennial Rye	8%	94%

B. The seed shall be sown following or in conjunction with the fertilizer and while the seed bed is on a friable condition. Just prior to seeding, the topsoil shall be harrowed with a disk, a spring tooth drag, a spike tooth drag, or by other equipment designed to condition the soil for seeding and meeting the approval of the ENGINEER. The harrowing shall be done horizontally across the face of the slope.

C. Areas sown by the hydro-seed or the broadcast method shall be floated and lightly compacted to incorporate the seed into the uppermost one-half inch of the soil. Immediately after setting the seed, the seeded areas shall be mulched as specified.

D. Seed shall be applied at the rate of 100 pounds per acre.

E. Seasonal Limitations - Seeding shall be done during the following seasonal periods:

1. Southern Lower Peninsula - South of the north boundary of the tier of Townships 20 North, May 1 through October 10.
2. Northern Lower Peninsula - North of the north boundary of the tier of Townships 20 North, May 1 through October 1.
3. Upper Peninsula - May 1 through September 20.

F. Dormant Seeding - Dormant seeding will only be permitted for limited areas to complete a project or a stage of a project as approved by the ENGINEER.

-04- MULCHING

A. Areas to be mulched within the seasonal limitations for seeding shall be seeded and fertilized prior to placing mulch. At other times, temporary mulching may be required for temporary erosion control.

- B. Straw (hay) or excelsior mulches shall be spread over the surface to a uniform thickness at the rate of 2 tons per acre unless otherwise specified on the Drawings, except that for areas where dormant seeding has been permitted, the mulch shall be placed at the rate of 3 tons per acre. The mulch shall be loose enough to allow sunlight to penetrate and air to slowly circulate, but thick enough to shade the ground, reduce rate of water evaporation, and prevent or reduce water or wind erosion.
- C. Mulch which has become displaced shall be replaced at the CONTRACTOR'S expense.
- D. Mulch shall be anchored in place with a mulch adhesive or with a mulch net, except that mulch placed over dormant seeded areas shall be anchored with both a mulch adhesive and a mulch net. Any additional costs incurred by the CONTRACTOR in electing to place dormant seeding will be at his expense.
- E. Mulch adhesives shall be applied by spraying simultaneously with the mulch or by spraying a surface application of adhesive immediately following mulching. The CONTRACTOR shall protect all traffic, signs, structures, and other objects from being marked or disfigured by the adhesive material. The mulch adhesives shall be applied at a minimum rate as recommended by the manufacturer and in accordance with weather condition requirements.
- F. When required, or when permitted by the ENGINEER, the mulch shall be held in place by covering with net secured by staples. The net shall be spread over the mulch so that there is room for a workman to walk between adjacent widths of the net. The edges of the adjacent widths of net shall be pulled together and held in place by staples spaced not more than 2.5 feet apart along the edges, joints, and centerline of the net. Some of the mulch must be under the staples so that the net is not in direct contact with the ground. The staples shall be pushed into the ground so that the top of the staple is about 1/2 inch above the ground. The ends of each width of net shall be held in place by staples at each salvage edge and at the center of the net.
- G. No traffic will be permitted over the net after it is placed, except to repair it, and any torn or damaged net shall be replaced with undamaged material.
- H. Erosion blankets may be used in lieu of mulch when approved by the ENGINEER. Installation shall be per the manufacturers recommendations.

END OF SECTION

DIVISION 2

SITE - WORK

02800 - LANDSCAPING

02822 - SODDING

- INDEX: -01- General
-02- Materials
-03- Placing Sod
-04- Top Dressing, Fertilizer, Watering

-01- GENERAL

- A. The CONTRACTOR shall furnish and place live sod on the areas designated on the Drawings. Sod for lawns shall conform to MDOT 917.13.
- B. Areas to be sodded shall be brought to within the thickness of the sod of the finished grade with allowance for settlement.
- C. CONTRACTOR shall verify that all quantities listed on the Drawings reflect the actual quantities needed for the work. CONTRACTOR'S bid shall include all labor, materials, and quantities necessary to complete the project, as intended.

-02- MATERIALS

- A. The sod shall consist of a dense, well-rooted growth of permanent and desirable grasses which are indigenous to the general locality where it is to be used, and shall be practically free from weeds or undesirable grasses. Sod with clover will not be accepted. At the time the sod is cut, the grass on the sod shall have a length of approximately 2" (if longer, the grass shall be cut to approximately this length) and the sod shall have been raked free from debris.
- B. The sod shall be cut in uniform strips approximately 1'-6" x 6'-0", but not larger than is convenient for handling and transporting.
- C. The thickness of the sod shall be as uniform as possible, approximately 3/4" or more, depending on the nature of the sod, so that practically all of the dense root system of the grasses will be retained, but exposed, in the sod strip and so that the sod can be handled without undue tearing or breaking.

- D. In the event the sod which is to be cut is in the dry condition so as to cause crumbling or breaking during cutting operations, the CONTRACTOR, at his own expense, at least 12 hours before cutting the sod, shall apply water in sufficient quantities to provide a well moistened condition of the sod to the depth to which it is to be cut.

-03- PLACING SOD

- A. The earth bed upon which the sod is to be placed shall be moistened, if not naturally sufficiently moist, and the sod shall be placed within approximately 24 hours after it has been cut.
- B. Unless otherwise required, the sod on slopes shall be laid in horizontal strips beginning at the bottom of the slope and working upward.
- C. Sod shall be laid so that the joints caused by abutting ends of sod strips are not continuous. Each sod strip shall be laid to abut snugly against the strip previously laid.
- D. As the sod is being laid, it shall be rolled or firmly but lightly tamped with suitable wooden or metal tampers, sufficiently only to 'set' or press the sod into the underlying soil.
- E. At such points where water will start flowing over a sodded area, the upper edges of the sod strips shall be turned into the soil below the adjacent area and a layer of earth placed over this juncture, which earth shall be thoroughly compacted to conduct the surface water over the upper edge of the sod.
- F. At the limits of sodded area, wherever practicable or feasible, the end strips shall be turned in and treated as above described.
- G. Any sod that has been frozen prior to laying, or which is laid during freezing weather or upon a frozen bed, will not be accepted or paid for until it has become evident in the following growing season that such sod has not suffered any damage. Any sod laid under these conditions, which does not establish itself during such following growing season, shall be removed and replaced by the CONTRACTOR at his own expense.

-04- TOP DRESSING, FERTILIZING, WATERING

- A. After sodding has been completed, the surface shall be cleaned of loose sod, excess soil, or other foreign material, whereupon a thin layer of topsoil shall be scattered over the sod as a top dressing and the areas shall then be thoroughly moistened by sprinkling with water.
- B. Formula 10-10-10 fertilizer shall be spread uniformly over the sodded areas at the rate of

18 pounds per 100 sq. yds. and raked into the sod, after which the area shall be moistened by sprinkling sufficiently to allow the fertilizer to soak into the sod. The rate of sprinkling shall be slow enough to permit the sod to absorb the water, and should not cause any appreciable runoff from the areas sprinkled.

- C. The CONTRACTOR shall be responsible for the initial watering immediately after the application of the fertilizer. Subsequent watering shall be done by the OWNER under the supervision of the CONTRACTOR.

END OF SECTION

DIVISION 2

SITE WORK

02800 - LANDSCAPING

02830 - TREES, SHRUBS, AND GROUND COVER

- INDEX: -01- General
-02- Materials
-03- Protection of Existing Trees and Plants

-01- GENERAL

- A. The OWNER shall furnish and plant or install all new trees, shrubs, or ground cover except sodding as indicated in Section 02822 and as shown on the plans.
- B. The CONTRACTOR shall be responsible for removal of existing trees, shrubs and ground cover which is in the location of construction. The CONTRACTOR, under the direction of the OWNER and ENGINEER, shall re-plant these trees and shrubs and relocate the existing ground cover on the site as directed.
- C. The CONTRACTOR shall be responsible for applying all watering that may be necessary during the period of construction to insure adequate development of the trees and shrubs that have been relocated.
- D. CONTRACTOR shall verify that all quantities listed on the Drawings reflect the actual quantities needed for the work. CONTRACTOR'S bid shall include all labor, materials, and quantities necessary to complete the project, as intended.

-02- MATERIALS

- A. Fill materials shall be approved and conform to the following except as specifically indicated otherwise on the Drawings:
 - 1. Fill, except as otherwise specified, shall be earth, free of debris, cinders, combustibles, frost, ice, silt, roots, sod, wood, cellulose, and organic materials. Up to 30 percent of fill material may be rock-like materials not more than .50 cubic foot in volume or more than 10 inches in length, if evenly distributed in the total fill.
 - 2. Top 18 inches of fill under topsoil of lawn and planted areas shall be earth, free of debris, cinders, frost, ice, sod, wood, and roots over 1/4 inch in diameter. Up to 10

percent of fill material may be rock-like materials not more than .05 cubic foot in volume or more than 4 inches in length. Also, up to 20 percent of fill material may be topsoil, but no sod.

3. Fill, within 2 feet from buildings and other structures, shall be soil free of debris, cinders, combustibles, frost, ice, roots, sod, wood, cellulose, and organic material. Up to 40 percent of fill material may be rock-like materials not more than .02 cubic foot in volume nor more than 3 inches in length.
- B. Carefully relocate existing trees and shrubs as directed by the OWNER and ENGINEER. Do not relocate within 10 feet from any underground utilities.
1. Provide bracing ties to hold tree in place until soil around tree stabilizes and roots take hold.
 2. Stone or bark areas to have a 6 mil black poly sheeting or non-woven geotextile, as indicated on the Drawings, under rock and around plantings.
 3. Water and liquid fertilizer (Miracle-Gro, or equal) before leaving site.
 4. Clean up all materials on site and leave areas completed.
 5. Rubber or metal edging shall match the existing edging.

-03- PROTECTION OF EXISTING TREES AND PLANTS

- A. All existing trees and vegetation indicated to remain and other existing trees which do not interfere with construction and grading operations shall be protected as hereinafter specified. Removal of existing trees outside these limits shall be only as approved by the OWNER and ENGINEER.

END OF SECTION

DIVISION 3

CONCRETE

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DIVISION 3

CONCRETE

03100 - CONCRETE FORMWORK

03105 - FORM COATINGS

INDEX: -01- General

-01- GENERAL

- A. Treat or wet contact forms as follows: Coat plywood, wood moldings, with non-staining form oil or other approved bond breaking agent. Wipe off excess oil with rags. Coat board forms with oil or lacquer in cold weather; in warm weather keep continuously wet with water at least 12 hours before concrete is poured. Give metal forms coat of light form oil, in hot weather cool by thoroughly wetting with water just prior to placing concrete. Apply oil, lacquer or agent before reinforcement is placed. Oil, lacquer or other agents on reinforcement will not be permitted. Form oil shall be water repellent.

END OF SECTION

DIVISION 3

CONCRETE

03100 - CONCRETE FORMWORK

03110 - CONCRETE FORMS

- INDEX: -01- General
-02- Workmanship
-03- Materials
-04- Construction
-05- Tolerance
-06- Reusing Forms
-07- Removal of Forms
-08- Forms for Equipment

-01- GENERAL

- A. The CONTRACTOR shall assume responsibility for complete design of forms and centering and for safety of structures and occupants during construction, as well as, adequacy for specified tolerances.
- B. The CONTRACTOR shall use, as a basis for design, ACI Standard Recommended Practice for Formwork, ACI 347.

-02- WORKMANSHIP

- A. Formwork shall be true and rigid, thoroughly braced, both horizontally and diagonally, sufficiently strong to carry dead and live loads to which it may be subjected, sufficiently tight to prevent leakage of mortar; so that the finished concrete will conform to shapes, lines, grades, dimensions, as indicated on Drawings.
- B. Where height of shores exceeds 10'-0", provide diagonal bracing for each shore in both longitudinal and transverse directions. In addition, provide diagonal braces at ends of framework.
- C. The CONTRACTOR shall be responsible for adequate design and construction of forms used in construction.
- D. During placement of concrete, workmen shall correct faulty formwork and shall insure that there is no movement of shores, braces, or other supports.

-03- MATERIALS

- A. Unless specified otherwise, the CONTRACTOR shall use metal, plywood, presswood form liners or plastic surfaced plywood. Free standing structural wood posts for support of slab forms and beam and girder bottoms shall not be smaller than 4 in. x 4 in. or steel posts of required capacity.

-04- CONSTRUCTION

- A. Build all forms, using the largest pieces possible. All form joints shall be laid out having straight lines.
- B. All footings shall be formed.
- C. Exposed finish concrete is considered that concrete which is exposed to public view, inside or outside of completed structure. Where structural concrete slabs remain exposed, the CONTRACTOR shall use new plywood forms with straight line joints and shall use the largest pieces possible. Where walls remain exposed, the CONTRACTOR shall use new plywood, wood, or prefabricated metal forms. Boards are not acceptable. The form joints for walls shall also be laid out in straight lines.
- D. Use bolts, rods or other approved devices for form ties. Arrange ties so that when forms are removed, no metal will be within 1 in. of surface. Wire ties will not be accepted on exposed concrete. Plastic cone snap ties may be used. Removal of wall ties shall leave holes clean cut and of practically the same size as metal removed and without leaving shallow depressions or disfigurements on face of concrete. Where walls are to be subject to water pressure, a minimum 1" diameter steel or neoprene collar shall be affixed, watertight to the midpoint of the metal tie.
- E. If not indicated otherwise, crown framework of floors, beams, in excess of 12'-0" not less than 1/4" in all directions for every 16'-0" of building span. In case of flat spans crowning shall be done in two directions.
- F. Provide for 3/4" chamfer on external corners of exposed concrete beams and columns. Do not chamfer columns that are flush with concrete block walls. Stop chamfers 6 in. below suspended ceilings and 4-1/2 in. above finished floor where columns are exposed. Terminate chamfers with 45 degree angle cut.

- G. Provide access openings at base of vertical forms for access to cleaning and inspection of forms and reinforcing prior to depositing concrete. Construct forms for beams and lintels so that sides may be removed without disturbing bottom of form or its support.
- H. Keyways must be nominal 2 inches deep by 1/3 the thickness of the pour unless shown otherwise on the Drawings.
- I. Before concrete is placed, true forms to line and level by means of adjustable shores, jacks, shims or other approved methods.
- J. If bulging, sagging or deflection in forms cannot be corrected to the satisfaction of the ENGINEER, concrete must be removed immediately, forms reset and braced against further movement at the CONTRACTOR'S expense.

-05- TOLERANCE

- A. Permissible tolerances shall be as set forth in ACI 347.

-06- REUSING FORMS

- A. Thoroughly clean, patch and repair form material before reusing. Repair any damage to forms, patch holes and defects. Replace rejected form material with an acceptable material.

-07- REMOVAL OF FORMS

- A. Forms shall not be removed:
 - 1. Until approval is obtained from the ENGINEER.
 - 2. For a minimum of 24 hours.
 - 3. From under cast-in-place slabs for at least two weeks.
 - 4. Until members have acquired sufficient strength to support their weight and load.

-08- FORMS FOR MECHANICAL EQUIPMENT

A. The CONTRACTOR shall:

1. Check with mechanical and electrical CONTRACTORS for location of piping, ducts, conduit or equipment which require openings in concrete. Mechanical and/or electrical contractors shall supply required sleeves, thimbles for their work.
2. Form such openings before pouring any concrete.

END OF SECTION

DIVISION 3

CONCRETE

03200 - CONCRETE REINFORCEMENT

03210 - METAL REINFORCEMENT

- INDEX: -01- General
-02- Cleaning, Protecting, and Bending Reinforcement
-03- Shop Drawings
-04- Accessories
-05- Placing Reinforcement
-06- Placing and Spacing of Bolster Supports
-07- Splices in Reinforcement
-08- Concrete Protection for Reinforcement
-09- Tolerances

-01- GENERAL

- A. All reinforcing steel except #2 bars in column shall be deformed as defined in Section 301, "Building Code Requirements for Reinforced Concrete" (ACI 318). All reinforcement shall be suitably marked for field determination of grade.
- B. All reinforcing steel shall be of 60,000 psi yield point - one of the following:
1. "Specifications for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement" (ASTM A-615).
 2. Special grade of "Specifications for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement" (ASTM A-996).
 3. Wire for Concrete reinforcement shall conform to "Specification for Carbon Steel Wire and Welded Wire Reinforcement for Concrete: (ASTM A-1064).

-02- CLEANING, PROTECTING AND BENDING REINFORCEMENT

- A. Metal reinforcement, at the time concrete is placed, shall be free from rust, scale, or other coatings that will destroy or reduce the bond. All bars shall be bent cold. Bends for stirrups and ties shall be made around pins having at least twice the thickness of the bars; of six times for 1" and smaller bars, eight times for larger bars. Straightening or re-bending shall not be allowed to an extent which will injure the reinforcement. Bars with kinks or bends not shown on the Drawings shall not be used.

- B. Protect reinforcement against mechanical injury or excessive rusting. Store at site, keeping steel at least 3 inches above ground. Steel having deposits of scale shall be rejected. Store the steel in a place that will protect it from damage due to construction activities.

-03- SHOP DRAWINGS

- A. Submit to the ENGINEER complete shop drawings showing bending diagrams, assembly diagrams, location diagrams, splicing end laps of rods, shapes, dimensions and details for bar reinforcing, stirrup spacing, accessories and openings. Shop drawings shall show all openings. Submit shop drawings based on contract drawings. Redesigning of reinforcing will not be acceptable. Show all bend dimensions and typical bending diagrams for slabs. Submit drawings in accordance with ACI 315 except as noted otherwise. Detailing of reinforcement and providing of accessories shall conform to "Manual of Standard Practice for Detailing Reinforced Concrete Structures" of the ACI. Support reinforcement on metal supports of proper type. Shop drawings shall be complete upon first submission.

-04- ACCESSORIES

- A. Accessories shall include metal spacers, chairs, ties and other devices necessary for properly placing, spacing, supporting and fastening reinforcement in place.
- B. Provide spacers with tie wire at proper intervals to hold slab bars in position and to raise them above forms to distance shown. Provide wire chairs for all beam bars at such intervals so as to prevent bar sagging between chairs. Tie bars to chairs. All reinforcing shall be supported on bolsters or chairs and carrying bars whether or not specifically called for on Drawings. Bolsters and chairs in exposed locations, interior and exterior, shall have plastic or stainless steel supports.

-05- PLACING REINFORCEMENT

- A. Metal reinforcement shall be accurately placed and adequately secured in position by chairs and spacers. In no case shall the clear distance between bars be less than 1", or less than one and one third times the maximum size of the coarse aggregate. Where reinforcement in beams or girders is placed in two or more layers, the clear distance between layers shall be not less than 1", and the bars in the upper layers shall be placed directly above those in the bottom layer. Bar lists and setting drawings shall be furnished by the CONTRACTOR.
- B. CONTRACTOR shall be responsible for correcting any displacement of reinforcement just prior to and during concrete pouring operations.

- C. Reinforcing steel is to be inspected and approved in place before it is covered with concrete. No bending or welding or reinforcement will be permitted at job site, unless approved by the ENGINEER. Position reinforcement to a plus or minus 1/4 in. of the spacing shown on Drawings, unless specified otherwise. Secure against displacement at intersections by using 16 gauge soft annealed wire or suitable clips.
- D. Wire fabric shall extend to within 2 in. of edges of slab or section. Lap sheets at least 6 in. or one wire space, whichever is greater, at ends and edges and wire together.
- E. Splice vertical rods in concrete columns by extending as many of them as there are rods in column above, up through floor slab or wall and lap as called for or as otherwise shown. Set dowel rods and ties for footings as shown. Where size of column is changed, offset vertical reinforcing rods just below floor slab by bending twice to form angle or not more than ratio of one horizontal to six vertical before placing. Offsetting shall be done in shop. Place vertical rods as shown on Drawings for each column type. Wire tie.
- F. Support lower layer of reinforcement in slabs on gravel fill on cone shaped concrete masonry blocking of proper height with reinforcement placed in center of such slabs unless otherwise shown.

-06- PLACING AND SPACING BOLSTER SUPPORTS

- A. Provide support bolsters for positive steel between column lines, with tie wires to hold slab bars in position and to raise them above forms to distance shown or specified. Bar bolsters shall be maximum of 3'-6" o.c.
- B. Provide wire chairs for top bars at maximum 3'-6" centers. No carrying bar shall be less than No. 5. Top reinforcing steel with bars in both directions will require chairs only.
- C. Support rods in beams at correct distance from forms by means of welded wire spacers. Where more than one layer of steel occurs, separate layers by approved spacers of proper size. Beams having stirrups shall have bolsters in two rows, parallel with beam sides and full length of stirrup spacing.

-07- SPLICES IN REINFORCEMENT

- A. Necessary splices not shown on Drawings shall be lapped sufficiently to develop the strength of the bars by bond and be securely wired. Splices in adjacent bars shall be staggered. The clear distance between bars shall also apply to the clear distance between a contact splice and adjacent contact splices or bars. All rods shall be placed as shown on the Drawings and as specified. Adjoining bars at all splices shall lap at least 32 bar diameters. All horizontal rods in outside wall shall be bent and lapped at corners not less than 24" into adjoining walls. All horizontal rods in intersecting walls shall be bent and lapped not less than 12" into end walls. Floor rod splices are shown over beams where the floor rods shall be lapped at least 24". All rods shall be accurately placed and securely wired in proper position before concrete is placed. All placing of reinforcing steel, etc., shall be done strictly according to Drawings, Specifications and instruction of the ENGINEER.

-08- CONCRETE PROTECTION FOR REINFORCEMENT

- A. The reinforcement of footings and other principal structural members in which the concrete is deposited against the ground shall have not less than 3" of concrete between it and the ground contact surface. If concrete surfaces after removal of the forms are to be exposed to the weather or be in contact with the ground, the reinforcement shall be protected with not less than 2" of concrete for bars more than 5/8" in diameter and 1-1/2" for bars 5/8" or less in diameter.
- B. The concrete protective covering for reinforcement at surfaces not exposed directly to the ground or weather shall be not less than 3/4" for slabs and walls; and not less than 1-1/2" for beams, girders and columns. In concrete joist floors in which the clear distance between joists is not more than 30", the protection of reinforcement shall be at least 3/4".

-09- TOLERANCES

- A. Tolerances shall be in accordance with requirements of ACI 318-71 unless noted to contrary on Drawings. Tolerances must be held during construction and pouring. If it is found that construction causes movement beyond these tolerances, the CONTRACTOR shall take additional steps to insure proper support before pouring is allowed. Tolerances shall apply to all bars including stirrups, column ties, dowels, and all other steel except temperature bars over joists. Temperature bars over joists are to be placed above joists top bars and will be allowed to drape down below joist top steel. Where there is no joint steel to support the temperature steel at bulkheads, it shall be supported on chairs.

END OF SECTION

DIVISION 3

CONCRETE

03200 - CONCRETE REINFORCEMENT

03240 - FIBROUS REINFORCEMENT

- INDEX: -01- General
-02- Submittals
-03- Related Work
-04- Materials
-05- Special Precautions

-01- GENERAL

- A. The work covered by this Section consists of furnishing all labor, materials and equipment in connection with fibrous reinforced concrete.
- B. Fibrous reinforced concrete will be used in slabs on grade where designated on the Drawings.

-02- SUBMITTALS

- A. The CONTRACTOR shall submit data sheets for approval on materials.

-03- RELATED WORK

- A. Section 03300 Cast-In-Place Concrete.

-04- MATERIALS

- A. Fiber shall be collated fibrillated polypropylene a minimum of 12 inches long.
- B. Dosage shall be at a minimum rate of 1.5 pounds per cubic yard following manufacturer's recommendations for mixing time.

-05- SPECIAL PRECAUTIONS

- A. Do not use tyned rakes for moving fibrous reinforced concrete.
- B. Standard slump tests meeting ASTM C143 must be performed prior to adding the fiber.
- C. Broom finish: Use a stiff bristled broom (bristles must be stiffer than fibers).

END OF SECTION

DIVISION 3

CONCRETE

03250 - CONCRETE ACCESSORIES

03251 - EXPANSION AND CONTRACTION JOINTS

- INDEX: -01- General
-02- Construction Joints

-01- GENERAL

- A. The CONTRACTOR shall provide preformed expansion joint filler conforming to ASTM D-1752 where expansion joints are indicated on the project drawings or in these specifications.
- B. Provide expansion joints for walks and curbs wherever concrete adjoins vertical surfaces. Use non-extruding bituminous fiber type expansion joint filler conforming to ASTM D1751 for walks and curbs. Unless otherwise shown, expansion joints shall be 1/2 inch wide. This group of joint fillers shall extend full depth of concrete to within 1/8 inch of top surface. Round off concrete edges with small radius edging tool.

-02- CONSTRUCTION JOINTS

- A. CONTRACTOR shall submit to the ENGINEER, for review, proposed sequence of placing various sections of concrete and location of all construction joints, all at least 30 calendar days prior to actual placing. Joints not indicated on the Drawings shall not be made without permission of the ENGINEER, but if permitted, shall be made and located so as to impact the least impair to the strength of the structure. All construction joints shall be provided with a keyway, and where directed by the ENGINEER, a water stop, the design, depth, and width of same to be approved by the ENGINEER. Where a joint is to be made, the surface of the concrete shall be roughened, thoroughly cleaned, and all laitance removed. In addition to the foregoing, joints shall be thoroughly wetted and slushed with a coat of neat cement grout immediately before placing of new concrete.
- B. At least two hours must elapse after depositing concrete in the columns or walls before depositing in beams, girders, or slabs supported thereon. Beams, girders, brackets, column capitals and haunches shall be considered as part of the floor system and shall be placed monolithically therewith unless otherwise specifically indicated on the drawings.

- C. Construction joints in floors shall be located near the middles of the span of slabs, beams, or girders unless a beam intersects a girder at this point, in which case the joints in the girders shall be offset a distance equal to twice the width of the beam. In this case, the CONTRACTOR shall provide inclined shear reinforcement as directed by the ENGINEER.
- D. Distance between construction joints shall not exceed 20 feet in any horizontal direction unless otherwise indicated. Concrete shall be placed continuously so that each unit will be monolithic in construction. Columns or walls of ordinary height shall be poured at least two hours before any overhead work is placed thereon. Joints not shown or specified shall be located so as to least impair strength and appearance of work.
- E. No horizontal construction joints will be permitted except in walls over 12 feet high or at intersection of column and/or wall with a floor, or as indicated on plans. All construction joints, regardless of location, shall be bulk headed out and mechanically keyed. Reinforcing must be continuous through the bulkheads. See plans for location of construction joints in exterior walls, and slabs on grade. Location of construction joints required by the Specifications and not shown on the drawings, in structural walls, slabs and beams, are to be determined by the CONTRACTOR and subject to approval by the ENGINEER.

END OF SECTION

DIVISION 3

CONCRETE

03250 - CONCRETE ACCESSORIES

03252 - ANCHORS AND INSERTS

INDEX: -01- General

-01- GENERAL

- A. Inserts, sockets, wire, bolts, etc. shall be galvanized steel. Aluminum items are not to be incorporated into the concrete.
- B. Provide and install a 20 gauge, galvanized steel, 1 inch wide back, removable filler, lengths to suit where masonry walls abut concrete surfaces. Crimped anchors to be furnished by the trades involved.

END OF SECTION

DIVISION 3

CONCRETE

03250 CONCRETE ACCESSORIES

03253 WATER STOPS

- INDEX: -01- General
-02- PVC Water Stops
-03- Metal Water Stops

-01- GENERAL

- A. Water stops will be required at all construction joints in structures which will retain or contain liquids, whether indicated on the Drawings or not. They shall be properly located and secured within the formwork before the concrete is cast.
- B. Joints at intersections and at ends of pieces shall be made to develop effective water tightness fully equal to that of the continuous water stop material.

-02- PVC WATER STOPS

- A. Water stops shall be a minimum of 4 inches x 1/4 inch thick. Water stops at expansion joints shall have provisions for expanding or contracting a minimum of 1 inch.
- B. Installation and splicing of water stops shall be done strictly in accordance with manufacturer's recommendation. To prevent buckling during placing of concrete, all water stops shall be firmly secured in place. If necessary, wires may be installed in the outside rib. Reinforcing rods shall not pierce or deflect water stops.

-03- METAL WATER STOPS

- A. Metal water stops, if indicated on the Drawings, shall be 12 gauge ungalvanized steel, 6 inches wide, and shall be free of any coatings. All joints shall be welded together to form a continuous water stop.

END OF SECTION

DIVISION 3

CONCRETE

03300 - CAST-IN-PLACE CONCRETE

03301 CONCRETE MATERIALS

- INDEX: -01- Cement
-02- Aggregates
-03- Water
-04- Storage of Materials
-05- Concrete Admixtures

-01- CEMENT

- A. The cement shall be Portland cement conforming to the current ASTM C-150, Type I or Type III, where high early strength concrete is specified.

-02- AGGREGATES

- A. Fine Aggregates - Sand for concrete work shall conform to the current ASTM C-33, and shall be composed of clean, uncoated grains of strong material. Fine aggregate subjected to calorimetric test for organic impurities and producing a color darker than the standard shall be rejected unless, when tested in accordance with ASTM C-87, the mortar develops a compressive strength of 7 and 28 days of not less than 95% of that developed by the mortar specified in that method as the basis for comparison. The grading shall be from fine to coarse with coarser particles predominating. After being thoroughly dried, the sand must meet the following requirements by weight:

Percentage	
3/8" screen, circular opening, retained on	0
No. 4 sieve, retained on	0 to 5
No. 8 sieve, retained on	5 to 20
No. 14 sieve, retained on	30 to 65
No. 25 sieve, retained on	55 to 75
No. 48 sieve, retained on	79 to 95
No. 100 sieve, retained on	95 to 100

The above limits cover the natural variations from the sources of supply, but the ENGINEER reserves the right to vary the grading within the limits given, as may be rendered necessary in order to obtain a dense and stable mixture.

- B. Coarse Aggregate - The coarse aggregate shall be gravel or crushed stone conforming to ASTM C-33. The gravel shall consist of clean gravel, free from clay or coating of any character. Flat or elongated particles, soft stone or shale or bank gravel will not be accepted. If crushed stone is used, it must first have the approval of the ENGINEER, and must be obtained from clean tough, durable rock, free from slaty structures or cleavage planes and shall be clean and free from thin, flat or shaly pieces. All stone must meet the following requirements:

- Abrasion-percent of wear, not over 5.
- Toughness-not less than 6.
- Soundness-must not check, crack or disintegrate.

If the ENGINEER so desires, samples of sand and aggregate which the CONTRACTOR proposes to use for the work must be submitted to the ENGINEER at least two (2) weeks before the CONTRACTOR commences to deliver the material at the site of the work. Material must not be delivered until the ENGINEER has approved the samples furnished and materials delivered must be in all respects equal to the samples delivered.

-03- WATER

- A. Water used in mixing concrete shall be clean and free from injurious amounts of oils, acids, alkalies, organic materials, or other deleterious substances.

-04- STORAGE OF MATERIALS

- A. Cement and aggregates shall be stored in such a manner as to prevent deterioration or contamination with foreign matter. Each size of aggregate shall be stored separately and in such a manner as to avoid segregation. Cement which has become caked, partially set, or otherwise deteriorated, or any material which has become damaged or contaminated, shall be rejected for use, be removed from the premises within twenty-four (24) hours.

-05- CONCRETE ADMIXTURES

- A. Air entraining agent shall conform to ASTM C260. When requested, certification attesting to compliance with ASTM C260 shall be furnished by the manufacturer.
- B. Water reducing, set controlling admixture shall conform to ASTM C494, Type A (water reducing, normal setting), Type D (water reducing, set retarding). Type D shall be used for all concrete when the ambient temperature is over 70 degrees F. Both Type A and

Type D admixtures shall be used at uniform dosages to provide uniform strengths as analyzed by ACI 214. The Type D admixture shall produce a set retardation of 20% at early ages and 15% at 28 days, when added to the specified mixes. Both Types A and D admixtures shall show a reduction in bleeding over plain concrete when measured in accordance with ASTM C232. Neither Type A or Type D admixture shall increase the air content of the concrete.

- C. A qualified concrete technician employed by the manufacturer shall be available to assist in proportioning concrete materials for optimum use, to advise on proper use of the admixture and adjustment of concrete mix proportions to meet jobsite and climatic conditions.
- D. Calcium chloride shall not be used.

END OF SECTION

DIVISION 3

CONCRETE

03300 - CAST-IN-PLACE CONCRETE

03302 - CONCRETE SUPPLIER

INDEX: -01- Supplier Certification

-01- SUPPLIER CERTIFICATION

- A. The concrete supplier shall conform to the requirements of the NRMCA certification plan where the plan relates to material storage, batching, central mixer, delivery units and ticketing system, etc. Proof of compliance shall be submitted to the ENGINEER.

END OF SECTION

DIVISION 3

CONCRETE

03300 - CAST-IN-PLACE CONCRETE

03303 - CONCRETE CLASSIFICATIONS AND PROPORTIONS

- INDEX: -01- General
-02- Classifications
-03- Class of Concrete to be Used

-01- GENERAL

- A. Concrete shall be composed of cement, fine aggregate, coarse aggregate, water and admixtures as specified. Proportions of ingredients shall produce concrete which will work readily into corners and angles of forms, bond to reinforcement, without segregation or excessive bleed water forming on the surface of the concrete.
- B. Cements, aggregates, water and admixtures shall be proportioned and mixed according to ASTM C94 and ACI 211.1-91.
- C. Proportions of ingredients shall be selected by past field experience or in lieu of past performance, by laboratory trial mixes to produce placeability, durability, strength and the additional properties as specified.
- D. Determinations of required average strength above specified strength shall be in accordance with ACI 318-71 "Building Code Requirements for Reinforced Concrete" and evaluations of compressive strength results of field concrete shall be in accordance with ACI 214-65.

-02- CLASSIFICATIONS

- A. The following table includes mixes that have been figured for the use of water reducing agent. The CONTRACTOR does not have to order concrete using this admixture; however, if the admixture is not employed in the mix, the cement content of the mix shall be increased by 12%.

Class	Compressive Strength (28 Day)	Sacks of Cement per cu. yd. (min.)	Aggregate Size	Slump
A	5,000 psi	7	3/4 inch	3 inch
B	4,000 psi	6	3/4 inch	3 inch
C	3,000 psi	5.5	1-1/2 inch	4 inch
D	2,000 psi	5	1-1/2 inch	4 inch

-03- CLASS OF CONCRETE TO BE USED

- A. Class A and Class D concrete shall only be used when called for on the Drawings. All concrete for this project shall be Class B, except for footings, which shall be Class C (unless noted differently on the structural Drawings). Exterior concrete such as sidewalks, curbs, fence post piers, etc. shall be Class B, air entrained.
- B. All concrete shall contain an air entraining agent conforming to ASTM C260; however, air may be omitted for interior trowel finished slabs. The air entrained concrete shall contain the following air contents by volume.

Nominal Max. Size Aggregate	Total Air Content
3/4 inch	6% ± 1%
1-1/2 inch	4% ± 1%

Maximum total air content on interior trowel finished slabs receiving a dust on surface hardener shall be 3%.

END OF SECTION

DIVISION 3

CONCRETE

03300 - CAST-IN-PLACE CONCRETE

03304 - QUALITY CONTROL

- INDEX: -01- General
-02- Tests on Concrete
-03- Delivery Ticket

-01- GENERAL

- A. Materials and work shall conform to the requirements of all standards, codes and recommended practices required in this Section. In conflicts between standards, required standards and this specification, or this specification and the local building code, the more stringent requirement shall govern.
- B. Applicable Standards:
1. "Specifications for Structural Concrete " ACI 301.
 2. "Building Code Requirements for Structural Concrete" ACI 318.
 3. "Standard Specification for Ready-Mixed Concrete" ASTM C94.

-02- TESTS ON CONCRETE

- A. Materials and operations shall be tested and inspected as work progresses. Failure to detect defective work shall not prevent rejection when defect is discovered, nor shall it obligate the ENGINEER for final acceptance.

Testing agencies shall meet the requirements of ASTM E329.

All costs due to tests shall be at the CONTRACTOR'S expense and shall be included in the Contract price.

- B. Concrete samples shall be obtained in accordance with ASTM C172.

- C. Perform slump tests in accordance with ASTM C143. Air tests shall be made in accordance with ASTM C231. These tests shall be conducted daily as a minimum or at the direction of the ENGINEER. (Also see B7 of this section). If tests and check tests do not meet specifications, the concrete shall not be used for the structure.
- D. Compression test cylinders shall be molded and cured in accordance with ASTM C31. Test specimens in accordance with ASTM C39. Field cured specimens shall be cured full time at job site before sending to laboratory for testing. Two (2) specimens shall be tested at 28 days and one (1) at 7 days for information purposes. The results from the two (2) 28 day tests shall be averaged and this average shall be considered the strength of the concrete unless the sampling and molding of one of the samples results in a large discrepancy in strength. If this is found to be the case, the sample shall be disregarded.
- E. If within 48 hours of concrete placement, the temperature is expected to fall below 45 degrees F., two additional cylinders shall be made and field cured under the same conditions as that concrete used in the structure. One cylinder shall be tested at 28 days and one at 7 days.
- F. Strength tests shall be made when any of the following conditions occur; each 100 cubic yards of concrete, each days pour, each class of concrete, or each change in source of supply.
- G. For each strength test, the total air content and slump of the concrete shall be tested and the results recorded.
- H. Compressive strength test results shall be submitted to the ENGINEER on approved forms, as required by ASTM 39. If specified compressive strengths are not achieved, the CONTRACTOR shall take and test core samples from the structure in accordance with ASTM C-42. If the core sample compressive strengths do not meet the specified strengths, the CONTRACTOR shall remove the concrete or, at the option of the OWNER, may perform a design load to be specified by the ENGINEER to determine if the structure has adequate strength. Defective concrete due to faulty material, improper mix, handling or any reason shall be removed and replaced at the CONTRACTOR'S expense.
- I. The strength level of the concrete will be considered satisfactory if 90% of the strength test results and the averages of all sets of three consecutive strength test results equal or exceed specified strength and no individual test result is below specified strength by more than 500 psi.
- J. The CONTRACTOR shall maintain records indicating the exact location in the structure and the delivery ticket number of each load of concrete on which a strength test was performed.

- K. Additional tests for rechecking strength tests and any other tests required by the CONTRACTOR shall be paid for by the CONTRACTOR.

-03- DELIVERY TICKET

- A. Ready-mixed concrete supplier shall furnish with each load of concrete duplicate delivery tickets. One ticket shall be retained by the CONTRACTOR and one ticket shall be given to the ENGINEER. Delivery tickets shall include the following information:
1. Number of ticket and date.
 2. Name of supplier and job description.
 3. Compressive strength and any admixtures (include brand name).
 4. Number of cubic yards delivered.
 5. Truck number and dispatch time.
 6. Slump of concrete ordered.
 7. Amount of water added at job site.

END OF SECTION

DIVISION 3

CONCRETE

03300 - CAST-IN-PLACE CONCRETE

03305 - MIXING AND DELIVERY

INDEX: -01- General

-01- GENERAL

- A. Supplier shall furnish and deliver the concrete in a manner conforming to ASTM C94.
- B. No water shall be added at the job site until it has been determined that the slump is less than that specified. The amount of water necessary to increase the slump to specified limits shall be recorded on all delivery tickets. Upon addition of water, the drum or blades shall be turned, at mixing speed, an additional 30 revolutions or more if necessary. No further water shall be added.
- C. The concrete shall be discharged within 1-1/2 hours of its being loaded or after 300 revolutions of the drum, whichever comes first. These limitations may be waived by the ENGINEER if the concrete is of such a slump after the 1-1/2 hour time or 300 revolution limit has been reached, that it can be placed without the addition of water to the batch.
- D. Concrete delivered to the job site shall be of a temperature greater than 60 degrees and less than 90 degrees F.

END OF SECTION

DIVISION 3

CONCRETE

03300 - CAST-IN-PLACE CONCRETE

03306 - EMBEDDED ITEMS

- INDEX: -01- General
-02- Items Furnished by Others

-01- GENERAL

- A. Slabs on grade are not to contain piping, conduits or ducts. All such work shall be contained below the slab at such a depth as not to impair the fine grading for the slab.
- B. Where conduits and pipes are provided for in structural slabs, but are not specifically shown on the Drawings, the following limitations shall apply.
 - 1. Minimum clear spacing for conduits and sleeves shall be three times the diameter of the largest.
 - 2. Location of conduits or sleeves larger than 2" O.D. shall receive prior approval of the ENGINEER.
 - 3. Duct, piping or conduits shall not exceed 1/3 the thickness of a slab nor be placed within 3 diameter from each other; nor shall they be placed in a column in which their cross sectional area exceeds 4% of the gross column area.
 - 4. Placement of all reinforcing must be complete before placing of any other embedment, unless otherwise authorized by the ENGINEER. No reinforcement shall be cut or moved without authorization.

-02- ITEMS FURNISHED BY OTHERS

- A. The CONTRACTOR shall set items provided to him by other CONTRACTORS according to the approved Drawings.
- B. The Masonry CONTRACTOR shall supply and the Concrete CONTRACTOR shall install all dove tail anchor slots for masonry anchor ties. Install masonry ties vertically and space a maximum of 24 inch o.c.

- C. All anchors, hangers, inserts and ties shall be provided by the individual trades involved in securing items to the concrete.

END OF SECTION

DIVISION 3

CONCRETE

03300 - CAST-IN-PLACE CONCRETE

03307 - PLACING CONCRETE

- INDEX: -01- Preparation
-02- Placing
-03- Conveying

-01- PREPARATION

- A. The CONTRACTOR shall provide proper access for delivery trucks and provide sufficient equipment and manpower to rapidly and continuously place all concrete. All work shall be in accordance with ACI 304-73 "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete". Formwork shall have been completed; snow, ice, water and debris removed from within forms. Expansion joint material, anchors and all embedded items shall have been positioned.
- B. Subgrades shall be sprinkled sufficiently to eliminate water loss from the concrete. Concrete shall not be placed on frozen ground or in forms with a frost coating.
- C. Before placing the concrete, this CONTRACTOR shall notify all other trades that may have some involvement in the area to be poured.

-02- PLACING

- A. Concrete shall be deposited as nearly as practicable in its final position to avoid segregation due to re-handling or flowing. The concreting shall be carried on at such a rate that the concrete is at all times plastic and flows readily into the spaces between the bars. No concrete that has partially hardened or been contaminated by foreign material shall be deposited on the work, nor shall re-tempered concrete be used. Concrete shall not be deposited during rain unless adequately protected, and in any case shall be protected from rain until it has hardened sufficiently so that it will not be damaged.
- B. When concreting is once started, it shall be carried on as a continuous operation until the placing of the panel or section is complete in such a manner that fresh concrete will not be deposited on concrete which has hardened sufficiently to cause formation of seams and planes of weakness within the section. The top surface shall be generally level.

- C. All concrete shall be thoroughly compacted by suitable means during the operation of placing, and shall be thoroughly worked around the reinforcement and embedded fixtures and into the corners of the forms. Vibrators shall be used to aid in the placement of the concrete. Internal vibration shall have a minimum frequency of 7000 v/min. with amplitude to consolidate the concrete effectively. Vibrators shall be operated by competent workmen. Use of vibrators to transport concrete shall not be allowed. Vibrators shall be inserted and withdrawn approximately every 18 in. for 5 to 10 sec.
- D. Where conditions make compacting difficult, or where the reinforcement is congested, batches of mortar containing the same proportions of cement to sand as used in the concrete shall first be deposited in the forms to a depth of at least one inch.
- E. When placing of concrete is suspended, construction joints shall be provided as shown on the Drawings and as specified. When work is resumed, the surface of the construction joint shall be roughened, thoroughly cleaned of foreign matter and coated with mortar consisting of one part portland cement and one part clean sand.
- F. Top surfaces shall be smooth and uniform and shall be checked with a 10'-0" straight edge frequently during finishing operations with deviations in the concrete of over 1/8" in the length of the straight edge to be corrected.

-03- CONVEYING

- A. Concrete shall be conveyed from the mixer to the place of final deposit by methods which will prevent the separation or loss of the materials.
- B. Equipment for chuting, pumping and pneumatically conveying concrete shall be of such size and design as to insure a practically continuous flow of concrete at the delivery end without separation of the materials.
- C. Concrete shall not be allowed to free-fall over 3'-0" for any reason during placing. This requirement also applies to dispensing concrete from ready-mix trucks into conveying equipment. If pumping is to be used, the method shall be submitted to the ENGINEER for approval. Aluminum piping delivery systems are not to be used.

END OF SECTION

DIVISION 3

CONCRETE

03300 - CAST-IN-PLACE CONCRETE

03308 - FINISHING

- INDEX: -01- General
-02- Concrete Slab Finishes

-01- GENERAL

- A. There should be little need for patching of voids if the forms were installed according to specifications and the concrete was properly placed and compacted. Patching and rubbing of faulty work shall be done as specified.
- B. All exterior concrete shall be rubbed with a carborundum stone to provide a smooth trowel like appearance. Immediately after removing the forms from interior concrete that will remain exposed, remove all joint marks, indentations, projections, loose material and fins; and point up all voids and air and water bubbles with cement mortar. The mortar shall be one part Portland cement and two parts clean sand with the color of the adjoining walls to be matched by blending in white cement mortar. Moisten surface and apply grout by brush uniformly over entire surface. Immediately scour the grout with a cork or other suitable float. Finish the surface with a sponge rubber float, removing all excess grout without removing the grout from the voids. Allow the surface to dry and then rub the surface with burlap to remove all dried grout. The entire process must be completed the same day it is started.
- C. Any cracks or other defects developing before the final acceptance of the work or which may develop within the period of one year following the acceptance of the said work, must be repaired by the CONTRACTOR in a manner satisfactory to the ENGINEER.

-02- CONCRETE SLAB FINISHES

- A. Tank bottoms shall be screeded and machine floated to provide the slope as indicated on the Drawings. The finished floor tolerance shall not exceed 1/8" in 8 feet.
- B. Exposed concrete finished slabs shall be screeded level, floated and then steel troweled. Knee boards shall be used during troweling. Caution shall be taken so as not to "over work" the concrete and draw excessive grout to the surface of the slab. The finished product shall be a hard, smooth slab free of irregularities and trowel marks.

- C. Interior non-slip concrete floors shall be provided where indicated on the Drawings. Trowel the surface to a hard finish after adding non-slip aggregate. Uniformly sprinkle 1/2 lb. per square foot on the surfaces or as specified by the manufacturer. Apply this finish to outdoor concrete as well if specified.
- D. Unless otherwise specified, all outdoor concrete slabs and platforms shall be troweled smooth and hard and broomed as directed by the ENGINEER.
- E. When specified, liquid hardener shall be applied after concrete has cured. A minimum of 2 lbs. of crystal per gallon of water shall be used. Clean and dry the surface before applying hardener. Apply the hardener in 2 separate coats with one gallon of hardener covering a maximum of 100 square feet or as recommended by the manufacturer. Re-clean floor before second application. Floor shall not have discolorations or excess hardener showing on the surface.

END OF SECTION

DIVISION 3

CONCRETE

03300 - CAST-IN-PLACE CONCRETE

03309 PROTECTION AND CURING

INDEX: -01- General
-02- Floors

-01- GENERAL

- A. All cast-in-place concrete shall be protected against rapid drying and must be kept moist for a minimum of seven (7) days for normal concrete and three (3) days for high early strength concrete. Vertical and overhead surfaces may be kept moist and cured by leaving the forms in place or by periodically spraying with water in such a manner as to keep the surface moist. If necessary, keep all surfaces wet by suitable temporary coverings.

-02- FLOORS

- A. Cure and protect all floors by covering with waterproof, non-tearing, continuous paper or other suitable covering material. The covering shall not stain the concrete surface.
- B. The ENGINEER may allow liquid curing compounds to be used. Application procedures must be approved by the ENGINEER before using this material.
- C. Curing compound shall not be used where sealers, hardeners, epoxy or urethane finishes are called for.
- D. The CONTRACTOR shall be responsible for any damage to any finishes or covering of a curing compound due to the use that is incompatible with a finish or covering.
- E. During windy, dry days, the CONTRACTOR shall pay particular attention to rapid drying of the concrete by lightly spraying with water.

END OF SECTION

DIVISION 3

CONCRETE

03300 - CAST-IN-PLACE CONCRETE

03310 - COLD AND HOT WEATHER REQUIREMENTS

INDEX: -01- Cold Weather
-02- Hot Weather

-01- COLD WEATHER

- A. After first frost, all concrete shall be protected from freezing for the first 48 hours. When the mean daily temperature falls below 40 degrees F. for more than 24 hours in succession, the CONTRACTOR shall protect fresh concrete according to ACI-306.
- B. Mixing water and aggregate shall be heated to provide a concrete temperature of between 60 degrees F. and 90 degrees F. at the time of placement. All fresh concrete shall be housed in temporary structures. These structures shall be maintained at 70 degrees F. for the first three days or at 50 degrees F. for the first 5 days and protected from freezing for the first 7 days. The concrete surface evaporation of moisture shall be minimized for the first 5 days.
- C. The CONTRACTOR shall place the heating units in such a manner as to provide as even a temperature as possible within the structure. Adequate fire protection and manpower for the continuous operation of the heater units shall be provided at all times. The CONTRACTOR is responsible for the safety of the men and damage to the concrete by devices which exhaust directly into an enclosed room.

-02- HOT WEATHER

- A. Hot weather concreting practices shall conform to those outlined in ACI-305.
- B. Concrete temperatures shall not exceed 90 degrees F. during placement and curing if at all possible.

END OF SECTION

DIVISION 3

CONCRETE

03300 - CAST-IN-PLACE CONCRETE

03311 - WALLS, COLUMNS, BEAMS, AND SLABS

- INDEX: -01- Walls
-02- Columns
-03- Beams
-04- Structural Slabs
-05- Slabs on Grade or Fill

-01- WALLS

- A. This CONTRACTOR shall provide openings, recesses, etc., required by other CONTRACTORS. Finish top of wall to a level and uniform surface with wood darby and float. If wall top is to remain exposed, steel trowel finish after placing 3/4" chamfer strips on both sides of wall form.
- B. Masonry support ledges shall be provided at elevations shown on the Drawings.
- C. Forms must be free of sawdust, wood chips or other foreign matter before concrete is placed.

-02- COLUMNS

- A. Pour concrete columns at least one panel ahead of floor they support. Columns between floor slab or footing and between bottom of column or slab or beam shall be cast monolithically. No construction joints shall be allowed.

-03- BEAMS

- A. Unless otherwise shown or specified, pour beams with the floor slab they support. Wherever possible, construction joints shall be located in the center of a span and match construction joints in slabs. Form bulkheads with holes cut to fit reinforcing steel. Also provide a horizontal keyway at all bulkheads.

-04- STRUCTURAL SLABS

- A. Pour slabs as continuously as possible, providing construction joints at center of beam spans or slab spans if called for on the Drawings or at the direction of the ENGINEER. At construction joints, provide a bulkhead with holes cut for reinforcing steel. Also, provide a horizontal key-way to all bulkheads.
- B. Settlement of forms during placing shall be connected immediately. Structural slabs shall be screeded to a uniform and level surface by using non-floating screed strips set to proper elevation. Provide depressions where indicated on the Drawings and around all floor drains.

-05- SLABS ON GRADE OR FILL

- A. Provide a 4-mil (or as shown on Drawings) plastic vapor barrier under all slabs on fill. Lap all joints 8" and patch any holes or punctures caused before or during concrete placing.
- B. Vibrate or puddle concrete closing all voids and straight edge. Finish surface as specified or as shown on the Drawings.
- C. Provide construction and expansion joints. Provide contraction joints in floors on grade to prevent shrinkage cracking. Divide floors as indicated by the ENGINEER. Joints shall be vertical straight line and shall not be tooled.

END OF SECTION

DIVISION 3

CONCRETE

03300 - CAST-IN-PLACE CONCRETE

03312 - FOUNDATIONS FOR EQUIPMENT

INDEX: -01- General

-01- GENERAL

- A. Provide concrete foundations and bases as shown on the Drawings and as required to mount and support mechanical equipment. Finish the foundations and bases to match the floor slab. Provide 3/4" chamfer on all edges.
- B. All anchor bolts, piping, etc., shall be set in the concrete in accordance with the approved mechanical Shop Drawings. Verify locations with the CONTRACTOR and manufacturer involved with the work.
- C. Grout under all steel base plates and bearing plates using a non-shrink, non-metallic grout mixed according to manufacturer's recommendations. The entire area under the plates shall be fitted. Work sufficiently to drive out all air pockets. Finish exposed grout edges to a smooth hard finish.

END OF SECTION

DIVISION 4

MASONRY

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DIVISION 4

MASONRY

04100 MORTAR

04110 CEMENT AND LIME MORTARS

- INDEX: -01- General
-02- Materials
-03- Mortar
-04- Retempering Mortar

-01- GENERAL

- A. The CONTRACTOR shall furnish all labor, equipment and material necessary to provide mortar for setting masonry where specified, where necessary, and where shown on the Drawings.

-02- MATERIALS

- A. All materials shall be protected from water contamination and breakage after delivery. Materials must remain in original containers until used. No partial containers shall be delivered to the site.
- B. Water used for mixing shall be clean and potable.
- C. Portland cement shall conform to the requirements of ASTM C150, Type I.
- D. Hydrated lime shall be at least 92% hydrated and shall conform to ASTM C207 Type S.
- E. Lime putty for quick lime shall be a stiff mixture of 92% hydrated lime and water. Putty made from hydrated lime shall stand for a minimum of 24 hours before use.
- F. The plasticizer shall be approved by the ENGINEER.

-03- MORTARS

- A. Mortar for brick and concrete block shall be type S except when in contact with earth in which case the mortar shall be type M. Type S mortars shall have proportions of 1:1:6, for Portland cement, lime, and damp sand respectively.
- B. Plasticizer shall be used for exterior work. The CONTRACTOR may use plasticizer for interior partition work provided the work is done according to the manufacturer's requirements.
- C. Masonry cement mortars made with masonry cement, Type II, conforming to ASTM C91 and mixed according to manufacturer's requirements will be accepted for Type M mortar. The mortar must meet all state requirements.

-04- RE-TEMPERING MORTAR

- A. Re-tempering of mortar will only be allowed when it is clear that the non-plastic state of the mortar is due to simple evaporation and not hydration.
- B. Fresh mortar shall be prepared at the rate it is being used so that its workability will remain about the same throughout the day. Mortar that has stiffened because of hydration hardening shall be discarded. Mortar should be used within 1-1/2 hours after mixing.
- C. If colored mortar is used, no re-tempering shall be permitted. Additional water may cause a significant lightening of the mortar.

END OF SECTION

DIVISION 4

MASONRY

04100 - MORTAR

04112 COLD WEATHER PROCEDURES

INDEX: -01- General
-02- Requirements

-01- GENERAL

- A. When masonry construction is carried on during periods of freezing weather, proper facilities shall be available for preparing the mortar and protecting the fresh masonry work against frost damage. The most important consideration is that sufficient heat be provided to ensure hydration of the cement. After combining all ingredients, mortar temperature should be within the range of 40 degrees F. to 120 degrees F. If the air temperature is falling, a minimum temperature of 60 degrees F. shall be maintained. The following table gives requirements at various cold weather temperatures for heating of materials and protection of construction.
- B. The use of an admixture to lower the freezing temperature of mortars during winter construction shall not be used.

-02- REQUIREMENTS

- A. The CONTRACTOR shall use the following table for cold weather requirements.

Air Temp. Deg. F.	Heating of Materials	Protection
Above 40	Normal masonry procedures. No heating required.	Cover walls with plastic or canvas at end of work day to prevent water entering masonry.
Below 40	Heat mixing water. Maintain mortar temperatures between 40 deg. F. and 120 deg. F. until placed.	Cover walls and materials to prevent wetting and freezing. Covers should be plastic or canvas.

Below 32	In addition to the above, heat the sand. Frozen sand and frozen wet masonry units must be thawed.	With wind velocities over 15 mph, provide windbreaks during the work day and cover walls and materials at the end of the work day to prevent wetting and freezing.
Below 20	In addition to the above, units must be heated to 20 deg. F.	Provide enclosure and dry masonry supply sufficient heat to maintain masonry enclosure above 32 deg. F. for 24 hours after laying units.

END OF SECTION

DIVISION 4

MASONRY

04160 MASONRY ACCESSORIES

04160 JOINT REINFORCEMENT

INDEX: -01- General
-02- Materials

-01- GENERAL

- A. The CONTRACTOR shall furnish all labor, equipment and material to provide all accessories necessary to complete the masonry work as specified, as necessary and as shown on the drawings.

-02- MATERIALS

- A. Joint reinforcement shall be welded wire fabric. Wires making up the fabric shall conform to ASTM Standard A1064 and shall be galvanized for exterior walls. Zinc coating shall conform to ASTM A153. Longitudinal wires may be smooth or deformed and shall be not less than No. 9 gauge galvanized. Cross wires shall be not less than No. 12 gauge galvanized, and spaced not more than 6 inches center to center for smooth longitudinal wires, and not more than 16 inches center to center for deformed longitudinal wires. The spacing of the longitudinal wires shall be 2 inches less than the nominal width of the block. Cross wires may be placed between and in the same plane as deformed longitudinal wires, but shall intersect above or below smooth longitudinal wires with ends of cross wires not extending beyond the outer sides of the longitudinal wire. Joint reinforcement shall be furnished in flat sections of convenient lengths ranging from 10 to 20 or more feet. Reinforcement furnished in rolls will not be permitted. Special shapes shall be provided for corner and wall intersections. Intersecting walls shall be lapped a minimum of 16 inches. Lap all reinforcement a minimum of 6 inches.
- B. Cavity masonry walls shall have horizontal reinforcing spacing shall be 16" o.c. vertical.
- C. Single width masonry walls shall have horizontal reinforcing spacing shall be 16" o.c. vertical.

- D. Where continuous tie system masonry reinforcing is used, the top course and first two courses above and below all openings shall be reinforced and the reinforcing shall extend 24" beyond such openings.
- F. Reinforcing shall be continuous except shall not pass through control joints.

END OF SECTION

DIVISION 4

MASONRY

04200 UNIT MASONRY

04210 BRICK MASONRY

- INDEX: -01- General
-02- Materials
-03- Related Work
-04- Sample Wall Panel
-05- Workmanship
-06- Mechanical

-01- GENERAL

- A. The work covered under this Section consists of furnishing all labor, materials and equipment in connection with brick masonry.

-02- MATERIALS

- A. Face brick shall conform to grade SW requirements of ASTM C62, modular size.

-03- RELATED WORK

- A. 04112 Cold Weather Procedures.
B. 04220 Concrete Unit Masonry.

-04- SAMPLE WALL PANEL

- A. A sample wall panel, approximately 3 x 4 feet shall be erected near the building. This panel shall set the standard of quality for appearance, workmanship, and cleaning and must be approved by the ENGINEER before proceeding with the work.
B. Tool joints concave.

-05- WORKMANSHIP

- A. Workmanship shall conform to the following: Requirements of local building code and Building Code Requirements for Masonry - American Standard A.41.1, instructions of each manufacturer, applicable published recommendation of the Structural Clay Products Institute and the National Concrete Masonry Association, and the requirements of these Specifications unless specifically indicated otherwise on the Drawings.
1. Handle materials carefully and avoid damaging them.
 2. Protect materials from contact with earth and cover with weatherproof material until used.
 3. Promptly remove damaged materials from the site or dispose of them otherwise in an approved manner.
 4. During construction of walls and prior to their completion, the CONTRACTOR shall brace the walls substantially with suitable timbers to guard against their damage from wind and storm. Any portion of the walls which becomes damaged or warped or out of line during construction shall be torn down and replaced as directed by the ENGINEER. Also protect walls from freezing.
 5. Where fresh clay masonry joins masonry that is partially or totally set, remove loose brick and mortar and clean and lightly wet surfaces of older work so as to obtain the best possible bond with new work.
 6. When raining, cover tops and top two feet (2') of each side of all walls with strong waterproof membrane securely anchored, except when masonry work is actually in progress or permanent protection from rain is provided otherwise.
 7. Bond all intersections of masonry walls of all types by laying a true bond with at least 50 percent (50%) of the units at the intersection of bond with approved anchors.
 8. Lay only surface dry units, and stop work and cover walls when it rains, unless work is protected by weather tight floor or roof construction.
 9. Prepare mortar with only materials herein before specified, and in conformance with ASTM C-270.
 10. Lay exposed interior masonry in running bond, unless shown otherwise. Bond walls, as required by code, either with bonding units that match other exposed units or with metal ties as specified.

11. Tool all exposed joints and those which will be in contact with earth, as initial set takes place, with approved round jointer slightly larger than width of mortar joint, unless indicated otherwise.
12. All unexposed joints shall be cut flush, except those which will be in contact with earth.
13. Provide three-eighths inch (3/8") diameter open weep holes just above all flashings, about two feet (2') apart and also where indicated on the Drawings.
14. Install grounds for all trades. Secure accurate measurements from trades requesting grounds.
15. Build in all items, specified in this and other divisions, as necessary to complete the work. Some such items are electrical boxes, chases, flashings, anchors, inserts, lintels, anchor bolts, caulking and sealing spaces, frames around openings, etc.
16. Lay all bricks, sills, copings, and solid units with full bed and head joints. Fill vertical longitudinal joints with mortar or grout.
17. Provide galvanized, corrugated wall ties spaced 24" o/c vertically at all curtain wall studs. Ties shall be attached through the sheathing to the studs. Ties shall be 22 gauge steel 7/8" x 7".
18. Cut out defective joints; fill joints solidly; tool to match adjacent work. Fill all holes in mortar joints, except weep holes.
19. Provide solid bearings of adequate strength for all lintels, beams, joints, rafters, plates, and other load supporting members in accordance with applicable codes.
20. Lay all masonry plumb and true to lines. Cut units required in exposed work with saws. Properly locate metal ties in concrete forms to suit masonry. Tightly fit around sleeves, conduits, and ceilings. All work shall conform to the drawings.
21. Masonry shall be clean and free of excess dust and mortar. Vertical surface shall be sealed with a clear, penetrating, waterproofing solution. New masonry surfaces shall be allowed to cure ten (10) days prior to application under normal weather conditions. The solution carrier shall be a clear hydrocarbon solvent that will not stain or discolor the concrete or masonry, and shall comply with the following:

Flash point (TCC)	105 deg. (min.)
Viscosity (75 deg. F.)	0.960 centipoise (max.)
Specific gravity	0.808 (max.)
Chemical solids	4.7 - 5.7%

The solution shall have solids dissolved in the carrier to form a clear solution. These solids, which are the active ingredients, shall form a moisture barrier within the concrete or masonry during the drying-curing cycle. The application shall be at not more than forty (40) square feet per gallon on the first coat and eighty (80) square feet per gallon on the second coat. Allow material to flow down at least eight to ten inches (8" - 10") from contact point. Spray pressure is to be no more than 20 psi. Use airless spray equipment. Application rate is to be one coat with a coverage of 150 square feet per gallon.

-06- MECHANICAL

- A. See the mechanical Drawings for installation of any equipment or piping.
- B. Wherever such installation of equipment or piping requires work by this trade or branch of the General Construction, furnish same.
- C. Patch or match work to leave area or room in completed condition. Cut any or all openings in masonry required for this installation. Patch brick work to match adjoining.

END OF SECTION

DIVISION 4

MASONRY

04200 - UNIT MASONRY

04220 - CONCRETE UNIT MASONRY

- INDEX: -01- General
-02- Concrete and Lightweight Block
-03- Workmanship
-04- Mechanical

-01- GENERAL

- A. Concrete masonry units shall be of modular dimensions and shall be made from Portland Cement and aggregate, with or without the addition of other suitable materials, and shall be of the sizes and special shapes to complete the work shown on the Drawings. Concrete units shall be free of any deleterious matter that will stain plaster or corrode metal, shall be adequately cured before shipment, and shall conform to ASTM C-90, ASTM C-145, and ASTM C-129. Check the Drawings for units required. All units shall be sound and free from cracks or other defects that would interfere with the proper setting of the units or impair the strength, appearance or durability of the construction. Units abutting concrete columns or poured concrete walls shall be square-end units to permit anchorage.

-02- CONCRETE AND LIGHTWEIGHT BLOCK

- A. Load-Bearing Concrete Masonry Units conforming to ASTM C-90, Grade N, except as otherwise noted, shall be furnished for all exterior walls, and interior supporting walls.
1. Concrete masonry units shall be made of concrete using light-weight aggregate conforming to ASTM C-331 for the aggregate.
 2. Concrete masonry units used in exterior walls below grades, and for unprotected exterior walls above grade that may be exposed to frost action shall conform to ASTM Specification C-90, Grade N, having a minimum compressive strength of 1,000 pounds per square inch of gross area for the average of five (5) or more units and 800 psi for individual units.
- B. Non-Load-Bearing Concrete Masonry Units conforming to ASTM C-129 shall be furnished for interior non-load-bearing walls and partitions.

- C. Solid-Load-Bearing Concrete Masonry Units conforming to ASTM C-145 shall be used where solid units are shown on the Drawings.

-03- WORKMANSHIP

- A. Workmanship shall conform to the following: Requirements of local building code and Building Code Requirements for Masonry - American Standard A.41.1, instructions of each manufacturer, applicable published recommendation of the Structural Clay Products Institute and the National Concrete Masonry Association, and the requirements of these Specifications unless specifically indicated otherwise on the drawings.
1. Handle materials carefully and avoid damaging them.
 2. Protect materials from contact with earth and cover with weatherproof material until used.
 3. Promptly remove damaged materials from the site or dispose of them otherwise in an approved manner.
 4. During construction of walls and prior to their completion, the CONTRACTOR shall brace the walls substantially with suitable timbers to guard against their damage from wind and storm. Any portion of the walls which becomes damaged or warped or out of line during construction shall be torn down and replaced as directed by the ENGINEER. Also protect walls from freezing.
 5. Where fresh clay masonry joins masonry that is partially or totally set, remove loose brick and mortar and clean and lightly wet surfaces of older work so as to obtain the best possible bond with new work.
 6. When raining, cover tops and top two feet (2') of each side of all walls with strong waterproof membrane securely anchored, except when masonry work is actually in progress or permanent protection from rain is provided otherwise.
 7. Bond all intersections of masonry walls of all types by laying a true bond with at least fifty percent (50%) of the units at the intersection of bond with approved anchors.
 8. Lay only surface dry units, and stop work and cover walls when it rains, unless work is protected by weather tight floor or roof construction.
 9. Prepare mortar with only materials herein before specified, and in conformance with ASTM C-270, Mortar for Unit Masonry.

10. Lay exposed interior masonry in running bond, unless shown otherwise. Bond walls, as required by code, either with bonding units that match other exposed units or with metal ties as specified.
11. Tool all exposed joints and those which will be in contact with earth, as initial set takes place, with approved round jointer slightly larger than width of mortar joint, unless indicated otherwise.
12. All unexposed joints shall be cut flush, except those which will be in contact with earth.
13. Provide three-eighths inch (3/8") diameter open weep holes just above all flashings, two feet (2') apart and also where indicated on the drawings.
14. Install grounds for all trades. Secure accurate measurements from trades requesting grounds.
15. Build in all items, specified in this and other divisions, as necessary to complete the work. Some such items are electrical boxes, chases, flashings, anchors, inserts, lintels, anchor bolts, caulking and sealing spaces, frames around openings, etc.
16. Lay all bricks, sills, copings, and solid units with full bed and head joints. Fill vertical longitudinal joints with mortar or grout.
17. Lay all hollow units with full mortar coverage on outer and inner shells of bed and head joints, except webs also shall be bedded in all courses of piers, columns, and pilasters.
18. Cut out defective joints; fill joints solidly; tool to match adjacent work. Fill all holes in mortar joints, except weep holes.
19. Provide solid bearings of adequate strength for all lintels, beams, joints, rafters, plates, and other load supporting members in accordance with applicable codes.
20. Lay all masonry plumb and true to lines. Cut units required in exposed work with saws. Properly locate metal ties in concrete forms to suit masonry. Tightly fit around sleeves, conduits, and to ceilings. All work shall conform to the drawings.
21. Masonry shall be clean and free of excess dust and mortar. Vertical surfaces shall be sealed with a clear, penetrating, waterproofing solution. New masonry surfaces shall be allowed to cure ten (10) days prior to application under normal weather conditions. The solution carrier shall be a clear hydrocarbon solvent that will not stain or discolor the concrete or masonry, and shall comply with the following:

Flash point (TCC)	105 deg. (min)
Viscosity (75 deg.F.)	0.960 centipoise (max)
Specific gravity	0.808 (max)
Chemical solids	4.7 - 5.7%

The solution shall have solids dissolved in the carrier to form a clear solution. These solids, which are the active ingredients, shall form a moisture barrier within the concrete or masonry during the drying-curing cycle. The application shall be at not more than forty (40) square feet per gallon on the first coat and eighty (80) square feet per gallon on the second coat. Allow material to flow down at least eight to ten inches (8" - 10") from contact point. Establish an overlapping pattern of application. Spray pressure is to be no more than 20 psi. Use airless spray equipment. Application rate is to be one coat with a coverage of 150 square feet per gallon.

-04- MECHANICAL

- A. See the mechanical Drawings for installation of any equipment or piping.
- B. Wherever such installation of equipment or piping requires work by this trade or branch of the General Construction, furnish same.
- C. Patch or match work to leave area or room in completed condition. Cut any or all openings in masonry required for this installation. Patch brick work to match adjoining.

END OF SECTION

DIVISION 4

MASONRY

04500 - MASONRY RESTORATION AND CLEANING

04510 MASONRY CLEANING

INDEX: -01- Pointing and Cleaning

-01- POINTING AND CLEANING

- A. At completion of the work, all holes in joints of exposed concrete masonry and brick masonry surfaces shall be filled with mortar and suitably tooled. After pointing has set and hardened, all exposed masonry surfaces shall be cleaned with stiff fiber brushes, leaving the masonry clean, free of mortar daubs, and with tight mortar joints throughout. Brick masonry surfaces, prior to final brushing, shall be cleaned using a Unit Masonry Cleaner, following the manufacturer's recommendations. If Unit Masonry Cleaner is not utilized, CONTRACTOR shall wet the brick and then brush clean the masonry work with a solution of ten percent (10%) by volume of commercial muriatic acid. Immediately after cleaning, the masonry surfaces shall be thoroughly rinsed down with clear water.

END OF SECTION

DIVISION 5

METALS

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DIVISION 5

METALS

05100 - STRUCTURAL METAL FRAMING

05110 STRUCTURAL STEEL

- INDEX: -01- General
-02- Materials and Tests
-03- Workmanship
-04- Loose Lintels
-05- Erection
-06- Painting
-07- Special Notes, Miscellaneous Items
-08- Approval
-09- Mechanical Equipment

-01- GENERAL

A. Furnish all labor and material for:

1. All structural steel work.
2. Fabrication, shop and field.
3. Erection.
4. Prime-coat painting of structural steel.

B. Division 05100 and 05200:

1. Are complementary.
2. Shall be considered "as one".
3. Are separated only for the convenience of the CONTRACTOR and for estimating purposes.

- C. Work called for in either Division 05100 or 05200:
 - 1. Shall be binding upon the other the same as if it were specified wholly herein.
- D. Furnish and deliver complete, all materials to other trades as required in connection with the work of this Division including:
 - 1. Loose lintels.
 - 2. Bearing plates.
 - 3. Anchor bolts.
 - 4. Cast-in weld plates.

-02- MATERIALS AND TESTS

- A. Design, fabrication and erection of steel shall conform to:
 - 1. Specifications for Design, Fabrication and Erection of Structural Steel for Buildings, as amended to date.
 - 2. The Code of Standard Practice, A.I.S.C.
- B. Structural Steel shall conform to:
 - 1. Standard Specifications, ASTM for Steel for Buildings, A36, latest edition.
- C. High strength bolts, nuts and washers shall conform to: ASTM F3125.
 - 1. Certification will be required for all nuts and bolts used on the project.

-03- WORKMANSHIP

- A. Insofar as possible, work shall be:
 - 1. Fitted and shop assembled.
 - 2. Ready for erection.
 - 3. Executed in strict accord with Drawings, details and approved shop drawings.

B. Shop connections may be:

1. Welded.
2. Riveted.

C. Field connections may be:

1. Bolted.
2. Welded.
3. Riveted.

D. Connections between primary members shall be only:

1. By riveting or
2. By bolting with high strength bolts.

E. Main structural steel connections shall not be field-welded unless so detailed on Drawings. Shop welding of connection and/or seat angles to main structural members is allowed.

F. Structural assembly using high strength bolts shall be:

1. In accordance with Standard Spec. of the Research Council on Riveted and Bolted Joints of the Engineering Foundation, and endorsed by the A.I.S.C.

G. Welding:

1. Shall conform to American Welding Society Code for Welding in Building Construction, latest edition.
2. Shall be by experienced fabricators/welders, licensed and certified only.

-04- LOOSE LINTELS

A. Furnish to the Masonry Contractor:

1. Any/all loose lintels shown/required, including window, door, mechanical equipment and miscellaneous lintels.

05- ERECTION

- A. Cutting of flanges and webs shall not be done without ENGINEER'S approval.
- B. Light drifting is allowed.
- C. Reaming that weakens members or makes it impossible to fill holes completely is not allowed.
- D. Bearing plates shall be set to proper grade and level.
- E. Columns shall be placed plumb, true and vertical.

-06- PAINTING

- A. Before leaving shop, all structural steel under this Division shall be:
 - 1. Thoroughly cleaned.
 - 2. Free of oil, scale and rust.
 - 3. Given one (1) good, smooth, uniform shop coat of rust inhibitive prime paint.
 - 4. Do not paint areas to be field welded.
- B. After erection:
 - 1. Touch up as required by this CONTRACTOR.
 - 2. Final painting will be by others.

-07- SPECIAL NOTES, MISCELLANEOUS ITEMS

- A. This CONTRACTOR shall furnish all:
 - 1. Anchor bolts for setting in concrete; furnish to Concrete Contractor, if applicable.
 - 2. Anchor bolts for bolting of wood-on-steel; furnish to Carpentry Contractor, if applicable.

B. Include also all:

1. Angles, plates, bars, channels, etc., that are to be formed with the masonry or concrete, including any or all concrete or masonry anchors or straps required or detailed.
- C. All mill marks, trade names, etc., on the exposed face of any exposed steel work shall be ground off flush, and steel shall be sandblasted, prior to shop painting, to remove loosed scale.
- D. In addition to the items specified herein, all other items of similar nature shown on Drawings and not specified in other sections shall be included with the work of this section. This includes all steel items not shown on the Structural Drawings.

-08- APPROVAL

- A. Fabrication and erection not to proceed until Shop Drawings have been approved by the ENGINEER.

-09- MECHANICAL EQUIPMENT

- A. See the Mechanical Drawings for installation of any heating equipment or piping.
- B. Wherever such installation of equipment or piping requires work by this trade of the General Construction, furnish same.
- C. Furnish all lintels required.

END OF SECTION

DIVISION 5

METALS

05200 METAL JOISTS

05211 STANDARD STEEL JOISTS

- INDEX: -01- General
-02- Shop Drawings
-03- Materials
-04- Painting
-05- Erection

-01- GENERAL

- A. Provide steel joists as shown on Drawings conforming to latest Standard Specification for Steel Joists of Steel Joist Institute in design, construction, fabrication method of installation and painting.
- B. See Drawings for location, size, type and spacing of steel joists. Splicing of joists will not be permitted.
- C. Top chords of steel joists shall be designed for proper concentrated loads.
- D. Store joists on site by supporting joists on two or more points and 12" off of ground. Damaged joists shall not be used. Protect from weather by covering with waterproof cover.
- E. Provide headers, bridging, extensions, trimmers, bracing, bearing plates, anchors and clips and other accessories shown or required.
- F. Members shall be reinforced, punched or drilled as necessary for securing other materials. Provide angles or steel support framing of size required to carry roof and equipment loads at openings.
- G. Welding shall conform to Standard Code for Arc and Gas Welding in Building Construction of the American Welding Society and shall be done by certified welders.

-02- SHOP DRAWINGS

- A. Submit Shop Drawings and erection diagrams to ENGINEER for approval prior to

fabrication. Diagrams shall show sizes, spacing, splices where required, bridging and other details of erection. Details shall show installation of bridging, beams, wall anchors, bearing plates, connections and headers for openings.

-03- MATERIALS

- A. Steel shall conform to SJI Specifications.
- B. Welding shall be done with E-70 electrodes.

-04- PAINTING

- A. Clean joists of rust and scale and apply shop coat of rust-inhibitive prime paint.

-05- ERECTION

- A. Remove joist from truck or place or storage, erect and hoist into place by hooking to top chord of joists. Hoisting facilities shall not be released during erection procedure until line of bridging nearest mid-span is installed.
- B. Unless shown otherwise, set short span joist with minimum bearing of 2-1/2" on steel and 4" on masonry or concrete. Secure each end to steel with minimum of two 3/16" fillet welds one inch long.
- C. Set long span joists with minimum bearing of 4" on steel and 6" on masonry or concrete. Secure each end to steel supports with two 1/4" fillet welds two inches long.
- D. Joists parallel to walls shall be anchored to wall at top and bottom chords at each line of cross bridging.
- E. Bridge joists at intervals in accordance with Local Building Code, Steel Joist Institute, and as shown. Connections for bracing or bridging shall be sufficient to develop stresses listed on Drawings or shall equal applicable strength of attached members.

- F. Permanently fasten joists in place and complete bridging before application of loads. Provide temporary bracing as required to hold joist until all other work has been erected.
- G. Paint damaged in handling or erection shall be restored with touch up coat by erector.

END OF SECTION

DIVISION 5

METALS

05500 METAL FABRICATION

05502 EXPANSION AND TOGGLE BOLTS

- INDEX: -01- General
-02- Materials and Workmanship

-01- GENERAL

- A. The CONTRACTOR shall furnish all labor, equipment, and material necessary to install anchor bolts as shown on the Drawings.

-02- MATERIAL AND WORKMANSHIP

- A. Expansion and toggle bolts, where required, shall be of approved types and suitable for the work to be anchored. All expansion bolts and toggle bolts used for mounting equipment outdoors shall be stainless steel. All other shall be galvanized. If manufacturer's of equipment designate a certain type, there shall be used; if not, they shall be suitable for the work to be anchored. Built-in bolts and anchors shall be used in all places where practicable.

END OF SECTION

DIVISION 5

METALS

05500 - METAL FABRICATIONS

05520 - HANDRAILS AND RAILINGS

- INDEX: -01- General
-02- References
-03- Materials
-04- Workmanship

-01- GENERAL

- A. The Contractor shall furnish labor, equipment and materials required to furnish, fabricate, and install handrails and railings as shown in the Drawings as set forth in these Specifications.
- C. Related Sections:
1. Section 05100: Structural Metal Framing

-02- REFERENCES

- A. Work covered under this Section shall be in accordance with the latest available version of the following references, unless otherwise noted:
1. SSPC-SP10: Steel Specifications Painting Council Specifications
 2. ASTM A-123: Specification for Zinc (Hot-Dipped Galvanized) Coatings on Iron and Steel Products
 3. ASTM A-153: Specification for Zinc (Hot-Dipped Galvanized) Coatings on Iron and Steel Hardware
 4. ASTM B-6: Specifications for Zinc
 5. ASTM-A36: Specification for Carbon Structural Steel
 6. The Code of Standard Practice, A.I.S.C.

-03- MATERIALS

A. Galvanized Coating System:

Metal used for the galvanized coating system shall conform to the ASTM B-6 for the zinc metal. The zinc coating used for touch-up shall be approved by the ENGINEER.

B. All steel members that are to be galvanized shall be dipped after fabrication in accordance with the latest ASTM A-123 or A-153, as applicable. The zinc coating shall weigh at least 2 oz. per square foot of surface area.

C. The Contractor shall exercise care in his operations so that the galvanizing is not damaged. All scratches, mars, welds, or other breaks in the continuity of the galvanizing shall be thoroughly cleaned to White Metal by wire brushing or sandblasting and painted with the zinc coating in accordance with the manufacturer's recommendations.

-04- WORKMANSHIP

A. Welding:

1. Shall conform to the American Welding Society Code for welding in Building Construction, latest edition.
2. Shall be by experienced fabricators/welders, licensed and certified only.

END OF SECTION

DIVISION 5

METALS

05500 METAL-FABRICATION

05521 TUBE RAILINGS

- INDEX: -01- General
-02- Material and Workmanship

-01- GENERAL

- A. Furnish/install handrails at the locations shown on the Drawings.

-02- MATERIAL AND WORKMANSHIP

- A. Exterior handrails shall be/have:
1. Fabricated as per the design and materials indicated on the Drawings and details.
 2. All ends closed, welded.
 3. All welds ground flush.
 4. All steel sand-blasted to remove scale.
- B. Furnish handrail brackets or pockets as indicated on Drawings. Brackets shall be designed to withstand a minimum applied load of 200 pounds in any direction at any point.
- C. Handrails furnished under this item will be:
1. Thoroughly cleaned so as to be free of oil, scale, and rust.
 2. Include one coat of Primer.
 3. Painted as indicated on the Drawings

END OF SECTION

DIVISION 5

METALS

05500 - METAL FABRICATIONS

05530 GRATINGS

- INDEX: -01- General
-02- Materials and Workmanship

-01- GENERAL

- A. The contractor shall provide all labor, materials, equipment and incidentals as specified and are required to furnish and install grating, stair treads and supports as indicated on the Drawings.
- B. Bearing bars shall include a serrated surface.

-02- MATERIALS AND WORKMANSHIP

- A. Submit Manufacturer's standard load tables.
- B. Installation shall be in accordance with the manufacturers recommendations.
- C. Install grating sections flat and square with ends bearing on supporting structures as indicated on the Drawings.

END OF SECTION

DIVISION 5

METALS

05500 METAL FABRICATION

05550 GUARD POSTS AND ANGLES

- INDEX: -01- General
-02- Materials and Workmanship

-01- GENERAL

- A. The CONTRACTOR shall furnish all labor, equipment and material necessary to furnish and install all steel guard posts and angles as shown on the Drawings.
- B. Fill with and embed in concrete.

-02- MATERIALS AND WORKMANSHIP

- A. Guard Posts shall meet ASTM-A53 GR.B, Guard Angles A36.
1. Surface preparation: SP-2
 2. Primer: Tnemec Series 10, or approved equal
 3. Finish Coat of Paint see Division 9
- B. Grind top of pipe flat and smooth with external perimeter edge rounded off.

END OF SECTION

DIVISION 6

WOOD AND PLASTICS

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DIVISION 6

WOOD AND PLASTICS

06100 - ROUGH CARPENTRY

06110 - FRAMING SHEATHING

- INDEX: -01- General
-02- Materials
-03- Grades and Species
-04- Wood Door Bucks
-05- Roof Hatches and Curbs
-06- Fastenings
-07- Abbreviations

-01- GENERAL

- A. Carpentry items shall be laid out as called for by the Drawings, and shall be cut and fitted as necessitated by the conditions encountered. All work shall be plumbed, leveled, and braced with sufficient nails, spikes, screws, bolts, etc., to ensure rigidity.
- B. Any piece of wood or carpentry material with a defect that prevents it from serving its intended purpose satisfactorily, including crooked, warped, bowed, or otherwise defective material shall be replaced with an acceptable piece.
- C. Stack all lumber off the ground and cover to protect all materials from the elements and to maintain specified moisture content and so that the material is not subject to twisting or bending.

-02- MATERIALS

- A. Lumber Standards and Grade Marking: Each piece of framing lumber and each board shall comply with the American Lumber Standards, SP 20, and with specific grading requirements of the association recognized as covering the species used and under whose grading rules it is produced. Each piece of framing lumber and each board shall be identified by the grade mark of a recognized association or independent inspection agency. Such association or independent inspection agency shall be certified by the Board of Review, American Lumber Standards Committee, to grade the species.

- B. Plywood: Plywood shall conform to Commercial Standards issued by the U. S. Department of Commerce as follows:
 - 1. Douglas Fir Plywood – PS 1-09. Each standard size panel shall be stamped or branded to show the type and grade of the panel.
 - 2. When used structurally, all plywood shall meet performance standards for its type as described in PS 1-09 for Douglas Fir Plywood.
 - 3. In addition to the above requirements, all plywood permanently exposed in outdoor applications shall be of exterior type and shall be so identified.
- C. Oriented Strand Board (O.S.B.): 7/16", "Blandex" or equal.
- D. Moisture Content: Of various materials shall meet the following requirements at time of installation:
 - 1. Framing lumber 2" and less in thickness - not more than 19%.
 - 2. Boards 8" or less in width - not more than 19%.
 - 3. Boards wider than 8" - not more than 15%.
 - 4. Finish lumber and millwork - not more than 10%.
- E. Dressed Lumber: Shall be S4S to conform to simplified Practice Recommendations R16-39 unless, in addition to being stressed, it has been notched, ship-lapped or patterned.
- F. Dimensions of Lumber: All lumber dimensions called for by Drawings are nominal.

-03- GRADES AND SPECIES

A. Structural Lumber

- 1. Stressed members in bending shall be 1200 f. and 1,300,000 E stress grade lumber.
- 2. Lumber for studs, plates, blocking, furring, etc. may be of any of the following species provided the grade is not lower than the minimum shown:

Fir, Douglas--WCLA & WPA Rules	Standard
Fir, White--WCLA & WPA Rules	Standard
Hemlock, West Coast--WCLA & WPA Rules	Standard
Pine, Southern Yellow--SPA Rules	No. 2

B. Exterior and interior trim, frames for interior doors, (when wood frames are shown on Drawings):

1. May be any of the following species provided the grade for each is not lower than the minimum shown.

Pine, Ponderosa--WPA Rules	D-Select
Redwood-- CRA Rules	Clear Heart for Stain
Plywood, Douglas Fir (Exterior Type)	Grade A-C

-04- WOOD DOOR BUCKS (WHEN WOOD IS SHOWN ON DRAWINGS)

- A. Wood door bucks of nominal 2" thickness and widths necessitated by adjacent work shall be provided at locations called for by the Drawings and/or found necessary at the job.
- B. Zinc coated 11 gauge, 1-1/4" wide anchors with a 90 degree bend at one end and 2 screw holes on end screwed to buck shall be provided for anchoring the bucks to adjacent masonry construction. Screw anchors to the back of each buck at three locations on each side of door opening. Anchors shall extend 8" into brick masonry, concrete masonry and concrete construction.

-05- ROOF HATCHES AND CURBS

- A. Construct roof hatches and curbs as detailed on Drawings, if applicable. Curbs may be required for both roof hatches and ventilators.

-06- FASTENINGS

- A. Provide all necessary wood blocking, bracing, cleating, nailers, grounds, sleepers, etc. where required for all trades.
- B. Provide all necessary nails, screws, bolts, anchors, etc. to assemble and secure work as shown.
- C. Since it is not practical to indicate all fastenings on the Drawings, furnish all fastenings obviously required whether or not they are specifically detailed.

-07- ABBREVIATIONS

- A. SPR - American Lumber Standards

- B. CS - Commercial Standards
- C. WCLA - West Coast Lumber Association
- D. WPA - Western Pine Association
- E. SPA - Southern Pine Association
- F. CRA - California Redwood Association

END OF SECTION

DIVISION 6

WOOD AND PLASTICS

06190 - PREFABRICATED STRUCTURAL WOOD

06192 - FABRICATED WOOD TRUSSES

INDEX: -01- General
-02- Materials
-03- Installation

-01- GENERAL

- A. The work covered by this section shall include all labor and materials required for the fabrication and installation of wood trusses as specified herein and shown on the Drawings.
- B. The CONTRACTOR shall submit Shop Drawings to the ENGINEER for approval in accordance with Section 01300, General Requirements. Shop Drawings shall show size, species and grade of lumber, size and location of connectors and be sealed by an ENGINEER registered in the State of Michigan.

-02- MATERIALS

- A. All members shall be cut from lumber which bears the proper grade mark stamp of a recognized grading association or licensed lumber inspection agency.
- B. Connectors shall be "Gang Nail" plates Manufactured from ASTM – A653 grade A galvanized steel sheet of not less than 20 gauge with a minimum yield of 33,000 psi.
- C. All members shall be accurately cut to length and angle to assure tight joints. Plates shall be of proper size and accurately located.

-03- INSTALLATION

- A. Trusses shall be handled with care. If the trusses are to be stockpiled prior to erection, they shall be set in vertical position, supported at the bearing points and braced to prevent bending or tipping.

- B. Field erection of trusses, including proper handling, safety precautions and temporary bracing shall be the responsibility of the General CONTRACTOR and/or the Erection CONTRACTOR.
- C. Proper erection bracing shall be installed to hold the trusses true and plumb until permanent truss bracing and bridging can be installed. All permanent bracing shall be installed and all components permanently fastened before the application of any loads.
- D. Framing anchors and/or truss hangers shall be provided by the CONTRACTOR as required.

END OF SECTION

DIVISION 6

WOOD AND PLASTICS

06200 - FINISH CARPENTRY AND MILLWORK

06220 - MILLWORK AND TRIM

- INDEX: -01- General
-02- Interior Trim
-03- Installation of Builder's Hardware
-04- Caulking
-05- Drawings and Hardware Lists

-01- GENERAL

- A. Exterior trim called for by Drawings shall be provided and installed with tight joints, securely nailed. Galvanized siding nails shall be used. Interior millwork and trim shall be fastened in place with finishing nails, the heads of which shall be set in putty. Interior wood shall be sanded to remove irregularities and machine marks. All work shall be left free of blemishes and defects.
- B. Joints in all work shall be tight and formed to conceal shrinkage and exclude water. When Drawings call for wood door, window, and louver trim, it shall be in single lengths without splicing and corners shall be mitered unless otherwise called for by Drawings. Running trim shall be in long lengths and jointed only where solid fastenings can be made. End joints in built-up members shall be well distributed. Exterior corners shall be mitered and interior corners shall be coped. Whenever necessary, wood work shall be scribed to adjacent work.
- C. All millwork and trim, which will be in contact with concrete or masonry, shall be back-primed by the subcontractor for painting work. It shall be the responsibility of the general contractor to notify the painter in ample time that the millwork and trim are ready for back priming to permit painting and drying before installation is to start.

-02- INTERIOR TRIM

- A. Trim shall be as called for on Drawings.
1. Casings shall be set with margins of approximately 1/4" and shall be nailed securely in place.

2. Stops for windows and doors shall be provided as necessary for the proper operation of the windows and doors. Stops shall be 1/2" thick, of simple design, and of widths to suit conditions encountered. Stops shall be fitted carefully and nailed securely in place.
3. Other wood trim that is indicated on the Drawing shall be size as shown, primed and painted.

-03- INSTALLATION OF BUILDER'S HARDWARE

- A. Check hardware lists (Division 8); store hardware in area set aside by OWNER.
- B. Install hardware without marring or injuring adjacent work.
- C. Handle hardware carefully; keep free from scratches, dents or defacements.
- D. Hardware shall be installed in accordance with manufacturer's directions, accurately fitted, securely applied and properly adjusted.
- E. Cover knobs, handles and the like until completion of painting and the work of any other trades which may cause defacement.
- F. Keys shall be properly tagged and given to the OWNER.
- G. Door knobs and door pulls shall be centered 36 inches and 45 inches above finished floors, respectively.

-04- CAULKING

- A. See Division 7, Section 07951, Sealants and Caulking.

-05- DRAWINGS AND HARDWARE LISTS

- A. Provide Shop Drawings and hardware lists. See Division 8, Section 08710 for finish hardware.

END OF SECTION

DIVISION 6

WOOD AND PLASTICS

06400 - ARCHITECTURAL WOODWORK

06410 - CABINETWORK AND WARDROBES

- INDEX: -01- General
-02- Counter Top and Cabinet Finishes
-03- Shop Drawings and Samples

-01- GENERAL

- A. Furnish and install all cabinets and counter work as shown on the Drawings or herein specified. All units shall be prefinished manufactured units to sizes shown on details.
- B. Hardware knobs and pulls of manufacturer's standard design with finish compatible with cabinets. Hinges shall be semi-concealed. Catches may be either roller or magnetic type. (Self closing hinges accepted). Drawer guides of nylon rollers or center guide type for easy operation. Provide drawer stops, but so arranged that drawer can be removed.
- C. Color as selected by the Owner from manufacturer's standard finishes. Interior shall be finished to compliment the exterior.
- D. Installation: Install plumb and level in a rigid manner and in strict accordance with manufacturer's instructions.
- E. Base cabinets shall be properly aligned, set plumb and secured into place with cadmium or nickel plated 1-1/2 inch wood screws, toggle bolts, or other satisfactory method as approved by the OWNER or ENGINEER. Closers, fillers, and finishing moldings shall be provided as necessary.

-02- COUNTER TOP AND CABINET FINISHES

- A. Counter top and cabinet coverings, where noted as plastic laminate, shall be Formica, or equal. Entire installation shall be in accordance with the manufacturer's recommendations. Self-edge 1-1/2" wide at front with edge banding applied and 4" backsplash at rear and sides where required.
- B. All materials used to construct the counter tops, wardrobes and cabinets shall be Class A.

-03- SHOP DRAWINGS AND SAMPLES

- A. Shop Drawings of tops, filler panels and knee space backing shall be submitted for approval. Drawings shall clearly indicate the complete layout of the cabinets, accessories, and pertinent details of construction, fabrication, and attachments.
- B. Submit samples of laminated plastic where indicated on the Drawings for coordination of color and finish.

END OF SECTION

DIVISION 7

THERMAL AND MOISTURE PROTECTION

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DIVISION 7

THERMAL AND MOISTURE PROTECTION

07150 - DAMPPROOFING

07160 - BITUMINOUS DAMPPROOFING

Index: -01- General

-02- Materials and Workmanship

-01- GENERAL

- A. The CONTRACTOR shall furnish all labor, equipment and material to dampproof all below grade concrete or concrete block walls.

-02- MATERIALS AND WORKMANSHIP

- A. All exterior concrete walls below the finished grade shall be painted with two (2) heavy coats of emulsified asphalt applied either by brush or spraying methods. Concrete shall be completely covered and show a definite gloss. This is for all structures. If applicable, tanks and reservoirs, which have an earth berm around them, shall be painted to top of berm. Tanks and reservoirs, which have earth over the roofs, shall be waterproofed full height of walls and top of roofs.
- B. Material shall be Tnemec 47-461 Foundation Coating, or equal.

First Coat	8.0 mils
Second Coat	5.5 mils
Curing time between coats (at 75 ° F.)	12 hours
Surface Preparation	Surface shall be clean and dry.

END OF SECTION

DIVISION 7

THERMAL AND MOISTURE PROTECTION

07200 - INSULATION

07210 - BUILDING INSULATION

INDEX: -01- General
-02- Material
-03- Installation

-01- GENERAL

- A. Work included in this section consists of furnishing all labor, materials and equipment necessary to complete installation of all blanket insulation as shown on the Drawings.

-02- MATERIALS

- A. Blanket Insulation shall be fiberglass with foil backed vapor barrier, unless indicated otherwise. See Drawings for R-factor requirements and location.

-03- INSTALLATION

- A. The blanket insulation shall be laid per manufacture's recommendations with vapor barrier toward heated side.
- B. Fit insulation around mechanical and electrical work where encountered.
- C. Any tears in vapor barrier or joints between adjoining panels shall be repaired with tape.
- D. Installation of fiberglass batts over lighting fixtures shall be per lighting manufacturer recommendations and applicable codes. The construction of any required framing is the responsibility of this CONTRACTOR.

END OF SECTION

DIVISION 7

THERMAL AND MOISTURE PROTECTION

07200 - INSULATION

07212 - RIGID INSULATION

- INDEX: -01- General
-02- Materials and Workmanship
-03- Adhesive

-01- GENERAL

- A. The CONTRACTOR shall furnish and install all material and appurtenances as shown on the Drawings and specified herein.
- B. The CONTRACTOR shall submit samples and literature for the proposed material for approval.

-02- MATERIALS AND WORKMANSHIP

- A. Unexposed Application.
 - 1. Remove fins and projections left after removal of concrete forms (where applicable). Remove all oily films or waxes.
 - 2. Insulation shall be the thickness and R-value shown on the Drawings, plastic foam board-stock type having a minimum compressive strength of 25 psi and maximum water absorption of 0.1% by volume. See the Drawings for location.

-03- ADHESIVE

- A. Adhesive shall be type recommended by the manufacturer for the type of installation shown on the Drawings.

END OF SECTION

DIVISION 7

THERMAL AND MOISTURE PROTECTION

07200 - INSULATION

07213 - FIBER GLASS BATT INSULATION

- INDEX: -01- General
-02- Materials and Workmanship
-03- Cleanup & Protection

-01- GENERAL

- A. The CONTRACTOR shall furnish and install all material and appurtenances as shown on the Drawings and specified herein.
- B. The CONTRACTOR shall submit samples and literature for the proposed material for approval.

-02- MATERIALS AND WORKMANSHIP

- A. Batt insulation shall be flame resistant foil faced with a flame spread rating of 25 or less, Class A rating. Parallel batts shall be stapled and taped together.
- B. Required insulation value is as indicated on the Drawings. Vapor barrier 0.03 perms or less.
- C. Sound control batts, if applicable, shall be 2 1/2" (R8) for installation in stud walls where shown on plans.
- D. Acoustical ceiling batts, if applicable, for suspended ceiling shall be 3 1/2 (R-11) placed on top of lay-in panels.
- E. All seams in roof insulation shall be sealed with a non-combustible vapor barrier pressure sensitive adhesive tape to form a complete vapor tight system.

-03- CLEANUP AND PROTECTION

- A. Protect all materials during delivery, storage and installation. Replace any damage materials as directed.
- B. Clean up area after completion removing and properly disposing of all packaging material, scrap, debris, etc.

END OF SECTION

DIVISION 7

THERMAL AND MOISTURE PROTECTION

07600 FLASHING AND SHEET METAL

07610 STANDING SEAM ROOF SYSTEM

- INDEX: -01- General
-02- Submittals
-03- Related Work
-04- Delivery, Storage, and Handling
-05- Materials
-06- Installation
-07- Warranty
-08- Cleanup and Protection

-01- GENERAL

- A. The work covered by this section consists of furnishing all labor, materials and equipment in connection with the installation of a standing seam metal roof as indicated on the Drawings.
- B. Materials and installation shall meet UL 580 and ASTM E1592 for uplift resistance and UL 790 and ASTM E119 for fire resistance.
- C. Materials and installation shall meet all State and local building codes.

-02- SUBMITTALS

- A. Shop drawings and data sheets shall be submitted by the CONTRACTOR for approval in accordance with Section 01300 of the General Requirements.
- B. Details of edge, rake, trim, expansion joints, ridges, etc. will be required.

-03- RELATED WORK

- Section 05200 - Metal Joists
- Section 06110 – Framing and Sheathing
- Section 06192 – Fabricated Wood Trusses

-04- DELIVERY, STORAGE AND HANDLING

- A. General: Comply with manufacturer's recommendations.
- B. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- C. Storage: Store materials in a clean, dry area, under waterproof covering, and protected from exposure to harmful weather conditions. Provide proper ventilation of metal panel system to prevent condensation build-up between each panel and trim or flashing component. Store products in manufacturer's unopened packaging until just prior to installation.
- D. Handling: Exercise caution in unloading and handling metal panel system to prevent bending, warping, twisting, and surface damage.

-05- MATERIALS

- A. Roof surface shall be 24 gauge galvalume conforming to ASTM A792, or approved equal. Color to be selected by OWNER.
- B. Thermal blocks shall be high density extruded polystyrene.
- C. Sub-purlins will be furnished and installed under this Section, if applicable. Cooperate with metal joist supplier as to location and loading. Other sub-purlins may be used with prior written approval by ENGINEER.
- D. Underlayment sheathing shall be as indicated on the Drawings, if applicable
- E. All accessories such as clips, fasteners, starter flashing, gable flash, closers, trim, etc. will be furnished under this Section.

-06- INSTALLATION

- A. Installation shall be in conformance with manufacturer's installation procedures.
- B. Fasten metal roof panels to supporting underlayment with concealed clips at each standing seam joint at location, spacing, and using proper fasteners as recommended by the manufacturer.
- C. All clips and fasteners shall allow for thermal expansion.

- D. Install all flashing, trim, and accessories in accordance with the manufacturer's recommendations. Install work with laps, joints, and seams to be permanently watertight.

-07- WARRANTY

- A. A 20 year material warranty shall be furnished to the OWNER at completion of work.

-08- CLEANUP AND PROTECTION

- A. Protect all materials during delivery, storage, and installation. Replace any damaged materials as directed.
- B. Clean up area after completion removing and properly disposing of all packaging material, scrap, debris, etc.

END OF SECTION

DIVISION 7

THERMAL AND MOISTURE PROTECTION

07600 - FLASHING AND SHEET METAL

07622 - ALUMINUM FLASHING AND TRIM

- INDEX: -01- General
-02- Materials
-03- Installation

-01- GENERAL

- A. The work covered by this section includes the furnishing and installation of all flashing and sheet metal work as specified herein and shown on the Drawings.

-02- MATERIALS

- A. See Drawings for configuration and locations of the following flashings, if applicable:
1. Drip edge flashing .040 aluminum--prepaint.
 2. Rake edge flashing .040 aluminum--prepaint.
 3. Sill flashing .040 aluminum--paint.
 4. Plywood horizontal joint flashing .024 aluminum--paint.
 5. Gutter .032 aluminum Ogee-style with 5" opening--paint.
 6. Downspout .032 aluminum rectangular corrugated size 3" x 4"--paint.
 7. Precast concrete splash blocks.

-03- INSTALLATION

- A. Verify condition and attachment of all underlayments, blocking etc. before proceeding with the work.
- B. Install all flashing in a plumb, true and aligned manner.

- C. Gutters pitch to down spouts 1/16" per foot secure to fascia boards with aluminum brackets 48" o.c. Seal thoroughly and allow for thermal expansion at joints.
- D. Down spouts: All bends shall insure a free and unobstructed flow of water. Secure to building with matching straps 6 feet o.c.

END OF SECTION

DIVISION 7

THERMAL AND MOISTURE PROTECTION

07700 COPINGS AND ROOF EDGES

07712 ALUMINUM CORNICE & DECORATIVE TRIMS

PART I GENERAL

1.01 RELATED DOCUMENTS

- A. The provisions included under Division 1, General Requirements, are included as part of this section as though bound herein.

1.02 SUMMARY

- A. Provide labor, material, and equipment necessary for furnishing a complete installation of pre-designed aluminum cornice & decorative trims.
- B. Related Work
 - 1. Division 5 Sections for support framing.
 - 2. Division 6 Sections for nailers and support framing.
 - 3. Division 7 Sections for related roofing materials.

1.03 SUBMITTALS

- A. Product Data: Each type of product specified. Submit manufacturer's detailed product data showing dimensions of individual components, profiles, and finishes.
- B. Shop Drawings: Show fabrication and installation of pre-designed cornice including fully dimensioned roof plans, reflective plan views, dimensioned framing requirements, sections and details of components and other related trims.
- C. Finish & Color Selection: Furnish manufacturer's technical data for specified finish and color chart showing full range of colors available.

1.04 QUALITY ASSURANCE

- A. Where pre-engineered manufactured products are specified, other field fabricated or shop/field fabricated substitutions will not be accepted. However, where

shop/field fabrications are indicated pre-engineered systems will be considered with approval by the ENGINEER.

- B. Obtain all components and related accessories from one single source manufacturer.
- C. Follow manufacturer's guidelines & shop drawings for installing pre-designed cornice & decorative trims. If cornice or trims join a roof system then follow primary roofing manufacturer's printed instructions for installing associated roof material for flashing decorative trims to roof.

1.05 DELIVERY, STORAGE & HANDLING

- A. All products delivered shall be stored in a clean dry location prior to installation.
- B. Products furnished with strippable protective masking shall not be exposed to direct sunlight for more than 30 minutes without removing masking.
- C. Do not install finished materials with scars or abrasions.

1.06 PROJECT CONDITIONS

- A. Coordinate work of this Section with adjoining work for proper sequencing to ensure protection from inclement weather and to protect materials and their finish against damage.
- B. Do not install cornice & decorative trims during inclement weather. When installing in cold conditions, warm sealant to at least 50 degrees Fahrenheit prior to application.

PART 2 PRODUCTS

2.01 SHOP DRAWINGS

- A. Provide manufacturer's shop drawings for each type of cornice and trim to be used.

2.02 MATERIALS & FABRICATION

- A. Decorative cornice mouldings shall be aluminum extrusions with interlocking seam design. Moulding profiles shall be manufacturer's stock profiles as indicated on Drawings.

- B. Decorative cornice moulding splices shall be aluminum extrusions, designed to mate the inside of the profiles.
- C. Support Brackets, attachments brackets and retainer brackets shall be manufactured from 0.125" x 1.00" aluminum, heliarc welded construction (where necessary), factory punched for fasteners.
- D. Mounting Gussets (if shown) shall be manufactured from 22 gauge, galvanized steel, G90 coating.

2.03 ACCESSORIES / HARDWARE

- A. VHB Assist / Isolator Tape shall be 45 mil, 1" width, synthetic composition, double sided and high adhesion.
- B. Hardware for fastening cornice members shall be stainless steel, type 304, #8-32 x 0.75" machine screws with nylon core hex lock nuts.
- C. Hardware for mounting gussets shall be selected based on minimum pull strength of 100 lbs / fastener. Fastener material and type must be compatible with building substrates and in conformance with local building codes.

2.04 FINISHES

- A. General: Apply coatings to exposed aluminum components after fabrication for maximum coating performance and to prevent crazing, abrasion, and damage to finished surfaces.
- B. Pretreatment: Aluminum components shall be pretreated with solutions to remove organic and inorganic surface soils, remove residual oxides, followed by a chrome phosphate conversion coating to which organic coatings will firmly adhere.
- C. Coating Type: High Performance Coating, two-coat, shop applied.
- D. Color: Provide OWNER manufacturer's full range of color options.

PART 3 EXECUTION

3.01 EXAMINATION

- A. The installer must examine substrates and conditions under which cornice & decorative profiles will be installed. All wood plates and/or fascia boards shall be installed true, straight, and free of splits, cracks, or other irregularities. Do not proceed with installation until unsatisfactory conditions are corrected.

- B. The installer must field verify that framing has been built in accordance with the dimensions furnished by the cornice manufacturer either by shop drawings or published literature. Do not proceed with installation until unsatisfactory conditions are corrected.

3.02 INSTALLATION

- A. General: The pre-designed cornice and decorative trims shall be installed in strict accordance with manufacturer's recommendations and shop drawings.
- B. Fastening:
 - 1. Wood Substrates: Cornice trims must be order with factory punched elongated holes. Cornice trims shall be fastened with #8 x 1-1/2" stainless wood screws. Support brackets, retaining brackets and attachment brackets shall be installed with #10 x 2" stainless steel wood screws at locations and spacing as shown on shop drawings.
 - 2. Steel Gussets: VHB Assist / Isolator tapes shall be adhered at all fastening locations to separate dissimilar metals. Fasten cornice members with stainless steel, type 304, #8-32 x 0.75" machine screws with nylon core hex lock nuts.
 - 3. Aluminum miter connections: Fasten cornice members with stainless steel, type 304, #8-32 x 0.75" machine screws with nylon core hex lock nuts.
- C. Splice Joints: Install cornice profiles and decorative trims with concealed splice plates over brackets and/or framing substrates as shown on shop drawings. In accordance with shop drawings;
 - 1. Coordinate and align spacing of expansion reveal joints with associated trims (stack joints).
 - 2. Plan spacing of joints so there is no sections of fascia shorter than 48" in length.
 - 3. Check horizontal alignment of fascia during installation and adjust as required.
 - 4. Remove cornice moulding fastening and locking flanges to accommodate splice plates.

- D. Mitering: Field saw cut aluminum cornice mouldings in angles and directions for miter conditions. Use manufacturer's angle connectors, vhb tape, and hardware to mechanically fasten and form miters. Use only experienced tradesmen for miter work. Caulk or touch up miter work as required.

END OF SECTION

DIVISION 7

THERMAL AND MOISTURE PROTECTION

07900 - SEALANTS

07951 - SEALANTS AND CAULKING

- INDEX: -01- General
-02- Joint Preparations
-03- Materials and Workmanship
-04- Submittals

-01- GENERAL

- A. The CONTRACTOR shall furnish all labor, equipment and material necessary to seal and caulk as provided on the Drawings and in this section.

-02- JOINT PREPARATIONS

- A. All surfaces to receive sealant shall be clean, dry, and free from dust, grease, oil, or wax, including residue resulting from installation of backup material. Avoid contamination of water-proofing, oils, or curing agents. Surfaces shall be wiped clean with suitable solvents. All surfaces shall be primed as recommended by the manufacturer. Sealants shall be applied before any field painting is started.

-03- MATERIALS AND WORKMANSHIP

- A. Seal the entire perimeter of frames of doors and windows, metal louvers, panels, copings, concrete masonry, interfaces, all exposed precast ceiling plank joints, and other related items.
- B. It shall meet Federal Specification TT-S-00230C, Type II, Class A and ASTM C920.
- C. Minimum joint shall be one-quarter inch by one-quarter inch (1/4" x 1/4") deep. Maximum joint shall be one-half inch by one-half inch (1/2" x 1/2") deep.
- D. The surfaces of all material adjoining caulked joints shall be cleaned of any smears of compound or other soiling due to the caulking application.

-04- SUBMITTALS

- A. Product samples, manufacture's data and color charts shall be submitted. Color shall be selected by the ENGINEER or OWNER.

END OF SECTION

DIVISION 8

DOORS AND WINDOWS

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DIVISION 8
DOORS AND WINDOWS
08100 METAL DOORS AND FRAMES

SECTION 08110 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes hollow-metal doors and frames.
- B. Related Requirements:
 - 1. Section 08210 "Flush Wood Doors" for wood doors installed in hollow-metal frames.

1.2 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include elevations, frame profiles, metal thicknesses, preparations for hardware, and other details.
- C. Schedule: Prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or approved equal:

1. Ceco Door Products;
2. Curries Company;
3. LaForce, Inc.

2.2 REGULATORY REQUIREMENTS

- A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
 1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.
- B. Fire-Rated, Borrowed-Light Assemblies: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

2.3 INTERIOR DOORS AND FRAMES

- A. Heavy-Duty Doors and Frames: SDI A250.8, Level 3.
 1. Physical Performance: Level A according to SDI A250.4.
 2. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches.
 - c. Face: Uncoated, cold-rolled steel sheet, minimum thickness of 0.053 inch. Provide metallic coated doors if noted in door schedule.
 - d. Edge Construction: Model 1.
 - e. Core: Honeycomb.
 3. Frames:
 - a. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch. Provide metallic coated frames if noted in door schedule.
 - b. Construction: Face welded.
 4. Exposed Finish: Prime.

2.4 EXTERIOR HOLLOW-METAL DOORS AND FRAMES

- A. Extra Heavy-Duty Frames: SDI A250.8, Level 3.
 1. Physical Performance: Level A according to SDI A250.4.
 2. Doors:

- a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches.
 - c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A40 coating.
 - d. Edge Construction: Model 1.
 - e. Core: Polystyrene.
3. Frames:
- a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A40 coating.
 - b. Construction: Face welded.
4. Exposed Finish: Prime.

2.5 FRAME ANCHORS

A. Jamb Anchors:

- 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch (1.0 mm) thick, with corrugated or perforated straps not less than 2 inches (51 mm) wide by 10 inches (254 mm) long; or wire anchors not less than 0.177 inch (4.5 mm) thick.
- 2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch (1.0 mm) thick.
- 3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
- 4. Post-installed Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch- (9.5-mm-) diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

- B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch (1.0 mm), and as follows:

2.6 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.
- D. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.
 - 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- F. Power-Actuated Fasteners in Concrete: From corrosion-resistant materials.
- G. Grout: ASTM C 476, except with a maximum slump of 4 inches (102 mm), as measured according to ASTM C 143/C 143M.
- H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing).
- I. Glazing: Comply with requirements in Section 088000 "Glazing."

2.7 FABRICATION

- A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Hollow-Metal Doors:
 - 1. Fire Door Cores: As required to provide fire-protection and temperature-rise ratings indicated.
 - 2. Vertical Edges for Single-Acting Doors: Bevel edges 1/8 inch in 2 inches.
 - 3. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets:
 - 4. Bottom Edge Closures: Close bottom edges of doors with end closures or channels of same material as face sheets.
 - 5. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of door against water penetration.
 - 6. Astragals: Provide overlapping astragal on one leaf of pairs of doors where require by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.
- C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
 - 1. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
 - 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 - 3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.

4. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
 5. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 16 inches (406 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c., to match coursing.
 - b. Stud-Wall Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c.
 - c. Compression Type: Not less than two anchors in each frame.
 - d. Post-installed Expansion Type: Locate anchors not more than 6 inches (152 mm) from top and bottom of frame. Space anchors not more than 26 inches (660 mm) o.c.
 6. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers.
- D. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
1. Reinforce doors and frames to receive non-templated, mortised, and surface-mounted hardware.
 2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.
- E. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with mitered hairline joints.
1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
 3. Provide fixed frame moldings on outside of exterior and on secure side of interior frames.
 4. Provide loose stops and moldings on inside of hollow-metal work.
 5. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

2.8 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
 1. Shop Primer: SDI A250.10.

2.9 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- B. Grout Guards: Formed from same material as frames, not less than 0.016 inch (0.4 mm) thick.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned and securely fastened in place. Comply with drawings and manufacturer's written instructions.
- B. Hollow-Metal Frames: Install hollow-metal frames of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.
 - 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. At fire-rated openings, install frames according to NFPA 80.
 - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - c. Install frames with removable stops located on secure side of opening.
 - d. Install door silencers in frames before grouting.
 - e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
 - a. Floor anchors may be set with power-actuated fasteners instead of post-installed expansion anchors if so indicated and approved on Shop Drawings.
 - 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
 - 4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
 - 5. Concrete Walls: Solidly fill space between frames and concrete with mineral-fiber insulation.

6. In-Place Concrete or Masonry Construction: Secure frames in place with post-installed expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 7. In-Place Metal or Wood-Stud Partitions: Secure slip-on drywall frames in place according to manufacturer's written instructions.
 8. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.
- C. Hollow-Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified according to NFPA 80. Shim as necessary.
- D. Glazing: Comply with installation requirements in Section 08800 "Glazing" and with hollow-metal manufacturer's written instructions.
1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.

3.2 ADJUSTING AND CLEANING

- A. Final Adjustments: Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow-metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.
- E. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 08110

DIVISION 8

DOORS AND WINDOWS

08100 METAL DOORS AND FRAMES

SECTION 08120 – ALUMINUM DOORS AND FRAMES

PART 1 - GENERAL

1.1 Related Documents

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

1.2 Summary

- A. This Section includes Kawneer Aluminum Entrances, glass and glazing, and door hardware and components.

- 1. Types of Kawneer Aluminum Entrances include:

- a. 500 Swing Door; Wide stile, 5" (127 mm) vertical face dimension, 1-3/4" (44.5 mm) depth, high traffic applications.

- B. Related Sections:

- 1. 07900 "Sealants"
- 2. 08700 "Hardware and Specialties"
- 3. 08800 "Glazing"

1.3 Definitions

- A. Definitions: For fenestration industry standard terminology and definitions refer to American Architectural Manufacturers Association (AAMA) – AAMA Glossary (AAMA AG).

1.4 Performance Requirements

- A. General Performance: Aluminum-framed entrance system shall withstand the effects of the following performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.

- B. Aluminum Framed Entrance Performance Requirements:

1. Air Infiltration: For single acting offset pivot or butt hung entrances in the closed and locked position, the test specimen shall be tested in accordance with ASTM E 283 at a pressure differential of 1.57 psf (75 PA) for single and pairs of doors. A single 3'0" x 7'0" (915 mm x 2134 mm) entrance door and frame shall not exceed 1.0 cfm/ft². A pair of 6'0" x 7'0" (1830 mm x 2134 mm) entrance doors and frame shall not exceed 1.0 cfm/ft².
2. Structural Performance: Corner strength shall be tested per the Kawneer dual moment load test procedure and certified by an independent testing laboratory to ensure weld compliance and corner integrity [Testing procedure and certified test results available upon request].

1.5 Submittals

- A. Product Data: Include construction details, material descriptions, and fabrication methods, dimensions of individual components and profiles, hardware, finishes, and installation instructions for each type of aluminum-framed entrance door indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, hardware, and attachments to other work, operational clearances and installation details.
- C. Samples for Initial Selection: For units with factory-applied color finishes including samples of hardware and accessories involving color selection.
- D. Samples for Verification: For aluminum-framed entrance door and components required.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for each type of aluminum-framed entrance doors.
- F. Fabrication Sample: Corner sample consisting of a door stile and rail, of full-size components and showing details of the following:
 1. Joinery, including welds.
 2. Glazing.
- G. Other Action Submittals:
 1. Entrance Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

1.6 Quality Assurance

- A. Installer Qualifications: An installer which has had successful experience with installation of the same or similar units required for the project and other projects of similar size and scope.

- B. **Manufacturer Qualifications:** A manufacturer capable of fabricating aluminum-framed entrance doors and storefronts that meet or exceed performance requirements indicated and of documenting this performance by inclusion of test reports, and calculations.
- C. **Source Limitations:** Obtain aluminum-framed entrance door through one source from a single manufacturer.
- D. **Product Options:** Drawings indicate size, profiles, and dimensional requirements of aluminum-framed entrance doors and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements". Do not modify size and dimensional requirements.
 - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- E. **Pre-installation Conference:** Conduct conference at Project site to comply with requirements in Division 01 Section "Coordination".

1.7 Project Conditions

- A. **Field Measurements:** Verify actual dimensions of aluminum-framed entrance door openings by field measurements before fabrication and indicate field measurements on Shop Drawings.

1.8 Warranty

- A. **Manufacturer's Warranty:** Submit, for Owner's acceptance, manufacturer's standard warranty.
 - 1. **Warranty Period:** Two (2) years from Date of Substantial Completion of the project provided however that the Limited Warranty shall begin in no event later than six months from date of shipment by manufacturer.

PART 2 - PRODUCTS

2.1 Manufacturers

- A. **Basis-of-Design Product:**
 - 1. Kawneer Company Inc.
 - 2. The door stile and rail face dimensions of the 500 entrance door will be as follows

Door	Vertical Stile	Top Rail	Bottom Rail
500	5" (127 mm)	5" (127 mm)	10" (254 mm)
 - 3. Major portions of the door members to be 0.125" (3.2) nominal in thickness and glazing molding to be 0.05" (1.3) thick.
 - 4. Glazing gaskets shall be either EPDM elastomeric extrusions or a thermoplastic elastomer.

5. Provide adjustable glass jacks to help center the glass in the door opening.
- B. Substitutions: Refer to Substitutions Section for procedures and submission requirements
1. Pre-Contract (Bidding Period) Substitutions: Submit written requests ten (10) days prior to bid date.
 2. Post-Contract (Construction Period) Substitutions: Submit written request in order to avoid aluminum-framed entrance door installation and construction delays.
 3. Product Literature and Drawings: Submit product literature and drawings modified to suit specific project requirements and job conditions.
 4. Certificates: Submit certificate(s) certifying substitute manufacturer (1) attesting to adherence to specification requirements for aluminum-framed entrance door system performance criteria, and (2) has been engaged in the design, manufacturer and fabrication of aluminum-framed entrance doors for a period of not less than ten (10) years. (Company Name)
 5. Test Reports: Submit test reports verifying compliance with each test requirement required by the project.
 6. Samples: Provide samples of typical product sections and finish samples in manufacturer's standard sizes.
- C. Substitution Acceptance: Acceptance will be in written form, either as an addendum or modification, and documented by a formal change order signed by the Owner and Contractor.

2.2 Materials

- A. Aluminum Extrusions: Alloy and temper recommended by aluminum-framed entrance door manufacturer for strength, corrosion resistance, and application of required finish and not less than 0.090" (2.3 mm) wall thickness at any location for the main frame and door leaf members.
- B. Fasteners: Aluminum, nonmagnetic stainless steel or other materials to be non-corrosive and compatible with aluminum-framed entrance door members, trim hardware, anchors, and other components.
- C. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.
- D. Reinforcing Members: Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.

1. Weather Seals: Provide weather stripping with integral barrier fin or fins of semi-rigid, polypropylene sheet or polypropylene-coated material. Comply with AAMA 701/702.

2.3 Entrance Framing System

- A. Entrance Framing:
 1. Trifab™ 601T.
- B. Non-Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials. Where exposed shall be stainless steel.
- D. Perimeter Anchors: When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.
- E. Packing, Shipping, Handling and Unloading: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- F. Storage and Protection: Store materials protected from exposure to harmful weather conditions. Handle storefront material and components to avoid damage. Protect storefront material against damage from elements, construction activities, and other hazards before, during and after storefront installation.

2.4 Glazing

- A. Glazing: As specified in Division 08 Section "Glazing".
- B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, extruded EPDM rubber.
- C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

2.5 Hardware

- A. General: Provide hardware as specified in section 087100.
- B. Standard Hardware:
 1. Weather-stripping:
 - a. Meeting stiles on pairs of doors shall be equipped with an adjustable astragal utilizing wool pile with polymeric fin.
 - b. The door weathering on a single acting offset pivot or butt hung door and frame (single or pairs) shall be comprised of a thermoplastic elastomer weathering on a tubular shape with a semi-rigid polymeric backing.

2.6 Fabrication

- A. Fabricate aluminum-framed entrance doors in sizes indicated. Include a complete system for assembling components and anchoring doors.
- B. Fabricate aluminum-framed glass doors that are reglazable without dismantling perimeter framing.
 - 1. Door corner construction shall consist of mechanical clip fastening, SIGMA deep penetration plug welds and 1-1/8" (29 mm) long fillet welds inside and outside of all four corners. Glazing stops shall be hook-in type with EPDM glazing gaskets reinforced with non-stretchable cord.
 - 2. Accurately fit and secure joints and corners. Make joints hairline in appearance.
 - 3. Prepare components with internal reinforcement for door hardware.
 - 4. Arrange fasteners and attachments to conceal from view.
- C. Weather-stripping: Provide weather-stripping locked into extruded grooves in door panels or frames as indicated on manufacturer's drawings and details.

2.7 Aluminum Finishes

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. Factory Finishing:
 - 1. Kawneer Permanodic™ AA-M10C21A31, AAMA 611, Architectural Class II Clear Anodic Coating (Color #17 Clear) (Standard).

PART 3 - EXECUTION

3.1 Examination

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work. Verify rough opening dimensions, levelness of sill plate and operational clearances. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated installation.
 - 1. Masonry Surfaces: Visibly dry and free of excess mortar, sand, and other construction debris.
 - 2. Wood Frame Walls: Dry, clean, sound, well nailed, free of voids, and without offsets at joints. Ensure that nail heads are driven flush with surfaces in opening and within 3 inches (76.2 mm) of opening.
 - 3. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.
 - 4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 Installation

- A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing aluminum-framed entrance doors, hardware, accessories, and other components.
- B. Install aluminum-framed entrance doors level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.
- C. Set sill threshold in bed of sealant, as indicated, for weather tight construction.
- D. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.3 Field Quality Control

- A. Manufacturer's Field Services: Upon Owner's written request, provide periodic site visit by manufacturer's field service representative.

3.4 Adjusting, Cleaning, and Protection

- A. Clean aluminum surfaces immediately after installing aluminum-framed entrance doors. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
- B. Clean glass immediately after installation. Comply with glass manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels, and clean surfaces.
- C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

END OF SECTION 08120

DIVISION 8

DOORS AND WINDOWS

08200 WOOD AND PLASTIC DOORS

SECTION 08210 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid-core doors with wood-veneer faces.
2. Factory finishing flush wood doors.
3. Factory machining for hardware.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of door. Include factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:

1. Dimensions and locations of blocking.
2. Dimensions and locations of mortises and holes for hardware.
3. Dimensions and locations of cutouts.
4. Undercuts.
5. Requirements for veneer matching.
6. Doors to be factory finished and finish requirements.

C. Samples: For factory-finished doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or approved equal:

1. Algoma Hardwoods, Inc.

2. Eggers Industries.
3. Marshfield Door Systems, Inc.
4. VT Industries, Inc.

2.2 FLUSH WOOD DOORS, GENERAL

- A. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, "Architectural Wood Flush Doors."
- B. WDMA I.S.1-A Performance Grade:
 1. Heavy Duty unless otherwise indicated.
- C. Particleboard-Core Doors:
 1. Particleboard: ANSI A208.1, Grade LD-2.
 2. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.

2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

- A. Interior Solid-Core Doors:
 1. Grade: Premium, with Grade A faces.
 2. Species: Red oak.
 3. Cut: Plain sliced.
 4. Match between Veneer Leaves: Book match.
 5. Assembly of Veneer Leaves on Door Faces: Running match.
 6. Core: Particleboard.
 7. Construction: Five plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering.

2.4 FABRICATION

- A. Factory machine doors for hardware that is not surface applied.

2.5 FACTORY FINISHING

- A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
 1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

- B. Factory finish doors that are indicated to receive transparent finish.
- C. Transparent Finish:
 - 1. Grade: Premium.
 - 2. Finish: WDMA TR-6 catalyzed polyurethane.
 - 3. Staining: As selected by Architect from manufacturer's full range.
 - 4. Sheen: Satin.

PART 3 - EXECUTION

3.1 INSTALLATION

- 1. Hardware: For installation, see Section 08700 "Hardware and Specialties".
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
- C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
 - 1. Clearances: Provide 1/8 inch (3.2 mm) at heads, jambs, and between pairs of doors. Provide 1/8 inch (3.2 mm) from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch (6.4 mm) from bottom of door to top of threshold unless otherwise indicated.
- D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

END OF SECTION 08210

DIVISION 8

DOORS AND WINDOWS

08300 SPECIAL DOORS

08360 OVERHEAD DOORS

- INDEX: -01- General
-02- Submittals
-03- Materials
-04- Installation
-05- Cleanup

-01- GENERAL

- A. The work covered by this section consists of furnishing all labor, materials and equipment for the installation of the overhead doors.

-02- SUBMITTALS

- A. The CONTRACTOR shall submit detailed Shop Drawings for approval on all materials furnished under this specification.

-03- MATERIALS

- A. Overhead garage doors shall be fully insulated steel sectional upward acting type. They shall be Series #422 as manufactured by Overhead Door Company, or approved equal. Door sections shall be 2" nominal thick. Inside and outside surface shall be factory primed painted steel with solid core expanded polystyrene. Hardware shall consist of heavy gauge 3" galvanized steel track with graduated seal for weathertight closing. All hinges, brackets, etc. of heavy gauge galvanized steel. Door bottom to be sealed with PVC weather seal. See Division 9, finishes, for final coat of paint.
- B. Vertical tracks shall be continuous angle mounted to wood jambs and fully adjustable for sealing door against jamb. Continuous angle size 2 1/2" x 4" x 3/32". Horizontal track reinforced with 1 1/2" x 1 1/2" x 1/8" angle. Doors shall be counter balanced with heavy duty torsion springs on continuous ball bearing cross header shaft. Lifting cable shall be galvanized and have a minimum 10 1/4" balls per roller. Doors shall have safety polycarbonate sections as shown on the Drawings.

- C. Motor-operated doors shall have Overhead Door Company's Model EL Commercial Operator approved equal. Motor characteristics are: 1/2 h.p., 120 v, single phase with standard three-button wall mounted push-button stations on interior side of each door. Overhead doors shall be equipped with exterior surface-mounted momentary contact keyed station. Each motor operated door shall come equipped with safety edges.

-04- INSTALLATION

- A. Surfaces to be exposed shall be protected at all times against abrasions, surface damage and marring.
- B. Install all doors and accessories in accordance with final Shop Drawings and manufacturer's data.
- C. Set units accurately in position, plumb, aligned and braced securely until permanently anchored and set.
- D. Check and adjust operation prior to final inspection. Leave work in complete and operating condition.

-05 CLEANUP

- A. This CONTRACTOR shall remove and properly dispose of all packaging materials, scrap, debris, etc.

END OF SECTION

DIVISION 8

DOORS AND WINDOWS

08500 - METAL WINDOWS

Section 08520 ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 SCOPE

- A. Description of Work: Provide all labor, material and equipment to furnish and install the aluminum windows as shown on the Drawings and or specified herein.
- B. Related Work Specified Elsewhere
 - 1. Masonry Work, Section 04210, UNIT MASONRY
 - 2. Caulking and Sealants, Section 07900, SEALANTS
 - 3. Glass and Glazing, Section 08800, GLAZING

1.2 APPLICABLE SPECIFICATIONS

- A. All aluminum sash shall carry the quality approved seal of the Architectural Aluminum Manufacturers' Association (AAMA).
- B. Architectural Aluminum Manufacturers' Association Master Specification.

1.3 SUBMITTALS

- A. General: All submittals shall be made in accordance with Section 01300, SUBMITTALS.
- B. Testing: Furnish a certified test laboratory report stating that the windows have been tested by an independent testing laboratory in accordance with AAMA "Standard Specifications for Aluminum Windows and that they comply with all requirements.
- C. Shop Drawings
 - 1. Submit complete, detailed shop drawings of all the windows and accessories. Obtain approval before fabrication or delivery.
 - 2. Shop drawings shall be fully dimensioned, showing full size sections, metal thicknesses, window construction and details, elevations, methods of installation and anchorage, and relationship to adjacent work.

D. Samples

1. Submit one sample corner showing construction of frame of window.
2. Submit sample of finish required.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. The window type and construction shall be as manufactured by Kawneer Co., or approved equal.
- B. Frames and ventilator members shall be not less than 1-5/8 inches front to back subject to commercial tolerances. Frame members shall provide for approximately 5/8 inch lap of adjacent construction at head and jambs.
- C. Glazing beads shall be aluminum, designed for inside glazing, using lock-on screwless, extruded bead. Fixed glazing stop shall be 3/4 inch high. All glazing materials other than bead shall be furnished under Section 08800, GLAZING. Provide 1 inch space for insulating glass double glazed with extruded aluminum snap-in type glazing beads.
- D. All screws, bolts and other parts shall be aluminum or stainless steel.
- E. Etched and clear alkaline resistant lacquer protected coating added.
- F. All exposed surfaces shall be free of scratches and other blemishes and shall receive. An architectural Class I Color Anodic Coating, confirming with Aluminum Association Standard AA-M12C22A42/44
- G. Color to be selected by Owner.

2.2 FABRICATION

- A. Window members shall be straight and true, free of bow, twist, or imperfections. Joints shall be precisely fitted, true, rigid and weathertight, with all corners square.
- B. Windows shall have 1/8 inch minimum wall thickness for frames.
- C. Corners of frames and ventilators shall be closely fitted and tightly joined by mechanical means, without destroying the homogeneity of the metals.
- D. Mullions shall be sufficiently stiff to deflect not more than 1/175th of the span under

design wind load requirements. Mullions shall permit expansion and contraction of adjacent windows and form watertight closures. Finish shall be the same for all adjacent windows.

- E. Provide 0.093 inch thick plate mullions as shown on all multiple units, complete, with all attachment devices and internal reinforcing where required.
- F. All horizontal members except muntin and sill rails under panels shall be tubular in section.
- G. Ventilators shall be of the projected type, located as shown, and constructed with inside and outside surfaces each in a single plane.
- H. Continuous, double overlap of ventilator and frame shall be provided around entire perimeter. Inside contact shall have elastomeric vinyl weatherstrip, held in grooves extruded in frame members. There shall be no gaps in weatherstrip contact.
- I. Each ventilator shall be balanced on two supporting arms of aluminum alloy and shall be equipped with two nylon shoes, sliding smoothly with adjustable friction in channels at jambs. Channels shall be designed to prevent escape of shoe, and shoes shall provide sufficient friction to hold ventilators firmly at any opening within their limits without use of springs. Ventilators shall open in, at 45 Degree angle maximum.
- J. Nylon guides shall be provided, attached to ventilators, to insure proper alignment of ventilators when closing.
- K. Hardware
 - 1. All hardware fasteners penetrating frame or inside plane of window shall be factory-sealed with resilient non-hardening compound.
- L. Design wind load shall meet local Building Code requirements.

2.3 SCREENS

- A. Standard insect screen members shall be constructed of extruded aluminum frames meeting 6063-T5. Provide screens where specified of manufacturer's approved design, applicable to the specific window for which intended. Screen frames shall be finished to match the aluminum window, unless otherwise noted.
- B. Corners shall be firmly joined in a secure manner, using staked-in-place cast corner keys. Frames shall have sufficient rigidity and be cross-braced as required.
- C. Standard screen cloth shall be aluminum 18 x 16 mesh securely held in frame with vinyl spline, meeting CS 138-55 "Insect Wire Screening" requirements.

- D. Screens shall be held in place with screen clips and screws, and shall be easily removed and replaced without use of special tools.

2.4 SHIPPING PROTECTION

- A. Windows shall be wrapped in protective covering by the manufacturer. Paper shall be type 311 craft paper laminated two ply, faced with white polyethylene and reinforced with fiberglass strands.

PART 3 - EXECUTION

3.1 STORAGE AND PROTECTION

- A. Brace and protect windows to prevent damage or distortion in shipping and handling. Provide suitable temporary covering to protect finish. Store windows under cover at the site, set upright on wood blocking.
- B. Support, brace and protect windows after installation to prevent distortion and misalignment. Remove temporary protection when directed.

3.2 INSTALLATION

- A. Windows shall be installed square, plumb and level in a secure and professional manner, to assure neat and weathertight construction in accordance with the manufacturer's recommendations. A permanent weathertight joint shall be made at the junction of sill and side frame members of the master frame, with a good sealant grade meeting AAMA 803. Windows shall be properly caulked with compound meeting AAMA 808, "Specifications for Exterior Perimeter Sealing Compounds", to accomplish a thorough weathertight installation.
- B. Provide all anchors, clips, fasteners and accessories necessary for complete installation.
- C. Bed screws or bolts in sill members, joints at mullions, and contacts of windows with sills, built-in fins, or subframes in mastic sealant, of a type recommended by the window manufacturer.
- D. Fasteners shall be concealed where possible. Any exposed fasteners shall be aluminum or stainless steel and unless otherwise indicated shall be counter sunk. Concealed fasteners, anchors and accessories shall be stainless steel, zinc or cadmium plated or galvanized steel.
- E. When expedient, and with the Engineer's approval, remove the protective covering.

3.3 CLEANING

- A. Clean metal surfaces, both the inside and outside, of all mortar, plaster, paint and other foreign matter. Wash with a stiff-fiber brush, soap and water, and thoroughly rinse with clear water. Clean stained or discolored windows or have finish restored in accordance with recommendations of the Architectural Aluminum Manufacturers' Association. Replace stained, discolored, or abraded windows that cannot be satisfactorily repaired with new windows at the Contractor's own expense.

END OF SECTION

DIVISION 8
DOORS AND WINDOWS
08700 HARDWARE AND SPECIALTIES

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Mechanical door hardware for the following:
 - a. Swinging doors.

1.2 ACTION SUBMITTALS

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

B. Other Action Submittals:

1. Door Hardware Schedule: Prepared by or under the supervision of Installer, detailing fabrication and assembly of door hardware, as well as installation procedures and diagrams. Coordinate final door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - a. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.
 - b. Content: Include the following information:
 - 1) Identification number, location, hand, fire rating, size, and material of each door and frame.
 - 2) Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
 - 3) Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
2. Keying Schedule: Prepared by or under the supervision of Installer, detailing Owner's final keying instructions for locks.

C. Schedules shall be kept current with all changes to the project. If changes occur, project hardware schedules shall be maintained to reflect the changes as they are approved. Omitted items shall be deleted from openings, added and replaced items shall be included. Installation

submittals shall be kept current as changes occur. Upon request, a complete updated hardware schedule shall be provided to the contractor. Supplemental submittals that include only the changed openings will not be acceptable.

- D. Prior to final payment, provide a record copy of hardware schedules, including all revisions and updates. All openings shall be listed to reflect final installed configuration only.

1.3 QUALITY ASSURANCE

- A. **Supplier Qualifications:** The hardware supplier shall be a corporate member in good standing of The Door and Hardware Institute (DHI), employing at least one Architectural Hardware Consultant (AHC) who is currently participating in DHI's continuing education program (CEP).
- B. **Source Limitations:** Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated.
- C. Items of hardware not definitely specified herein but necessary for completion of the work shall be provided. Such items shall be of type and quality suitable to the service required and comparable to the adjacent hardware. Where size and shape of members is such as to prevent the use of types specified, hardware shall be furnished of suitable types having as nearly as practicable the same operation and quality as the type specified. Sizes shall be adequate for the service required.
- D. Include such nuances as strike type, strike lip length, raised barrel hinges, mounting brackets, blade stop spacers, special templates, fasteners, shims, and coordination between conflicting products. All doors shall be provided with a stop.
- E. **Fire-Rated Door Assemblies:** Where fire-rated door assemblies are indicated, provide door hardware rated for use in assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C, unless otherwise indicated. Provide positive latching and self-closing, regardless if specified in sets.
- F. **Smoke- and Draft-Control Door Assemblies:** Where smoke- and draft-control door assemblies are required, provide door hardware that meet requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
 - 1. **Air Leakage Rate:** Maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at the tested pressure differential of 0.3-inch wg (75 Pa) of water.
- G. **Means of Egress Doors:** Latches do not require more than 15 lbf (67 N) to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
- H. **Accessibility Requirements:** For door hardware on doors in an accessible route, comply with ICC/ANSI A117.1.
 - 1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf (22.2 N).
 - 2. Comply with the following maximum opening-force requirements:

- a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
 - b. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch (13 mm) high.
 4. Adjust door closer sweep periods so that, from an open position of 90 degrees, the door will take at least 5 seconds to move to a point 12 degrees from the latch, measured to the leading edge of the door.
- I. Keying Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination."

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver keys to Owner by registered mail or overnight package service.

1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
 1. Warranty Period: Manufacturers' standard warranty period.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. Provide door hardware for each door as scheduled in Part 3 "Door Hardware Schedule" Article to comply with requirements in this Section.
 1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturers' products.

2.2 HINGES

- A. Hinges: BHMA A156.1. Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hager Companies.
 - b. IVES Hardware; an Allegion company.
 - c. Stanley Commercial Hardware; Div. of The Stanley Works.

2. Interior Door Hinges: Steel, 0.134 inch minimum thickness except as noted. Provide heavyweight 0.180 inch minimum thickness on doors wider than 3'0".
3. Exterior Door Hinges: Stainless steel, provide heavyweight 0.180 inch minimum thickness unless noted otherwise.
4. Hinge Size: 4-1/2" x 4-1/2" unless noted otherwise.
5. Hinge Options:
 - a. Nonremovable Pins: Provide set screw in hinge barrel that when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for out-swinging exterior doors, out-swinging lockable corridor doors and doors with access control components.
 - b. Corners: Square.
6. Provide quantity as follows unless otherwise indicated.
7. For doors up to 60 inches in height, provide 1 pair hinges; for doors 60 inches to 90 inches in height, provide 1-1/2 pairs of hinges; for doors over 90 inches and up to 120 inches in height, provide 1 additional hinge for each 30 inches of height.

2.3 MECHANICAL LOCKS AND LATCHES

- A. Strikes: Provide manufacturer's standard strike for each lock bolt or latch bolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.
- B. Bored Locks: BHMA A156.2; Grade 1; Series 4000.
 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Schlage Commercial Lock Division.

2.4 EXIT DEVICES AND AUXILIARY ITEMS

- A. Exit Devices and Auxiliary Items: BHMA A156.3.
 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Von Duprin.

2.5 LOCK CYLINDERS

- A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver.
 1. Manufacturer: Same manufacturer as for locking devices.

2.6 KEYING

- A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Incorporate decisions made in keying conference.
 - 1. Existing System:
 - a. Master key or grand master key locks to Owner's existing system.
- B. Keys:
 - 1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
 - a. Notation: Information to be furnished by Owner.
 - 2. Quantity: In addition to one extra key blank for each lock, provide the following:
 - a. Cylinder Change Keys: Three.
 - b. Master Keys: Five.

2.7 SURFACE CLOSERS

- A. Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. LCN.

2.8 MECHANICAL STOPS AND HOLDERS

- A. Wall- and Floor-Mounted Stops: BHMA A156.16; polished cast brass metal.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hager Companies.
 - b. IVES Hardware; an Allegion company.
 - c. Rockwood Manufacturing Company.
 - d. Trimco.

2.9 DOOR GASKETING

- A. Door Gasketing: BHMA A156.22; air leakage not to exceed 0.50 cfm per foot (0.000774 cu. m/s per m) of crack length for gasketing other than for smoke control, as tested according to

ASTM E 283; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hager Companies.
 - b. National Guard Products.
 - c. Reese Enterprises, Inc.
 - d. Zero International.

2.10 THRESHOLDS

- A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hager Companies.
 - b. National Guard Products.
 - c. Reese Enterprises, Inc.
 - d. Zero International.

2.11 METAL PROTECTIVE TRIM UNITS

- A. Metal Protective Trim Units: BHMA A156.6; fabricated from 0.050-inch- (1.3-mm-) thick stainless steel; four sides beveled, with manufacturer's standard machine or self-tapping screw countersunk fasteners.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hager.
 - b. IVES.
 - c. Rockwood.
 - d. Trimco.

2.12 AUXILIARY DOOR HARDWARE

- A. Auxiliary Hardware: BHMA A156.16.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hager Companies.
 - b. IVES Hardware; an Allegion company.
 - c. Rockwood Manufacturing Company.
 - d. Trimco.

2.13 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
 - 1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
 - 2. Fire-Rated Applications:
 - a. Wood or Machine Screws: For the following:
 - 1) Hinges mortised to doors or frames; use threaded-to-the-head wood screws for wood doors and frames.
 - 2) Strike plates to frames.
 - 3) Closers to doors and frames.
 - b. Steel Through Bolts: For the following unless door blocking is provided:
 - 1) Surface hinges to doors.
 - 2) Closers to doors and frames.
 - 3) Surface-mounted exit devices.
 - 3. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
 - 4. Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, "Recommended Fasteners for Wood Doors."
 - 5. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.14 FINISHES

- A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.

- B. Wood Doors: Comply with DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."
- C. Mounting Heights: Mount door hardware units at heights to comply with the following unless otherwise indicated or required to comply with governing regulations.
 - 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
 - 2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- D. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.
 - 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 - 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- E. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 079200 "Joint Sealants."
- F. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.
- G. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
- H. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- I. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.
- J. Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.2 DOOR HARDWARE SCHEDULE

HARDWARE SET 1

EA	HINGES	AS SPECIFIED	630	HAG
1 EA	EXIT DEVICE	99L	626	VON
1 EA	CYLINDER	AS REQUIRED	626	SCH
1 EA	CLOSER	4040XP SCUSH	689	LCN
1 EA	KICK PLATE	10" X 2" LDW	630	ROC
1 EA	THRESHOLD	8425	719	NGP
1 EA	SWEEP	200NA	628	NGP
1 SET	WEATHERSTRIPPING	9700A	628	NGP

HARDWARE SET 2

EA HINGES	AS SPECIFIED	652	HAG
1 EA PASSAGE	ND10S RHO	626	SCH
1 EA WALL STOP	403	626	ROC

HARDWARE SET 3

EA HINGES	AS SPECIFIED	652	HAG
1 EA CLASSROOM	ND70PD RHO	626	SCH
1 EA WALL STOP	403	626	ROC

HARDWARE SET 4

EA HINGES	AS SPECIFIED	652	HAG
1 EA PASSAGE	ND10S RHO	626	SCH
1 EA CLOSER	4040XP SCUSH	689	LCN
1 EA KICK PLATE	10" X 2" LDW	630	ROC

HARDWARE SET 5

EA HINGES	AS SPECIFIED	630	HAG
1 EA ENTRANCE	ND53PD RHO	626	SCH
1 EA CLOSER	4040XP SCUSH	689	LCN
1 EA KICK PLATE	10" X 2" LDW	630	ROC
1 EA THRESHOLD	8425	719	NGP
1 EA SWEEP	200NA	628	NGP
1 SET WEATHERSTRIPPING	9700A	628	NGP
1 EA LATCH PROTECTOR	320CXL	630	ROC

HARDWARE SET 6

EA HINGES	AS SPECIFIED	652	HAG
1 EA PRIVACY	ND40S RHO	626	SCH
1 EA WALL STOP	403	626	ROC

HARDWARE SET 7

EA HINGES	AS SPECIFIED	652	HAG
1 EA ENTRANCE	ND53PD RHO	626	SCH
1 EA WALL STOP	403	626	ROC

HARDWARE SET 9

EA HINGES	AS SPECIFIED	630	HAG
1 EA PASSAGE	ND10S RHO	626	SCH
1 EA CLOSER	4040XP SCUSH	689	LCN
1 EA KICK PLATE	10" X 2" LDW	630	ROC

END OF SECTION 087100

DIVISION 8

DOORS AND WINDOWS

08800 - GLAZING

08810 - GLASS

- INDEX: -01- General
-02- Materials
-03- Installation, Shop Drawings
-04- Glass
-05- Guarantee

-01- GENERAL

- A. Furnish all labor, equipment and materials to complete all glass and glazing work shown on the Drawings, specified herein, or reasonably implied.

-02- MATERIALS

- A. All glass shall be:
1. Factory labeled on each pane (labels to remain on glass until cleaning of glass).
 2. Free from scratches or imperfections. Glass that is scratched or imperfect must be replaced before final acceptance by OWNER.
- B. Kinds and quality of glass shall be as hereinafter specified or shown on the Drawings.
- C. Lexan shall be installed where specified or shown on the Drawings, if applicable.

-03- INSTALLATION, SHOP DRAWINGS

- A. All glass shall be:
1. Accurately cut to fit openings.
 2. Set with equal bearing on the entire width of pane.
- B. Replace any and all broken or scratched glass at termination of work.

- C. It shall be the duty of this CONTRACTOR.
 - 1. To contact the millwork manufacturer or General CONTRACTOR and verify all glass sizes.
- D. In general:
 - 1. All glass set in exterior hollow metal frames shall be set with putty.
 - 2. All interior glass shall be set dry, with felt or tape to prevent rattling.
 - 3. All exterior sliding window glass shall be set as per manufacturer's recommendations.

-04- GLASS

- A. All windows to be factory glazed.
- B. All windows requiring re-glazing shall receive same thickness and type of glass as the window unit had.
 - 1. Glass strength (thickness) shall be as determined by local building code.
- C. Comply with local codes, state laws and the "Safety Standards for Architectural Glazing Materials" (16 CFR 1201) issued by the Consumer Products Safety Commission.

-05- GUARANTEE

- A. At completion of this work:
 - 1. Remove all packing crates and rubbish resulting from the work.
 - 2. Leave space broom clean.
- B. This CONTRACTOR and the General CONTRACTOR hereby:
 - 1. Guarantee this material and workmanship for a period of one year from date of final certificate.
 - 2. Agree to replace any such defective material during the term of this Guarantee, including adjoining work damaged thereby.

END OF SECTION

DIVISION 9

FINISHES

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09512 - Lay-In Acoustic Tile System.....09512-1

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09901 - General Painting Interior and Exterior09901-1

DIVISION 9

FINISHES

09250 - GYPSUM WALLBOARD

09260 - GYPSUM WALLBOARD SYSTEMS

- INDEX: -01- General
-02- Materials
-03- Guarantee

-01- GENERAL

- A. CONTRACTOR shall furnish all labor, materials and equipment necessary to apply gypsum wallboard surfacing to all walls and ceilings specified to be covered with gypsum wallboard in these specifications or as shown on the Drawings.
- B. In cold weather, the building shall be heated and ventilated during application of gypsum wallboard.

-02- MATERIALS

- A. Unless shown otherwise, materials shall comply with the applicable parts of the following:

Item	Standard
1. Gypsum wallboard, Type III, Class A	ASTM C-1396
2. Gypsum backing board (if required)	ASTM C-1396
3. Joint treatment material for gypsum wallboard construction	ASTM C-474 and ASTM C-475

- B. All materials herein specified shall be by U. S. Gypsum unless otherwise specified. The type of wallboard to be used is shown below.

1. Gypsum wallboard for general use shall be 1/2" sheetrock SW Regular.

2. Gypsum wallboard for use on walls or at beam protection designed as being fire-rated shall be 5/8" fire resistive sheetrock SW Fire Code "C".
3. Gypsum wallboard for use on duct protection designated as being fire-rated shall be 1/2" fire resistive sheetrock SW Firecode "C".
4. Gypsum wallboard for high moisture areas shall be 5/8" U. S. Gypsum sheetrock W/R.
5. Gypsum wallboard for high moisture areas and requiring a 1 hour fire rating shall be 5/8" U. S. Gypsum sheetrock W/R Firecode "C".
6. U. S. Gypsum Type S buglehead screws shall be used for attaching wallboard. Size and spacing shall be as per manufacturer's recommendations to meet code requirements.
7. Fire Rating. Details and locations of fire resistant construction for 1 and 2 hour conditions are shown on the Drawings. All gypsum wallboard construction in these locations shall follow one of tested construction procedures outlined in ASTM Standard E119, or Fire Resistance Design data published by the Gypsum Association.
8. Gypsum Board shall be used for finished walls where noted. Standard gypsum board shall be 1/2" thick, "Sheetrock" SW Firecode wallboard.
 - a. Studs and runners shall be 2 1/2", 3 5/8" or 6" roll-formed members, formed from 20 gauge galvanized steel.
 - b. Support System. Suspended drywall soffits shall be constructed with No. 8W & M gauge galvanized wire hangers supporting main runners of 1 1/2" channels wire-tied to 7/8" deep hat channels.
 - c. Gypsum Sheathing. At exterior stud walls with brick veneer, provide 1/2" thick "Firecode" gypsum sheathing, unless indicated otherwise on the Drawings.
 - d. Insulating Blankets shall be 3 5/8" thick "Thermafiber M-S" blankets for use at all exterior stud walls with brick veneer, unless indicated otherwise on the Drawings.
 - e. Sound Attenuation Blankets shall be 2" thick "Thermafiber" for use at interior sound insulated walls where shown on Drawings, unless indicated otherwise on the Drawings.
 - g. Finishing Materials. Tape and finishing compounds shall be as recommended by the board manufacturer.

- D. Workmanship shall comply with applicable parts of the American Standard Specifications for Gypsum Wallboard Finishes.
- E. Provide corner beads at all external angles, casing beads, and strip lath and cornerites where required or usually considered necessary.
- F. Joint taping should utilize U. S. Gypsum materials and be accomplished in strict accordance with manufacturer's recommendations.
- G. CONTRACTOR is responsible for all debris caused by his trade and shall leave the job in a clean orderly condition.

-03- GUARANTEE

- A. This CONTRACTOR guarantees all work and materials installed under this contract for a period of one (1) year from date of final acceptance.
- B. All equipment, material and workmanship, which are found to be defective within the guarantee period, shall be replaced at no cost to the OWNER.

END OF SECTION

DIVISION 9

FINISHES

09300 - TILE

09310 - CERAMIC TILE

- INDEX: -01- General
-02- Materials
-03- Installation
-04- Cleaning and Protection

-01- GENERAL

- A. Furnish all labor, materials and equipment for the properly completed installation of all ceramic tile and quarry tile in strict accordance with these plans, specifications and schedules.
- B. See Drawings and schedule for location and quantity of the tile work required.
- C. Deliver, store and handle all material to prevent damage. Deliver and store in original containers with seals unbroken and labels intact until time of use.

-02- MATERIAL

- A. All ceramic tile shall be quality certified by the Tile Council of North America, Inc.
- B. Ceramic tile for floors shall be 1" x 1" size. The tile shall be selected by the OWNER from stock patterns and colors.
- C. Ceramic tile for walls and base shall be 4" x 4" size. The tile shall be selected by the OWNER from stock patterns and colors.
- D. Porcelain tile for floors shall be 6" x 6" size. The tile color to be selected by the OWNER.
- E. Mortar shall be dry-set mortar, conforming to ANSI A118.1.
- F. Contractor shall supply owner with reasonable amounts of each color, size and pattern for repair and maintenance purposes.

-03- INSTALLATION

- A. Lay out tile on floors so that no tile less than half size occurs.
- B. Installation of floor tile shall be with water resistant organic adhesives. Each container must bear approved hallmark showing conformance with ANSI A136. Adhesives shall also be certified by their manufacture as proper for intended application. All joints shall be grouted with prepared waterproof grout or waterproofed Portland cement mixed to creamy consistency and forced into all joints so that joint is filled to its entire depth.
- C. Installation of wall tile shall be in accordance with the manufacturer's written instructions.

-04- CLEANING AND PROTECTION

- A. Tile surfaces shall be left clean after grouting and protected with a suitable covering where necessary.

END OF SECTION

DIVISION 9

FINISHES

09500 - ACOUSTICAL TREATMENT

09512 - LAY-IN ACOUSTIC TILE SYSTEM

INDEX: -01- General
-02- Material

-01- GENERAL

- A. See Drawings and room finish schedule for location and quantity of work.
- B. Provide all labor, material and equipment required to supply and install all lay-in units and exposed grid suspension system, including wire hangers, main T runners, cross T's and angle molding and all adhesives and equipment required for the installation of the acoustical tile specified.
- C. All lay-in acoustical tile ceiling systems shall be installed in accordance with the manufacturer's recommendations and as indicated on the Drawings.

-02- MATERIAL

- A. Ceiling panels shall be United States Gypsum Auratone Firecode Panels, 5/8" x 24" x 24" Filigree pattern, or approved equal. Provide factory applied coated panels at bathroom or locker room areas, if applicable. Finish shall be Class A with 0-25 flame spread.
- B. Hanger wire shall be No. 12 SWG galvanized steel wire installed per the manufacturer's recommendations.
- C. Contractor shall supply owner with full box of each type of ceiling tile for future use.

-03- HEAT STOP TREATMENT

- A. Furnish and install heat stops at all mechanical openings in acoustical tile ceiling, detailed as shown on the Drawings, if applicable. See Mechanical Drawings for locations of heat stops. Heat stops shall be of 1-1/4" thick rigid mineral wool batts, fastened securely to duct work with No. 18 SWG tie wire.

- B. Furnish and install recessed light fixture protection panels at all locations requiring same.
See Electrical Drawings for locations of fixture protection.

END OF SECTION

DIVISION 9

FINISHES

09680 - CARPETING

09682 - CARPET

- INDEX: -01- General
-02- Material
-03- Installation

-01- GENERAL

- A. The carpet shall be installed in areas indicated on the Drawings. A temperature of at least 70° F. shall be maintained in the spaces where carpet is being installed for at least 24 hours before, during, and 24 hours after installation. Adequate ventilation shall be provided to remove moisture and volatile fumes.
- B. CONTRACTOR shall furnish letters of certification, carpet waiver forms or other documents required by the Michigan Department of Public Health and the State Fire Safety Board.

-02- MATERIAL

- A. Where carpet floor covering is noted on the Room Finish Schedule, the carpet manufacturer shall provide installation and maintenance procedures, along with warranty information. Installation, including base and the mastic required, shall be included in the base bid, and shall be in accordance with the manufacturer's recommendations. Carpet color/style shall be selected by the OWNER.

-03- INSTALLATION

- A. Inspect all sub-flooring to insure a clean, dry and secure surface before installation. If filling compound is needed for floor leveling, a latex based sub-floor filler will be used.
- B. Carpet shall be installed to produce a tight, smooth, secure and uniform surface as indicated per construction documents and finish schedules. In areas where more than one width of carpet is required, precut the carpet to the proper length allowing for flash up at walls and through doorways. Position first two pieces of carpet, and cut seams by

row cutting and trace cutting for the second piece in a manner that will produce a tight, uniform seam requiring a minimum amount of adjusting with a knee kicker.

- C. Carpet seams shall be secured by a non-releasable backed low profile hot melt seaming tape per carpet manufacturers recommendations.

END OF SECTION

DIVISION 9

FINISHES

09900 - PAINTING

09901 - GENERAL PAINTING INTERIOR AND EXTERIOR

- INDEX:
- 01- General
 - 02- Material
 - 03- Exterior Work
 - 04- Interior Work
 - 05- Colors, Samples, Formulas
 - 06- Work Not Included
 - 07- Application
 - 08- Touch-Up
 - 09- Miscellaneous
 - 10- Guarantee-Warranty

-01- GENERAL

- A. CONTRACTOR shall furnish all labor, material and equipment necessary to complete the painting as specified herein.
- B. This CONTRACTOR shall:
 - 1. Keep all materials for his use in one area of the building where designated.
 - 2. Move location of such designated area when/if directed.
 - 3. Adequately protect storage area floor.
 - 4. Take adequate precautions to safeguard against fire in such designated area(s).
- C. When no specific manufacturer of paint or finish is specified:
 - 1. Such material shall be the product of only high grade nationally known manufacturers.
 - 2. Obtain approval of brands from ENGINEER before starting work.

- D. When only one manufacturer and type is mentioned, it is a guide for quality and type of similar products of Pittsburgh Paints, DuPont, Sherwin-Williams, or equal.
- E. All nail holes and joints in trim, wall surfaces, and finish woodwork, both exterior and interior, shall be:
 - 1. Puttied with paintable putty, tinted to perfectly match surrounding work.

-02- MATERIALS

- A. Materials shall be:
 - 1. Delivered in original unbroken containers, with labels intact.
 - 2. Used as per manufacturer's directions.
 - 3. Mixed at the job site, except ready-mixed material may be brought to the job site in unopened containers.
 - 4. In compliance with formulas specified unless written permission is granted to alter same.
- B. Pigment (tinting) shall be the highest grade obtainable.
- C. All paint and finishes are to be approved by the ENGINEER with colors to be selected by the OWNER

-03- EXTERIOR WORK

- A. Furnish all labor and material to complete all exterior painting work as follows:
 - 1. All exterior wood - sand and apply one coat primer, then all wood shall have one coat exterior paint.
 - 2. All exterior ferrous metal.

-04- INTERIOR WORK

- A. CONTRACTOR shall furnish all labor and material necessary to complete all interior painting work.
 - 1. Shown on the Paint Finish Schedule.
 - 2. Specified herein and as indicated on the Drawings.

- B. In general, where interior trim finish is indicated, it shall be used on:
1. Door frames and trim.
 2. Window frames, sash, and trim.
 3. Interior base, shoe and moldings, where wood.
 4. Miscellaneous and metal work, except where such metal work, etc. is aluminum, no paint will be required.
 5. Any interior metal doors that are not factory-prefinished.
- C. Interior walls shall be painted as specified.
- D. Refer to drawings for this project for:
1. Painting Schedule.
 2. Various finishes to be used in different spaces and rooms.
- E. All metal door frames, grilles, convectors, etc., shall be given a final coat of enamel over primer coat by others, if applicable.

-05- COLORS, SAMPLES, FORMULAS

- A. CONTRACTOR shall:
1. Match color samples furnished by OWNER.
 2. Tint primer different shade of final color.
 3. Execute color samples to satisfaction of ENGINEER and OWNER.
 4. Execute samples on the job.
 5. Apply samples on same kind of surfaces as those on which final color is to be applied.
- B. Formulas following:
1. Do not include tinting pigments.

2. Shall have pigments added, as required, to produce the desired color and tints.
- C. The following is a schedule of the type of paint to be used, if applicable, for the various designated finishes in the Painting Schedule.
1. Masonry Surfaces
 - 1 coat block filler
 - 2 coats Alkyd Industrial Enamel (see plan schedule)
 2. Interior Plaster, Drywall, or Wood
 - 1 coat primer (tinted)
 - 2 coats latex (see plan schedule)
 3. Ferrous Metals
 - 1 coat Universal metal primer
 - 2 coats Alkyd Industrial Enamel
 4. Pre-Engineered Building Steel
 - 2 coats macropoxy epoxy mastic

-06- WORK NOT INCLUDED

- A. The following is excluded by this Contract:
1. Priming of structural steel.
 2. Any painting of heating, ventilating or plumbing machines, fans or pumps, unless specified herein (except grilles, baseboard, unit ventilators, etc., shall be painted as specified elsewhere herein).
 3. Electrical panel boards.

-07- APPLICATION

- A. Primer shall be:
1. Same brand as final paint used, best quality only.
 2. Adulterated or cut only upon manufacturer's directions.
- B. All work shall be:
1. By skilled tradesmen.

2. Accomplished in a workmanlike manner.
3. Evenly applied, free from sags, runs, crawls or other defects.
4. Of proper even consistency.
5. Done only under conditions suitable for satisfactory results.

C. Prime coats shall:

1. Be tinted at least one shade lighter than final color.
2. Not be covered with final coat until ENGINEER or OWNER has been notified.

NOTE: Where this is not carried out, it will be assumed that only one coat (that which is visible) has been given, and the CONTRACTOR may be required to furnish, at his own expense, additional coats of paint.

D. Before starting work:

1. Inspect all new surfaces to be painted.
2. Report any defects in working surfaces to ENGINEER.

NOTE: Commencement of work will indicate CONTRACTOR'S acceptance of working surfaces, and his ability to complete the Work.

E. In addition to work specified elsewhere herein:

- 1 Broom clean spaces before starting work.
2. Do no painting when temperature is below 50 degrees.
3. After primer has dried, apply putty or filler to all cracks, counter-sunk nails, open joints and other defects.
4. Paint shall cover all surfaces specified completely and shall be uniform in sheen, color, and texture.
5. Clean up all paint spills and excess paint.

G. CONTRACTOR'S attention is specifically called to the following requirements, if applicable: Where paint on block work is called for, it shall be roller or spray applied. Where paint on plastered and other smooth surfaces is called for, it shall be roller applied.

Paint on any trim shall be only brush-applied. Duct work and piping, grilles, convectors, etc., shall be spray-painted.

-08- TOUCH-UP

A. Painting coats, as specified:

1. Touch-up all surfaces damaged during construction.
2. Touch-up all defects after first coat of paint to produce an even result.

B. Miscellaneous painting shall include:

1. Furnishing and laying of drop cloths to protect floors, fixtures and other work from damage during painting.
2. Upon completion, removal of all spilled and splashed paint from fixtures, glass, fittings, floors, etc.

-09- MISCELLANEOUS

A. The work under this Contract Division shall include:

1. Removal and replacement of any/all receptacle and light switch plates, hardware, etc., that interfere with this CONTRACTOR'S ability to complete paint work.
2. Masking/protection of permanent fixtures and other work that will remain in place, and removal of such protection after painting work is completed.

-10- GUARANTEE-WARRANTY

A. CONTRACTOR hereby guarantees:

1. All work executed herein to be free from defects for a period of ONE YEAR from date of final acceptance.
2. To replace, at his own expense, any work which becomes defective during this guarantee period.

B. This guarantee will not cover:

1. Failure of adjacent work of others.

2. Failure of this work if due to defects impossible to detect at time of examination of working surfaces, prior to painting.

END OF SECTION

DIVISION 10

SPECIALTIES

<u>SECTION 10150 - COMPARTMENTS AND CUBICLES</u>	<u>PAGE</u>
10162 - Metal Toilet Partitions and Urinal Screen	10162-1
 <u>SECTION 10400 - IDENTIFYING DEVICES</u>	
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 <u>SECTION 10520 - FIRE EXTINGUISHERS, CABINETS AND ACCESSORIES</u>	
10521 - Portable Fire Extinguishers	10521-1
 <u>10600 - PARTITIONS</u>	
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DIVISION 10

SPECIALITIES

10150 COMPARTMENTS AND CUBICLES

10162 METAL TOILET PARTITIONS AND URINAL SCREEN

- INDEX: -01- General
-02- Submittals
-03- Related Work
-04- Materials
-05- Installation
-06- Protection and Cleaning

-01- GENERAL

- A. The work covered by the Section consists of furnishing all labor, materials, and equipment in connection with the installation of metal toilet partitions and appurtenances.
- B. The partitions shall be floor mounted, overhead braced, "Concord" metal toilet compartments with baked enamel finish, as manufactured by Accurate Partition Corp., or approved equal.

-02- SUBMITTALS

- A. Shop Drawings. The CONTRACTOR shall submit detailed data sheets and Shop Drawings for approval on materials furnished under this Specification, in accordance with the requirements of Section 01300 of the General Requirements.

-03- RELATED WORK

- A. Section 10800 - Toilet and Bath Accessories.

-04- MATERIALS

- A. Toilet Partition. Accurate "Concord", floor mounted, baked enamel finish doors, partitions, and pilasters. Color shall be as selected by OWNER. All doors to be one-way swing and shall be equipped with slide latch (slotted for screwdriver) and

adjusted to remain open 30° when not occupied.

-05- INSTALLATION

- A. Partitions to be installed to pilasters and walls with four equally spaced stirrup brackets. Each door shall be installed with combination coat hook/bumper. At sides of handicapped toilet compartment, partitions shall be reinforced for installing grab bars with 1-1/2" clearance between rail and wall, 33" from finish floor to centerline of grab bar with tamper-proof attachment to partition through factory drilled holes of grab bar. Attach coat hook/bumper with vandal-proof screws.
- B. Install partitions rigid, straight, plumb, and level with the panels laid out as shown on the Drawings. Provide clearances of not more than 1/2" between pilasters and panels and not more than 1" between panels and wall. Secure panels to supporting walls with manufacturer's recommended anchoring devices as shown on the final Shop Drawings or manufacturer's instructions.

-06- PROTECTION AND CLEANING

- A. Protect units during delivery, storage, and after erection so that there will be no indication of use or damage at the time of acceptance. Replace damaged work as directed.
- B. Perform all final adjustments to pilaster leveling devices, door hardware, and other operating parts of the partition assembly just prior to final inspection.
- C. Clean exposed surfaces of partitions, hardware, fittings, and other accessories and touch up minor scratches and other finish imperfections using materials and methods recommended by the partition manufacturer.

END OF SECTION

DIVISION 10

SPECIALTIES

10400 - IDENTIFYING DEVICES

10440 - SIGNS

INDEX: -01- General

-01- GENERAL

- A. Restrooms shall have the appropriate sign/symbol marking the entrance door to each room.

END OF SECTION

DIVISION 10

SPECIALTIES

10520 FIRE EXTINGUISHERS, CABINETS AND ACCESSORIES

10521 PORTABLE FIRE EXTINGUISHERS

INDEX: -01- Scope of Work
-02- Materials

-01- SCOPE OF WORK

- A. CONTRACTOR shall furnish and install fire extinguishers where indicated on Drawings and as required per code.

-02- MATERIALS

- A. All fire extinguishers, unless otherwise noted, shall be 10 lb. Type ABC, Ansul Sentry, with bracket, or approved equal.

END OF SECTION

DIVISION 10

SPECIALTIES

10601 - MESH PARTITION

10601 - MESH PARTITION

- INDEX:
- 01- General
 - 02- Submittals
 - 03- Features
 - 04- Materials
 - 05-Installation

-01- GENERAL

- A. The work covered by this section consists of furnishing all labor, materials, and equipment in connection with the installation of wire mesh partitions.
- B. Wire mesh partitions shall be of the size shown on the Drawings.
- C. Height of partitions shall be 10'-0", size and location as shown on the Drawings.
- D. Wire mesh partitions shall be as manufactured by Marquette Fence Company, Inc., or approved equal.

-02- SUBMITTALS

- A. Shop Drawings. The CONTRACTOR shall submit detailed data sheets and shop drawings for approval covering material furnished under this section in accordance with Section 01300 of the General Requirements.

-03- FEATURES

- A. Doors to enclosures shall be hinged as shown on the Drawings and provide locking by means of padlock.
- B. Design shall prevent access to mounting hardware from outside the enclosure.

-04- MATERIALS

- A. Mesh shall be 10-gauge steel wire mesh woven into 1-1/2" diamond mesh, securely clinched to frames unless indicated otherwise on the Drawings.
- B. Frames, reinforcing sections, posts, and door frames shall be cold rolled steel sections.
- C. Door shall be 3'-0" x 6'-10" with appropriate pair of hinges.
- D. Finish shall be galvanized.

-05- INSTALLATION

- A. Anchor to floor and walls as required to form a stable installation.

END OF SECTION

DIVISION 10

SPECIALTIES

10800 TOILET AND BATH ACCESSORIES

10800 TOILET ACCESSORIES

INDEX: -01- General
-02- Room Accessories Listing

-01- GENERAL

A. Furnish and install all accessories listed below. This CONTRACTOR shall carefully check plans for exact quantity and placement. Accessories shall not be included in the Finish Hardware Section.

-02- ROOM ACCESSORIES LISTING

A. Each Restroom

1. Soap dish, B-5050, Bobrick, or approved equal.
2. Paper towel dispenser, B-52860, Matrix Series, Bobrick, or approved equal.
3. Multi-roll toilet tissue dispenser, B-5288, Matrix Series, Bobrick, or approved equal.
4. Surface-mounted waste receptacle, B-5277, Matrix Series, Bobrick, or approved equal.

END OF SECTION

DIVISION 13

SPECIAL CONSRUCTION

PAGE

SECTION 13120 - PRE-ENGINEERED STRUCTURES

13122 - Metal Building Systems..... 13122-1

DIVISION 13

SPECIAL CONSTRUCTION

13120 PRE-ENGINEERED STRUCTURES

13122 - METAL BUILDING SYSTEMS

1.0 GENERAL

This section specifies a rigid-frame-type Metal Building System. Drawings and other specification sections may apply to this section.

1.1 APPLICABLE PUBLICATIONS

- A. American Institute of Steel Construction (AISC): "Steel Construction Manual".
- B. American Iron and Steel Institute (AISI): "Cold-Formed Steel Design Manual", 2013 edition.
- C. American Society for Testing and Materials (ASTM):
 - 1. A36 Carbon Structural Steel.
 - 2. A653 Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process,
 - 3. A463 Steel Sheet, Aluminum-Coated by the Hot-Dip Process.
 - 4. A792 Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
 - 5. A1011 Steel, Sheet and Strip, Hot Rolled, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
 - 6. A572 High Strength Low-Alloy Columbium-Vanadium Structural Steel.
 - 7. A307 Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength.

8. F3125 High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions.

- D. Underwriters Laboratories (UL): "Tests for Wind-Uplift Resistance of Roof Assemblies--UL 580".
- E. American Welding Society (AWS): "Structural Welding Code-Steel", ANSI/AWS D1.1.
- F. Metal Building Manufacturers Association (MBMA): "Metal Building Systems Manual".

1.2 QUALITY ASSURANCE

- 1.2.1 The Metal Building System shall be designed, engineered, and fabricated by a Building Manufacturer who has been regularly engaged for at least twenty (20) years in the design, engineering, and fabrication of the type and quality herein specified.
- 1.2.2 Unless otherwise noted, all materials in this specification shall be furnished by the Building Manufacturer.
- 1.2.3 The Building Manufacturer shall be certified for AISC's "Certification Standard for Steel Fabrication and Erection, and Manufacturing of Metal Components" program. This project shall be engineered and fabricated to meet the requirements of this certification.
- 1.2.4 All structural mill sections and welded plate sections shall be designed in accordance with the AISC's "Steel Construction Manual".
- 1.2.5 All cold-formed steel structural members shall be designed in accordance with the 2013 edition AISI's "Cold-Formed Steel Design Manual".
- 1.2.6 All roof and wall panels shall be designed in accordance with the AISI's "Cold-Formed Steel Design Manual".
- 1.2.7 Welded connections shall comply with the American Welding Society's (AWS) "Structural Welding Code-Steel", ANSI/AWS D1.1 for welding procedures.
- 1.2.8 All materials shall be new and unused prior to fabrication. The Building Manufacturer shall warrant the materials manufactured by it, of properly erected in accordance with the plans, specifications, and erection manual furnished by it, against

defects in materials and workmanship for a period of one (1) year after substantial completion. Provide 20 year manufacturer warranty for pre-finished panels. Include coverage for exterior pre-finished surfaces to cover pre-finished color coat against chipping, cracking or crazing, blistering, peeling, chalking or fading. Include coverage for weather tightness of building enclosure elements after installation.

1.2.9 Shop Drawings: Indicate assembly dimensions, locations of structural members, connections; wall and roof system dimensions, panel layout, general construction details, anchorages and method of anchorage, installation; framing anchor bolt settings, sizes, and locations from datum, foundation loads; indicate welded connections with AWS A2.4 welding symbols; indicate net weld lengths; provide professional seal and signature.

1.2.10 Shop drawings shall be submitted within three (3) weeks of subcontract award.

1.3 RECEIVING, STORAGE, AND HANDLING OF MATERIALS ON JOB SITE

1.3.1 All materials shall be unloaded, handled, hauled, and delivered to storage by competent personnel in a manner which will prevent bends, dents, scratches, or other damage. Damaged materials shall be rejected and promptly replaced. All materials shall be properly stored and protected from weather damage. All shipments must be thoroughly checked by the consignee. If shortage or damage is found, a notation must be placed on the bill of lading and must be confirmed by the carrier.

1.3.2 Primed Materials: Upon receipt, all bundles of primed material shall be stored on blocking at an angle sufficient to allow any trapped water to drain and should be protected from the weather by covers allowing air circulation. Water, ice, and snow should not be allowed to collect and remain thereon.

1.3.3 Roof and Wall Panels: Bundles of panels shall be inspected for moisture upon receipt. If moisture is present, dry the panels and, if possible, store them in a warm, dry place. The panel bundles shall be elevated and sloped in a manner to allow moisture to drain. Cover all bundles with a tarp or plastic, leaving airspaces for adequate air circulation.

1.4 ERECTION

1.4.1 The erection of the metal building and the installation of accessories shall be performed in accordance with the Building Manufacturer's erection drawings and erection manuals by a qualified erector using proper tools, equipment, and safety practices.

1.4.2 Erection practices shall conform to the "Metal Building Systems Manual", MBMA.

1.4.3 There shall be no field modifications to primary structural members except as authorized and specified by the Building Manufacturer.

2.0 FRAMING

2.1 GENERAL

2.1.1 Primary framing and columns, purlins, girts, eave struts, other structural members, and clips shall be factory punched for easy and rapid erection by field bolting, except where shop connections are used. Field welding will not be permitted unless specified by the Building Manufacturer and allowed by the ENGINEER.

2.2 RIGID FRAMES

2.2.1 Rigid Frames shall be complete with base plates and splice plates prepared for field-bolted connections. They shall consist of built-up sidewall columns of tapered or constant web depths and rafters with tapered or constant web depths as required by the Building Manufacturer's design. Interior columns may be pipe sections and located where shown on the Drawings, if applicable.

2.2.2 The rigid frames shall be designed as pinned base, with no moment transferred to the foundation, unless specified otherwise.

2.2.3 Steel for all built-up sections shall meet as applicable the physical and chemical properties of:

A. ASTM A572 modified to 55,000 psi minimum yield and 70,000 psi minimum tensile strength, or ASTM A1008, Grade 55, or ASTM A1011, Grade 55; or

B. ASTM A572, Grade 50 or ASTM A1008, Grade 50 or ASTM A1011, Grade 50.

2.2.4 Hot-rolled structural shapes shall comply with the requirements of ASTM A36. Pipes shall comply with the requirements of ASTM A500, ASTM A501, or ASTM A53.

2.3 END WALL FRAMING

The end wall columns and beams shall consist of cold-formed "C" sections, hot-rolled sections or built-up sections meeting their respective material specifications.

2.4 SECONDARY FRAMING STEEL

- 2.4.1 Steel used to form the "Z" and "C" shaped purlins, girts, and eave struts shall be at least 8 inches deep and not less than 16 gauge, 55,000 psi minimum yield steel comparable to or exceeding the requirements of ASTM A1011.
- 2.4.2 When designed as continuous beams, the purlins and girts shall be checked for the combined bending and shear stresses at the frame centerline and at the end of their laps.

2.5 BRACING

- 2.5.1 Locate bracing as shown on the drawings to remove horizontal wind and seismic forces. The bracing may be either:
 - A. Cables of ASTM A475, 7 strand, extra-high-strength material, 1/4 inch diameter minimum.
 - B. ASTM A36 rods, 1/2 inch diameter minimum.
 - C. ASTM A36 angle pipe or tube
- 2.5.2 If x-bracing cannot be used, portal frames or fixed base end wall columns may be used.

2.6 STRUCTURAL PAINTING

- 2.6.1 All structural steel and light gauge steel members shall be cleaned of loose mill scale, dirt, and other foreign material by the procedures of SSPC-SP2 and then be given a one mil coat of red oxide primer meeting or exceeding the performance requirements of Specification SSPC Paint 15. The primer is not intended to be a finish coat.
- 2.6.2 Abrasions caused by handling and erection shall be touched-up by the contractor performing field touch-up. Use the same primer used by the Building Manufacturer.

2.7 STRUCTURAL BOLTS

All field connections shall be made with black, unpainted ASTM F3125 or A307 bolts, nuts, and washers as shown on the Building Manufacturer's erection drawings. All bolts shall be

installed and tightened in accordance with the "Specification for Structural Joints Using ASTM F3125 Bolts".

2.8 ANCHOR BOLTS AND FOUNDATION DESIGN

2.8.1 Anchor bolts shall be ASTM A307 and installed in accordance with the Anchor Bolt Plan furnished by the Building Manufacturer.

3.0 DESIGN CRITERIA

3.1 CODE REQUIREMENTS

3.1.1 All Code references are to the current International Building Code (IBC).

3.1.2 Combinations of loads shall be in compliance with IBC.

3.2 ROOF LOADS

3.2.1 Roof loads shall be applied in compliance with IBC roof loads and snow loads, and shall not be less than:

A. Dead Load: Weight of all building components furnished by the metal building system manufacturer.

B. Roof Live Load: Shall be as specified in IBC.

C. Roof Snow Load: Shall be determined using: $P_f = P_g * C_e * I$
Ground Snow Load: p_g (per IBC)
Snow Exposure Factor: C_e (per IBC)
Snow Importance Factor: I (per IBC)

D. Collateral and Mechanical Loads.

1. This weight includes the weight of non-structural material and equipment supported by the structure, including (but not limited to) HVAC units, ductwork, conduit, sprinkler and utility piping, suspended ceilings, lighting, and other building accessories, if applicable.

2. This load shall be added to DEAD LOAD and combined with ROOF LIVE LOAD, ROOF SNOW LOAD, WIND LOAD and SEISMIC FORCES in compliance with Section 1616.0

3.3 WIND LOADS

3.3.1 Wind loads shall be applied in compliance with IBC and shall not be less than:

- A. Basic Wind Speed V: (per IBC)
- B. Exposure Category: (per IBC)
- C. Wind Importance Factor: (per IBC)
- D. This building is Greater than 100 miles from a hurricane coastline.

4.0 ROOF PANELS AND FINISHES

4.1 ROOF PANEL DESCRIPTION

4.1.1 The roof panel shall be constructed of 24 gauge standing seam panels which provide a 24 inch net coverage in width and consist of 2" high (3" including seam) ribs spaced on 24 inch centers. Panels shall be jointed at the sidelaps with an interlocking seam standing 1 inch above the major rib. The female panel seam shall have factory applied sealant.

4.1.2 Longitudinal minor ribs may be used. Lateral reinforcing ribs impeding drainage and causing the trapping of dirt and debris are not permitted.

4.2 PANEL FINISH

4.2.1 Panel material shall be aluminum-zinc alloy-coated steel, AZ 55 designation, conforming to the requirements of ASTM A792.

4.3 STANDING SEAM PANEL CLIPS

4.3.1 Panel clips shall be a two part assembly with a total expansion or contraction capability of 1-1/4 inch.

A. The clip portion shall be die-formed SAE 1050 high carbon spring steel and heat treated to Rockwell 45C to 50C. The clip portion shall have a fluorocarbon coating for corrosion resistance.

B. The base portion of the clip shall be die-formed 18 gauge galvanized steel.

4.3.2 The panel clips shall be attached to the purlins by means of self-drilling, carbon steel, No. 12-14 x 1-1/4 inch hex-head, cadmium or zinc plated fasteners with a 1/2 inch diameter washer head and stand-off shoulder. The fasteners shall be suitable for use with fiberglass blanket insulation up to 6 inches thick.

4.4 THERMAL BLOCKS

4.4.1 Thermal blocks shall be used at all roof secondary framing. They shall be 3/4 inch thick and of a high density extruded polystyrene board and have a UL 25 flame spreading rating.

5.0 WALL PANELS

5.1 PANEL FINISH

5.1.1 The panels shall have an exterior finish meeting or exceeding for the following criteria:

A. EXTERIOR SURFACE:

1. Prime coat: The base metal shall be pretreated and primed with an epoxy or urethane type primer for superior adhesion and superior resistance to corrosion. The dry film thickness shall be 0.2 mils.
2. Exterior coat: After priming, the exterior side shall be given a 20 year long life coating baked in excess of 500 degrees F. to a controlled dry film thickness of 0.7 to 0.8 mils.
3. Excellent weatherability and resistance to coating deterioration shall be evident when subjected to the following tests:
 - a) Humidity resistance: Immediately after removal from cabinet, the exposed area shall contain less than 5 percent (5%) No. 8 blisters after 1000 hours when tested according to ASTM D2247.
 - b) Salt spray resistance: Immediately after removal from cabinet, the exposed area shall contain less than 5 percent (5%) No. 8 blisters after 750 hours when tested according to ASTM B117.
 - c) Specular gloss: The gloss rating shall be 25-35 degrees on a Gardner 60 degree gloss meter when tested in accordance with ASTM D523.

B. INTERIOR FINISH:

The interior finish shall have a parchment polyester top coat over an epoxy or urethane primer. The dry film thickness shall be 0.3 mils.

5.1.2 COLOR SELECTION

Exterior panel and trim colors will be selected from the Building Manufacturer's standard colors. Submit three (3) color charts to the OWNER for selection.

END OF SECTION

DIVISION 15

MECHANICAL

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DIVISION 15

MECHANICAL

15010 GENERAL PROVISIONS

15015 - MECHANICAL REFERENCE SYMBOLS

INDEX: -01- List of Standard Abbreviations

-01- LIST OF STANDARD ABBREVIATIONS

A. The following standards and abbreviations are referred to in this Division:

1. ANSI - American National Standard Institute, Inc.
2. UL - Underwriters' Laboratories, Inc.
3. NFPA - The National Fire Protection Association
4. SMACNA - Sheet Metal and Air Conditioning Contractor's National Association, Inc.
5. ASTM - American Society of Testing and Materials
6. AMCA - Air Moving and Conditioning Association
7. ASHRAE - American Society of Heating, Refrigeration, and Air Conditioning Engineers
8. N.E.C. - The National Fire Protection Association "National Electric Code"
9. AGA - American Gas Association
10. ASME - American Society of Mechanical Engineers
11. I.B.R. - Institute of Boiler and Radiator Manufacturers

END OF SECTION

DIVISION 15

MECHANICAL

15010 GENERAL PROVISIONS

15020 - WORK INCLUDED

- INDEX:
- 01- General
 - 02- Scope of Work
 - 03- Drawing Details
 - 04- Permits, Fees, Inspections
 - 05- Shop Drawings
 - 06- Submittals

-01- GENERAL

- A. Comply with all Contract Documents for this project, including “Instruction to Bidders”, General Requirements”, “General Conditions”, Supplemental General Conditions, Addenda, Drawings, and Specifications.
- B. Where the specifications require “Approval” or “As Directed”, such approval or direction must be obtained from the project ENGINEER.
- C. Comply with all instructions, directions, and requirements in the Mechanical Specifications and Drawings. Where the word “Provide” is used, it is hereby defined to mean “furnish and install, complete, and ready for use”.
- D. Some items called for in these General Specifications may not apply to this specific project. The specifications included on the drawings shall govern.

-02- SCOPE OF WORK

- A. The omission of express reference to any parts necessary for, or reasonably incidental to, a complete mechanical installation shall not be construed from releasing the CONTRACTOR from furnishing such parts.
- B. Work included under this Division consists of the furnishing of all labor, material, equipment, and supervision required to complete the Mechanical Work as shown in this specification, Division 15, and on the Mechanical Drawings.

- C. This includes, but is not limited to:
1. Provide and install all equipment indicated on the Drawings.
 2. Provide complete controls for all systems.
 3. Provide testing and balancing of the completed systems.

-03- DRAWING

- A. Mechanical Drawings are diagrammatic with no attempt made to show every el, tee, fitting, etc. All ducts and pipes shall be run in spaces indicated as job conditions warrant, arranged for most convenient access for servicing, with due consideration given to swing joints and to other work.
- B. The Mechanical Drawings are diagrammatic and show requirements by the use of graphic symbols. In general, these are the recognized symbols of the industry and of the engineering profession. Questions of meaning or intent will be decided by the ENGINEER and shall be consistent with system of symbols indicated or, if none is indicated, with recognized conventions.
- C. Should any structural difficulties prevent the installation of the piping, ductwork, fixtures, or equipment at the points shown on the Drawings, the necessary deviations, as determined by the ENGINEER, will be permitted and shall be made without additional cost.

-04- PERMITS, FEES, AND INSPECTIONS

- A. Where governing regulations and imposed codes and standards require charges, notices, permits, licenses, inspections, tests, and similar items or actions in order to lawfully proceed with the required mechanical work, obtain those items, pay all fees, and take those actions in accordance with the regulations of the governing authority.
- B. The Mechanical work shall be in conformance with the following:
1. State of Michigan Building Code.
 2. State of Michigan Plumbing Code.
 3. State of Michigan Mechanical Code.
 4. State of Michigan Boiler Law and ASME Codes.
 5. Sanitary, Gas, and Water Utility Authority Standards.
 6. All local codes and regulations.

C. Certificates of approval:

Upon completion of the building, provide OWNER with certificate of approval from the Plumbing and Mechanical Divisions, Bureau of Construction Codes, Department of Labor, State of Michigan, local office.

-05- SHOP DRAWINGS

- A. The CONTRACTOR shall submit six (6) copies of Certificates and Shop Drawings to the ENGINEER within 30 days after the Notice to Proceed, unless otherwise required. Submittals shall include the project number and name, and be clearly marked to indicate the type, model, style, performance capability, and other pertinent data as called for in these Specifications.

-06- SUBMITTALS

- A. Submittals shall include list of equipment and their manufacturers being used.
- B. CONTRACTOR shall apply in writing, two weeks in advance of bid date, to the ENGINEER for approval to substitute another equipment manufacturer's product other than those specifically named in these Specifications.
- C. CONTRACTOR shall bare all responsibility for any changes incurred by other disciplines due to the substitution of equipment that is different than those designated on the Drawings.

END OF SECTION

DIVISION 15

MECHANICAL

15010 GENERAL PROVISIONS

15044 - GENERAL COMPLETION REQUIREMENTS

- INDEX:
- 01- Identification
 - 02- Connections to Equipment
 - 03- Contractor's Responsibilities
 - 04- Electrical Wiring
 - 05- Mechanical Closeout Work

-01- IDENTIFICATION

- A. CONTRACTOR shall provide printed charts and instructions for the proper operation and maintenance of the mechanical, plumbing, and heating systems. He shall also provide instructions necessary for the operation of all equipment installed.

-02- CONNECTIONS TO EQUIPMENT

- A. Connect all services to and make complete installation of all equipment furnished by the other trades or the OWNER. If such equipment is positioned by others, only connections will be required. Run water, gas, condensate, sewer, drains, etc., and make all necessary connections to all equipment and fixtures requiring same, whether furnished by this CONTRACTOR or not, unless noted otherwise. Coordinate with other Sections of these Specifications.

-03- CONTRACTOR'S RESPONSIBILITIES

- A. The CONTRACTOR shall familiarize himself with the progress and execution of the job and notify the proper parties of interferences and problems with the proper installation of his materials.
- B. Any disturbance to work that has been completed by other contractors shall be the responsibility of the MECHANICAL CONTRACTOR or his subcontractors to rectify and restore to its finished condition.

-04- ELECTRICAL WIRING

- A. Electrical wiring, including distribution panels, cabinets, supports, feeders, circuit wiring, motor-disconnects, and related items and electrical connections to equipment, fixtures, and devices shall be provided under Electrical Division 16 unless specifically called for in another Division of these Specifications.
- B. ELECTRICAL CONTRACTOR shall furnish and install all wiring and conduit to and for the equipment that is furnished by the MECHANICAL CONTRACTOR.
- C. All electric wiring that is provided as part of Mechanical Equipment under this Division shall meet requirements of N.E.C. and applicable Sections of Division 16.

-05- MECHANICAL WORK CLOSEOUT

- A. As-Built Drawings:
 - 1. The CONTRACTOR shall provide and keep up-to-date a complete “As-Built” record set of Drawings which shall be corrected daily and shall show every change from the original Drawings and specification. CONTRACTOR shall indicate the exact location of all underground piping by dimensioned references to building reference points. He shall also indicate all changes in location, size, equipment, revisions, , etc., for the project.
 - 2. The requirement of providing and keeping up-to-date “As-Built” Drawings shall not be misconstrued as authority for the CONTRACTOR to make changes in the design without specific authorization for each case from the ENGINEER.
 - 3. Upon completion of the Work, the above “Record Drawings” will be delivered to the OWNER.
- B. Operating, Maintenance, and Instructions:
 - 1. The CONTRACTOR shall operate the entire installation for a period of time the ENGINEER deems necessary to ensure correct operation.
 - 2. During this period, the OWNER or his Representative shall be instructed in the operation and maintenance of all mechanical systems.
 - 3. The CONTRACTOR shall provide the OWNER manufacturer’s warranties, operating instructions, repair parts list, equipment manuals, and automatic control diagrams.
 - 4. The CONTRACTOR shall also provide the OWNER with a set of the final

approved shop drawings of all equipment, fixtures, and accessories used on this project.

5. The CONTRACTOR shall furnish a list of all subcontractors, including telephone numbers, with the maintenance manuals, operating instructions, etc., to the OWNER.

C. Lubrication:

1. After complete installation of any equipment, such as motors, ventilating fans, or any equipment that depends on lubrication for efficient operation, CONTRACTOR shall properly lubricate per instructions of manufacturer. This shall be done before any test runs are permitted or before this equipment is put in final operation.
2. All instruments used in the checking, adjusting, and balancing shall be accurately calibrated and maintained.
3. Air balance and checking shall not begin until all systems have been completed and are in full working order. The CONTRACTOR shall put all systems and equipment into full operation and shall continue the operation of such equipment during each working day of testing and balancing.
4. Upon completion of the checking, adjusting, and balancing, the CONTRACTOR shall submit a certified copy of the Balance Report to the ENGINEER for approval. No final payment shall be made until this Balance Report is accepted and systems are balanced and function as specified. The Report shall be in tabulated form with each piece of equipment or outlet property identified by its equipment, name, or room number and location.

G. Cleaning:

1. After cleaning of the building has been completed, the CONTRACTOR shall thoroughly clean all heating and ventilating units, exhaust fans, ductwork, elements, and the inside of all enclosures to completely remove the construction dust and dirt from same. The CONTRACTOR shall also clean plumbing fixtures and equipment as specified under that Division. The CONTRACTOR shall replace all air filters with new at this time.

H. Touch-up Painting:

1. After cleaning of equipment furnished under this Division, the CONTRACTOR shall repair any scratches or mars on the equipment by obtaining paint from equipment manufacturer matching that on the equipment.

I. Warranty:

1. Conform to General Conditions.

J. Inspections:

1. During the first year of operation, make two complete inspections of the heating, ventilating, air conditioning, and plumbing systems making any adjustments required.

END OF SECTION

DIVISION 15

MECHANICAL

15100 - BASIC MATERIALS AND METHODS

15110 - PIPING METHODS

- INDEX:
- 01- General
 - 02- Interior Pipe Placement
 - 03- Exterior Pipe Placement
 - 04- Pipe Testing
 - 05- Cleaning

-01- GENERAL

- A. The following specifications cover all piping not specifically included in the plumbing section of the specifications. The items listed are those generally used in connection with the construction of waterworks and sewerage projects. It is likely that all items will not be used on this particular project. The CONTRACTOR shall check the Drawings and all sections of the specifications for items required.
- B. All pipe, fittings, and accessories are to be furnished by the CONTRACTOR complete and ready for use. All gaskets, bolts, supports, couplings, wall sleeves, sleeves, hangers, anchors, seals, wedges, and other specialties necessary to complete the work shall be provided and considered incidental to the work.
- C. The following specifications shall be considered applicable to all pipe materials to be constructed in interior or exposed exterior locations and in buried locations unless otherwise specified or detailed on the Drawings.

-02- INTERIOR PIPE PLACEMENT

- A. The CONTRACTOR shall furnish a complete system of pipe supports, provide expansion joints, and anchor all piping. The pipe support system shall be installed complete with all necessary insert bolts, nuts, rods, washers, miscellaneous steel, and other accessories. In some instances, pipe supports, anchors, and expansion joints have been shown on the Drawings, but no attempt has been made to indicate every pipe support, anchor, and expansion joint for piping included under this portion of the specifications. Portions of the piping are shown on the detail Drawings. Some of the piping, however, is shown only on the schematics.

- B. All piping exposed in interior locations shall be adequately blocked, anchored, or harnessed to resist thrust due to change in pipe diameter or direction, or at pipe dead-ends to prevent separation of joints.
- C. For suspended piping, anchors shall be centered, as closely as possible, between expansion joints and between elbows and expansion joints. Anchors shall hold the pipe securely and shall be sufficiently rigid to force expansion and contraction movement to take place at expansion joints and elbows.
- D. All piping work shall be done in accordance with the arrangements shown on the Drawings. The runs of piping are, in part, diagrammatic and the CONTRACTOR shall, without extra cost, run the piping as directed by the ENGINEER at the time of installation so as to best fit the conditions in the building, and so that no piping shall pass through beams or other structural members in such a way as to impair their strength.
- E. Special care shall be exercised to keep all piping in the buildings in locations as shown on the Drawings and to install the risers and horizontal runs so as to occupy a minimum space.
- F. All horizontal lines carrying liquids shall be pitched to facilitate draining and all low points shall be provided with 3/4-inch hose bibs suitable for the material being handled, located so that the entire system can be drained unless otherwise shown on the Drawings, if applicable.
- G. Piping running parallel to walls shall be placed a minimum of 1½-inches out from the face of walls and at least 3-inches below ceilings, unless otherwise shown on the Drawings. Pipe supports and expansion joints shall be provided to satisfy the following conditions:

Pipe Material	Liquid Piping Max. Pipe Support Spacing	Air Piping Max. Length Straight Run without Bend or Expansion Joint	Max. Length Straight Run without Bend or Expansion Joint
Ductile Iron	14 ft.	80 ft.	40 ft.
Steel 6" and over 5" and under	20 ft. 12 ft.	80 ft. 50 ft.	40 ft. 25 ft.
Copper over 2" 2" and under	10 ft.	50 ft.	
Plastic & Fiberglass Reinforced Plastic over 3" 3" and under	9 ft. 6 ft.	30 ft. 30 ft.	

-03- EXTERIOR PIPE PLACEMENT

- A. All trenching, backfilling, and compacting work required for pipe placement shall conform to the appropriate section in Division 2 of the specifications.
- B. All trench shoring shall conform to Section 02413, site drainage and dewatering shall conform to Section 02530 and 02532, and rock excavation shall conform to Section 02211, if applicable.
- C. The embedment of all pipe shall conform to the class of bedding requirements specified in Division 2.
- D. The Class II bedding shall be furnished and provided for all plastic and cement pipe materials and a Class I bedding shall be furnished and supplied for all ductile iron, steel, concrete, and copper pipe materials unless otherwise specified. A Class III pipe bedding shall be furnished only where specified on the Drawings and the specifications.

-04- PIPE TESTING

- A. Each system of piping and control tubing shall be tested by the trade responsible for the work under the supervision of the CONTRACTOR. All pumps, gauges, instruments, test equipment, etc. necessary for the test shall be furnished by the trade making the test.
- B. The tests shall be made in the presence of the ENGINEER, and at the completion of each test, a test report shall be completed by the CONTRACTOR and submitted to the ENGINEER.
- C. All interior pressure piping and connections shall be subjected to a hydrostatic pressure test prior to painting, installation of insulation, or concealment within the building. The test pressure shall be not less than 50 percent (50%) in excess of the pressure to which the pipe will ordinarily be subjected, except that no pipe shall be subjected to a test pressure of less than 50 psi. Test shall demonstrate fitness of piping to hold required pressure for a period of not less than two hours. Defective material or defects in workmanship that develop during the tests shall be remedied and the subject piping retested.
- D. Interior non-pressure piping such as waste and vent systems, shall be tested by means of a water test, such that the minimum test pressure is a 10 foot head of water, except for uppermost 10 feet of the system. System shall demonstrate ability to hold such head conditions for a period of 30 minutes. Joints shall be physically inspected for leaks during test periods.
- E. Exterior piping shall be tested in accordance with the sections in Division 2 pertaining to that particular type of pipe ie: water main, sewer, etc.

-05- CLEANING

A. Domestic Water Piping:

1. Before placing in service, all domestic hot and cold water piping shall be flushed and chlorinated. The method used shall be one of the methods set forth in AWWA Standard C651-14, "Disinfecting Water Mains".

B. Hot Water Heating Piping:

1. Clean system with a solution of one of the following, or as recommended by the manufacturer:
 - Trisodium phosphate: one pound for each 50 gallons in the system;
 - Sodium carbonate: one pound for each 30 gallons in the system;
 - Sodium hydroxide: one pound for each 50 gallons in the system.
2. Fill, vent, and circulate for a period of eight hours allowing temperature to reach design temperature. Drain, clean strainers, and refill with fresh water, if applicable. The system shall again be operated at design temperature for four hours and a sample of water from each system shall be tested with pH paper. The paper shall indicate a pH of 7 or higher. Sampling and testing shall be done in the presence of the ENGINEER, and results shall be to his satisfaction. Additional cleaner shall be added, if necessary, to obtain a pH reading between 7 and 8. Clean strainers and boiler fittings.

C. Compressed Air Piping:

1. Blow clear of chips and scale with 100 psi air.

D. Process Piping (Non-Potable Water):

1. Flush pipelines with clear water to achieve a clean piping system clear of all debris, rust, and dirt.

END OF SECTION

DIVISION 15

MECHANICAL

15100 - BASIC MATERIALS AND METHODS

15111 - DUCTILE IRON PIPE

- INDEX:
- 01- General
 - 02- Flanged Pipe
 - 03- Pipe and Fitting Linings and Coatings

-01- GENERAL

- A. Ductile iron pipe shall be used where shown on the Drawings and indicated in the specifications. All ductile iron pipe and fittings shall conform to the physical requirements and specifications of the latest revisions of applicable American Water Works Association (AWWA) Standards and applicable standards of the American National Standards Institute (ANSI).
- B. All pipe in interior or exposed exterior locations shall be flanged-joint ductile iron pipe, if applicable.
- C. All pipe located in buried conditions shall be either mechanical joint or push-on joint ductile iron pipe unless otherwise specified, if applicable.
- D. Each pipe shall have the weight class or nominal thickness, casting period, manufacturer's mark, and the year the pipe was produced conspicuously painted or marked on it.

-02- FLANGED PIPE

- A. The pipe shall be rated for 250 psi working pressure and have a minimum wall thickness conforming to a Class 53 standard thickness in accordance with AWWA C-151.
- B. Flanged joints shall be in accordance with AWWA C-115. The joints shall be provided with 1/8-inch thick rubber gaskets in accordance with ASTM D1330 and hexagonal heavy semi-finished pattern nuts in accordance with ANSI B16.1. The flange shall have a 125 lb. template unless otherwise specified. All joints shall be assembled in accordance with the manufacturer's recommendations.

- C. The pipe shall extend through the flange and shall be fully faced by machine finishing in a single operation. The flange face shall be flat and perpendicular to the pipe centerline. Gasket build-up will not be permitted to compensate for partially faced flange surfaces.
- D. Flanged fittings may be either ductile iron or cast iron in accordance with AWWA C110 or ANSI A21.10 and A21.15. All fittings 12-inches and under shall have a 250 psi pressure rating and all fittings over 12-inches shall have a 150 psi pressure rating. All flange fittings shall be provided with 125 lb. templates in accordance with ANSI B16.1 unless otherwise specified.
- E. Flange coupling adapters shall be installed where indicated on the Drawings and shall be Dresser "Style 128", or an approved equal. All flanged coupling adapters shall be installed in accordance with the manufacturer's recommendations and be restrained with tie rods.

-03- MECHANICAL JOINT PIPE

- A. The pipe shall be rated for 250 psi working pressure and have a minimum wall thickness conforming to a Class 52 standard thickness in accordance with AWWA C151 or ANSI A21.51 unless otherwise specified in the special provisions or on the drawings.
- B. Mechanical joints shall be in accordance with AWWA C111 or ANSI A21.11. Mechanical joints shall be carefully assembled in accordance with the manufacturer's recommendations. Any leaking joint shall be disassembled, cleaned, and reassembled. Over tightening of the bolts to compensate for poor installation practice will not be permitted. All surfaces should be brushed with soapy water before placing the gasket on the pipe. Glands shall be ductile iron or high strength cast iron. All nuts and bolts shall be high strength, low alloy steel.
- C. Mechanical joint fittings may be either ductile iron or cast iron and shall meet the physical requirements of AWWA C110 or ANSI A21.10 and the joint requirements of AWWA C111 or ANSI A21.11 specifications. All fittings 12-inches and under shall have a 250 psi pressure rating and all fittings 14-inches, and larger shall have a 150 psi rating.

-04- PUSH-ON JOINT PIPE

- A. The pipe shall be rated for 250 psi working pressure and have a minimum wall thickness conforming to a Class 52 standard thickness in accordance with AWWA C151 or ANSI A21.51 unless otherwise specified in the special provisions or on the plans. All field cut pipe must be beveled at the outside edge of the cut to smooth all sharp corners.
- B. All push-on joints shall be in accordance with AWWA C111 or ANSI A21.11. Push-on joints shall be carefully assembled in accordance with the manufacturer's

recommendations. Gaskets shall be of a synthetic rubber. All joint surfaces shall be cleaned and lubricated with a non-toxic lubricant recommended by the pipe manufacturer for use in potable water and must be kept clean and stored in closed containers.

- C. Push-on joint fittings may be either ductile iron or cast iron, and shall meet the physical requirements of AWWA C110 or ANSI 21.10 and the joint requirements of AWWA C111 or ANSI 21.11 specifications. All fittings 12-inches and under shall have a 250 psi pressure rating, and all fittings 14-inches and over shall have a 150 psi pressure rating.
- D. Provide a cable bond conductor system for thawing purposes. System shall be rated at 600 amps sustained current.

-05- RESTRAINED PUSH-ON JOINT PIPE

- A. When river crossing, joint restraint for a 4-inch through 54-inch push-on joint pipe installation is required and indicated in the project Drawings or specifications, restrained push-on joint pipe and fittings utilizing ductile iron components shall be provided.
- B. Restrained joint pipe shall be ductile iron manufactured in accordance with the requirements of ANSI/AWWA C151/A21.51. Push-on joints for such pipe shall be in accordance with ANSI/AWWA C111/A21.11. Pipe thickness shall be designed in accordance with ANSI/AWWA C150/A21.50, and shall be based on laying conditions and internal pressures as stated in the project plans and specifications. Pipe shall be U.S. Pipe TR FLEX pipe or equal.
- C. Restrained joint fittings shall be ductile iron in accordance with applicable requirements of ANSI/AWWA C110/A21.10 with the exception of the manufacturer's proprietary design dimensions. Push-on joints for such fittings shall be in accordance with ANSI/AWWA C111/A21.11. Fittings shall be U.S. Pipe TR FLEX fittings or equal.
- D. Cement mortar lining and seal coating for pipe and fittings shall be in accordance with ANSI/ AWWA C104/A21.4. Bituminous outside coating shall be in accordance with ANSI/AWWA C151/A21.51 for pipe and ANSI/AWWA C110/A21.10 for fittings.
- E. Restrained push-on joints for pipe and fittings shall be designed for a water working pressure of 350 psi in sizes 4-inch through 24-inch, and 250 psi for sizes 30-inch through 54-inch.
- F. Restrained push-on joint pipe and fittings shall be capable of being deflected after assembly. Deflection shall not exceed the manufacturer's recommendations.

-06- PIPE AND FITTING LININGS AND COATINGS

- A. A cement mortar lining with a bituminous seal coat in accordance with AWWA C104 or ANSI A21.4 shall be provided in the interior of all flanged, mechanical joint or push-on pipe and fittings unless otherwise stated on the Drawings or specifications, or requires a special lining in accordance with the requirements of this section. The standard cement lining shall not be less than 1/16-inch thick on all pipe up to 12-inches in diameter, and 3/32-inch thick on all pipe 14-inches through 24-inches in diameter, if applicable.
- B. All air service piping and fittings shall be unlined and uncoated, if applicable.
- C. The exterior of all piping and fittings used in submerged or buried applications shall be shop coated with a bituminous coating not less than 1.0 mil thick, if applicable.
- D. The exterior of all piping and fittings used in interior or exposed applications shall be supplied without the bituminous coating, but shall have a shop coat of Tnemec Shop Primer 77 or similar coating by Mobil, PPG or equal, if applicable.

-07- POLYETHYLENE ENCASEMENT IN CORROSIVE SOILS

- A. The polyethylene wrap shall meet all requirements for material and installation of the AWWA C-105 or ANSI 21.5 specification. The wrap shall be either flat polyethylene sheets or polyethylene tube of adequate size to meet the requirements of AWWA C-105 and to adequately fit the pipe. All polyethylene film shall be 8.0 mil thick, if applicable.
- B. All valves, crosses, tees, service connections, and specialty items shall be wrapped with flat sheets and adequately taped. The wrap shall extend 2 feet beyond the main on service connections to protect the pipe. All rips or punctures shall be repaired with tape or by rewrapping that area with polyethylene film, if applicable.
- C. The use of polyethylene encasement shall be as indicated on the Drawings and/or the specifications. Its use will be designated by the ENGINEER in areas of corrosive soil and in areas so recommended by a soil survey report, if applicable.

END OF SECTION

DIVISION 15

MECHANICAL

15100 - BASIC MATERIALS AND METHODS

15112 - HIGH DENSITY POLYETHYLENE

- INDEX:
- 01- General
 - 02- Polyethylene Pipe
 - 03- Pipe Joinings
 - 04- Joining, Terminating, or Adapting by Mechanical Means

-01- GENERAL

- A. The pipes and fittings shall be made of high density polyethylene resins classified as Type III, Category 5, Grade P34 (pipe designation PE 3406 defined per ASTM D3035-15). In addition, the material shall comply with the following:
1. Be of virgin quality.
 2. Have a melt flow of less than 5.0 gms/10 min. determined by ASTM D1238-13.
 3. Exceed 200 hours on Environmental Stress Crack Resistance as determined by ASTM D1693-15, Condition B.
 4. Have a minimum specific based resin density of .945 g/cc.
 5. The polyethylene resin shall contain anti-oxidants and be stabilized with carbon black against ultra-violet degradation to provide protection during processing and subsequent weather exposure.

-02- POLYETHYLENE PIPE

- A. The pipe shall be homogeneous throughout and be free of visible cracks, holes, foreign material, blisters, or other deleterious faults.
- B. The polyethylene pipe shall have a minimum manufacturer's recommended hydrostatic design stress rating of 710 psi at 73.4 ° F. based on a material with a 1420 psi design basis determined in accordance with ASTM D2837-13.

- C. All fittings shall be fabricated and molded with high density polyethylene in accordance with Section A on material unless otherwise approved by the ENGINEER.
- D. The supplier shall provide polyethylene pipe with a permanently imprinted manufacturer's brand name, pipe size, and other identification for tracing pipe quality to raw material source and pressure rating.

-03- PIPE JOININGS

- A. The pipe is to be joined by thermal butt fusion joints or electrofusion couplers. All fusion equipment and tools used must be either supplied or approved for use by the pipe supplier. All fusion operations shall be done by persons qualified and trained by personnel of the pipe supplier. Factory supervision and training of personnel by the pipe supplier shall be included in the unit price per lineal foot of pipe as specified.
- B. The heat fusion machine shall have hydraulic pressure control for fusing two pipe ends together. The machine shall be capable of joining pipes in the field. The machine shall have a facing unit to trim irregularities from the pipe ends. The heating plate on the fusion machine shall be electrically heated and thermostatically controlled and shall be monitored. Heat fusion techniques and procedures shall conform to the pipe manufacturer's recommendations.
- C. Joint strength must be equal to that of adjacent pipe as demonstrated by tensile test. In addition, results of tensile impact testing of joining should indicate a ductile rather than a brittle fracture. External appearance of fusion bead should be smooth with a uniform juncture groove..
- D. Shipping, handling, storage, and job site preparations for the pipe shall be in accordance with the pipe manufacturer's recommendations.
- E. Threaded or solvent-cement joints and connections are not permitted.

-04- JOINING, TERMINATING, OR ADAPTING BY MECHANICAL MEANS

- A. Installation lengths shall be joined by the use of flange adapters as specifically stated in the project specifications.
- B. The polyethylene pipe shall be connected to systems or fittings of other materials by means of an assembly consisting of a polyethylene flange adapter butt-fused to the pipe; a backup ring of either cast iron, steel, or high silica aluminum alloy made to ASA B-16.1 dimensional standards (with modified pressure ratings); bolts of compatible material (insulated from the fittings where necessary); and a gasket of reinforced black rubber;

rubber compound or other material approved by the ENGINEER cut to fit the joint. In all cases, the bolts shall be drawn up evenly and in line.

- C. Termination to valves or fittings such as tees, bends, etc. made of other materials shall be of the flange assemblies of paragraphs 1 and 2. The pipe adjacent to these joints and to joints themselves must be rigidly supported for a distance of one pipe diameter or 1 foot, whichever is the greater, beyond the flange assembly and in accordance with the details shown on the plans.
- D. Appurtenances must be placed on their foundations, unsupported by the pipe, in accordance with the details.

END OF SECTION

DIVISION 15

MECHANICAL

15100 - BASIC MATERIALS AND METHODS

15113 - RESILIENT SEATED GATE VALVES

INDEX: -01- Exterior--Below Ground Valves

-01- GENERAL

- A. Any valves buried in the ground shall be manufactured in accordance with AWWA Specification C509. Valves 12-inches and smaller shall be designed for 200 psi working pressure. Buried valves shall have mechanical joint ends and shall have clear waterway equal to the full nominal diameter of the valve. Valves shall have non-rising stems, opening by turning counterclockwise and provided with a 2-inch square nut with arrow cast in metal to indicate direction of opening.
- B. Stuffing boxes shall be O-ring with two rings located in the stem above the thrust collar.
- C. Body, cover bolts, and nuts shall meet specification ASTM A-307 rustproofed. Stems shall be in full conformance with AWWA specifications with cast integral stem collar. Bronze stem collar shall conform to ASTM B584. Stem nuts shall be made independent of wedges and shall be made of solid bronze conforming to ASTM B-62.
- D. Valves shall have resilient seated gates.
- E. Valve boxes shall be designed for use with nut operated valves installed underground. Boxes shall be cast iron, screw type consisting of a top section, bottom section, and cover. The assembly shall be of length as required by grade. Furnish cast iron extensions, if required. Boxes shall fit all sizes of valves so fitted.
- F. Where ground elevations are such that valve boxes cannot be used, the CONTRACTOR shall build approved manholes with cast iron frames and covers and steps.
- G. If valves have gear operators, but the operators are not buried construction gear operators with adapter and nut for manual operation with wrench through valve box, valve manholes shall be constructed.

END OF SECTION

DIVISION 15

MECHANICAL

15100 - BASIC MATERIALS AND METHODS

15114 - BUTTERFLY VALVES

INDEX: -01- General
 -02- Valve Construction

-01- GENERAL

- A. The CONTRACTOR shall number all interior valves and place a metal tag with the valve number on each valve. The CONTRACTOR shall furnish the OWNER with a chart listing each valve by number and name of function.
- B. Valve boxes on exterior buried valves shall be designed for use with nut operated valves. Boxes shall be cast iron, screw type, consisting of a top section, bottom section, and cover. The assembly shall be of length as required by grades. Furnish cast iron extensions, if required. Boxes shall fit all sizes of valves so fitted.
- C. Where ground elevations are such that valve boxes cannot be used, the CONTRACTOR shall build ENGINEER approved manholes with cast iron frames, covers, and steps.

-02- VALVE CONSTRUCTION

- A. All butterfly valves shall be of the tight closing rubber seat-type with seats bonded or mechanically retained into the valve body. Valves shall have a full uninterrupted 360° sealing surface and shall be bubble-tight at rated pressure in both directions. Valves shall be designed for use in either throttling application or for very infrequent operation after extended periods of inactivity. Valves shall be in full compliance with AWWA specification C-504, Class 150B, as specified herein.
- B. Valve bodies shall be of ASTM A126 Class B cast iron. Bodies of the flangeless design shall be provided with at least four (4) flange bolt guides to center the valve in the pipeline. Lug body valves shall have a retained seat and shall provide tight shutoff to the full rating of the valve on dead-end service or isolation service without the use of downstream flanges. Valve seats not molded into the body shall be molded to a rigid non-corrosive reinforcing ring.
- C. Valves shall be of the offset disc design allowing a full annular seating surface uninterrupted by the shaft. Disc-to-shaft connection shall be accomplished without

upstream/downstream holes through the disc, and be of a locked-type allowing zero backlash.

- D. All valve discs shall be streamlined and present the smallest profile possible consistent with the structural requirements of the pressure class. They shall be of offset design and material composition being ductile iron. Disc sealing edge shall have a continuous interrupted 360° sealing surface of Type 304 stainless steel.
- E. Valve shafts shall be of Type 304 stainless steel. Shaft design shall be of through or stub-type construction with at least 1½ shaft diameter engagement into the disc. Shaft to disc connection shall be a rigid, non-slip type connection.
- F. Valve seats shall be Buna N material bonded or mechanically retained to the valve body, or approved equal.
- G. Valve bearings shall be self-lubricating and non-corrosive and shall have a significant difference in hardness from the valve shaft.
- H. All valve actuators shall be designed as an integral part of the valve and shall meet or exceed all the requirements of AWWA C-504. Actuators shall be of rack and pinion or traveling nut design. All moving penetrations into the actuator shall have corrosion resistant surfaces in contact with the housing seals. All actuator types, in a given size, to be interchangeable and fastened to valves with readily accessible external bolts. All actuators must fit on the valves they are designed to operate in any mounted position or rotational direction without any special prior preparation to either the valve or the actuator.
- I. Unless otherwise noted, interior valve actuators shall be of the hand wheel type and have adjustable open and closed position stops.

END OF SECTION

DIVISION 15

MECHANICAL

15100 - BASIC MATERIALS AND METHODS

15115 - SWING CHECK VALVES

INDEX: -01- General
 -02- Valve Construction

-01- GENERAL

A. The CONTRACTOR shall number all valves and place a metal tag with the valve number on each valve. The CONTRACTOR shall furnish the OWNER with a chart listing each valve by number and name of function.

-02- VALVE CONSTRUCTION

A. Check valves shall be of the “swing check” type equipped with an outside spring and lever for valves 4-inches and larger. These valves shall be suitable for sewage and gas lines, and shall also be suitable for operation in the vertical or horizontal positions. These valves shall be rated for pressures of at least 150 psi.

B. Valves shall be full opening and designed with an ample safety factor. For easy maintenance, all working parts shall be removable through the top of the valve by simply unbolting and lifting the cover. All working parts shall be of bronze or bronze mounted, and shall be standardized and interchangeable.

C. The body shall be iron bronze mounted of sturdy proportions to provide protection against damage. The body shall be provided with bases that may be tapped for bypass valves or drains.

D. The gate and gate rings on valves 6-inches and smaller shall be solid bronze. All other sizes shall have gates of high strength cast iron with a bronze gate ring rolled into grooves under such pressure that the gate and gate ring becomes one inseparable unit. After fitting, the gate rings shall be carefully machined to provide a watertight surface. Gate shall be connected to the hinge in such a manner as to permit the gate to rotate, distributing seat wear and assuring accurate alignment of the gate with the body seat.

E. The seat ring shall be bronze, back-faced, and screwed into an accurately machined body.

- F. The hinge shall be solid bronze and “Y” shaped to provide maximum gate support. Internal design shall be such that the gate is prevented from sticking in the open position

END OF SECTION

DIVISION 15

MECHANICAL

15100 - BASIC MATERIALS AND METHODS

15120 - PIPING SPECIALTIES

- INDEX:
- 01- Sleeves and Plates
 - 02- Cleanouts
 - 03- Flashing for Roof Pipe Vents and Roof Drains
 - 04- Fire Stop Protection
 - 05- Installation

-01- SLEEVES AND PLATES

- A. Sleeves shall be installed by the CONTRACTOR wherever pipes pass through wood, concrete, or masonry slabs, walls, floors, etc. Sleeves in concrete shall be standard full weight steep pipe. In wood or plaster, they shall be No. 26 gauge galvanized steel. Sleeves shall be flush with finished walls and ceilings, and extend 1/2-inches above finished floors. Sleeves for bare pipe shall be two pipe sizes larger than the pipe, and for insulated pipe they shall be large enough to pass the insulation.
- B. Provide wall and floor plates where pipes pass through finished walls and floors, sized to fit the pipe. Floor plates shall be molded rubber sized to cover the sleeve, and wall plates chrome plated brass with set screw.
- C. Furnish and install wall penetration closures where indicated on the Drawings, at all exterior wall locations. Continuously fill the annular space between the pipe and wall sleeve. The closure shall consist of interlocking synthetic rubber links connected with pressure plates and bolt and nut assemblies. Closure shall be equal to Link-Seal or approved equal.
- D. Furnish and install fire rated wall penetration closures where indicated on the plans. The closure shall be constructed of completely inorganic materials, with steel pressure plates and fire resistance silicone rubber sealing elements.

-02- CLEANOUTS

- A. Furnish and install all cleanouts as shown on the Drawings and/or required, if applicable. Cleanouts shall be installed at floor level in tops of 1/8th bends which shall have been extended

by means of straight pieces of pipe from “Ys” in under-floor piping at each change of direction and in straight runs not more than 50 feet apart.

- B. Floor level cleanouts for use in carpeted areas shall be 1¼-inch diameter stainless steel with carpet cleanout marker.
- C. Floor level cleanouts for use in vinyl tiled areas shall have square frames and round nickel bronze covers, brass or bronze internal plugs with recessed cover, and vandal-proof screws.
- D. Floor level cleanouts for use in quarry tiled areas shall have square frames and round nickel bronze covers, brass or bronze internal plugs, and vandal-proof screws.
- E. Floor level cleanouts for use in terrazzo areas shall have round nikaloy top, recessed terrazzo cover and vandal-proof screws.
- F. Cleanouts enclosed at the base of stacks or end of runs shall have a cleanout tee with counter-sunk brass plug, vandal-proof securing screw, and a round stainless steel access cover.
- G. Exterior cleanouts shall be enclosed in a cast nikaloy frame with vandal-proof removable cover.
- H. General purpose cleanouts shall be brass counter-sunk plugs.
- I. Floor cleanouts under carpet shall have carpet markers.
- J. Exterior cleanouts shall be cast iron construction, gas-tight with vandal-proof screws with concrete ring in grass areas.

-03- FLASHING FOR ROOF PIPE VENTS AND ROOF DRAINS

- A. Flashing shall be provided on all pipes passing through roofs. All flashing shall extend up the pipe at least 6 inches, and along the roof not less than 12 inches.

-04- FIRE STOP PROTECTION

- A. Furnish and install fire stop assemblies at all pipe penetrations at fire rated floors and walls with a self-sealing intumescent material. The fire resistive material shall volumetrically expand 8 to 10 times its original size when exposed to 250° F. The assembly shall consist of caulking or wrap with a restricting collar enclosing the system. The fire resistive material shall be UL classified and ASTM tested, approved equal to 3M fire barrier. All installation shall be in strict accordance to the manufacturer’s recommendations.

-05- INSTALLATION

- A. Installation shall be performed in a neat workman-like manner.
- B. Installation shall be complete and in accordance with the manufacturer's recommendations and meet all federal, state, and local codes having jurisdiction.

END OF SECTION

DIVISION 15

MECHANICAL

15250 - INSULATION

15250 - THERMAL INSULATION

- INDEX:
- 01- General
 - 02- Submittals
 - 03- Pipe Insulation
 - 04- Tank Insulation
 - 05- Duct Insulation
 - 06- Duct Lining
 - 07- Kitchen Hood Exhaust Duct Insulation

-01- GENERAL

A. Scope of Work

1. Installation shall be construed to mean (but not be limited to) purchasing, receiving, transporting, storing, fabricating, applying, inspecting, and proving complete insulation system is in accordance with MICA National Standards, current edition, and those technical specifications for the individual insulation systems under the contract.
2. The insulation CONTRACTOR shall include all applicable federal, state, and local taxes, fees, and charges relating to the installation work, inspection, and activities under this contract.
3. The CONTRACTOR shall provide all tools, equipment, staging, platforms, scaffolding, and other devices required for installation of the complete insulation system, and shall maintain these items in a safe operating condition.

B. Materials and Products

1. Material furnished under this specification shall be standard cataloged products, new and commercially available, suitable for service requiring high performance and reliability with low maintenance and free of all defects.
2. Materials include insulation materials, accessories (staples, bands, mesh, wire, clips, pins, tape, anchors, corner angles, and similar recommended accessories),

and compounds (cements, adhesives, coatings, sealers, protective finishes, and similar items) recommended by the manufacturer for the applications indicated.

3. The CONTRACTOR shall supply materials which meet the OWNER'S requirements with respect to the design criteria, thermal conductivity, and standards.
4. The CONTRACTOR shall warrant that materials furnished and installed be free of defects for a period of one (1) year from the time the system is completed.
5. If a defect occurs in materials, workmanship, or application within the stated time, the CONTRACTOR shall promptly repair or replace the defect. Damages caused by others shall be repaired at the expense of the damaging party.
6. All mastics, sealants, and adhesives shall be UL listed. Insulation shall composite (insulation, jacket, and enclosure) Flame Hazard Classification not exceeding Flame Spread 25, Smoke Developed 50, and Fuel Contributed 50 when tested in accordance with procedures of UL Standard 723, and shall meet requirements of ASTM 84 and NFPA 255.
7. All accessories and materials (i.e., coatings, adhesives, sealers, etc.) Are to be shipped to the job site in marked, unopened containers as received from the manufacturer.
8. The CONTRACTOR shall be solely responsible for his own material take-off, purchasing, methods and procedures, tools, and equipment and field safety program.

C. Execution

1. General
 - a. All insulation work shall be performed by skilled personnel regularly engaged in the insulation trade.
 - b. The CONTRACTOR shall be responsible for coordination and cooperation with the OWNER and other trades so that the installation is performed with minimum interference and conflict.
 - c. The final appearance of the insulation work shall be a neat, workmanlike, and attractive insulation system.
 - d. Progressive testing of systems to be insulated shall have been completed, inspected, and approved by OWNER'S representative before insulation is applied.

- e. Insulation shall not be applied until all surfaces are clean, dry, free of dirt, dust, grease, frost, moisture, and other imperfections.
- f. Suitable application temperature and conditions shall be provided by others.
- g. Insulation shall be protected from moisture and weather during storage and installation. Applied insulation which has become wet shall be thoroughly dried before it is sealed or jacketed.
- h. The CONTRACTOR shall not arc-weld brackets, clips, or other devices to ASME coded pressure vessels or piping. Insulation pins or studs shall be as specified and installed in accordance with acceptable standards.
- i. Insulation, fabric, and jacketing shall be protected from mechanical damage during construction. Damage by the insulator shall be repaired without cost to the OWNER. Damage by others shall be reported in writing to the purchaser.
- j. CONTRACTOR is responsible for proper material storage at the work site.
- k. Work performed prior to receipt of approved documents or submittals which later proves to be incorrect or inappropriate shall be promptly replaced by the CONTRACTOR without cost to the purchaser.
- l. Insulation shall not be installed until adequate access and clearances at control mechanisms, dampers, sleeves, columns, and walls have been provided.
- m. All insulation at handholes, access doors, or other openings and adjacent to flanges and valves shall be neatly finished where exposed to view.
- n. Where insulated pipes or ducts pass through sleeves or openings, the full specified thickness of the insulation shall pass through the sleeve or opening.
- o. Vapor barriers shall be continuous through sleeves, hangers, etc. If pierced, vapor barriers shall be covered and suitably resealed.

2. Owners Acceptance

- a. All materials, accessories, and methods of installation and fabrication are subject to the OWNER'S inspection and approval during any phase of the work.

3. Housekeeping
 - a. The CONTRACTOR shall prevent the accumulation of insulation debris in the buildings and on the premises of the OWNER.
4. Safety Program
 - a. The CONTRACTOR shall be responsible for his own safety program at the work site and shall provide instruction on safe practices for his workers assigned to the project.
5. Contractor's Responsibilities
 - a. The CONTRACTOR shall familiarize himself with the progress and execution of the job and notify the proper parties of interferences and any problems with the proper installation of his materials.

-02- SUBMITTALS

- A. In compliance with requirements established with these specifications, provide SHOP DRAWINGS on all types of insulation being used and specify the application of each type.

-03- PIPE INSULATION

- A. Starting from connections to equipment, all piping systems listed in paragraph "C" shall be insulated, including supply mains, branches, flanges, unions, valves, fittings, accessories, etc., whether concealed or exposed.
- B. All piping shall be covered with glass fiber pipe insulation with factory applied white dual temperature foil-scrim-Kraft vapor barrier jacket consisting of 0.001" aluminum foil laminated with a flame retardant self-extinguishing adhesive to a layer of 35 lb. flame resistant embossed white Kraft reinforced with glass yarn mesh.
 1. Insulation shall be not less than 3 lb. Density with K factor of .23 at 250° F. mean temperature. Vapor barrier shall have water vapor permeability of less than .02 perms.
 2. All longitudinal seams shall have at least 1½-inch lap sealed with white vapor barrier lap adhesive, or may have self-sealing lap. End joints shall be 3-inch or 4-inch wide factory furnished vapor barrier strips, applied with the lap cement. Ends of pipe insulation shall be sealed off with fire resistive mastic at flanges, valves, and fittings.

3. Flanges, valves, and fittings shall be insulated using molded or fabricated insulation of same thickness as that of adjoining pipe securely fastened in place for fittings 4-inches and larger, and plastic insulating cement on smaller fittings finished off with spiral wrap of waterproof, vaporproof, flame resistant, self-adhesive cloth backed tape or premolded PVC fitting covers and jacketing. Stapling of barrier will not be accepted.
4. All runouts to units may be covered with Armaflex, or approved equal, provided it is slipped over the lines and is not cut lengthwise to apply the same, and shall be installed according to manufacturer's recommendations.

C. Thickness of Pipe Insulation Shall be as Follows:

<i>SYSTEM</i>	<i>PIPE SIZE</i>	<i>INSULATION THICKNESS</i>
Make Up Water	2" and under	1/2"
Domestic Cold Water	runouts	1/2"
	1" and under	1/2"
	over 1"	1"
Domestic Hot Water	runouts	1/2"
	1-1/4" and under	1/2"
	1-1/2" to 2"	1"
	over 2"	1-1/2"
Hot Water Supply	2" and under	1"
	over 2"	1-1/2"
Hot Water Return	2" and under	1"
	over 2"	1-1/2"
High Pressure Steam	runouts up to 2"	1-1/2"
	2" and under	2-1/2"
	2-1/2" to 4"	3"
	5" and over	3-1/2"
Medium Pressure St.	runouts up to 2"	1-1/2"
	1" and under	2-1/2"
	1-1/4" to 4"	3"
	5" and over	3-1/2"
Low Pressure Steam	runouts up to 2"	1"
	2" and under	1-1/2"
	2-1/2" and over	2"

Condensate Return	runouts up to 2"	1"
	1" and under	1"
	1-1/4" to 2"	1-1/2"
	1/2" and over	2"
Refrigerant Suction	runouts up to 2"	1"
	1" and under	1"
	1-1/4" and over	1-1/2"
Chilled Water Supply	runouts up to 2"	1/2"
	1" and under	1/2"
	1-1/2" and over	1"
Chilled Water Return	runouts up to 2"	1/2"
	1" and under	1/2"
	1-1/2" and over	1"
Roof Drain Piping Above Ceiling	All	1"

- D. Insulation exposed to the outdoor weather shall be totally covered with a weather protective jacket and using solvent welding adhesive producing a totally sealed system.

-04- TANK INSULATION

- A. Condensate tank shall be insulated with a semi-rigid fiber-board.
- B. Insulation shall be mechanically fastened.

-05- DUCT INSULATION

- A. All supply air ductwork above ceiling beginning at the Packaged Roof Top Unit and ending at the Supply Air Diffusers shall be insulated with a commercial grade faced duct wrap insulation, 1½-inch nominal thickness.
- B. Insulation shall be applied to cover all exterior surfaces of ductwork and sealed tightly to prevent leakage.
- C. Insulation shall be glass fiber type, factory laminated to a reinforced foil Kraft (FRK) vapor barrier facing with a 2-inch stapling and taping flange. Insulation shall have a thermal conductivity of not more than 0.25 at 75° F. mean temperature. Vapor barrier shall have a water vapor permeability of not more than 0.02 perms.
- D. All joints shall be sealed with a non-combustible vapor barrier pressure sensitive adhesive tape to form a complete vapor-tight system.

-06- DUCT LINING

- A. Interior duct lining shall be provided in all return air ductwork beginning at the Packaged Roof Top Units and ending 10'-0" downstream from the units.
- B. Interior duct lining shall be provided in all exhaust air ductwork beginning at the Exhaust Fans and ending after the first branch take-off, or 10'-0" downstream from the fan.
- C. Duct lining shall be 1-inch thick rigid glass fiber-type suitable for interior duct application and shall meet all local, state, and federal codes.
- D. Insulation shall be adhered to all interior surfaces of ducts with 100% coverage of fire retardant adhesive, UL listed and labeled, and mechanical fasteners consisting of metal clips, sheet metal screws and washers, or pins and caps spaced in accordance with SMACNA Duct Liner Application Standard. The smooth, heavy density surface shall face the air stream. Liner may be supplied before bracing, but all joints shall be at the corners and lapped. Edges of insulation that will butt shall be firmly butted and tightly sealed with the adhesive. Liner shall be accurately cut and ends thoroughly coated with adhesive to that when the duct section is installed. The liner shall make a firmly butted and tightly sealed joint to prevent moving air from getting behind the insulation or weakening the bond of the insulation with the metal surface. Coat cap of fasteners with a brush coat of the fire retardant adhesive.
- E. Materials and installation shall comply with Duct Liner Application Standards as published by Sheet Metal and Air Conditioning Contractors Association, Inc.

END OF SECTION

DIVISION 15

MECHANICAL

15400 -PLUMBING

15401 - PLUMBING AND PIPING SYSTEMS

- INDEX:
- 01- General
 - 02- Submittals
 - 03- Water System
 - 04- Sewer and Drainage Piping Systems
 - 05- Gas Piping Systems
 - 06- Air Piping Systems
 - 07- Cleaning and Operating System
 - 08- Installation

-01- GENERAL

- A. This section shall include all plumbing work required for this project as specified and/or shown on the Drawings. All piping and accessory items shall be provided as required to provide complete operating systems as described below. The materials to be used shall meet or exceed the State Plumbing Code, State Heating and Ventilating Code, and Applicable Standards of ASHRAE, ASTM, AWWA, ANSI, ASME, and Federal Standards.

-02- SUBMITTALS

- A. In compliance with requirements established within these specifications, provide Shop Drawings on all equipment, devices, and accessories specified in this section.

-03- WATER SYSTEM

- A. General

1. Furnish and install a new water line from the water main as indicated on the Drawings. Installation shall include main tap, curb stop, meter, remote read out, and meter isolation valves, if applicable. Pay all fees as required by the local water department for the installation of the water service.

2. Run mains in building as shown on the Drawings with connections to fixtures and equipment as indicated by Section 15450 and as shown on the Drawings.
3. Provide returns from end of each hot and tempered water main branch sized as indicated running back through recirculating pumps, returning to heater. Provide balancing valves on each return branch, if applicable.

B. Water Pipe and Fittings

1. Copper Pipe

- a. All piping in the building shall be copper tube Type "L" hard with soldered fittings using solder free of lead, antimony, and cadmium, unless indicated otherwise on the Drawings.
- b. Underground piping up to 3-inches shall be Type "K" conforming to ASTM B88; continuous coil type shall be used where possible to eliminate joints below grade, unless indicated otherwise on the Drawings.
- c. All copper pipe joints shall be carefully made in full conformance with manufacturer's recommendations, and special care shall be taken with any concealed pipes. Pipes shall be cut with appropriate tools and equipment. All burrs and slivers shall be removed from outside of pipe, and inside of fitting cleaned until it is bright and shiny. Apply flux to outside of pipe and inside of fitting and apply heat and solder until entire joint is penetrated and filled. Piping system shall be pressure tested. Where leaks occur, pipe shall be taken down and completely cleaned and re-soldered.
- d. Fittings shall be cast copper meeting ANSI B-16.18 or wrought copper meeting ANSI B-16.22, soldered except couplings may be copper pipe.

2. Ductile Iron pipe

- a. Underground piping 4-inches and larger shall be ductile iron, bell pattern, push-on joints conforming to ANSI A21.51 and AWWA C151 with molded rubber gaskets. Fittings shall be mechanical joint cast iron-type rated at 150 psi, mechanically bolted with gasket and glands.
- b. Underground main water supply line shall be installed at a minimum depth of 84-inches to top of pipe and shall be secured with thrust blocks and/or thrust collars. Blocks and collars shall bear against undisturbed soil and poured with 3000 lb. test concrete. Blocks and collars shall be installed at all pipe direction changes, reducers, dead ends, and valves. Thrust blocks shall be sized as recommended by pipe manufacturer. Mechanical restraints recommended by the

pipe manufacturer and approved by the ENGINEER may be used in lieu of thrust blocks.

c. Tapping sleeve shall be cast iron Class 125 mechanical joints at 200 psi working pressure and conventional packing, non-rising stem tapping valve with curb box.

3. Polyethylene Tubing

a. SDR 9, PE-3408 conforming to AWWA C901 and NSF/ANSI No. 14.

b. Copper tubing size (CTS) 200 psi.

4. PEX Tubing and Fittings

a. SDR 9 PEX tubing conforming to ASTM F877.

b. Fittings conforming to ASTM F1807, metal-insert type with copper or stainless steel crimp rings and matching PEX tube dimensions.

c. Manifold: Multiple-outlet, plastic or corrosion resistant metal assembly complying with ASTM F877, with plastic or corrosion resistant metal valve for each outlet.

5. CPVC Pipe

a. CPVC SDR 11 pipe conforming to ASTM D2846 for pipe and fittings.

6. PVC Pipe

a. PVC Schedule 40 and 80 pipe conforming to ASTM D1785.

b. PVC Schedule 40 fittings conforming to ASTM D2466.

7. All connections between pipes of dissimilar metals and piping connections to equipment of dissimilar metals shall be made with insulating couplings or dielectric pipe fittings.

C. Manifold Block and Piping from Manifold to Fixtures

1. Manifold blocks and the piping system downstream from these blocks shall be equivalent to Vanguard Engineered Piping Systems “Manabloc Modular Manifold Plumbing System” with Vanguard Vanex Series SDR9 PEX cross-linked polyethylene tubing, or approved equal.

2. Provide shut-off valves on hot and cold supply lines to each block and at each fixture.
3. Follow manufacturer's recommendations for installation.

D. Installation

1. All water piping shall be graded so as to be drained, and suitable valves provided for this purpose.
2. Shut-off valves shall be provided in the main branches to each group of fixtures and on the service to each individual fixture.
3. Air chambers not less than 18-inches high shall be installed in a vertical position at the ends of all branches to hot and cold water supply mains to fixtures of the same size as the branch mains. Shock arresters may be used at the CONTRACTOR'S option.
4. Hot and cold water supplies to each restroom shall be provided with shock arresters designed and sized as recommended by the manufacturer to eliminate water hammer.
5. All exposed supply pipes and fittings at fixtures shall be standard pipe size brass pipe, annealed, seamless, drawn, finished, and chrome plated; fittings to be cast brass, finished, and chrome plated. Supply lines to all hanging fixtures shall be from the wall, except fixtures located on outside walls shall be supplied from floor. All supplies from cold water main to water closets shall be from wall.
6. Fixture supplies shall be as indicated in Section 15450 of this Specification. Install valves on all branches as indicated on Drawings. All water supplies to fixtures shall be valved with stop cock on supply line to the fixture. Adjacent fixtures, unless otherwise specified, may share the same shut-off valve except water closets, which shall have a separate shut-off ahead of the flush valves.
7. All water lines shall be insulated as called for by Section 15250 and as indicated on the Drawings.
8. All domestic water service under this contract shall be tested, cleaned, and disinfected in accordance with Section 15110.

E. Thermostatic Mixing Valves

1. Provide mixing valve at domestic hot water heater to provide not more than 115° F. water, composition disc, valve stem lubricator, two-ply thermostatic bellows, capillary, bulb, and well 55° to 115° F. range set 110° F.

F. Backflow Preventers

1. Provide reduced principle backflow preventer in water supply to hot water heater where shown.
2. Provide complete assembly, including strainer with test cock, backflow preventer with three test cocks, and gate valves all bronze construction with stainless steel internal parts, union connections.

-04- SEWER AND DRAINAGE PIPING SYSTEMS

A. Soil and Waste Pipe and Fittings

1. All roof drain pipe and fittings, above and below ground, shall be Schedule 40 PVC DWV, ASTM D2665. Joints shall be fused with solvent cement ASTM D2564. All joints shall be cleaned with solvents recommended by the manufacturer.
2. All under and above floor soil, sewers and vents, piping, and fittings shall be Schedule 40 PVC DWV, ASTM D2665. All joints shall be cleaned with solvents recommended by the manufacturer.
3. Plumbing drains outside the building shall be Schedule 40 PVC DWV, ASTM D2665 drainage pipe.

B. Conductors

1. All inside conductors, except as otherwise specified, shall be PVC pipe of sizes shown, sealed watertight, and supported so as to provide for contraction, expansion, and settlement of the building. All connections between outlet at roof sump and conductors shall be made and caulked watertight. Install all inside conductors and cooperate with the Roofing Division Contractor to properly install connections to the roof drains or sumps.
2. Roof drains shall be PVC pipe with large sump and flange, bottom outlet, flashing clamps integral with gravel stops, deck clamp, and poly-propylene locking.

C. Flashing

1. Provide flashing around all vent pipes made of seamless lead sheets, weighing 4 pounds per square foot, or approved equal. Flash-up over top of vent pipes with proper extension out onto roof.
2. All flashing shall be made watertight.

D. Installation

1. Check all levels before starting any sewers.
2. Interior waste lines shall be run in practical alignment and at a uniform grade of not less than 1/4-inch per foot where possible, but in no case less than 1/8-inch to the foot.
3. Exterior underground waste lines shall pitch not less than 1/8-inch per foot.
4. Cleanouts shall be installed:
 - a. at the base of each down spout;
 - b. at intervals not to exceed 75 feet on horizontal sewers;
 - c. at the point the sewer(s) leave the building;
 - d. and where shown on the Drawings.

-05- GAS PIPING SYSTEM

A. General

1. Furnish and install all gas piping from a new service by the Gas Company. Make all arrangements necessary with the gas company for the installation of this new gas service into the building, including provisions for setting a new gas meter as shown on the plans and pay all costs involved. Installation of piping and equipment shall be in accordance to NFPA-54 National Fuel Gas Code.
2. All joints between dissimilar metals shall be isolated with dielectric fittings.
3. Exterior underground piping shall be black steel Schedule 40 pipe and fittings coated and protected against corrosion as recommended in AWWA C203-86 (coal tar coated pipe protection for steel pipe) or polyethylene pipe and fittings manufactured in accordance to ASTM D2513, Type III, Grade 3 with butt fusion joint connections.

C. Valves

1. Furnish and install gas cocks where shown or required. Cocks for pipe sized up to 3/4-inch shall be screwed, 125#, bronze body, bronze trim, square head equal to Crane 250 or Walworth 590. Cocks for pipe sizes larger shall be screwed 175# iron body, lubricated, and wrench operated.

D. Testing

1. Gas lines shall be tested at 100 psi with Nitrogen or inert gas (not oxygen). Tests shall be made before making final connections to the equipment or allowing gas to enter the pipes. Tests shall be made in the presence of a representative of the OWNER and the Gas Company. Notify the OWNER and the Gas Company when such tests are to be made. Test pressure, valved off, shall not drop more than 2 percent (2%) in a 24-hour period. Gas line shall be purged slowly to the outside through a hose.

E. Gas Regulator

1. Gas pressure regulator shall be spring load type, manufactured in accordance to ANSI B31.8, die cast aluminum, diaphragm case, interchangeable diaphragm, internal relief valve, low pressure cut-off, Buna-N molded valve disc, and cast iron tee fitting with interchangeable brass orifice. Regulator shall be Rockwell Model 243, or approved equal.

F. Equipment Hookup

1. Hookup to gas fired equipment shall be with rigid steel pipe from the branch supply through a gas cock, dirt leg, union, and connecting nipple.
2. Gas appliances shall be connected with an AGA approved semi-rigid tubing from the branch supply through a gas cock +24-inches off finished floor.
3. Furnish and install gas regulator for any equipment that is not furnished with a pressure reduction device and requires low pressure operation, vent regulator to the exterior.

-06- AIR PIPING SYSTEMS

A. GENERAL

1. Furnish and install a complete compressed air piping system, including tie into existing compressed air system and valved tee connection for equipment hookup as indicated on the Drawings, if applicable.
2. Units shall be installed where shown on the Drawings and mounted in a neat workmanlike manner.

B. Piping

1. Piping shall be black steel Schedule 40 with 150 lb. malleable iron screwed fittings with unions or flanges at valves and equipment for piping 2-inches and smaller, and butt welded with flanges at valves and equipment over 2-inches.
2. All piping shall pitch down in direction of flow 1-inch in 60 feet. Provide valves at all low points and where necessary to collect condensate. Provide drip legs to 2-inch pipe, 18-inches long with a ½-inch globe blow off valve.

-07- CLEANING AND OPERATING SYSTEM

- A. The entire plumbing system being added under this contract shall be thoroughly flushed out with an approved cleaning agent to remove all pipe dope, flushing compounds, oils, welding slag, loose mill scale, or other extraneous materials. All dirt pockets and strainers shall then be cleaned and neutralized.

-08- INSTALLATION

- A. Units shall be installed where shown on Drawings and mounted in a neat workmanlike manner.
- B. Installation of each unit shall be complete in accordance with the manufacturer's recommendations and meet all federal, state, and local codes having jurisdiction.

END OF SECTION

DIVISION 15

MECHANICAL

15400 -PLUMBING

15420 - PLUMBING EQUIPMENT

- INDEX:
- 01- General
 - 02- Submittals
 - 03- Floor and Shower Drains
 - 04- Roof Drains
 - 05- Cleanout and Access Covers
 - 06- Domestic Water Heaters
 - 07- Domestic Hot Water Recirculator
 - 08- Duplex Submersible Sewage Ejector
 - 09- Elevator Sump Pump
 - 10- Lift Station
 - 11- Duplex Storm Sump
 - 12- Storm Sump Pump
 - 13- Air Compressor
 - 14- Sloped Trench Drain System and Oil Separator
 - 15- Vehicle Wash System
 - 16- Automotive Lubrication System

-01- GENERAL

- A. CONTRACTOR shall furnish and install all applicable plumbing equipment necessary for a complete installation thereof as required and where shown on Drawings and specified herein.
- B. CONTRACTOR shall receive and store equipment upon delivery to insure good working condition. If equipment is damaged due to shipment, CONTRACTOR shall immediately take the appropriate action to correct the situation and protect the OWNER from damaged equipment.

-02- SUBMITTALS

- A. In compliance with requirements established within these specifications, provide Shop Drawings on all equipment and accessories specified in this section, including pump curves.

-03- FLOOR AND SHOWER DRAINS

- A. Provide floor drains as indicated on the Drawings
- B. Drains shall be approved PVC or cast iron body with traps unless otherwise shown. Drains in finished areas shall have adjustable strainer. All drains shall be of size as shown and scheduled on Drawings.

-04- ROOF DRAINS

- A. Provide roof drains as manufactured by Wade or equal by Zurn, Josam, or Jay R. Smith.
- B. Units shall be similar to Wade 3000 series bottom outlet as required with medium sump and flange with removable beehive dome, bolted flashing clamp with integral gravel stop, and deck clamp, or approved equal.
- C. Coordinate with General Contractor for exact location and elevation of drains and be responsible for their proper location to insure drainage of all areas.

-05- CLEANOUTS AND ACCESS COVERS

- A. All soil, waste, and drain pipes shall have cleanouts at foot of stacks, at wall where line enters building, at every change in the direction of run, at upper end of all horizontal runs, at intervals of not more than 40'-0" in straight runs of sanitary sewers inside of building walls, and as required by local code. All outlets shall be accessible so that drain line may be readily cleaned with a snake or other rodding tool. Cleanouts shall be of the same diameter as the pipe into which they are inserted, up to 4-inches maximum. All cleanout plugs shall be PVC, brass, or bronze.
- B. Cleanouts installed in pipe in fill under floors shall be provided with long sweep 1/4 bend or two 1/8 bends to an easily accessible place or where indicated on the Drawings. In finished floors, they shall terminate in an adjustable floor level cleanout with nickel bronze access cover, and square frame set flush with finished floor. Furnish one carpet marker for each cleanout in carpeted areas. Cleanouts in carpeted areas shall be avoided where possible. In unfinished floors, they shall terminate in a floor level cleanout with heavy duty cast iron cover. In finished walls, they shall terminate in a cleanout with nickel bronze or stainless steel access cover.

-06- DOMESTIC WATER HEATERS

Electric

- A. Furnish and install where shown on Drawings an electric water heater with 80 gallon storage, as manufactured by Ruud or an approved equal.

Natural Gas

- B. Furnish and install where shown on Drawings two AGA Certified commercial, natural gas-fired, tank-type water heaters, as manufactured by A.O. Smith Corporation, or an approved equal.

Natural Gas

- C. Water heaters shall be of glass-lined design and include a powered natural gas burner with electronic ignition, main, and pilot automatic gas valves, gas pressure regulator, and flame inspection port.
- D. Tank shall be glass-lined fused to the steel at 1600 deg. Tank shall be designed and tested to withstand 300 psi hydrostatic test pressure for working pressure of 150 psi U.L. standard.
- E. Controls shall include dual thermostats, automatic cut-off for excess temperature situation, and ASME approved temperature, and pressure relief valve.
- F. Tank shall have two high-efficiency heating elements 208V-1-60hz. (*Electric*)
- G. Heaters shall be equipped with 1½-inch NPT water inlet and outlet openings, one hand-hold cleanout, and shall have a working pressure of 160 psi.
- H. The heaters shall be equipped with anodes for cathodic protection and include an inlet water diffuser for minimizing scale deposits.
- I. The heaters shall be insulated with rigid polyurethane foam insulation for maximum efficiency.
- J. Heaters shall meet the latest ASHRAE 90A requirements for thermal efficiency and standby loss.
- K. The outer jacket shall have a baked enamel finish over a bonderized undercoating.
- L. All internal surfaces of the heaters exposed to water shall be glass-lined and have a nickel oxide undercoating. The glass lining shall be fused to the steel by firing at a temperature range of 1400° F. to 1600° F.
- M. Heater's tank shall have a 3-year limited warranty against corrosion and tank failure due to sediment build-up as outlined in the written warranty.

-07- DOMESTIC HOT WATER RECIRCULATOR

- A. Where indicated on domestic hot water recirculating lines, provide circulating booster pump equal to Bell & Gossett Series 100 with fractional horsepower, 120 volt, single phase motor.
- B. Pump shall be of size and capacities as scheduled on the Drawings.
- C. Impellers and interior shall be bronze construction suitable for use on raw water.

-08- DUPLEX SUBMERSIBLE SEWAGE EJECTOR

- A. Furnish and install a duplex submersible sewage ejector as shown on the Drawings. The ejector shall be installed in a fiber-basin.
- B. The duplex submersible sewage ejector shall have the capacity to discharge _____ gpm at _____ feet head with two HP, _____ volt, _____ phase submersible pumps.
- C. The pump and motor are to be assembled by the pump manufacturer. The common shaft will be 316 stainless steel designed for rugged sewage pumping service. The motor shall be hermetically sealed with air or oil cooling medium, and the bearings are to be ball bearings, double shielded, and sealed with grease to provide lubrication for continuous pumping duty and protection for the bearing when the pump is idle. The maximum temperature rise in the motor windings is to be 40° C when operating the pump under full load continuously.
- D. Automatic float controls shall consist of mercury type switches enclosed in airtight floats, secured to a vertical rod assembly. Controls shall be used in combination with an automatic electric alternator. The duplex control will provide for alternating the pumps in each cycle of operation and start the second pump automatically for parallel operation which doubles pump capacity in emergency service.
- E. Furnish a (NEMA 1 or NEMA 4) control panel and install (on the wall adjacent to the sump pumps or on an exterior steel bracket frame). The panel shall include two magnetic contactors with overload relays, two fusible disconnect switches, and an electric alternator and terminal wiring strip. The enclosure shall be complete with two pump running lights and two TEST-OFF-AUTO selector switches. The enclosure shall have a hinged door with lock. The panel shall also include a high water alarm with warning light, bell, and silencing switch.
- F. The pumps shall be mounted on a quick removal rail with guide posts, stainless steel lifting cope, and positive locking elbow and pump discharge connection with gasket seal.

- G. In each pump discharge, furnish and install a union, check valve, and gate valve.
- H. Furnish and install a fiber-basin, in diameter by deep, with one 4-inch inlet and complete with gas-tight steel cover with holes for the pump floor plates to cover the openings in the cover through which the pumps may be installed and withdrawn, through which the 4-inch discharge pipes and power cables will go, manhole, and 4-inch vent.

-09- ELEVATOR SUMP PUMP

- A. Furnish and install a submersible sump pump and filter basin as shown on the Drawings in the elevator pit. The pump shall handle the floor drains in the pit.
- B. The submersible sump pump shall be a 110 volt, single phase.
- C. The pump and motor are to be assembled by the pump manufacturer. The common shaft will be 303 stainless steel. The motor shall be a hermetically sealed or oil filled capacitor start with built-in overload protection type, and bearings factory sealed, grease lubricated ball type.
- D. The impeller shall be bronze with a perforated steel plated strainer for protection.
- E. The controls shall be operated by a mercury float switch with a 10 foot non-breathing type PVC cord with ground plug and test button.
- F. Furnish and install a fiber basin, 18-inch in diameter by 48-inch deep, with one 4-inch inlet complete with gas-tight steel cover with holes for the discharge and vent piping and power cord.

-10- LIFT STATION

- A. Furnish and install duplex submersible pump set complete with float switches, lifting device, guide rails, support base, access lids, and control cabinet. Pump set shall be installed in a reinforced concrete pipe assembly as shown on the Drawings.
- B. Duplex pumps shall be submersible type with motor enclosed in a cast-iron housing, winding chamber completely oil filled and automatic thermal overload protection. Power cables shall enter the motor through sealed glands and a dry chamber. Motor shaft shall be sealed by a double mechanical seal with a leak sensor to indicate seal leakage. Shaft shall be stainless steel construction with oversized heavy duty ball bearings. Impeller shall be two port non-clog type constructed of cast iron, capable of passing 3-inch diameter solids. Each pump shall have a capacity of 100 gpm @ 36 feet TDH, and 4-inch discharge.

- C. Pumps shall be furnished with lifting devices including stationary cast iron support base, flanged discharge base elbow, and guide rail connections. Lifting device shall be guided on two 2-inch Schedule 40 galvanized iron pipe rails with a 5/16-inch x 23 feet long lifting chain for raising the pumps. Pipe rails shall also be installed with intermediate guide rails supports.
- D. Furnish and install at the top of the lift station a double door access lid and frame assembly. Lid and frame shall be constructed of heavy gauge steel blasted to white metal and coated with a black bitumastic protective coating. The doors shall have handles, holding latch, and locking clasp. Frame shall be 3" x 2" x 1/4" angle construction. Lift station access shall be through a 30" x 36" access cover.
- E. Control panel shall be in a NEMA 3R enclosure complete with circuit breakers, magnetic starters, third leg overload protection, HAND-OFF-AUTO selector switches indicating lights for pump running and leak sensors and alarm contacts at emergency level. Panel operation shall be activated through three suspended style mercury float switches with 50 feet cords. Set floats for proper pump operation. Remote alarm shall be installed in a location selected by the OWNER with low voltage alarm bell, transformer, silencer switch, and signal light.

-11- DUPLEX STORM SUMP

- A. Furnish and install a duplex submersible ejector as shown on the plans. The ejector shall be installed in a fiber-basin.
- B. The duplex submersible ejectors shall have the capacity to discharge _____gpm at ___ feet head with two HP, ___ volt, _____ phase submersible pumps.
- C. The pump and motor are to be assembled by the pump manufacturer. The common shaft will be 316 stainless steel designed for rugged pumping service. The motor shall be hermetically sealed with air or oil cooling medium and the bearings are to be ball bearings, double shielded and sealed with grease to provide lubrication for continuous pumping duty and protection for the bearing when the pump is idle. The maximum temperature rise in the motor windings is to be 40° C when operating the pump under full load continuously.
- D. Automatic float controls shall consist of mercury type switches enclosed in air-tight floats secured to a vertical rod assembly. Controls shall be used in combination with an automatic electric alternator. The duplex control will provide for alternating the pumps in each cycle of operation and start the second pump automatically for parallel operation which doubles pump capacity in emergency service.
- E. Furnish a NEMA 1 control panel and install on the wall adjacent to the sump pumps. The panel shall include two magnetic contactors with overload relays, two fusible disconnect

switches, and an electric alternator and terminal wiring strip. The enclosure shall be complete with two pump running lights and two TEST-OFF-AUTO selector switches. The enclosure shall have a hinged door with lock. The panel shall also include a high water alarm with warning light, bell, and silencing switch.

- F. In each pump discharge, furnish and install a union, check valve, and gate valve.
- G. Furnish and install a fiber-basin, in diameter by deep, with one 4-inch inlet complete with gas-tight steel cover with holes for the pump floor plates to cover the openings in the cover through which the pumps may be installed and withdrawn, through which the 4-inch discharge pipes and power cables will go, manhole, and 4-inch vent.

-12- STORM SUMP PUMP

- A. Furnish and install a submersible sump pump and fiber basin as shown on the plans. The pump shall handle the foundation drainage system.
- B. The submersible sump pump shall be 110 volt, single phase.
- C. The pump and motor are to be assembled by the pump manufacturer. The common shaft will be 303 stainless steel. The motor shall be a hermetically sealed or oil filled capacitor start with built-in overload protection type, and bearings factory sealed, grease lubricated.
- D. The impeller shall be bronze with a perforated steel plated strainer for protection.
- E. The controls shall be operated by a mercury float switch with a 10 foot non-breathing type PVC cord with ground plug and test button.
- F. Furnish and install a fiber basin, 18-inches in diameter by 48-inches deep with one 4-inch inlet complete with gas-tight steel cover, with holes for the discharge and vent piping and power cord.

-13- AIR COMPRESSOR SYSTEM

- A. Furnish and install a reciprocating two-stage air compressor mounted on a 120 gallon horizontal receiver with START-STOP control, operating at 740 rpm and delivering 43.1 cfm at 175 psi similar to Champion Model HR10-12, 10 HP, 208-3-60 volts.
- B. System shall include factory mounted and pre-wired NEMA 1 magnetic starter, vibration isolators, auto tank drain, low oil monitor, air-cooled after cooler, intake filter. Provide auto drains and quick disconnects for each system drop of size shown on the Drawings.

- C. System shall also include a cycling refrigerated air dryer rated at 75 cfm at 38 degree dew-point (based on 150 psi inlet air pressure) with ON-OFF switch, power on light, high temperature light, and auto condensate trap.
- D. Air receiver and compressor pump shall be protected by a 5-year parts and labor prorated factory warranty.

-14- SLOPED TRENCH DRAIN SYSTEM AND OIL SEPARATOR

- A. The work under this section consists of furnishing all labor, materials, and equipment to install sloped trench drain and oil separator where shown on the Drawings complete and in accordance with manufacturer's instructions.
- B. Sloped trench drain system:
 - 1. Channel units shall have the minimum requirements as follows:
 - unit width 6.1" internal width 4.0"
 - unit depth 5.6" to 12.4"
 - compressive strength 14,500 psi
 - flexural strength 2,900 psi
 - built-in slope 0.6%
 - water absorption rate not to exceed 1%

Provide all other necessary grates, outlets, caps, etc. for complete installation.

- C. Oil separator:
 - 1. Where shown on the Drawings and diagramed, provide and install a chemical resistant integrally constructed precast oil separator or polymer concrete (14,500 psi); covers shall be hot dipped galvanized steel; each basin shall be 110 gallon capacity. Provide extensions as required to allow cover to be flush with floor.

-15- VEHICLE WASH SYSTEM

- A. The work under this section consists of furnishing all labor, materials, and equipment to install a vehicle wash system as herein specified and shown on the Drawings.

B. Equipment:

1. Two (2) pumping stations up to 1500 psi at 3 gpm, pre-wired and pre-plumbed with heavy-duty cat 310 pump and 3 HP, 208V-3-60hz motor, detergent and wax flow indicator, stainless steel solenoid and metering valves, cycle metering lights, built-in motor protection, 24v circuit breaker, couple belted pulley, bypass relief valve, glycerine filled high-pressure gauge, E-Z oil change, HD belt guard, stainless steel float tank, heavy gauge tubular steel frame with baked enamel finish.
2. Two (2) auto-sweep systems (automatic-thermostatic).
3. Two (2) 360 deg. ceiling mounted boom assemblies with steel braided bay hoses, hose swivels, and hose hooks.
4. Two (2) ON-OFF trigger gun/wand assemblies, complete.
5. Two (2) 100% stainless steel spring mounted wand holders to protect wand and boom assembly.
6. Two (2) pressurized foam brush systems with weeps, control panels, pump assemblies, heavy duty 180 deg. aluminum wall mounted booms with steel braided bay hoses, brush and handle assemblies, hose swivels, brush holders, complete less air compressor.
7. Two (2) foaming tire/motor cleaning systems, pre-wired and pre-plumbed with stainless steel check valve boom assemblies, control panels, pump assemblies, stainless steel solenoid and metering valves, complete less air degrease units for trucks.
8. Two (2) instantaneous water heaters, natural gas 121,500 BTUH each
9. All high and low pressure hoses to be plumbed from equipment room to the bay booms with all fittings and fasteners.

-16- AUTOMOTIVE LUBRICATION SYSTEM

A. The work under this section consists of furnishing all labor, materials, and equipment to install a complete automotive lubrication system where shown and as diagramed on the Drawings in accordance with the manufacturer's instructions.

B. General:

1. All lube pumps to have 3'-4" diameter air motor and a lifetime warranty, and remaining parts to have a one year warranty. All hose reels shall be standard duty

type. System shall be installed by a qualified and experienced CONTRACTOR with five years experience in the installation of centralized lubrication and air systems.

2. The lubrication system piping shall be 7/8-inch OD (0.083" wall) annealed steel tubing and matching fittings. Air system shall be Schedule 40, 1/2-inch galvanized steel piping, and annealed steel tubing and matching fittings.
3. All reels and pumps shall have shut-off valves. Adjustable type runaway valves shall be installed on all pumps.
4. The piping shall be installed as per the manufacturer's installation instructions and good practice. The manufacturer's installation procedure shall be complete followed by the CONTRACTOR.
5. The reels shall be mounted and secured to the wall as high as possible above the floor.
6. Emphasized procedure on the following, but in no way minimize the remaining manufacturer's installation instruction:
 - a. Blow all air lines clean before making final equipment connections.
 - b. Flush lubricant lines with non-flammable solvent (kerosene, diesel fuel, etc.) to remove foreign materials.
 - c. Do not install control valves before flushing.
 - d. Each line shall be flushed with the pump to be used on the line.
 - e. After the lines are flushed, install control valves and pressure test with line under pressure. Check all connections and fittings for leakage.
 - f. Adjust the hose ball stops so valves hang 7'-0" above floor.

C. Motor Oil:

1. one (1) 5:1 pump
2. one (1) air regulator
3. one (1) extension for pump to pump from 275 gallon tank
4. one (1) air filter (install in air header to pumps to serve all pumps — no oiler needed)
5. one (1) air shut-off valve for motor oil pump — install in air inlet line

D. Transmission Fluid:

1. one (1) 5:1 pump
2. one (1) air regulator
3. one (1) suction hose kit
4. one (1) air shut-off valve for transmission fluid pump
5. one (1) wall mounting bracket for transmission fluid pump (pump to be mounted and syphon kit attached, and syphon tube placed in 55 gallon drum)

E. Grease Pumps:

1. two (2) 5:1 pumps
2. two (2) air regulators

F. Anti-Freeze Pump:

1. one (1) 1:11 diaphragm pump
2. one (1) 6'-0" suction hose
3. one (1) air regulator
4. one (1) wall mounted bracket
5. one (1) air shut-off valve

G. Reels:

1. one (1) motor oil reel with 50' x 1/2" hose with metered control valve
2. one (1) transmission fluid reel with 50' x 1/2" hose with metered control valve
3. two (2) grease reels with control 50' x 3/8" hose
4. one (1) anti-freeze reel with 40' x 3/8" hose
5. one (1) unmetered control valve
6. two (2) air reels with 60' x 3/8" hose
7. two (2) water reels
8. seven (7) inlet hose kit, low pressure
9. two (2) inlet hose kit, high pressure
10. two (2) 3-reel mounting channel
11. one (1) 1-reel mounting channel
12. one (1) 2-reel mounting channel
13. ten (10) shrouding
14. two (2) end panels
15. one (1) oil bar
16. one (1) oil bar meter

Note: metered control valves to be electronic controlled to allow selection of metering to be reset for changing from metering pints, quarts, or gallons by pressing a button on the front of the meter.

END OF SECTION

DIVISION 15

MECHANICAL

15400 -PLUMBING

15450 - PLUMBING FIXTURES AND TRIM

- INDEX:
- 01- General
 - 02- Submittals
 - 03- Materials and Finish
 - 04- Installation
 - 05- Fixtures

-01- GENERAL

- A. CONTRACTOR shall furnish and install all plumbing fixtures and trim necessary for a complete installation of same as required and where shown on Drawings and specified herein.
- B. CONTRACTOR shall receive and store equipment and materials upon delivery to insure good working condition. If equipment or materials are damaged due to shipment, CONTRACTOR shall immediately take the appropriate action to correct the situation and protect the OWNER from damaged items.

-02- SUBMITTALS

- A. In compliance with requirements established within these specifications, provide Shop Drawings on all equipment and accessories specified in this Section.

-03- MATERIALS AND FINISH

- A. Fixtures shall be as scheduled on Drawings or an approved equal by Kohler, American-Standard, Crane, Sloan, Williams, Delta, or Woodford.
- B. Fixtures shall be best quality vitreous china, acid resisting enameled cast iron, or stainless steel as specified and free from discoloration, chips, dents, warps, flaws, crazes, cracks, or other blemishes. All vitreous china and enamel shall be white, unless otherwise specified. Fixtures shall have manufacturer's guarantee label or trademark indicating first quality.
- C. All exposed pipe, fittings, traps, wastes, faucets, valves, valve handles, escutcheons, bolts, nuts, screws, and accessories in finished areas shall be polished chrome plated cast brass unless otherwise specified. Exposed traps shall be cast brass chrome plated, adjustable, with cleanout plug and escutcheon.

-04- INSTALLATION

- A. All fixtures shall be set rigid, tight, plumb, level, and true to assure rigidity and permanence. Provide chair carriers for wall mounted lavatories, sinks, drinking fountains, water coolers, urinals, and water closets. Carriers for wall mounted lavatories, sinks, drinking fountains, water coolers, and urinals shall have dual cantilever foot supports, tubular uprights, adjustable headers, alignment trusses, and all necessary accessories. Lavatory and sink carriers shall include concealed arms for lavatories and exposed arms for sinks. Urinal carriers shall include a bearing plate. Drinking fountain and water cooler carriers shall be as required for proper support. Water closet carriers shall be complete with waste pipe, integral gasket, lock nuts, adjustable 4-inch IPS coupling, fixture bolts, washers and nuts, and foot supports.
- B. All wall mounted fixtures shall be tested by bearing the weight of a 185 pound man without sagging or pulling away from the wall. Damage resulting from this test shall be made good by this CONTRACTOR. All other piping and fixtures shall be secured to walls with wall plates, wall hangers, and approved expansion shields and bolts.
- C. Connections between earthenware fixtures and soil pipe flanges shall be made gas and water-tight with closet setting compound or approved Neoprene gaskets without use of putty. Hold down bolts shall be brass, not less than 1/4-inch in diameter and shall be equipped with nuts and washers.
- D. Provide each fixture with an approved compression service stop.
- E. Fixtures shall be set at heights indicated on Drawings or as directed by the ENGINEER where not shown.
- F. See Section 15010 for protection and cleaning.

-05- FIXTURES

- A. General
 - 1. Fixtures shall be the following selected from the catalog of Kohler or equal by American Standard, Crane, or Elger except as otherwise specified and described.
 - 2. Fixtures shall be set at heights indicated on Drawings or as directed by the ENGINEER where not shown.
- B. Water Closets
 - 1. Wall hung water closet with water guard siphon jet action, elongated bowl, 1-inch top spud, vitreous china with open front seat, and flush valve quiet operating with vacuum breaker and screwdriver angle stop. *ADA*

2. Floor mounted bowl/tank combo water closet with siphon jet, elongated bowl, vitreous china, tank/bowl combination with white open front elongated solid plastic seat and cover, and self-sustaining check hinge. *ADA*

C. Urinals

1. Wall hung siphon jet urinal mounted 17-inch AFF to rim with flush valve. *ADA*

D. Lavatories

1. Wall mounted, vitreous china lavatory, 21-inches wide by 18-inches deep overall, front overflow for concealed arm support, faucets with lever handles and grid drain. Mount lavatory 34-inches (maximum) above finished floor with a minimum of 29-inches clearance underneath (for handicap installation).
2. Self-rimming countertop white vitreous china lavatories, 20¼-inches x 17¼-inches with front overflow with faucet with lever handles. Mount lavatory on countertop so that lavatory is 34-inches (maximum) above finished floor (for handicap installation) with a minimum of 29-inch clearance underneath.

Accessories: Provide P-trap on all lavatories.

E. Showers

1. Shower stalls and base by general CONTRACTOR.
2. Shower floor drain 2-inch with 6-inch nickel bronze strainer.
3. Shower valve by plumbing CONTRACTOR will be safety shower unit with concealed valve and integral stops, less shower head. Plumbing CONTRACTOR will provide adjustable hand shower with vacuum breaker, swivel, wall mounts, and hose. Also provide 48-inch long glide bar.

F. Tub/Shower Modules

1. Provide bath/shower bath module, one-piece seamless gel-coated fiberglass with integral ledges, clear acrylic grab bar, outlet on left or right (see Plumbing Drawings for outlet side).

Temperature control faucet with pressure balance feature and diverter spout, ball joint shower head, vandal resistant metal handle, and 1½-inch adjustable pop-up drain.

2. Provide bath/shower barrier-free, one-piece seamless acrylic module, outlets on left or right (see Plumbing Drawings for outlet side), include nylon lift-out transfer

seat, integral soap ledge, gray nylon grab bars, slip resistant bottom, faucet/personal shower, and 1 ½ inch pop-up drain. Bath/shower to meet ANSI, IAPMO, and ASTM standards for ADA.

3. Provide barrier-free wheelchair shower, one-piece seamless acrylic module; including integral soap ledge and gray nylon grab bars, slip-resistant bottom. Unit shall meet ANSI and ASTM standards for ADA.

Provide drain and perforated strainer hardware.

Single control pressure balanced mixing valve, 24-inch slide bar, acrylic adjusting knob, swivel hanger, and 69-inch plated metal hose with rubber liner.

Fixtures shall have polished chrome finish.

G. Service Sinks

1. Provide utility, vitreous china wall mounted service sink with a three-hole faucet drilling. Sink shall be 28" x 22" x 11½" deep with a 5" ledge. Provide a polished chrome faucet and acrylon-coated brackets, drain with perforated strainer having a 1½" tailpiece, and a 1½" cast brass P-trap. Also provide angle supplies.
2. Provide mop-service sink basin, 28" x 28" x 12". Shoulders shall not be less than 12" high and not less than 2¼" wide. Drain body shall be chrome plated, brass cast integral and shall provide for a caulked lead connection not less than 1" deep to a 3" IPS pipe. Receptor shall be composed of pearl gray marble chips and white Portland Cement ground smooth, grouted, and sealed to resist stains and moisture. Provide stainless steel cap of one piece 20 gauge 302 stainless steel cast integral with No. 4 satin finish. Provide faucet with hose end spout, pail hook, wall brace, vacuum breaker and integral stops, finish rough chrome plate, hose and wall hook, stainless steel mop hanger and 20 ga. 304 stainless steel splash catcher panels.

H. Electric Water Coolers

1. Provide wall mounted barrier-free water cooler with self-closing push bars on both sides as well as on front, or equal with all attachments necessary for a complete installation.

I. Sinks

1. Provide 20 x 19, 18 ga., 7-1/2" deep single compartment type 304 18-8 stainless steel sound deadened, polished sink. Three-hole punching for sink faucet, crumb cup strainer, 1-1/2" 17 ga. P-trap, 1/2" ball valves on hot and cold supply lines.

2. Provide 22 x 33, 18 ga., 7-1/2" deep one side; 10-1/2" deep other side double compartment type 304, 18-8 stainless steel, sound deadened, polished sink. Three-hole punching for sink faucet; crumb cup strainer one side, garbage disposer mounted on other side. Install 1/2" 17 ga. P-traps and 1/2" ball valves on hot and cold supply lines. OWNER to advise R or L for deep compartment.
3. Provide single-basin, self-rimming sink, 18 gauge stainless steel, with three-hole faucet punching. Provide angle supplies, bar sink faucet having lever handles in polished chrome and strainers in polished chrome.

J. Grease Trap

Provide and install a cast iron grease interceptor with acid resisting rubber base coating inside and outside, flow control fitting, steel extension, removable baffles, threaded inlet and outlet, internal air relief, double wall trap with cleanout, gasketed cover, and PDI seal of approval.

L. Emergency Eye Wash

1. Bowl Only

Provide and install a wall-mounted eyewash with 10" diameter stainless steel bowl, hinged duct cover, and push handle. Eye wash shall be chrome plated brass soft-flow spray heads. Assembly shall include flow control. Eye wash valve shall be 1/2" IPS chrome-plated brass stay-open ball valve operated by a highly visible stainless steel push handle. Pipe and fittings shall be 1/2" galvanized steel pipe protected with a yellow coating. Waste shall have a dome-type strainer and 1-1/4" female drain fitting. Supply shall be 1/2" IPS female fitting.

2. Combination Shower and Eye Wash

Provide and install a floor-mounted combination emergency shower and eye wash. Eye wash shall have a 10" diameter stainless steel bowl, hinged duct cover and push handle, chrome-plated brass soft-flow spray heads. Assembly shall include flow control. Eye wash valve shall be 1/2" IPS chrome-plated brass stay-open ball valve operated by a highly visible stainless steel push handle. Shower shall have a 10" diameter yellow impact-resistant plastic shower head, 1" IPS chrome-plated brass stay-open ball valve operated by a stainless steel pull rod with triangular handle. Pipe and fittings shall be 1-1/4" galvanized steel pipe protected with a yellow coating. Waste shall have a dome-type strainer and a 1-1/4" IPS female drain fitting. Supply shall be 1/4" IPS female fitting.

M. Wall Hydrants

Wall hydrants shall be exposed-type automatic draining with vacuum breaker-backflow preventer, 3/4" hose thread nozzle, one-piece valve plunger to control both flow and drain functions, hardened stainless steel operating stem, chrome finish on brass castings. Loose tee key to be furnished with each hydrant.

N.

Size of Fixture Supplies, Waste, and Vents

Shall be as follows for fixtures shown on Drawings or specified, unless otherwise noted:

Fixtures	Supply		Waste	Vent
	Cold	Hot		
Bathtubs	1/2"	1/2"	2"	1-1/2"
Clothes Washer	1/2"	1/2"	2"	1-1/2"
Combination Fixtures	3/4"	3/4"	--	--
Dishwasher	1/2"	1/2"	--	--
Drinking Fountain	1/2"	--	1-1/2"	1-1/2"
Kitchen Sinks	1/2"	1/2"	2"	1-1/2"
Lavatory	1/2"	1/2"	1-1/2"	1/2"
Hose Bibs	3/4"	--	--	--
Service Sink	1/2"	1/2"	3"	2"
Showers	1/2"	1/2"	2"	1-1/2"
Urinals	3/4"	--	2"	1-1/2"
Water Closet (FV)	1"	--	4"	3"
Water Closet, Tank	1/2"	--	3"	3"
Wash Fountain	1"	1"	2"	1-1/2"
Floor Drain	--	--	3"	2"

END OF SECTION

DIVISION 15

MECHANICAL

15600 - HEAT GENERATION

15620 - BOILERS

- INDEX:
- 01- General
 - 02- Submittals
 - 03- Water Tube Boilers
 - 04- Cast Iron Water Boilers
 - 05- Cast Iron Stem Boilers
 - 06- Wood/Coal Fired Boilers
 - 07- Electric Boilers
 - 08- Pulse Boiler
 - 09- Boiler Accessories
 - 10- Installation

-01- GENERAL

- A. CONTRACTOR shall furnish and install piping, fittings, valves, etc., and supervision necessary for a complete boiler installation, if applicable. CONTRACTOR shall also install all control valves and provide thermometer wells, pressure connections, etc. required for the temperature control system.
- B. CONTRACTOR shall receive and store equipment upon delivery to ensure good working condition. If equipment is damaged due to shipment, CONTRACTOR shall immediately take the appropriate action to correct the situation and protect the OWNER from damaged equipment.

-02- SUBMITTALS

- A. In compliance with requirements established within these specifications and indicated on the Drawings, provide Shop Drawings on all equipment, devices, and accessories specified in this Section, including wiring diagrams complete with interlocks.

-03- WATER TUBE BOILER

- A. Furnish and install (where shown on Drawing) on a 4" solid concrete pad, a complete packaged automatic hot water boiler unit, factory assembled, on a skid-type base. Boiler

shall be as scheduled on Drawings. Boiler shall be rated for 30 psi working pressure, natural gas fuel, with forced draft burner, boiler fittings, automatic electronic safety and operating controls, electrical equipment and wiring, and all attached piping as required for a complete installation. Complete packaged boiler shall be approved as a unit by Underwriters' Laboratory and FIA, and shall be so labeled.

- B. Boiler shall be located with proper clearances for maintenance and cleaning as recommended by the manufacturer.
- C. Boiler design:
 - 1. Boiler shall be a three-pass horizontal fire tube, having separate rear tube sheet for each pass; designed, constructed, and hydrostatically tested to comply with the latest ASME Code Rules and Michigan Boiler Law for 30 psi water working pressure and be inspected and stamped by an authorized boiler inspector.
 - 2. The boiler shall be furnished with flanged and/or threaded openings for the trimmings and necessary external connections, sufficient hand holes to allow easy inspection, and thorough cleaning and gas-tight inspection doors. Boiler shall have conventional flow with return at bottom and supply at top.
 - 3. All tubes shall be 2" roller expanded.
 - 4. Boiler shell shall receive authorized boiler inspection prior to shipment and a copy of the inspection report shall be furnished with the unit.
 - 5. Boiler shall be provided with all openings for a complete installation and as required by code.
 - 6. Steel access doors shall be insulated and hinged. All flues shall be fully accessible for inspection and cleaning when doors are open, without it being necessary to remove burner or control equipment.
 - 7. A Pyrex observation port for the inspection of flame condition shall be provided at rear end of the boiler.
 - 8. The exhaust vent shall be top outlet.
 - 9. Provide flue cleaner and handle, extra set of gaskets, and any wrenches necessary for cleaning boiler.

-04- CAST IRON WATER BOILER

- A. Furnish and install (where shown on Drawing) on a 4" solid concrete pad, a complete packaged automatic hot water boiler unit, factory assembled, on a skid-type base. Boiler shall be as scheduled on Drawings. Boiler shall be rated for 30 psi working pressure, natural gas fuel with burner, boiler fittings, automatic electronic safety and operating controls, electrical equipment and wiring, and all attached piping as required for a complete installation. Complete packaged boiler shall be approved as a unit by Underwriters' Laboratory and FIA, and shall be so labeled.
- B. Boiler shall be located with proper clearances for maintenance and cleaning as recommended by the manufacturer.
- C. Boiler design:
1. Boiler shall be factory assembled cast iron sections designed, constructed, and hydrostatically tested to comply with the latest ASME Code Rules and Michigan Boiler Law for 30 psi water working pressure and be inspected and stamped by an authorized boiler inspector.
 2. The boiler shall be furnished with flanged and/or threaded openings for the trimmings and necessary external connections. Boiler shall have conventional flow with return at bottom and supply at top.
 3. Boiler shell shall receive authorized boiler inspection prior to shipment and a copy of the inspection report shall be furnished with the unit.
 4. Boiler shall be provided with all openings for a complete installation and as required by Code.
 5. All flues shall be fully accessible for inspection and cleaning without it being necessary to remove burner or control equipment.
 6. The exhaust vent shall be top outlet.
 7. Boiler jacket shall be insulated.
 8. Provide flue cleaner and handle, extra set of gaskets, and any wrenches necessary for cleaning boiler.

-05- CAST IRON STEAM BOILER

- A. Furnish and install (where shown on Drawing) on a 4" solid concrete pad, an insulated, steel jacketed, cast iron section steam boiler unit on steel skids. Boiler shall be as

scheduled on Drawings. Boiler shall be rated for 30 psi working pressure, natural gas fuel with burner, boiler fittings, automatic electronic safety and operating controls, electrical equipment and wiring, and all attached piping as required for a complete installation. Boiler shall be built in accordance with the requirements of the ASME Boiler and Pressure Vessel Code. Complete boiler shall be approved as a unit for Underwriters' Laboratory and FIA, and shall be so labeled.

- B. Boiler shall be field assembled and installed by a fully authorized factory representative.
- C. Boiler shall be located with proper clearances for maintenance and cleaning as recommended by the manufacturer.
- D. Boiler design:
 - 1. Boiler shall be field assembled with cast iron sections designed, constructed, and hydrostatically tested to comply with the latest ASME Code Rules and Michigan Boiler Law for 30 psi working pressure and be inspected and stamped by an authorized boiler inspector. Boiler shall operate at 5 psig.
 - 2. The boiler shall be furnished with flanged and/or threaded openings for the trimmings and necessary external connections. Boiler shall have conventional flow with return at bottom and supply at top.
 - 3. Boiler shell shall receive authorized boiler inspection prior to start up and a copy of the inspection report shall be furnished with the unit.
 - 4. Boiler shall be provided with all openings for a complete installation and as required by Code.
 - 5. All flues shall be fully accessible for inspection and cleaning without it being necessary to remove burner or control equipment.
 - 6. The exhaust flue shall be vented from the back.
 - 7. Boiler jacket shall be insulated and of steel construction.
 - 8. Provide flue cleaner and handle, extra set of gaskets, and any wrenches necessary for cleaning boiler.

-06- WOOD/COAL FIRED BOILER

- A. Furnish and install (where shown on Drawings) on a 4" solid concrete pad, a complete packaged wood and/or coal boiler similar to Jensen Model 36B. Boiler shall be as scheduled on Drawings. Boiler shall be rated for 30 psi working pressure.

- B. Boiler shall be ASME certified and approved by the National Board for Commercial Installation.
- C. Boiler shall be capable of burning wood or coal and shall have a forced draft air combustion blower, adjusted through a rheostat to force-burn hard/soft coal or wet/dry wood.
- D. Provide 30 lb. pressure relief valve, a pressure and temperature gauge, and an adjustable automatic aquastat.
- E. The doors, grates, grate holder, and front and rear baffles shall be quality cast iron. The firebox shall be lined with firebrick. Provide clean-out ports for easy cleaning. Also, provide smoke shield.
- F. Provide 5-year warranty on steel shell and a 1-year warranty on cast iron and electrical components.
- G. Wood boiler shall have the approval from the National Board for Commercial Installations.

-07- ELECTRIC BOILERS

- A. Furnish and install (where shown on Drawings) on a 4" solid concrete pad, an electric boiler being ULL listed, having capacities and voltages as scheduled on Drawings.
- B. Pressure vessel shall be constructed per ASME Standards with "H" stamp registered with National Board of Boiler and Pressure Vessel Inspectors. Minimum design pressure shall be 125 psi.
- C. Boiler shall be equipped with incoloy sheathed elements mounted on standard ASA flanges. Heating elements shall be 10KW maximum each, 75 watts per square inch, single U-bend construction, and shall be individually removable from flange. Elements shall be wired with ULL listed 125c conductors.
- D. All controls shall be pre-wired and tested in an integral ventilated control cabinet. Boilers with up to four steps shall be provided with heavy duty multi-stage thermostats. Boilers rated 5 steps or more shall have step controller and recycling relay to return the controller to the "OFF" position after power failure.
- E. Fuses shall be furnished for each heating element with 200,000 ampere interrupting capacity. Boilers of four or more steps shall have fuses mounted on copper bus in spring reinforced clips. Provide disconnecting break contactors, 120v control transformer with fused primary and secondary, pilot lights for each heating step, control circuit switch,

supply voltage indicator, and properly sized lugs for incoming conductors. Provide knockouts in top of control cabinet above line terminal lugs.

- F. Boiler shall be complete with ASME rated pressure relief valve, probe-type low water cutoff, temperature and pressure gauges flush-mounted in control cabinet face, dual automatic reset high temperature cutouts, a door interlock switch, and drain valve.
- G. Pressure vessel shall be insulated on all sides with 4" fiberglass blanket. Lifting lugs to be welded directly to vessel. Pressure vessel to be mounted on a 4" steel channel base with steel vessel enclosure and heavy ventilated NEMA 1 control cabinet. Provide hinged door with key-locking handle. All surfaces shall be protected against corrosion with an oven baked finish.

-08- PULSE BOILER

- A. Furnish and install (where shown on drawings) on a 4" solid concrete pad, in accordance with manufacturer's instructions and in compliance with all rules and regulations of authorities having jurisdiction, LP gas-fired pulse-combustion National Board registered modular hot water boilers complete with (4) boilers and accessories for a complete installation.
- B. Each multi-pulse module of the heating plant shall have an AFUE (Annual Fuel Utilization Efficiency) rating of over 90% and shall be ISA design certified for an input as scheduled on the Drawings for automatic operation with propane gas.
- C. For operation with propane gas, supply line pressure must be set at 11" W.C.
- D. Each module shall be factory wired, 100% operationally tested, and completely factory-assembled to include a combustion air inlet chamber, a pre-purge blower assembly, an air-gas fuel control valve, a cast pulse combustion chamber, a welded steel heat exchanger unit with stainless steel spiraled fire tubes, and exhaust chamber. This complete assembly shall be housed in an insulated jacket which includes a factory-mounted electrical control panel enclosure with operation sequence indicator lights. Couplings shall be provided on the combustion air inlet and exhaust chambers for connections (Schedule 40) to plastic tubing — PVC for outside air intake and CPVC for outside exhaust. A condensate drain fitting shall be provided for exhaust chamber.
- E. The heat exchanger unit shall be constructed in accordance with Section IV of the ASME Boiler and Pressure Vessel Code for Low Pressure Heating Boilers. It shall be constructed for 30 psi working pressure and carry a full 5-year heat exchanger warranty.
- F. The controls provided for each module shall include a solid state ignition controller with fan prove pressure switch and pressure sensing flame safeguard system. A combination gas control shall be provided with a manual shutoff valve, a system pressure controller

regulator, and automatic redundant shutoff valves. A single high limit water temperature control with adjustable differential, ASME approved pressure relief valve, and a temperature/pressure indicator shall be provided.

- G. Each module's gas controls shall be suitable for individual step firing without reducing module's thermal efficiency. Heating plant control system shall be provided by the manufacturer with factory-supplied wiring diagram.
- H. Each module shall be vented individually. The CONTRACTOR shall install an air intake for use of outdoor air for combustion and an exhaust line to the outdoors to vent the products of combustion of each module in accordance with manufacturer's specifications. Air intake and exhaust piping shall be Schedule 40 and shall conform to parameters outlined by the installation instructions.
- I. Manufacturer shall provide an approved engineering drawing of the modular heating plant installation, including piping, wiring, and controls. After completion of installation, the heating plant shall be started and operationally tested in the presence of a manufacturer's representative.

-09- BOILER ACCESSORIES

A. Boiler fittings:

The following items shall be furnished and installed on the boiler:

1. Boiler drain piping: shall conform to the requirements of ASME and State Boiler Code with regard to materials, pressure ratings, and arrangements. Drain connections shall be completely piped, including bronze 300 lb. "Y" type drain valve with removable disc and seat.
2. Immersion low water cut-off: shall be automatic-type and shall prevent burner operation if water level falls below a safe level. Low water cut-off shall be in compliance with state, local, and ULL-94 Codes.
3. High limit cutout: shall have a dual automatic reset high temperature thermal cutout, which shall de-energize the boiler in event of an over temperature condition.
4. Combination pressure-temperature gauge: a water pressure gauge shall be mounted on the boiler complete with a stop cock and inspector's test cock. A water temperature gauge shall be mounted on the boiler with a temperature sensitive element located at the boiler outlet.

5. Safety relief valves: shall be provided of the bronze angle ASME approved type. They shall be furnished in sufficient size and number to provide ample thermal and pressure relieving capacity in accordance with ASME Boiler Code. Outlets shall be piped to floor drain with piping supported independent of the valves.
6. Low fire hold aquastat water temperature control: temperature of water in boiler shall be determined by a separable socket-type immersion aquastat set at 160° F., with differential adjustment in boiler water which shall control burner on a modulating cycle. Also, provide high limit control
7. Stack thermometer: of the dial-type shall be mounted in the exhaust gas vent and so arranged as to be readily read from floor. Dial shall be calibrated from approximately 150° F. to 750° F.
8. For Steam Boilers Only
Combination pump control and low water cut-off: shall be automatic-type. It shall cycle condensate feed water pump to maintain proper water level within boiler and shall prevent burner operation if water level falls below a safe level.
9. Operating and high limit modulating controls: shall be as manufactured by Honeywell.
10. Control panel shall include five (5) indicating lights as follows: power on, ignition, main fuel, low water, and flame failure.
11. Boiler shall also be complete with siphon, gauge cocks,

B. Burners and supplementary equipment:

1. Unit shall be furnished complete with gas burner, approved for operation with natural gas with a heating value of approximately 1000 BTU per cubic foot.
2. Burner shall be full modulation-type, through potentiometer-type positioning controls to permit fully automatic operation at all intermediate points between 30% and 100% of nominal rating with low fire start. Combustion air damper and flow regulating gas valve shall be operating by a single damper control motor to regulate the fire according to load demand.
3. The gas burner shall be capable of firing the boiler to rated capacity with input as scheduled. Contractor shall verify gas pressure, BTU per cubic foot, and specific gravity before ordering boiler. Provide complete with gas burner piping; including hydrameter gas shut-off valves, one slow closing followed by a fast closing valve, and both motor operated with spring return, controlled to start or stop burner and to close automatically in the event of power failure, flame failure, high limit, or low water condition. Between the two gas valves, a vent line shall be

provided with a normally open solenoid which shall be piped to a suitable atmospheric vent. After the second gas valve, there shall be provided a test gauge and manual checking gas cock. Provide additional valve of the lubricated plug-type ahead of the motorized valves for manual shutoff. A master gas pressure regulating valve shall be furnished by the CONTRACTOR as approved by Gas Company, as manufactured by Fisher. All vent lines shall be piped to exterior of building away from any outside air intake. A high gas pressure interlock shall be provided beyond the butterfly valve and low pressure gas interlock shall be provided ahead of the dual gas valve.

4. The gas burner shall utilize a gas-electric ignition complete with all accessories; including as pressure regulator, solenoid valves, gas mixer, igniter electrode, and transformer. The pilot flame shall be intermittent burning only during ignition period. An electronic detector shall monitor the pilot so that the primary valve cannot open until the pilot flame has been established.
5. Burner and controls shall be mounted in such a way that all parts of burner shall be completely accessible for inspection and maintenance.

C. Boiler breeching:

1. Furnish and install boiler breeching from boiler to chimney. Breeching shall be constructed of not less than No. 16 U.S.S. gauge black iron with tight welded joints, except at connections to boiler which shall be woven gasket material, flanged bolted joint to properly connect to boiler with slip connection to stack. Provide cleanout door to be cast iron or tank steel, hinged airtight to be placed and secured in the breeching with positive fastening device. Breeching shall be supported by means of steel bands passing around breeching with ends secured to Boiler Room roof construction and shall be independent of boiler support.

D. Mechanical draft equipment:

1. Draft equipment shall consist of an electric motor driven forced air draft fan arranged to operate automatically with the burner, and capable of supplying all air required for complete and smokeless combustion against the static pressure of the system and with the air delivery controlled by a damper actuated by a modulating motor and interlocked with the modulating fuel valve. Blower and damper shall be quiet operating under all stages of modulation.

E. Automatic controls and electrical work:

1. Unit shall be equipped with a complete control system; including fuses, magnetic motor starting switches and overload protection, control devices and relays, all connected to a main disconnect switch, all mounted in a steel cabinet having NEMA 1A enclosure with hinged gasketed door mounted at front of boiler, with

pilot lights to indicate low water level, flame failure, fuel valve open, high limit cutout, and ignition.

2. All motors, devices, and wiring shall be in conformity with Underwriters' Laboratory's requirements and National Electric Code using only oil, heat, and moisture resistant wiring materials. All wiring shall be completely color coded. All wiring external to the panel shall be run in conduit and comply with NE Code.
3. All motors and controls shall be designed to operate on 120 volt, three-phase, 60 cycle, AC current. Boiler manufacturer shall provide control transformer, mounted and wired in panel.
4. The ELECTRICAL CONTRACTOR will provide line wiring to, and make connection to, main cut-out switch in boiler control panel. All other wiring shall be Boiler Manufacturer, including correction of fluctuating line voltages, as may be required for electrical control panel.
5. Programming controls shall have digital display board and shall include electronic flame failure and sequencing control, draft-air interlocking switch, and flame monitor. The sequence of operation shall provide for low fire start, pre-ignition purge, ignition overrun time, and a post purge. In event of pilot failure, the main fuel valve shall remain closed; or if main flame fails during run, the main fuel valve shall close in approximately 3 seconds and the electronic relay shall lock out on safety, lighting alarm pilot light and requiring manual reset. Also, provide flame failure and low water alarm bell with cutout switch. All controls shall fail safe.
6. Also, provide manual-automatic switch and damper positioning switch to permit automatic firing in accordance with load demand, or continuous firing at any desired rate between low fire and maximum rating.

-10- INSTALLATION

A. Tests:

1. Complete unit shall be subject to a firing test and a copy of the firing test data shall be furnished to OWNER. Construction, operation, and function of all controls shall be checked. All piping shall be pressure tested.
2. A combustion test shall be performed in the field after boiler is in operation and before acceptance. A written report of CO₂, as well as stack temperature and computed efficiency, shall be furnished to OWNER and ENGINEER.

B. Insulation and painting:

1. Boiler shall be complete with 2" insulated steel jacket and smooth enamel finish. Sufficient touch-up enamel shall be furnished for field touch-up of any marred or scratched areas after installation.

C. Instruction manuals:

1. Four (4) instruction manuals completely describing installation, operation, and maintenance, with parts lists and wiring diagram shall be provided with the shop drawings. Copies of the boiler inspection and operation test reports shall be submitted with the unit and affixed to the control panel.

D. Boiler inspection:

1. Prior to placing the boiler in operation, this Contractor shall have an inspection of the boiler, burner, and controls made by a commissioned boiler inspector. A copy of such inspection shall be posted in the boiler room. The Contract includes cost of complying with governing laws and such inspection. Contractor shall obtain and pay for State and Local permit to install.

E. Chemical treatment:

1. Before turning boiler over to OWNER, CONTRACTOR shall add cleaning agent to boiler water as recommended by the boiler manufacturer for the purpose of flushing out the residue in the existing piping system. CONTRACTOR shall flush system until clean.
2. After heating system has been thoroughly flushed, CONTRACTOR shall drain and clean heating system being sure to clean strainers, traps, boiler, condensate tank, etc. before placing heating system back into operation.
3. After cleaning, fill system with water adding the proper water treatment as recommended by the boiler manufacturer.

F. Servicing and guarantee:

1. The manufacturer shall furnish, without additional charge, a competent factory trained engineer to supervise and check the complete installation, start and adjust the initial fire, and instruct the OWNER'S Operator in the presence of the ENGINEER'S Representative in the proper operation and maintenance.
2. Boiler shall be provided with full warranty. Provide free service, inspection, and adjustment for one (1) year from date of completion and make good any defects in

material or workmanship at no cost to OWNER. The representative in the area shall have factory trained service personnel available at all times on short notice for emergency service.

END OF SECTION

DIVISION 15

MECHANICAL

15600 - HEAT GENERATION

15640 - BOILER WATER TREATMENT

- INDEX: -01- General
 -02- Submittals
 -03- Chemical Feed Metering Pump

-01- GENERAL

- A. CONTRACTOR shall furnish and install piping, fittings, valves, etc., and provide supervision necessary for a complete water treatment installation. CONTRACTOR shall also install all controls and equipment required for the water treatment system.
- B. CONTRACTOR shall receive and store equipment upon delivery to ensure good working condition. If equipment is damaged due to shipment, CONTRACTOR shall immediately take the appropriate action to correct the situation and protect the OWNER from damaged equipment.

-02- SUBMITTALS

- A. In compliance with requirements established within these specifications, provide Shop Drawings on all equipment, devices, and accessories specified in this section.

-03- CHEMICAL FEED METERING PUMP

- A. The chemical feed metering pump shall be a positive displacement-type.
- B. Metering pump shall be a positive displacement-type designed for industrial chemicals and U.L. listed.
- C. Pump shall have a heavy-duty motor and gear train with few moving parts. Pump shall have a self-lubricating disk located where the push rod connects to the diaphragm.
- D. The chemical feed rate shall be continuously adjustable over a 10:1 range.
- E. Motor shall be fan cooled, brushless, shaded-pole, induction-type, 115-1-60m, with thermal overheat protection

- F. Metering pump shall be complete with anti-syphon spring, 5' suction tubing, foot valve strainer, sight-flow indicator and main connection with check, 25' discharge tubing, and instructions.

END OF SECTION

DIVISION 15

MECHANICAL

15650 - REFRIGERATION

15660 - CONDENSING UNITS

- INDEX:
- 01- General
 - 02- Submittals
 - 03- Air Cooled Condensing Units
 - 04- Scroll Compressed Air-Cooled Condenser Units
 - 05- Installation
 - 06- Start up

-01- GENERAL

- A. CONTRACTOR shall furnish and install all materials, equipment, and supervision necessary for a complete installation of the Condensing Units where shown on the Drawings and herein specified. CONTRACTOR shall coordinate this work with the General CONTRACTOR.
- B. CONTRACTOR shall receive and store equipment upon delivery to ensure good working condition. If equipment is damaged due to shipment, CONTRACTOR shall immediately take the appropriate action to correct the situation and protect the OWNER from damaged equipment.

-02- SUBMITTALS

- A. In compliance with requirements established within these Specifications, provide Shop Drawings on all units, equipment, and devices and accessories specified in this Section; including performance data and wiring diagrams complete with interlocks.

-03- AIR COOLED CONDENSING UNITS

- A. General:
 - 1. Unit shall be of size and capacity as listed on the Drawings with complete controls to enable operation as outlined in the Sequence of Operation (15950) and shall be as manufactured by Trane, Carrier, York, McQuay, or an approved equal.

2. Units shall be assembled on heavy-gauge steel mounting/lifting rails, weather-proofed, and include hermetic compressors, coils, fans, and motors and operating charge of R-22, U.L. listed and CSA certified, and rated in accordance with AHRI Standard 210 and 270.
- B. Casing:
1. Unit casing shall be constructed of heavy-gauge, galvanized steel, and painted with a weather-resistant baked enamel finish.
- C. Refrigerant circuits:
1. Condensing units shall have two separated and independent refrigeration circuits. A refrigerant filter dryer shall be provided for each circuit. Each circuit shall have a liquid line service valve with gauge port and a gas line service valve with gauge port. Pressure trap ports shall also be provided in the suction and discharge gas lines of the refrigerant system.
- D. Compressors:
1. Unit shall have two (2) direct-drive, 3600 rpm, hermetic reciprocating compressors with centrifugal oil pump providing positive lubrication to moving parts.
 2. Crank case heater and internal pressure relief valve shall be included for maximum protection.
 3. Unit shall also have compressor overload protection.
 4. Unit shall have internal spring isolation and sound muffling to minimize vibration transmission and noise.
- E. Condenser fans:
1. Condenser fans shall be vertical discharge, direct-drive, statically and dynamically balanced, with aluminum blades and steel hubs. Motors shall be 1075 rpm with permanently lubricated bearings with built-in current and thermal overload protection.
- G. Controls:
1. Unit shall include 24 volt control circuit with fusing and control transformer. Unit shall be factory wired with magnetic contactors for compressors, overload protection, internal pressure relief, and low pressure cutout.

2. Controls to include low ambient operation to 20° F., anti-recycle timers, outdoor air stat, and automatic changeover stat.

-04- SCROLL COMPRESSORED AIR-COOLED CONDENSER

A. General:

1. Unit shall be of size and capacity as listed on the Drawings with complete controls to enable operation as outlined in the Sequence of Operation (15950) and shall be as manufactured by Trane, Carrier, York, McQuay, or an approved equal.
2. Unit shall be factory assembled on a heavy-gauge welded steel lifting frame, weather-proofed, including scroll compressors, coils, fans and motors, an operating charge of R-22, U.L. listed and CSA certified, and rated in accordance with AHRI Standard 210 and 270.

B. Casing:

1. Unit casing shall be constructed of heavy gauge steel, phosphatized, and finished with air dried paint that exceeds a 500 consecutive hour salt spray resistance in accordance with ASTM B117.
2. Units shall have factory installed decorative louvered panels to protect the condenser coils.

C. Compressor:

1. Unit shall incorporate direct drive scroll-type compressors with centrifugal oil pump, inlet dirt separator, journal bearings, oil sight glass, oil charging valve, and internal suspension.
2. Condenser fans shall be direct drive vertical discharge-type and statically and dynamically balanced. Three-phase motors shall be permanently lubricated ball bearing-type with thermal overload protection.

E. Refrigerant circuits:

1. Units having 20 through 30-ton of total capacity shall have one compressor with two step capacity and a single refrigerant circuit.
2. Units having 40 through 60-ton of total capacity shall have two compressors with two steps capacity and one refrigerant circuit for each compressor.

3. Units having 80 through 120-ton of total capacity shall have two compressors with six steps of capacity and one refrigerant circuit for each compressor.

F. Controls:

1. Unit shall be provided with a 115-volt control circuit which includes fusing and control power transformer. Unit shall also be wired with magnetic contractors for the compressor and condenser motors, three-leg, solid-state compressor overload protection, and high/low pressure cutouts. Also provide charge isolation, reset relay, and anti-recycle compressor timer.

-05- INSTALLATION

- A. Air cooled condensing units shall be installed where shown on Drawings and mounted in a neat workmanlike manner.
- B. Installation of each unit shall be complete in accordance with the manufacturer's recommendations and meet all federal, state, and local codes having jurisdiction.
- C. Controls shall operate as outlined in Section 15950, Sequence of Operation.

-06- START UP

- A. The air cooled condensing unit manufacturer shall provide the services of a factory trained representative to facilitate the start-up of each unit and check all final connections and operation of all control devices and shall instruct the OWNER'S Operator in the proper care, operation, and maintenance of the system. A copy of the check, test, and start-up report shall be furnished to the ENGINEER. The representative shall have factory trained personnel available at all times for emergency service.

END OF SECTION

DIVISION 15

MECHANICAL

15650 - REFRIGERATION

15670 - CHILLERS

- INDEX:
- 01- General
 - 02- Submittals
 - 03- Reciprocating Heat Generating Chiller
 - 04- Reciprocating Liquid Chiller
 - 05- Evaporator Chiller
 - 06- Rotary Liquid Chiller
 - 07- Installation
 - 08- Start up

-01- GENERAL

- A. CONTRACTOR shall furnish and install all materials, equipment, and supervision necessary for a complete installation of the refrigeration units where shown on Drawings and herein specified. CONTRACTOR shall coordinate this work with the General CONTRACTOR.
- B. CONTRACTOR shall receive and store equipment upon delivery to ensure good working condition. If equipment is damaged due to shipment, CONTRACTOR shall immediately take the appropriate action to correct the situation and protect the OWNER from damaged equipment.

-02- SUBMITTALS

- A. In compliance with requirements established within these Specifications, provide Shop Drawings on all units, equipment, and devices and accessories specified in this Section, including performance data and wiring diagrams complete with interlocks.

-03- RECIPROCATING HEAT GENERATING CHILLER

- A. Furnish and install (where shown on Drawings) on a 4" solid concrete pad, an electrically controlled reciprocating-type heat reclaim chiller, utilizing hermetic type compressors, of size and capacities as shown on Drawings. Chiller shall be installed in a closed loop

system. Unit construction shall comply with ANSI B9-1 safety code, NEC, and applicable ASME codes.

- B. Compressors shall be reciprocating serviceable-type only with shutoff valves, oil sight glass, refrigerant cooled motor, thermally protected, and vibration isolation mounting. Each compressor shall have a crank case heater and suction cutoff unloaders.
- C. Cooler:
 - 1. Cooler shall be shell-and-tube type with removable heads and seamless copper tubing rolled in tube sheets.
 - 2. Cooler shall be single water pass-type with multiple internal polypropylene baffles.
 - 3. Cooler shall also have dual independent direct expansion refrigerant circuit.
 - 4. Cooler shell shall be insulated with 3/4" closed cell foam or equivalent.
 - 5. Cooler shall be tested and stamped per ASME code for working pressures of 235 psig refrigerant side, and 150 psig minimum water side.
- D. Condensers:
 - 1. One condenser shall be water-cooled, shell-and-tube, with seamless integrally finned copper tubes, removable heads, and positive sub-cooling of liquid refrigerant.
 - 2. One condenser shall be water-cooled, shell-and-tube, with seamless finned copper tubes and removable heads for use with the heat reclaim circuit. This condenser shall be without sub-cooling and shall be insulated with 3/4" closed cell polyvinyl chloride foam or equivalent.
 - 3. Each condenser shall be equipped with a purge cock and liquid line shutoff valve, and shall be tested and stamped per ASME code for working pressures of 385 psig refrigerant side, 250 psig minimum water side.
- E. Each circuit shall contain the following refrigerant components: hot gas muffler, sight glass, filter drier with replaceable core, thermal expansion valve, liquid line solenoid valve, charging valve, discharge gas thermostat, and insulated suction lines.
- F. Controls and safeties:
 - 1. All controls shall be factory mounted in a central control cabinet and shall consist of a start-stop switch, indicator lights, a water step controller for heating or cooling capacity, and a manual heating-cooling switch. Capacity control shall be by

electronic suction cutoff cylinder unloaders in conjunction with a multiple-step controller.

2. Safety controls shall be factory mounted in the control cabinet and include high and low pressure switches, low water temperature switch, and compressor over-current circuit breakers.
- G. Chiller shall be complete with factory installed power and 115 volt control wiring. Manufacturer shall supply transformer package to permit 115 volts to be taken directly from the unit terminal block.
- H. Chiller shall carry full manufacturer's warranty with an extended 4-year compressor warranty.

-04- RECIPROCATING LIQUID CHILLERS

A. General:

1. Furnish and install (where shown on Drawings) on a 4" solid concrete pad, an evaporator chiller of size and capacities as shown on Drawings. Chiller shall be shipped with a full operating charge of oil. Exposed surfaces shall be painted with an air-dry primer finish prior to shipment. Chiller shall be as manufactured by Trane, Carrier, York, or an approved equal. Unit construction shall comply with ANSI B9-1 safety code, NEC, and applicable ASME codes.

B. Compressor motor:

1. Unit shall have two (2) direct drive, 1750 rpm, semi-hermetic reciprocating compressors. Each compressor shall have spring-loaded, positive displacement oil pump and self-relieving to the suction side; oil strainer and magnetic plugs; oil level sight glass; oil charging valve; two-point lubrication for each bearing and connecting rod; immersible crank case heater; double-mesh suction inlet screen; high-strength, non-flexing ring type suction and discharge valves; electric-actuated, gas operated cylinder head unloading; removable discharge heads and hand hole covers; discharge service valves; and rubber-in-shear isolators.

Motor shall be suction, gas-cooled, and suitable for a voltage utilization range of + or - 10% from the name plate voltage. One sensor embedded in each motor winding protects against excessive winding temperatures.

C. Evaporator:

1. Evaporator shall be dual-circuited, shell-and-tube design, with seamless copper tubes, roller expanded into tube sheets; designed, tested, and stamped in accordance with ASME code for refrigerant side working pressure of 225 psig; water side working pressure is 150 psig; one water pass with a series of internal baffles. Each shell shall include drain connections, bulb well for low temperature cutout and temperature controller, and 3/4" (K = 0.28) insulation.

D. Refrigerant circuit:

1. Unit shall have two completely independent refrigeration circuits. Each circuit shall include discharge line service valves, combination moisture indicator-sight glass, charging port, insulated suction line.

E. Control panel:

1. The unit control shall be in a NEMA-1 enclosure containing both a control section, as well as a starter section.
2. The starter section shall contain: top access for power wiring, single point power hookup, three-phase solid-state overload protection, part-winding start relays, field wired grounding lug, and control power transformer with fused protection.
3. The refrigerant section shall contain the reset relays, compressor service switch, control relay, cooling relays, auxiliary relay module, and the microprocessor chiller control.
4. The chiller control shall control the leaving chilled water temperature, compressor anti-recycle function, low water temperature cutout, loss of charge protection, timed periodic pump out, load limiting, automatic lead-lag, low ambient start logic, and self-diagnostic checkout capability.

-05- EVAPORATOR CHILLER

- A. Furnish and install (where shown on Drawings) on a 4" solid concrete pad, an evaporator chiller of size and capacities as shown on Drawings. Chiller shall be as manufactured by Trane, Carrier, York, or an approved equal. Unit construction shall comply with ANSI B9-1 safety code, NEC, and applicable ASME codes.
- B. Evaporator shall be shell and tube design with seamless copper tubes expanded into tube sheets with removable heads. The 20 through 30-ton units shall have one refrigerant circuit. The 40 through 120-ton units shall be dual circuited.

- C. Units shall be designed and tested for a minimum of 150 psig water side working pressure. Units shall also be designed, tested, and stamped in accordance with the ASME code for unfired pressure vessels for a refrigerant side working pressure of 225 psig.
- D. Evaporators shall be fully insulated and provided with fittings for temperature sensors and a drain plug for cleaning.

-06- ROTARY LIQUID CHILLER

A. General:

1. Furnish and install (where shown on Drawings) on a 6" solid concrete pad, rotary chiller and remote evaporator of size and capacities as shown on Drawings. Chiller shall be as manufactured by Trane, Carrier, York, or an approved equal. Unit construction shall comply with ANSI B9-1 safety code, NEC, and applicable ASME codes.
2. Units shall be leak and pressure tested at 450 psig high side, 300 psig low side, then evacuated and charged. Packaged units shall be shipped with a full operating charge of oil and refrigerant.
3. Unit panels, structural elements, and control boxes shall be constructed of 12-gauge galvanized steel and mounted on a welded structural steel base. Unit panels and control boxes shall be finished with a baked on powder paint, and the structural base with an air dry paint. All paints shall meet the requirement for outdoor equipment of the federal government agencies.

B. Evaporator:

1. The evaporator shall be remote to the chiller and suitable for indoor installation of a separate 4" concrete housekeeping pad.
2. The evaporator shall be a tune-in-shell heat exchanger design with internally finned copper tubes, roller expanded into the tube sheet.
3. The evaporator shall be designed, tested, and stamped in accordance with ASME for a refrigerant side working pressure of 300 psig.
4. The evaporator shall also be designed for a water side working pressure of 215 psig. Water connections shall be grooved pipe. The evaporator shall have one water pass with a series of internal baffles. Each shell shall include a vent, drain, and fittings for temperature control sensors and insulated with 3/4" insulation (K = 0.26).

C. Condenser and fans:

1. Air-cooled condenser coils shall have aluminum fins mechanically bonded to internally finned seamless copper tubing.
2. The condenser coils shall have an integral subcooling circuit and also provide oil cooling for the compressor bearing and injection oil.
3. Condensers shall be factory-proof and leak tested at 506 psig.
4. Direct-drive vertical discharge condenser fans shall be dynamically balanced. Three-phase condenser fans motors with permanently lubricated ball bearing and internal thermal overload protection shall be provided.
5. Standard 70-215 ton units shall start and operate down to 15 F. ambient.
6. Standard 240-400 ton units shall start and operate down to 0 F. ambient.

D. Compressor and lube oil system:

1. The rotary screw compressors shall be semi-hermetic type, direct drive, 3600 rpm, with capacity control slide valve, rolling element bearings, differential refrigerant pressure oil pump and oil heater.
2. The motor shall be suction gas cooled, hermetically sealed, two-pole squirrel cage induction motor.
3. Oil separator and filtration devices shall be provided separate from the compressor.
4. Check valves shall be provided in the compressor discharge and lube oil system, and a solenoid valve in the lube system.

E. Refrigeration circuits:

1. Each unit shall have two refrigerant circuits with one or two rotary screw compressors per circuit.
2. Each refrigerant circuit shall include a compressor suction and discharge service valve, liquid line shutoff valve, removable core filter drier, liquid line sight-glass with moisture indicator, charging port, and an electronic expansion valve.
3. Unit shall be provided with fully modulating compressors and electronic expansion valves for variable capacity modulation of the entire operating range.

F. Unit controls:

1. All unit control shall be housed in a weather tight enclosure with removable plates to allow for field connection of power wiring and remote interlocks.
2. All controls; including sensors, shall be U.L. listed and factory mounted and tested prior to shipment.
3. Microcomputer controls shall provide all control functions, including start up and shutdown, leaving chilled water temperature control, compressor and electronic expansion valve, modulation, fan sequencing, anti-recycle logic, automatic lead/lag compressor starting, and load limiting.
4. The unit control module shall automatically take action to avoid unit shutdown due to abnormal operating condition associated with low refrigerant temperature, high condensing temperature, and motor current overload. Should the abnormal operating condition continue until a protective limit is violated, the unit shall shut down and sound an alarm.
5. Unit protective functions shall include loss of chilled water flow, evaporator freezing, loss of refrigerant, low refrigerant pressure, high refrigerant pressure, reverse rotation, compressor starting and running over current, phase loss, phase imbalance, phase reversal, and loss of oil flow.
6. A menu driven digital display shall indicate over operating data points, including chilled water set point, current limit set point, leaving chilled water temperature, evaporator, and condenser refrigerant pressures and temperatures.
7. Diagnostic checks shall be made and displayed when a problem is detected. The digital display shall be read and advanced on the unit without opening any control panel doors.
8. Power connections shall include main three-phase power and two 115 volt single-phase power connections.

G. Starters:

1. Starters shall be housed in a weather-tight enclosure with removable cover plate to allow for field connection of power wiring.
2. Unit shall be provided with across-the-line 480 volt, 3-phase starters.

-07- INSTALLATION

- A. Each chiller shall be installed where shown on the Drawings and mounted in a neat workmanlike manner.
- B. Installation of each unit shall be complete in accordance with the manufacturer's recommendations and meet all federal, state, and local codes having jurisdiction.
- C. Controls shall operate as outlined in Section 15950, Sequence of Operation.

-08- START UP

- 1. The chiller manufacturer shall provide the services of a factory trained representative to facilitate the start up of each unit and check all final connections and operation of all control devices, and shall instruct the OWNER'S Operator in the proper care, operation, and maintenance of the system. A copy of the check, test, and start up report shall be furnished to the ENGINEER. The representative shall have factory trained personnel available at all times for emergency service.

END OF SECTION

DIVISION 15

MECHANICAL

15700 - HEAT TRANSFER SYSTEMS

15701 - HOT WATER HEATING SYSTEM

- INDEX:
- 01- General
 - 02- Submittals
 - 03- Pipe and Fittings
 - 04- Installation
 - 05- Drains
 - 06- Hot Water Specialties
 - 07- Steam Specialties
 - 08- In-Line Pumps
 - 09- Base Mounted Pumps
 - 10- Base Mounted Pumps
 - 11- Starting, Filling, Cleaning and Operating System

-01- GENERAL

- A. CONTRACTOR shall furnish and install all pipe, fittings, valves, run-outs, etc. required and as shown on the Drawings. CONTRACTOR shall also install all control valves and shall provide thermometer wells, pressure connections, etc. required for the temperature control system. CONTRACTOR shall provide everything necessary for a complete installation.
- B. CONTRACTOR shall receive and store equipment upon delivery to ensure good working condition. If equipment is damaged due to shipment, CONTRACTOR shall immediately take the appropriate action to correct the situation and protect the OWNER from damaged equipment.

-02- SUBMITTALS

- A. In compliance with requirements established within these Specifications, provide Shop Drawings on all pumps, equipment, devices and accessories specified in this Section, including pump curves and performance tables.

-03- PIPE AND FITTINGS

- A. All make-up water supply piping to boiler shall be Type "L" hard copper pipe and fittings with sweated joints. All below ground water piping shall be Type "K" soft copper pipe with no joints. All remaining heating piping inside building above ground shall be black steel pipe.
- B. Unless otherwise indicated or scheduled, all mains, risers, returns, and pipes shall be of sizes recommended in latest ASHRAE guide, based on 20" water drop per hundred lineal feet of run for hot water pipe.
- C. All copper water pipe joints shall be carefully made in full conformity with manufacturer's recommendations. Solder shall be silver solder, 95% tin and 5% antimony used with non-corrosive flux.
- D. Joints in ferrous pipe 2" and smaller shall be made with screwed fittings. Joints in ferrous pipe over 2" shall be welded or flanged, except swing joints shall be screwed. Final connections to valves, units, and equipment shall be made with unions for pipes 2". Provide sufficient unions or flanges for repair of lines.
- E. Full lengths of pipe shall be used where possible, short lengths and couplings will not be permitted. Nipples shall be of same material as the connecting pipe. Eccentric fittings shall be used for all changes in pipe size and to completely drain all piping and vent all air in pipes containing water. No reducing bushings will be permitted.
- F. All connections between pipes of dissimilar metals and piping connections to equipment of dissimilar metals shall be made with dielectric couplings or flanges.
- G. All screwed joints shall be made with full tapered threads properly cut and made perfectly tight by use of an approved Teflon tape or pipe compound. All joints shall be made tight without caulking. All pipes shall be accurately cut and reamed or filed. Special care must be used to remove all cuttings and foreign matter from inside of pipes before erection. All sizes of pipes up to 3/4", inclusive, shall be reamed out to the full size of pipe. Ferrous pipe shall be screwed into flanges within 1/8" of face of flange. Flanges shall have packing painted both sides with graphite and oil before applying, and shall be faced true and made up perfectly tight. Where leaks occur on screwed joints, the pipe shall be taken down, rethreaded, and new fittings installed.
- H. Installer may use electric welding of ferrous pipe where above specified, with forged steel welding neck flange connections for repair of lines and with welding fittings used throughout, except swing joints and connections to equipment having screwed taps shall be screwed. Expansion loops shall be made with long radius elbows. Elbows, reducers, caps, tees, etc., shall be welded. Saddling-in of run-outs to mains will be permitted only when done with proper fittings and shall be so arranged as to provide for full swing joints.

- I. No mitered branch welds will be permitted.
- J. All welding shall be done in accordance with the welding procedures of the National Certified Pipe Welding Bureau or any other approved procedure conforming to the requirements of the ASME Boiler and Pressure Vessel and the ANSI Code for Pressure Piping ANSI B31.1. Weld material shall be compatible with the pipe used. No welder shall be employed on the work who has not been fully qualified under the above specified procedure within the last 5 years and so certified by a member of the local chapter of the National Certified Pipe Welding Bureau or similar locally recognized testing authority. All work shall be done in a manner approved by the ENGINEER, presenting a neat and workmanlike appearance, with smooth unobstructed interiors. Cracks, pinholes, excessive undercutting, or other welding defects shall be removed and the joint re-welded.

-04- INSTALLATION

- A. Provide service shut-off valves on each heating and chilled water supply and return branch risers where indicated and on each side of each pump. All tappings in boiler shall be connected full size of tapping.
- B. Heating and chilled water supply and return mains shall generally pitch back to boiler and pumps. Provide air vents at all high points of each run.
- C. All branches shall be taken off bottom of the main for down-feed supply and from the top of the main for up-feed supplies by means of a tee looking up to a 45 degree elbow, all with swing joints for expansion.

-05- DRAINS

- A. A drain valve shall be installed at lowest points in all water piping, pump discharge lines, water heating and cooling coil lines, etc., as necessary for convenient and thorough drainage of all piping systems.
- B. Unless otherwise indicated, drain valves shall be 3/4" hose gate valves.

-06- HOT WATER SPECIALTIES

- A. Pressure reducing valves:
 - 1. Furnish and install pressure reducing water make-up feeder where shown on Drawings consisting of gate valves and diaphragm operated pressure reducing valve with check valve and strainer.

2. Provide a valved by-pass for quick filling.
- B. Triple duty valves:
1. Provide triple-duty combination lift check, balance, and positive shutoff valves at water pumps where shown. Valves shall have linear contoured disc, calibrated stem adjustment, and standard ANSI flanges.
- C. Air vents:
1. Air vents shall be furnished and installed at all high points of hot water heating system, on mains, and up-fed units to completely free system of entrapped air.
 2. Vents shall be accessible manual cocks installed with tubing connected to air pockets where possible.
- D. 3-way control valves:
1. Furnish and install an electrically operated 3-way control valve at each hot water coil, where shown on Drawings.
 2. Automatic operator shall provide full modulation of control valve and shall be controlled by the return air-stat.
 3. Provide unions on each side of valve to facilitate removal.
- E. Balancing valves and devices:
1. On each heating and chilled water branch, 3" size and under where shown on Drawings, provide combination balance and stop valves, consisting of a calibrated bronze balance valve with provisions for connecting a portable differential pressure meter. Meter connections shall have built-in check valves. An integral pointer shall register degree of valve opening. Each balance valve shall be constructed with internal seals to prevent leakage around rotating element. A calibrated curve shall accompany the balance valve that shall be used to determine the flow rate by means of pressure drop and valve setting. Provide performed polyurethane insulation for each valve.
 2. All valves shall have drip-tight shutoff and shall be located so as to be accessible for adjustment.
 3. Circuit setters shall be suitable for a working pressure of 125 psi at 250° F. Water flow shall be balanced by use of a differential meter.

F. Zone control valves:

1. Furnish and install where shown on Drawings, electrically operated heat motor actuated zone control valves.
2. Each valve shall provide 100% shut off at a maximum differential pressure of 35 psig.
3. All units shall be quiet operating and consist of a bronze valve body with sweat connections and a removable valve operator.
4. The operator shall be equipped with a solder-less, 3-terminal, leaf-type stack switch designed to operate on a 24-volt 60 hz single phase, 2-wire power source.
5. The zone valve shall be designed to handle liquid temperatures from 40° F. up to 240° F. at a maximum working pressure of 125 psig.
6. The valve design shall include a back seating disc that enables replacement of the seal gland without draining the system.
7. The valve design shall include an external position indicator and 360 degree rotation of the operator.
8. All operating components shall be protected within a plated steel frame enclosed by the valve operator cover.

G. Thermostatic control valves:

1. Thermostatic valves shall be adjustable, self-contained, wireless, automatic, modulating temperature control valves for use in hot water or two pipe low pressure steam heating systems.
2. Valves shall sense changes in temperature and automatically adjust the flow of heat through the specific equipment to maintain desired room temperature.
3. Operators shall be compatible with the equipment being controlled being mounted directly to valve or remote for ease of adjustment. Remote sensors shall be used to sense space temperature.
4. Valve body shall be corrosion resistant nickel plated brass. Stem shall be stainless steel with double O-ring seals. Cartridge shall be brass with stainless steel spring and stem.

5. Operators shall be of high strength plastics, with glass filled high temperature resistant isolator, with dial knob and attachment nut. Operators to utilize numbered dial settings.

-07- STEAM SPECIALTIES

A. Float and thermostatic steam traps:

1. CONTRACTOR shall furnish on all main drop points and steam equipment, or as otherwise noted on the Drawings, float and thermostatic traps.
2. Traps shall be constructed of heavy cast iron bodies and covers, and shall have horizontal straight-through piping connections.
3. Each trap shall be equipped with an externally accessible phosphor bronze thermostatic air vent with stainless steel valve cone and seat. Internal parts shall be accessible for servicing without disturbing piping.
4. Traps shall be of the upright, open-float type with positive opening and closing condensate valve mechanism of the “snap-action” principle. Condensate float construction shall be of a “fail-safe” design that will open the condensate valve in the event of float failure.
5. Condensate valve and seats shall be of hardened stainless steel. They shall be removable and replaceable. Condensate valve stem “snap-action” shall be independent of the float, and the float shall be of seamless copper.
6. Traps shall be capable of discharging condensate air and other gases without loss of steam within their entire respective operating pressure ranges.
7. Trap sizes and capacities shall be in accordance with the recommended standard adapted by the Steam Heating Equipment Manufacturer’s Association at a differential of 2 psig.

B. Steam control valves:

1. Furnish and install where shown on the Drawings, pneumatically operated steam control valves.
2. Each valve shall provide 100% shut off at a maximum differential pressure of 35 psig.
3. All units shall be quiet operating and consist of a bronze valve body with screwed connections and a removable valve operator.

4. The operator shall be designed to operate for pneumatic operation.
5. The zone valve shall be designed to handle liquid temperatures from 40° F. up to 500° F. at a maximum working pressure of 125 psig.
6. The valve design shall include a back seating disc that enables replacement of the seal gland without draining the system.
7. The valve design shall include an external position indicator and 360 degree rotation of the operator.
8. All operating components shall be protected within a plated steel frame enclosed by the valve operator cover.

C. Strainers:

1. Furnish and install “Y” type strainers ahead of all float and thermostatic traps, control valves, equipment inlets, and as otherwise noted on plans.
2. Each strainer shall be of cast iron construction suitable for line pressures of up to 250 psig.
3. The strainer element shall be of 20 mesh stainless steel and shall be easily removable for cleaning or service.
4. Each strainer shall be equipped with a blow-off tapping. The CONTRACTOR shall furnish and install in the blow-off tapping, pipe plugs or gate valves as noted elsewhere in these specifications, or as noted on Drawings.

-08- IN-LINE PUMPS

- A. In-line pumps shall be oil lubricated in-line horizontal centrifugal booster pumps as scheduled on Drawing, specifically designed and guaranteed for quiet operation, suitable for 175 psi working pressure with gauge ports at nozzles and with vent and drain ports. Pump shall have a hardened ground and polished steel shaft with integral thrust collar. The shaft shall be supported by two horizontal sleeve bearings designed to circulate oil. Pump shall be without stuffing boxes and shall be equipped with a water-tight seal to prevent leakage. Pump shall be of type to allow service on all moving parts without breaking pipe connections to the volute case and without breaking electrical connections to the motor. Pumps shall have capacity and motor characteristics shown on schedule. Power shall be transmitted to the pump shaft through a self-aligning, multi-spring flexible coupler.

- B. Motor shall be 1750 rpm, open, drip-proof, sleeve bearing; quiet operating, non-overloading, rubber mounted construction.
- C. Pumps shall be factory tested at the operating conditions, thoroughly cleaned and painted with one coat of machinery enamel prior to shipment. A set of installation instructions shall be included with the pump at time of shipment.
- D. Pumps shall be installed and aligned in strict accordance with manufacturer's recommendations.
- E. Pumps shall be provided with full warranty.

-09- BASE MOUNTED PUMPS

- A. Pumps shall be of size and capacities as shown on the drawings. Pump shall be base mounted, single-stage, end suction design, and capable of being serviced without disturbing piping connections or motor.
- B. Pump volute shall be cast iron with integrally-cast pedestal support. The impeller shall be cast bronze, enclosed-type, dynamically balanced, keyed to the shaft and secured with a suitable locknut. Pump shall employ a mechanical seal with carbon seal ring and ceramic seat. A replaceable bronze shaft sleeve shall completely cover the wetted area under the seal. Pump bearing housing assembly shall have heavy-duty re-greaseable ball bearings, replaceable without disturbing piping connections.
- C. Pump and motor shall be mounted on a common base plate of heavy structured steel design, suitable for pump mounting as shown on drawings. A flexible-type coupler, capable of absorbing torsion vibration, shall be employed between the pump and motor and all exposed moving parts shall be guarded.
- D. Motor shall meet NEMA specifications and shall be open-type, drip proof, ball bearing, 1750 rpm, and non-overloading.
- E. Pump and motor shall be factory aligned and shall be realigned by contractor after installation according to manufacturer's recommendations.
- F. Each pump shall be factory tested. It shall then be thoroughly cleaned and painted with a high-grade machinery enamel prior to shipment.
- G. Each unit shall be checked by the contractor and regulated for proper differential pressure, voltage, and amperage draw. This data shall be noted on a permanent tag or label and fastened to the pump for OWNER'S reference. A set of installation instructions shall be included with pump at time of shipment.

-10- BASE MOUNTED PUMPS

- A. Pumps shall be of size and capacities as shown on the Drawings. Pump shall be close coupled, single-stage, vertical-split case design and capable of being serviced without disturbing piping connections.
- B. Pump volute shall be cast iron and impeller shall be cast brass, enclosed-type, dynamically balanced, keyed to the shaft, and secured with a suitable locking cap-screw. Pump shall employ a mechanical seal with carbon seal ring and ceramic seat. A replaceable shaft sleeve shall completely cover the wetted area under the seal.
- C. Pump shall be rated for maximum of 175 psi working pressure. Casings shall have gauge ports and vent and drain ports at top and bottom of casings.
- D. Motor shall meet NEMA specifications and shall be open type, drip proof, all bearing, 1750 rpm, and non-overloading.
- E. Each pump shall be factory tested. It shall then be thoroughly cleaned and painted with a high-grade machinery enamel prior to shipment.
- F. Each unit shall be checked by the CONTRACTOR and regulated for proper differential pressure, voltage, and amperage draw. This data shall be noted on a permanent tag or label and fastened to the pump for OWNER'S reference. A set of installation instructions shall be included with pump at time of shipment.

-11- STARTING, FILLING, CLEANING, AND OPERATING SYSTEM

- A. Upon completion of the installation, instruct the OWNER'S operating staff in starting, care, and proper operation of the equipment of the system, and provide two copies of printed or typed step-by-step instructions for the efficient and practical operation and maintenance of the system and equipment.
- B. System shall not be put into operation until directed by the ENGINEER.
- C. At the beginning of the first heating and cooling season following completion of the installation, CONTRACTOR shall start the complete systems in the presence of the OWNER'S Operator, making all final adjustments as required.
- D. Boiler shall be slowly fired from time of starting until full water temperature and pressure is obtained. When under full temperature, all seams, welds, pipe joints, etc., shall be closely examined for signs of leaks which are to be made tight. When equipment and attached piping are found to be tight, they shall be thoroughly cleaned until all signs of grease and oil have been removed.

- E. If the equipment does not properly generate water at the required temperature, and if it is not free from grease, oil, scale, accumulated debris, or other obstructions, CONTRACTOR shall at his own expense drain or clean the system a sufficient number of times to secure these results.
- F. The entire water heating and cooling systems being added under this Contract shall be thoroughly flushed out with an approved detergent and cleaned to remove all pipe dope, slushing compounds, oils, welding slag, loose mill scale, or other extraneous materials. All dirt pockets and strainers shall then be cleaned and neutralized by filling the system with a water solution of trisodium phosphate (1 lb./50 gallons of water) and venting and circulating the water for at least 8 hours after which it shall be completely drained and flushed out; all strainers and dirt pockets cleaned and system filled with fresh water, adding water treatment at time of filling.
- G. Furnish the necessary supply of Vulcan or equal non-chromate chemical treatment and a surveillance consulting program to control corrosion, scale, and pitting in heating system and equipment from start up until the building is turned over to the OWNER.
- H. All dirt pockets and strainers shall again be cleaned prior to turning the system over to the OWNER.

END OF SECTION

DIVISION 15

MECHANICAL

15700 - HEAT TRANSFER SYSTEMS

15730 - HEAT EXCHANGERS

- INDEX:
- 01- General
 - 02- Submittals
 - 03- Plate and Frame Heat Exchangers
 - 04- Shell and Tube Heat Exchangers
 - 05- Installation

-01- GENERAL

- A. CONTRACTOR shall furnish and install all materials, equipment, and supervision necessary for a complete installation of the Heat Exchangers where shown on the Drawings and herein specified. CONTRACTOR shall coordinate this work with the General CONTRACTOR.
- B. CONTRACTOR shall receive and store equipment upon delivery to ensure good working condition. If equipment is damaged due to shipment, CONTRACTOR shall immediately take the appropriate action to correct the situation and protect the OWNER from damaged equipment.

-02- SUBMITTALS

- A. In compliance with requirements established within these Specifications, provide Shop Drawings on all units, equipment, devices, and accessories specified in this Section, including performance data and wiring diagrams complete with interlocks.

-03- PLATE AND FRAME HEAT EXCHANGERS

- A. The Plate and Frame Heat Exchangers shall be of size and capacity as scheduled on the Drawings.
- B. The corrugated channel plates shall be stainless steel.
- C. Channel plate ports shall be double nitrile clip-type gasketed to prevent mixing or cross-contamination of hot side and cold side fluids.

- D. Channel plate carrying bars shall be stainless steel.
- E. The fixed frame plates and the moveable pressure plates shall be corrosion resistant, epoxy painted, carbon steel.
- F. Piping connections 2" and smaller shall be carbon steel NPT tapings (or stainless steel NPT nozzles). Piping connections 4" and larger to be studded port design to accept ANSI flange connections. The connection ports shall be integral to the frame or pressure plate.
- G. Finished units shall be provided with OSHA required formed aluminum splash guards to enclose exterior channel plate and gasket surfaces.
- H. Units shall be designed for a minimum 150 psig working pressure at 150° F. design temperature. Assembled units shall be hydrostatically tested at 1.5 times the full differential design pressure.
- I. Heat exchanger shall be designed to ASME standards and bear the ASME "U" stamp. Each unit shall be registered with the National Board of Boiler and Pressure Vessel Inspectors.
- J. Unit shall carry manufacturer's full warranty.

-04- SHELL AND TUBE HEAT EXCHANGERS

- A. Furnish and install approximately where shown on the Drawings and with the manufacturer's recommendations, a liquid-to-liquid instantaneous water heater heat exchanger and meeting the performance criteria as scheduled on the Drawings.
- B. Heater shall be shell and tube, U-bend type, with removable tube bundle.
- C. Heater shell shall be made of steel, the tubes of 3/4" O.D. copper, heads of cast iron; and tube sheets, baffles, tie rods, and spacers of steel.
- D. A manufacturer's data report for pressure vessels as required by the provisions of the ASME code, shall be furnished to the ENGINEER for the OWNER. This form must be signed by an authorized inspector holding a National Board Commission, certifying that construction conforms to the latest ASME code for pressure vessels for 150 psig design pressure and 375° F. temperature. The ASME "U" symbol shall also be stamped on the heat exchanger. In addition, each unit shall be registered with the National Board of Boiler and Pressure Vessel Inspectors.

-05- INSTALLATION

- A. Heat exchangers shall be installed where shown on Drawings and mounted in a neat workmanlike manner.
- B. Installation of each unit shall be complete in accordance with the manufacturer's recommendations and meet all federal, state, and local codes having jurisdiction.
- C. Controls shall operate as outlined in Section 15950, Sequence of Operation.

END OF SECTION

DIVISION 15

MECHANICAL

15700 - HEAT TRANSFER SYSTEMS

15740 - TERMINAL UNITS

- INDEX:
- 01- General
 - 02- Submittals
 - 03- Finned Tube Radiation
 - 04- Electric Baseboard Radiation
 - 05- Unit Ventilators
 - 06- Blower Coil Units
 - 07- Fan Coil Units
 - 08- Cabinet Heaters
 - 09- Unit Heaters
 - 10- Radiant Panels
 - 11- Installation

-01- GENERAL

- A. CONTRACTOR shall provide all labor, materials, equipment, and supervision necessary for a complete installation of units as required and where shown on Drawings and specified herein.
- B. CONTRACTOR shall receive and store equipment upon delivery to ensure good working condition. If equipment is damaged due to shipment, CONTRACTOR shall immediately take the appropriate action to correct the situation and protect the OWNER from damaged equipment.

-02- SUBMITTALS

- A. In compliance with requirements established within these Specifications, provide Shop Drawings on all units, equipment, devices, and accessories specified in this Section, including complete wiring diagrams with interlocks.

-03- FIN-TUBE RADIATION

- A. Radiation shall be complete with heating element, cover, brackets, end panels, full length damper, and all other accessories for a complete installation.

- B. Elements and enclosures shall be of type, size, and capacities as scheduled on drawings.
- C. Elements shall be copper with aluminum fins bonded to tube.
- D. Hangers to be quiet, free expansion type, on not more than 4 foot centers, and one within 1 foot of each enclosure.
- E. Enclosures shall be constructed of 16 gauge steel. All fasteners shall be applied inside enclosures leaving exterior surface free of exposed screws.
- F. Baked-on enamel finish shall be selected by OWNER'S Representative.

-04- ELECTRIC BASEBOARD RADIATION

- A. Baseboard radiation units shall be complete with enclosures, electric elements, brackets, end panels, and all accessories necessary for a complete installation and shall be of size and capacities as scheduled on Drawings.
- B. Enclosures:
 - 1. Enclosures shall be constructed of 16-gauge steel and mounted into a continuous roll-formed captive channel mounting strip which permits hinge-type mounting and access at the top and invisible fastening onto the electrical assembly or enclosure brackets at the bottom.
 - 2. Front panels shall be individually removable to facilitate cleaning, servicing, or replacement.
 - 3. All accessories shall fasten to the enclosure assembly in a manner which prevents contact with the back wall during installation.
 - 4. Cabinet air outlets of sheet metal shall be recessed and framed or the manufacturer shall supply a bar-type grill or extruded aluminum grille to provide strong linear styling.
- C. Electric elements:
 - 1. All units shall be U.L. approved.
 - 2. Elements shall be suspended between junction boxes being factory installed on a reinforced 20 gauge back panel.

3. Factory installed raceway and wiring to both boxes shall allow power wiring to either end of the element.
4. A capillary-type automatic reset thermal overhear cutout shall be installed the entire length and within 1/2" of the element to protect immediately from overheating.
5. Thermostats shall be wall mounted and relays shall be factory installed within the right-hand junction box.

D. Accessories:

1. End panels, inside and outside corners, and enclosure extensions shall be die-formed and shall lock to enclosure assembly.
2. All enclosures, mounting strip, and accessories shall be cleaned, phosphatized, and finished with light gray, baked enamel finish.

-05- UNIT VENTILATORS

Furnish and install in accordance with manufacturer's instructions, Unit Ventilators of the type and size as scheduled on the Drawings. Unit Ventilators shall be operated with automatic controls provided by the supplier. Units shall be certified, conform to the latest ANSI standards for safe and efficient performance, U.L. listed, and wired in accordance with the National Electric Code.

A. General:

1. Unit Ventilators shall be constructed of 16 gauge steel. Front panels shall be retained by wrench operated camlocks.
2. All steel surfaces shall be cleaned, phosphatized, rinsed, and dried before application of final finish coat. The final finish shall be applied by an electrostatic power spray system, minimum thickness of 1 mil, with no visible run marks. Color shall be selected by the OWNER/ENGINEER.
3. The discharge grilles shall be constructed of heavy steel bars welded in place as an integral part of the unit structure. Sight block-offs shall be installed below the grill above the end pockets.
4. The inlet grilles shall be easily removable for easy filter access by loosening camlocks.

5. The end pockets on each unit shall be provided with removable outside end panels to allow fullest access for installation of valves and piping. Each unit shall have large pipe access openings in the bottom of both end pockets and large knockouts for piping and electrical connections in the back of both ends. Consul Drawings for which units shall be provided with a pipe chase across the back of the unit for field installation of crossover piping and/or running of electrical wiring as required.
6. Leveling legs shall be provided at both ends of the unit to facilitate alignment and leveling.
7. Each unit shall be designed and insulated to provide quiet operation in school classroom setting.

B. Dampers:

1. Units shall be equipped with dual blade-type mixing dampers to ensure proper modulation and mixing of return and outdoor air. A continuous divider shall be placed between the dampers to separate fresh air and return air compartments and prevent blow-through.

C. Fan board assembly:

1. The unit fan board assembly shall be a single, rigid assembly and include the fans, fan housing, bearings, fan shaft, and motor. The fan motor shall be mounted on the fan board.

D. Motors:

1. Motors shall be single speed, permanent split capacitor with thermal overload protection. A multiple tap, auto transformer shall be wired to the motor to provide different RPM settings and to ensure rated capacity with its coil. Motor speed shall not be affected by damper positions or filter loading. The motor shall be easily removable without the fan board.

E. Coils:

1. Units shall be provided with hydronic plate-fin type coils manufactured by the unit ventilator manufacturer and capable of providing the heating and cooling needs as scheduled on the Drawings. Drain pans shall be pitched to facilitate drainage. They must be reversible and easily cleanable.

F. Filters:

1. Each unit shall be equipped with a single 1-inch throw-away filter accessible with removal of the unit's front panel.

-06- BLOWER COIL UNITS

A. General:

1. Each unit shall be a factory assembled horizontal or vertical blower coil unit with centrifugal fan, hydronic coils, drain pan, filter, and mixing box sections as indicated on the Drawings designed for indoor installation. Units shall be U.L. listed and in compliance with NFPA 90A requirements.
2. Unit and accessories shall be insulated with 1-inch, 1½ lb/ft³ density insulation.

B. Casing:

1. The structural components of the casing shall be constructed of 18-gauge galvanized steel insulated with 1-inch, 1½ lb/ft³ density fire resistant and odorless glass fiber material.
2. Fan housing sides shall be directly attached to the air handler top and bottom panels.
3. Coil access panels shall be located on both sides of the air handler to allow removal of the internal coils and drain pan.
4. Main access panels shall provide access to the fan, motor, and drive from both sides of the unit.

C. Water coils:

1. Main water coils and auxiliary coils shall be of size and design as listed on the Drawings specifically designed and circuited for chilled and hot water applications as specified. Fins shall be mechanically bonded to seamless copper tubes and factory tested with 450 psi air under water.

D. Fan:

1. Fans shall be forward curved, centrifugal blower types equipped with heavy-duty, adjustable speed v-belt drive. Fan shaft shall be supported by a heavy-duty, permanently sealed ball bearings.

E. Drain pan:

1. Drain pans shall be sloped in both directions and fully drainable. Coils shall be mounted above drain pan to allow for inspection and cleaning. Drain pan shall be removable.

F. Filters:

1. Provide 2-inch pleated high efficiency (50%) filters with a flat filter rack sized for less than 500 fpm or as recommended by the manufacturer.

G. Motors:

1. Motor shall be open, drip-proof with permanently sealed ball bearings, internal current and thermal overload protection, frame resilient base with electrical characteristics as listed on the Drawings.

H. Mixing box:

1. Mixing box shall be constructed of heavy-gauge, galvanized steel with two low leak parallel blade dampers, factory linked together. Provide an extendible drive rod that can be used for actuator connection, either internally or externally. Damper blades to be extruded aluminum with interlocking extruded edge seals. Damper frame seals to be extruded forms interlocked to the damper frame and provide with the blade seals a continuous edge seal to the blades. Mixing boxes shall include two side access panels to provide access to the unit's internal components.

I. Piping package:

1. Unit shall have factory built piping packages for field installation:
 - *(3-way valve package)*
Piping package shall consist of a ball valve on both the supply and return connections, strainer, circuit setting balancing valve, (two position) modulating three-way control valve, and a balancing fitting on the bypass line.
 - *(2-way valve package)*
Piping package shall consist of a ball valve on both the supply and return connections, strainer, circuit setting balancing valve, and a (two position) modulating two-way control valve. On the auto changeover applications, the CONTRACTOR shall provide a small bleed line connected between the

supply and return lines to provide a slight water flow for the auto changeover sensor.

J. Electric heater:

1. Unit shall be provided where scheduled on the Drawings with a factory mounted U.L. recognized resistance, open-wire, electric heater with disc-type automatic thermal primary safety device. Heater shall be one stage with a single point power connection, mercury contactors, line fuses, and a door interlocking disconnect switch.

K. Controls:

1. Unit controls shall operate as outlined in Section 15950, Sequence of Operation.

-07- FAN COIL UNITS

- A. Furnish and install in accordance with manufacturer's instructions, Fan Coil Units of the type and size as scheduled on the Drawings. Units shall be operated with automatic controls provided by the manufacturer. Units shall be certified, conform to the latest ANSI standards for safe and efficient performance, U.L. listed, and wired in accordance with the National Electric Code.
- B. Units shall include chassis, coil, heavy-density, thermal and acoustical insulation, sure block-offs around coil, removable fan board/drain pan assembly, auxiliary drain pan, fans, fan housing, motor, filter, and grilles.
- C. Provide tamper-proof front panes of 16-gauge steel. Front and end panels shall be insulated over the entire coil section and shall be removable without tools. Low vertical cabinet models shall have removable webbed top and end panel assembly. Top panels shall be galvanized steel, channel-formed with quadrifuser grilles, constructed of 18-gauge galvanized steel and cam lock access door.
- D. Cabinet parts shall be cleaned, bonderized, phosphatized, and painted with light gray, baked-on enamel finish.
- E. Water coils shall be factory piped and burst tested at 450 psig (air) and leak tested at 300 psig (air) underwater. Maximum coil working pressure of 300 psig with a maximum entering water temperature of 275° F. Tubes and U-bends shall be 5/8" OD copper with expanded connections to access standard 5/8" OD copper tubing.
- F. Units shall have galvanized steel drain pans under the full length of coil.

- G. Fan wheels shall be centrifugal forward-curved and double-width. Fan wheels and housings shall be corrosion resistant.
- H. All motors shall have integral thermal overload protection. Motors shall be factory run tested in assembled unit prior to shipping.
- I. Filters shall be concealed from sight and removable without displacing front panels. Provide woven glass fiber throw-away type filters.
- J. Damper blades shall be 18-gauge steel, factory adjusted, to close across stops over the entire blade length.

-08- CABINET HEATERS

- A. The Cabinet Heaters shall be horizontal recessed types as scheduled on Drawings.
- B. Cabinets shall be constructed of 18-gauge steel throughout, removable, four-side overlap, adjustable bottom panel; with full length, piano-type hinge at back; camlocks at front; and bottom supply and discharge grilles.
- C. Coils
 - 1. *Water Coils*

Water Coils shall be of the extended surface-type with seamless copper tubes, mechanically bonded to aluminum fins, with continuous fin colors and sleeved coil and supports. Supply and return connections shall be on the same side of unit. Coils shall be designed, tested, and guaranteed for safe operation. Suitable means shall be provided for expansion and contraction within the casing.
 - 2. *Steam Coils*

Steam coils shall have 1" OD seamless copper tubes, mechanically bonded to configured aluminum fins, with continuous fin collars and sleeved coil end supports. Maximum working pressure of 75 psig for Type B steam coils and 100 psig on Type F steam distributing coil. Factory leak tested at 250 psig air under water. Maximum entering steam temperature of 325° F. for standard coil (Type B) and 400° F. for steam distributing coil (Type F). Steam distributing coils shall have cast iron headers. Supply and return connections shall be on the same side of units.
 - 3. *Electric Heating Coils*

The electric heating coils shall be a hydronic-type, finned-tube construction with resistance elements inserted in tubes on 200-600 cfm units and spiral sheath-type on 800-1800 cfm units. Each unit shall be factory wired with unit mounted heat

switch, magnetic contacters, high temperature cutout safety control, and fan override thermostat.

- D. Fans shall be multi-blade, forward curved, double inlet centrifugal-type, dynamically and statically balanced and mounted on fan board. Bearings shall have extended oilers.
- E. Motors shall be multi-speed permanent split capacitor-type with integral thermal overload protection and shall be specifically designed for continuous operation.
- F. Each unit shall be equipped with 1-inch thick throw-away filters. Provide one extra set of filters.
- G. Each unit shall be tested and rated in accordance with standard test codes and wired in accordance with National Electric Code, and U.L. listed.
- H. Provide approved hangers to support each unit independent of ceiling system and piping.
- I. Unit shall be complete with disconnect switch, motor starter, transformers, unit mounted speed switch, and wall mounted thermostat. Provide for complete installation as per manufacturer's recommendations.

-09- UNIT HEATERS

- A. Unit heaters shall be hot water horizontal discharge-type as scheduled on Drawings.
- B. Casings shall be made of heavy gauge steel, phosphatized to prevent corrosion and finished in baked enamel. Louvers shall be horizontal type. Fans shall have quiet operating, large area blades, machined and balanced to eliminate vibration and noise, located in a venturi-type shroud. Units shall have fan guards.
- C. Coils shall be of the extended surface-type with aluminum fins mechanically bonded to seamless copper tubing and suitable for use on steam pressures to 75 psi or hot water up to 200 psi, 325° F., and tested at not less than 300 psig air under water. All coils shall be one row deep in the direction of air flow. Suitable means for tube expansion shall be provided.
- D. Motors shall be totally enclosed, single speed type, suitable for use on 120 volt, single phase, 60 hz, AC current. Motors shall be designed for continuous duty operation in accordance with NEMA Standards, with sealed-in lubrication on all motors, built in overload protection, and speed shall not exceed 1550 RPM.
- E. Provide approved hangers to support units independent of the piping.
- F. Each unit shall also be provided with motor starters, manual disconnect switch, and unit mounted thermostat to control fan operation.

-10- RADIANT PANELS

- A. Electric Radiant Panels shall be ceiling surface mounted-type as scheduled on the Drawings.
- B. Each panel shall be constructed of a 24-gauge galvanized steel, back overlapping, and riveted to a 22-gauge galvanized steel front.
- C. Panel heating element shall be a carbon (graphite) element and not resistive wires.
- D. The panel surface shall be a multi-faced, crystalline-type, which will demonstrate a watt density of 0.72 watts per square foot at a distance of 6 feet down from the center of the panel if a low density panel (62.5 w/sq. ft.) or a watt density of 1.00 watts per square foot if a high density panel (95 w/sq. ft.).
- E. The rated output shall be:
 - 1. 62.5 watts / sq. ft. with an average surface temperature of not more than 165° F.
 - 2. 95 watts / sq. ft. with an average surface temperature of not more than 200° F.
- F. All panels shall come with not less than a 10 year warranty.

-11- INSTALLATION

- A. Units shall be installed where shown on Drawings and mounted in a neat workmanlike manner.
- B. Installation of each unit shall be complete in accordance with the manufacturer's recommendations and meet all federal, state, and local codes having jurisdiction.
- C. Controls shall operate as outlined in Section 15950, Sequence of Operation.

END OF SECTION

DIVISION 15

MECHANICAL

15700 - HEAT TRANSFER SYSTEMS

15760 - AIR HANDLING UNITS

- INDEX:
- 01- General
 - 02- Submittals
 - 03- Air Handling Unit
 - 04- Split System Air Handling Units
 - 05- Installation

-01- GENERAL

- A. CONTRACTOR shall furnish and install all materials, equipment, and supervision necessary for a complete installation of the heating and cooling units where shown on Drawings and herein specified. CONTRACTOR shall coordinate all roof openings with the General CONTRACTOR.
- B. CONTRACTOR shall receive and store equipment upon delivery to ensure good working condition. If equipment is damaged due to shipment, CONTRACTOR shall immediately take the appropriate action to correct the situation and protect the OWNER from damaged equipment.

-02- SUBMITTALS

- A. In compliance with requirements established within these Specifications, provide Shop Drawings on all units, equipment, and devices and accessories specified in this Section, including fan curves and wiring diagrams complete with interlocks.

-03- AIR HANDLING UNIT

- A. General:
 - 1. Unit shall be factory assembled, horizontal draw-thru, unit specifically designed for indoor heating, ventilating, and air conditioning application as scheduled on Drawings.

2. Unit shall be complete with cabinet section, coil section, filter section, mixing box, remote indicating panel, non-fused disconnect switch, and all operating and safety controls furnished by unit manufacturer. Each unit shall be shipped factory assembled and completely piped, wired, and factory tested. Each unit shall be U.L. listed. All wiring shall be in accordance with the National Electrical Code.
3. The checking, testing, and start up of each unit shall be performed by the manufacturer's representative, and a completed copy of the report shall be filed with the ENGINEER.

B. Cabinet:

1. Cabinet shall be fabricated of heavy gauge steel, reinforced, and braced with steel angle framework for maximum rigidity. Sectionalized casing shall be factory assembled and consist of separate fan and coil sections. Removable panels in fan and coil sections shall provide access to all internal parts. Coils shall be removable through access panels. Metal parts of casing and all accessories, with exception of the coil, shall be chemically cleaned, phosphatized, and given a protective enamel finish. Fan and coil sections shall be insulated with 1-inch, 3/4 pound, mat-faced glass fiber blanket insulation.
2. Drain pan shall be provided under complete fan and coil section with drain connections on both sides and completely insulated with seamless, 1/2" cellular sprayed, foam-in-place insulation. Panels shall be insulated with 1-inch, 3/4 pound, mat-faced glass fiber blanket insulation.
3. The supply air fan shall be DIDW, forward curved, centrifugal-type, statically and dynamically balanced and tested in factory, being installed on properly sized solid shafts and having adjustable sheave drive. Fans shall be mounted on grease lubricated ball bearings designed for long life with extended grease lines. Each fan motor and assembly shall be mounted on a common base and completely isolated from unit and fan board by rubber vibration isolators.
4. Fan housing shall be constructed with die-formed, streamlined inlets and side sheets.
5. Forward curved fans shall be equipped with inlet vanes operated by an aluminum center rotating ball bearing hub located out of fan inlet. Inlet vanes shall be 14-gauge steel welded to vane rods and have edges form-fit to inlet cone circumference. The inlet vane rods shall be offset for rotation out of fan inlet.
6. Airfoil fans shall be equipped with inlet vanes operated by steel center roller bearing, directly linked hub. Inlet vanes shall be 14-gauge steel, able to rotate about rods, and have edges form-fit to inlet cone circumference. Inlet vane rods shall be stationary.

C. Coil section:

1. Coils shall have collars drawn, belled, and firmly bonded to copper tubes by mechanical expansion of tubes. No soldering or tinning shall be used in the bonding process. Coils shall have galvanized steel casings and mounted pitched in the unit casing. Coils shall be removable through unit panel.
2. The hot water heating coil shall be provided by the unit manufacturer. Coil shall be proof-tested at 300 psig air pressure under water and capacities shall be as scheduled on Drawings.
3. Refrigerant coil shall be direct expansion-type, proof tested at 450 psig air pressure under water. The capacities shall be as scheduled on Drawings.

D. Filter section:

1. Provide a high capacity filter section with 2-inch thick, throw-away glass fiber filters.
 - Provide a high efficiency bag filter section with pre-filter and charcoal final filter. Pre-filter shall be 2-inch thick, throw-away glass fiber material. The extended surface bag filter shall have a (55%, 85%, or) 95% average atmospheric dust spot efficiency based on ASHRAE 52-76.
 - Filter cabinet shall have a side access hinged access door with gasketing and sealing latches.
 - Filter area shall be such that the filter velocity is in accordance with the filter manufacturer's recommendations. Filters shall be standard commercial sizes and shall fit snugly to prevent by-pass and arranged so all air handled by the unit fans shall pass through the filters before contacting fans and coils.
 - A signal device shall be factory installed in the filter section and wired to the remote indicating panel to indicate when filters become dirty and require changing.

E. Electrical:

1. Unit shall be provided with a factory mounted, non-fused disconnect switch mounted on the unit. Units shall be provided with short circuit protection of all

internal electrical components, motor starters, contactors, overload protection, remote indicating panel, and control transformers.

F. Controls:

1. Unit shall be complete with all controls necessary for a complete installation and remote monitoring of unit operation.
2. The remote indicating panel shall be furnished by the unit manufacturer and shall be installed under this contract. The remote panel shall include a “manual-off-auto” system switch and signal lights indicating supply fan operation, coil freeze-up, filter media replacement, and heating failure.
3. The temperature control system shall incorporate night setback and building warm up. The warm up cycle shall cause the outside air damper to close until the return air temperature reaches 70° F. Upon completion of warm up cycle, the outside air damper shall return to its open setting.

G. Start up:

1. Unit manufacturer shall provide the services of a factory trained representative to facilitate the start up of each unit and check all final connections and operation of all control devices and instruct the OWNER’S Operator in the proper care, operation, and maintenance of the system. A copy of the check, test, and start up report shall be furnished to the ENGINEER. The representative shall have factory trained personnel available at all times for emergency service.

-04- SPLIT SYSTEM AIR HANDLING UNITS

A. General:

1. Unit shall be factory assembled horizontal draw-thru unit specifically designed for indoor air conditioning application as scheduled on Drawings.
2. Unit shall be complete factory assembled with coil, condensate drain pan, fan motor(s), filter, and controls in an insulated casing that can be applied in either a vertical or horizontal configuration. Units shall be rated and tested in accordance with AHRI Standard 210, 240, 360 and U.L. listed and labeled, and CSA certified. Each unit shall be shipped factory and wired in accordance with the National Electrical Code.
3. The checking, testing, and start up of each unit shall be performed by the manufacturer’s representative and a completed copy of the report shall be filed with the ENGINEER.

B. Casing:

1. Unit casing shall be constructed of zinc coated, heavy gauge, galvanized steel. Exterior surfaces shall be cleaned, phosphatized, and finished with a weather-resistant baked enamel finish.
2. Casing shall be completely insulated with cleanable, foil-faced, fire-retardant, permanent, odorless glass fiber material. All insulation edges shall be either captured or sealed.
3. Knockouts shall be provided for unit electrical power and refrigerant piping connections. Captive screws shall be provided on access panels.

C. Evaporator coils:

1. Coils shall have configured aluminum fin surface mechanically bonded to 3/8" internally enhanced copper tubing and factory pressure and leak tested at 375 psig.
2. Coils shall be arranged for draw-through airflow and provided with a double sloped condensate drain pan, which can be installed in any of four positions, allowing for vertical or horizontal applications with either external drain connections. Drain pan shall be removable for cleaning.
3. Coils shall be completely factory assembled with expansion valves.

D. Evaporator fan:

1. Fan shall be double inlet, double width, forward curved, centrifugal-type with adjustable belt drive.
2. Fan shall have thermal overload protection.
3. Fan and motor bearings shall be permanently lubricated.

E. Controls:

1. Unit shall have a single point power entry, magnetic evaporator fan contactor, low voltage terminal strip, check valves, and evaporator defrost control.
2. All necessary controls shall be factory installed and wired.

F. Filters:

1. Unit shall be provided with two 1-inch throw-away filters accessible from the side coil access panel.

G. Accessories:

1. Provide a two row, hot water (one row steam) coil for mounting on the discharge outlet of the air handler. Coil shall be shipped completely factory assembled within a heavy gauge sheet metal casing, finished with enamel to match the blower coil unit. Coil shall be available for mounting in either a vertical or horizontal airflow configuration.
2. Provide spring-type vibration isolators, mounting subbase for vertical floor mount configurations, and a 7-day programmable electronic night setback thermostat.

-05- INSTALLATION

- A. Units shall be installed where shown on Drawings and mounted in a neat workmanlike manner.
- B. Installation of each unit shall be complete in accordance with the manufacturer's recommendations and meet all federal, state, and local codes having jurisdiction.
- C. Controls shall operate as outlined in Section 15950, Sequence of Operation.

END OF SECTION

DIVISION 15

MECHANICAL

15700 - HEAT TRANSFER SYSTEMS

15770 - PACKAGED HEATING AND COOLING UNITS

- INDEX:
- 01- General
 - 02- Submittals
 - 03- Packaged Roof Top Units
 - 04- Single Packaged Cooling Units
 - 05- Packaged Air Conditioning Unit
 - 06- Installation

-01- GENERAL

- A. CONTRACTOR shall furnish and install all materials, equipment, and supervision necessary for a complete installation of the heating and cooling units where shown on Drawings and herein specified. CONTRACTOR shall coordinate all roof openings with the General CONTRACTOR.
- B. CONTRACTOR shall receive and store equipment upon delivery to ensure good working condition. If equipment is damaged due to shipment, CONTRACTOR shall immediately take the appropriate action to correct the situation and protect the OWNER from damaged equipment.

-02- SUBMITTALS

- A. In compliance with requirements established within these Specifications, provide Shop Drawings on all units, equipment, and devices and accessories specified in the section, including fan curves and wiring diagrams complete with interlocks.

-03- PACKAGED ROOF TOP UNITS

- A. General:
 - 1. Units shall be a single packaged unit specifically designed for outdoor, rooftop application as scheduled on Drawings.

2. Units shall be complete with weatherproof cabinet, roof curb, refrigeration system, natural gas heating system, filter system, remote indicating panel, non-fused disconnect switch, and all operating and safety controls furnished by unit manufacturer. Each unit shall be shipped as a single package completely piped, charged, wired, and factory tested. Cooling capacity shall be rated in accordance with AHRI Standard 360. Each unit shall also be U.L. listed. All wiring shall be in accordance with the National Electrical Code. Each unit shall carry manufacturer's warranty.
3. The checking, testing, and start up of each unit shall be performed by the manufacturer's representative. A completed copy of the report shall be filed with the ENGINEER.

B. Cabinet:

1. Cabinet shall be designed for curb supply and return. It shall be constructed of heavy gauge, galvanized steel, phosphatized, and finished with a baked enamel paint. Top panels shall be of one-piece with lock seam joints filled with sealant and designed to ensure natural drainage. Provide hinged access panels to filters, control panel with quick release latches, and removable access panels shall have neoprene gaskets. All interior surfaces and exterior casing members in contact with airstream shall be insulated with 1-inch mat-faced fiberglass insulation.
2. Base of cabinet shall be water-tight with heavy gauge formed load bearing members, formed recess design to mate and seal with roof curb supplied by unit manufacturer, and curb overhang. A resilient base-to-curb sealing gasket shall be installed to provide a positive seal when the unit is installed on the curb. Provide drains on each side of the condenser section.
3. Both the supply air and the exhaust/return air fans shall be DIDW forward curved centrifugal-type, statically and dynamically balanced and tested in factory, with adjustable sheave drive. Fans shall be mounted on two grease lubricated ball bearings designed for long life with extended grease lines. Each fan motor and assembly shall be mounted on a common base and completely isolated from unit and fan board by rubber vibration isolators.
4. The exhaust/return fan system shall be 100 percent modulating. Provide discharge dampers at unit outlet to modulate exhaust airflow in response to outdoor air-damper position.

C. Roof curb:

1. Roof curb shall be designed and manufactured by the unit manufacturer and manufactured to National Roofing Contractors Association guidelines. Curb shall be constructed of a minimum of 14-gauge galvanized steel with a nominal 2 x 2

nailer. Curb height shall be a minimum of 12" height. Curb shall employ island design whereby it supports the perimeter of the entire unit. Curb shall be fully insulated and formed to provide counter-flashing. The supply and return air openings shall be gasketed.

D. Refrigeration system:

1. Refrigeration system shall be an integral direct expansion system fully charged and factory tested and rated in accordance with the latest ASHRAE standards. Performance shall be scheduled on Drawings.
2. The compressors shall be hermetic, reciprocating, direct drive, and 1750 rpm. Compressors shall have isolation mounting, integral suction accumulation, centrifugal oil pump, oil filter screen and magnetic disks, oil level sight glass, oil changing valve, two point lubrication for each bearing connecting rod, crankcase heater and well, double mesh suction inlet screen, high strength non-flexing ring-type suction and discharge valves, electric actuated unloading, replaceable unloader solenoid valves, and suction and discharge valves. Motor shall be suction gas cooled and have overload protection. Safety controls shall include high and low pressure cutouts, non-recycling pump-down, and reset relay.
3. Single compressor models shall be capable of 3-stop control. Multiple compressor models shall be capable of independent operation with partial standby, with a minimum of 4-steps. Capacity reduction shall be accomplished by cylinder unloading and compressor staging.
4. The evaporator coil shall be designed of seamless copper tubing mechanically bonded to heavy-duty aluminum fins. Each coil circuit shall have an independent thermal expansion valve and shall be factory pressure and leak tested to 300 psi.
5. The condenser coils shall have configured aluminum fins mechanically banded to seamless copper tubing. Provide sub-cooling circuits with liquid accumulators. Coils shall be factory tested and vacuum dehydrated.
6. The condenser fans and motors shall be vertical discharge, direct-drive, statically and dynamically balanced, with steel blades.
7. The refrigeration controls shall provide control of head pressure and prevent short cycling of the compressors during light load conditions, provide for recycling pump down of the refrigeration system, and prevent simultaneous start of the compressors.

E. Heating section:

1. Hot Water Heating Coils

The hot water heating coil shall be mounted external to the roof top unit below the roof. Coil shall be provided by the roof top unit manufacturer complete with a three-way electrically operated mixing valve to be field wired into the control circuit. Coil capacities shall be as scheduled on Drawings.

2. Gas Heating Section

- a. The roof top unit shall be equipped with a two-stage, natural gas heating section, completely assembled, wired, and piped. Design shall be certified by the appropriate agency, AGA or CSA, specifically for outdoor application. Gas connection to unit shall be threaded pipe.
- b. The heat exchanger shall be embossed, formed and seamed, 18-gauge aluminized steel. It shall be factory tested for gas leaks. It shall also be of stress-relieved, free-floating design. The heat exchanger shall be located upstream of the cooling coil.
- c. The burners shall be stamped and seam welded 20-gauge aluminized steel.
- d. Unit shall also be equipped with a forced combustion blower located out of the hot airstream.
- e. Unit shall also be equipped with a 2-stage gas valve and an electronic ignition system.

F. Filter section:

1. Each unit shall be provided with 2" thick, throw-away glass fiber filters. Filter area shall be such that the filter velocity is in accordance with the filter manufacturer's recommendations. Filters shall be standard commercial sizes and shall fit snugly to prevent by-pass, and arranged so all air handled by the unit fans shall pass through the filters before contacting fans and coils.
2. A signal device shall be factory installed in the filter section and wired to the remote indicating panel to indicate when filters become dirty and require changing.

G. Electrical:

1. Unit shall be provided with a factory mounted, non-fused disconnect switch mounted such that power supply wiring will be brought up through the bottom of unit inside the roof curb. Units shall be provided with short circuit protection of all internal electrical components, motor starters, contactors, overload protection, remote indicating panel, and control transformers.

H. Controls:

1. Unit shall be complete with economizer cycle and all controls necessary for a complete installation and remote monitoring of unit operation.
2. The economizer controls shall provide for minimum outside air required for ventilation and natural cooling by modulating outside and relief air dampers.
3. The remote indicating panel shall be furnished by the roof top unit manufacturer and shall be installed by the temperature control contractor. The remote panel shall include a "manual-off-auto" system switch, a refrigeration lockout switch, and signal lights indicating supply and relief fan operation, filter media replacement, heating failure, and cooling failure.
4. The temperature control system shall incorporate night setback and building warm up. The warm up cycle shall cause the outside air damper to close until room temperature is reached. Upon completion of warm up cycle, the outside air damper shall return to being controlled by the economizer cycle.

I. Start up:

1. Packaged roof top unit manufacturer shall provide the services of a factory trained representative to facilitate the start up of each unit and check all final connections and operation of all control devices and instruct the OWNER'S Operator in the proper care, operation, and maintenance of the system. A copy of the check, test, and start up report shall be furnished to the ENGINEER. The representative shall have factory trained personnel available at all times for emergency service.
- 2.

~~-04-~~ SINGLE PACKAGED COOLING UNITS

A. General:

1. Unit shall be a single-packaged, vertical-type cooling unit; including a self-contained, water-cooled condenser completely assembled and designed for indoor installation as manufactured by York or Trane, as scheduled on the Drawings or approved equal.
2. Unit shall be complete with insulated cabinet containing the fan section, water cooled condenser, refrigerant compressors, direct expansion evaporator coil, factory-mounted controls with remote indicating panel and non-fused disconnect switch. Each unit shall be shipped as a single-package, completely piped, charged, wired, and factory tested. Cooling capacity shall be rated in accordance with AHRI Standard 360. All wiring shall be in accordance with the National Electrical Code. Each unit shall carry the manufacturer's warranty.

3. The checking, testing, and start up of each unit shall be performed by the manufacturer's representative, and a completed copy of the report shall be filed with the ENGINEER.

B. Cabinet:

1. The framework of the unit shall be 14-gauge galvanized structural steel. The removable exterior panels shall be constructed from 18-gauge galvanized steel with a painted epoxy enamel finish.
2. The unit shall be insulated with 1" thick, 1-1/2 lb./cu.ft. density fiberglass insulation.

C. Fan section:

1. The supply fan shall be single (double) width, double inlet, low (medium) pressure, forward curved fan. The fan shall be mounted on a solid steel shaft with bearings designed and rated for 200,000 hours average life. The drive assembly consists of fixed pitch sheaves, v-belt drives, and open drip-proof motors.
2. The complete fan/motor assembly shall be spring isolated, as well as statically and dynamically balanced. The fan section shall be acoustically treated.

D. Condenser:

1. The condenser shall be water-cooled, tube-in-tube, counter-flow design, with removable headers at both ends permitting mechanical cleaning of the tubes. Tubes shall be seamless with no interior joints.
2. The condenser design shall eliminate oil trapping and promote positive oil return control.
3. The condenser, including water piping and valves, shall be designed, rated, and tested for 300 psig design working pressure on the water side. The refrigerant side shall be designed, rated, and tested for 400 psig design working pressure.
4. The condensers shall be fabricated in accordance with the ASME code for unfired pressure vessels.

E. Compressors/refrigerant circuit:

1. Unit shall have quiet, multiple hermetic compressors with each having its own independent refrigerant circuit.

2. Each refrigerant circuit shall consist of a sealed filter dryer, liquid line sight glass, thermal expansion valve, solenoid valve, liquid line shut-off valve, and a charging port. Each circuit shall be factory piped, tested, and fully charged with R-22.
3. Each compressor shall have solid state inherent motor with high and low pressure protection. Each compressor shall be suction cooled and complete with crank case heater, oil sight glass, and suction/discharge valves.
4. Supply the discharge and suction lines with rote-lock valves, each having a gauge port.
5. Each compressor shall be mounted on rubber-in-shear (R.I.S.) vibration isolators.
6. The lead circuit shall be equipped with hot by-pass.

F. Evaporator coil:

1. The direct expansion evaporator shall consist of a full-face coil with counter-flow circuits, seamless, 1/2-inch diameter copper tubes mechanically bonded in aluminum fins.
2. Provide a 16-gauge, insulated, galvanized steel drain pan with mastic coating under coil.
3. Each coil shall be pressure tested under water, completely dehydrated, and again pressure tested with refrigerant to ensure its integrity.
4. Each coil shall be rated per ANSI/ASHRAE — 15 code to 325 psig pressure.

G. Filter section:

1. Provide a high capacity filter section with 2-inch thick, throw-away glass fiber filter.
2. Filter cabinet shall have a side access, hinged access door with gasketing and sealing latches.
3. Filter area shall be such that the filter velocity is in accordance with the filter manufacturer's recommendations. Filters shall be standard commercial sizes and shall fit snugly to prevent by-pass and arranged so all air handled by the unit fans shall pass through the filters before contacting fans and coils.
4. A signal device shall be factory installed in the filter section and wired to the remote indicating panel to indicate when filters become dirty and require changing.

H. Controls:

1. Controls shall be factory mounted, wired, adjusted, and tested.
2. Control panel and remote indicating panel shall have the following diagnostic indicators: power on, compressors operating, no air flow, dirty filters.
3. Control panel shall include the following safety controls: high and low pressure switches, compressor overload protection, and compressor recycle timer. Control panel shall also include malfunction alarm and freeze-stat control.
4. Unit shall be equipped with a non-fused disconnect switch and have a single point power connection with each compressor circuit being individually fused.

I. Start up:

1. The unit manufacturer shall provide the services of a factory trained representative to facilitate the start up of each unit and check all final connections and operation of all control devices and instruct the OWNER'S Operator in the proper care, operation, and maintenance of the system. A copy of the check, test, and start up report shall be furnished to the ENGINEER. The representative shall have factory trained personnel available at all times for emergency service.

-05- PACKAGED AIR CONDITIONING UNIT

- A. Furnish and install an air-cooled, packaged terminal heat pump with auxiliary electrical resistive heat as indicated on Drawings. Size and capacities shall be as scheduled on Drawings.
- B. Controls shall be factory wired and completely enclosed within the unit and be accessible from top. Adjustable thermostat shall automatically cycle compressor to maintain space conditions. Thermostat shall be liquid-filled type. Unit control shall be six-position switch with high and low fan speeds for cooling and heating, and one-position for fan-only operation. Ventilation control shall be two-position. All vent air shall be filtered.
- C. Compressor shall be rubber shock mounted or spring mounted for quiet operation and vibration isolation. Compressor shall be in a hermetically sealed steel case that is sprayed with black paint.
- D. Evaporator and condenser coils shall have aluminum tubing and aluminum fins. A capillary tube shall be the metering device for the refrigeration system.
- E. Indoor and outdoor fans shall be direct drive. Indoor fan shall be centrifugal-type and outdoor fan shall be propeller-type with aspirator for condensate removal.

- F. Unit shall be furnished complete with sleeve, subbase, architectural grill with flange, hard wire kit, universal drain kit, and indoor trim strip.
- G. Unit shall be equipped with additional corrosion protection.
- H. Provide a 5-year warranty protection.

-06- INSTALLATION

- A. Units shall be installed where shown on Drawings and mounted in a neat workmanlike manner.
- B. Installation of each unit shall be complete in accordance with manufacturer's recommendations and meet all federal, state, and local codes having jurisdiction.
- C. Controls shall operate as outlined in Section 15950, Sequence of Operation.

END OF SECTION

DIVISION 15

MECHANICAL

15700 - HEAT TRANSFER SYSTEMS

15780 - HUMIDITY CONTROL

- INDEX:
- 01- General
 - 02- Submittals
 - 03- Humidifiers
 - 04- Installation

-01- GENERAL

- A. CONTRACTOR shall furnish and install all materials, equipment, and supervision necessary for a complete installation of the humidity control equipment as required and where shown on Drawings and specified herein.
- B. CONTRACTOR shall receive and store equipment upon delivery to ensure good working condition. If equipment is damaged due to shipment, CONTRACTOR shall immediately take the appropriate action to correct the situation and protect the OWNER from damaged equipment.

-02- SUBMITTALS

- A. In compliance with requirements established within these specifications, provide Shop Drawings on all humidity control equipment, devices, and accessories specified in this Section, including complete wiring diagrams and interlocks.

-03- HUMIDIFIERS

- A. The steam humidifier for distribution of humidity into air handling system shall be of the self-contained, electronically co-designed, being mounted in manufacturer's self-contained wall cabinet.
- B. Humidifier shall generate steam from ordinary tap water. All internal components shall be contained in a steel cabinet with key-locked access door to prevent unauthorized tampering.

- C. Humidifier shall have full modulating control to provide 0 to 100% capacity and shall be fully field adjustable over entire range.
- D. Humidifier shall have steam generators that can be taken apart for inspection, cleaning, and replacement of parts. Electrodes shall be field adjustable.
- E. Water fill lines shall incorporate an air gap to prevent backflow of contaminated water into the water supply system. Humidifier shall also incorporate an electronic timer to control the automatic water drain cycle which will evacuate minerals and particles left in suspension in the generator. The automatic drain cycle shall be field adjustable.
- F. Electronic circuit shall provide automatic protection from excessive electrode current and high water overflow. Provide electrical terminals for installation of controlling humidistat, duct high-limit stat, and interlock switches to roof top unit.
- G. Provide stainless steel steam dispersion tubes for uniform steam distribution over entire length and shall adequately span the entire width of the supply air duct. Provide flexible rubber steam supply hoses and a solid state electronic humidistat capable of fully modulating the steam flow.

-04- INSTALLATION

- A. Units shall be installed where shown on Drawings and mounted in a neat workmanlike manner.
- B. Installation of each unit shall be complete in accordance with the manufacturer's recommendations and meet all federal, state, and local codes having jurisdiction.
- C. Controls shall operate as outlined in Section 15950, Sequence of Operation.

END OF SECTION

DIVISION 15

MECHANICAL

15800 - AIR DISTRIBUTION

15810 - GAS HEATING SYSTEMS

- INDEX:
- 01- General
 - 02- Submittals
 - 03- Make-up Air Units-Direct Feed
 - 04- Make-up Air Units-Indirect Fire
 - 05- Roof Top Make-up Air Units
 - 06- Indoor Gas Fired Duct Furnaces
 - 07- Gas Fired Unit Heaters
 - 08- Gas Fired Infrared Unit Heaters
 - 09- Gas Fired Furnaces
 - 10- Installation

-01- GENERAL

- A. CONTRACTOR shall furnish and install pipes, fittings, hangers, etc., and all equipment necessary for a complete installation of units as required and where shown on Drawings and specified herein.
- B. CONTRACTOR shall receive and store equipment upon delivery to ensure good working condition. If equipment is damaged due to shipment, CONTRACTOR shall immediately take the appropriate action to correct the situation and protect the OWNER from damaged equipment.

-02- SUBMITTALS

- A. In compliance with requirements established within these Specifications, provide Shop Drawings on all equipment specified in the Section, including complete wiring diagrams with interlocks.

-03- MAKE-UP AIR UNITS -Direct Feed

- A. General:

1. Unit shall be a single packaged propane gas, direct-fired unit designed for indoor, 100% make-up air application, and roof hung through spring-type vibration isolators as scheduled on the Drawings.
2. Unit shall be for horizontal installation complete with cabinet, direct-fired propane gas heating section, filter section, inlet damper, double deflection discharge, louvers, motor starter, automatic mild weather burner lockout, remote control station with system switches, and indicating lights and all operating and safety controls furnished by the manufacturer. Each unit shall be shipped as a single package completely wired and factory tested. All wiring shall be in accordance with the National Electrical Code. Each unit shall carry the manufacturer's warranty.
3. The checking, testing, and start up of each unit shall be performed by the manufacturer's representative, and a complete copy of the report shall be filed with the ENGINEER.

B. Equipment casing:

1. Housing shall be constructed of high quality 14-gauge steel to ensure long rust-free life.
2. Access panels shall be provided to allow easy access to motors, filters, and controls.
3. Casing shall be primed and finished with a heat resistant enamel finish — inside and outside.
4. Unit shall incorporate four lifting lugs.

C. Blower section:

1. Blower wheels shall be statically and dynamically balanced, forward curved, double width, double inlet, Class 1-type. Wheels shall be mounted on a solid turned, ground shaft with keyway for driven shaft. Blower shall have an adjustable drive.
2. Bearings shall be ball bearing, self-aligning, and permanently lubricated.
3. Motor shall be T-frame, ODP, and 1800 RPM lubricated ball bearing-type for voltage as scheduled on Drawings.

D. Burner section:

1. The burner shall be a direct gas-fired line burner suitable for complete combustion of propane gas and having a turndown ratio of up to 30:1.
2. Burner combustion must be clean and odorless. Combustion efficiency must limit the products of combustion to a maximum of 5 ppm carbon monoxide and a maximum of 0.5 ppm nitrogen dioxide.
3. The burner shall have stainless steel combustion baffles, non-clogging gas ports, spark-ignited intermittent pilot, and flame safeguard system.
4. An observation port shall be provided in burner cabinet.
5. Profile plates to control proper air velocity across the burner shall be factory installed and adjusted during an actual firing test and locked in place before shipment.

F. Filter section:

1. Each unit shall be provided with 2" thick throw-away filters. Filters shall be such that the filter velocity is in accordance with the filter manufacturer's recommendations. Filters shall be standard commercial sizes, and shall fit snugly to prevent by-pass, and arranged so all air handled by the unit fans shall pass through the filters before contacting fans and heater.

G. Electrical:

1. Unit shall be provided with a factory mounted fused disconnect switch, short circuit protection of all internal electrical components, motor starters, contactors, overload protection, and control transformers.

H. Controls:

1. Controls shall be FM or IRI approved.
2. Controls shall include, but not be limited to: main gas hand shutoff valve, a main and pilot gas pressure regulators, pilot controls, electric safety shutoff valve, motorized modulating gas valve with temperature controller, ultra-violet flame sensor, air flow switch, low outlet temperature shutoff, high limit switch, an automatic mild weather burner lockout, ignition transformer, an electronic flame safeguard system, a NEMA 1 control box, a remote control station with switches and indicating lights.
3. Unit controls shall perform as outlined in Section 15950, Sequence of Operation.

I. Start up:

1. CONTRACTOR shall provide the services of a factory trained representative to facilitate the start up of each unit and check all final connections and operation of all control devices, and to instruct the OWNER'S Operator in the proper care, operation, and maintenance of the system. CONTRACTOR shall have factory trained personnel available at all times for emergency service.

-04- MAKE-UP AIR UNITS -Indirect Fired

A. General:

1. Unit shall be an indirect, natural gas-fired, vertical (horizontal) unit specifically designed for indoor mixed air application as scheduled on the Drawings.
2. Units shall be complete with indirect fired natural gas heating system, vertical mount with 45 degree discharge nozzles, power ventilator, bottom ducted inlet, combination V-bank filter mixing box section, FM/IRI approval, remote "ON-OFF-AUTO" system switch and a "Summer-Winter" selector switch, fused disconnect switch, full modulation burner having (2:1), (3:1), (8:1) turndown ratio, and all operating and safety controls for a complete installation furnished by the unit manufacturer. Each unit shall be completely wired and factory tested. Each unit shall be U.L. listed. All wiring shall be in accordance with the National Electrical Code. Each unit shall carry the manufacturer's warranty. Also provide a 5'-0" structural support stand.
3. The checking, testing, and start up of each unit shall be performed by the manufacturer's representative, and a completed copy of the report shall be filed with the ENGINEER.

B. Casing:

1. The cabinet shall be fabricated of 16-gauge CRS, heavily reinforced to assure rigidity, and backed by an internal radiation shield.
2. The casing shall be primed and finished with a coat of enamel.
3. Units shall incorporate a combination filtered mixing box section with ducted intake and return collars with control dampers. Unit shall also have duct discharge collar.

C. Fans and drives:

1. Units shall be equipped with forward curved, centrifugal DWDI fans, statically and dynamically balanced, and mounted on a heavy-duty, cold-rolled steel shaft of a size limiting first critical speed to at least 25% above maximum operating speed.
2. Bearings shall be ball bearings, self-aligning, permanently lubricated.
3. Blower scrolls, bearings, and adjustable motor base shall be mounted and properly reinforced to ensure rigidity and quiet operation.
4. The driver and driven sheaves shall be of the keyed hub-type. The driven sheave shall be of a fixed-pitch diameter, and the driver shall be a variable pitch diameter sheave. V-belt drives shall be sized for 135% of motor horsepower.
5. Motor shall be 1800 RPM, T-frame, open-drip proof, and pre-lubricated ball bearing-type.

D. Furnace section:

1. The primary combustion chamber shall be of all welded, 400 series, stainless steel construction, with a minimum of 16-gauge material. The chamber shall be designed for a minimum of two-pass flame travel within the chamber. The secondary heat exchanger shall be of mild steel tubes and headers.
2. Burners shall be modulating power-type and shall employ power spark ignition and main burner pilot ignition for use with natural gas.
3. Burner shall include in the standard manifold a main gas electric shutoff valve, main and pilot gas pressure regulator for maximum inlet pressure, pilot gas-air mixer, and pilot solenoid valve. Minimum inlet pressure is 4 oz.
4. Controls shall be factory mounted and shall include a control transformer, bonnet fan and limit switch, low voltage transformer, electric fan relay with pilot flame safeguard, and all necessary relays and switches.

E. Filter section:

1. V-bank filter section shall be provided with 2" thick throw-away filters. Filters shall be such that the filter velocity is in accordance with the filter manufacturer's recommendations. Filters shall be standard commercial sizes and shall fit snugly to prevent by-pass, and arranged so all air handled by the unit fans shall pass through the filters before contacting fans and heater.

F. Electrical:

1. Unit shall be provided with a factory mounted, non-fused disconnect switch, short circuit protection of all internal electrical components, motor starters, contactors, overload protection, and control transformers.

G. Temperature control:

1. Return air and outside air dampers shall be (fixed position) (motor operated).
2. Unit controls shall perform as outlined in Section 15950, Sequence of Operation.

H. Start up:

1. CONTRACTOR shall provide the services of a factory trained representative to facilitate the start-up of each unit and check all final connections and operation of all control devices and instruct the OWNER'S Operator in the proper care, operation, and maintenance of the system. CONTRACTOR shall have factory trained personnel available at all times for emergency service.

-05- ROOF TOP MAKE-UP AIR UNITS

A. General:

1. Unit shall be a single packaged indirect, natural gas-fired unit specifically designed for outdoor, rooftop, mixed or 100% make-up air application as scheduled on Drawings.
2. Units shall be complete with weatherproof cabinet, roof curb, indirect-fired natural gas heating system, filter system, mixed or 100% outside air capability, vertical supply and return air plenums, non-fused disconnect switch, and all operating and safety controls furnished by unit manufacturer. Each unit shall be shipped as a single package completely wired and factory tested. Each unit shall be U.L. listed. All wiring shall be in accordance with the National Electrical Code. Each unit shall carry the manufacturer's 5-year warranty.
3. The checking, testing, and start up of each unit shall be performed by the manufacturer's representative, and a completed copy of the report shall be filed with the ENGINEER.

B. Equipment casing and base:

1. Casing shall be constructed of high-quality aluminized steel to ensure long rust-free life.

2. Access panels shall be provided to allow easy access to motors, filters, and electrical controls.
3. Casing shall have air primed and enamel finish.
4. Base frame channels shall be constructed of 12-gauge aluminized steel for light models and 1/4" hot rolled steel base frame for heavier models.

E. Blower section:

1. Blower wheels shall be statically and dynamically balanced, forward curved, double width, double inlet, Class 1. Wheels shall be mounted on a solid turned ground shaft with keyway for driven sheave.
2. Bearings shall be ball bearings, self-aligning, permanently lubricated.
3. Blower scrolls, bearings, and adjustable motor base shall be mounted and properly reinforced to ensure rigidity and quiet operation.
4. Cabinet shall be of 16-gauge aluminized steel with a primed and enamel finish.
5. The driver and driven sheaves shall be of the keyed hub-type. The driven sheave shall be of a fixed pitch diameter and the driver shall be a variable pitch diameter sheave. V-belt drives shall be sized for 135% of motor horsepower.
6. Motor shall be 2-speed 1800/900 RPM, T-frame, open drip-proof, pre-lubricated ball bearing-type.

G. Furnace section

1. Heater exchanger tubes shall be :
 - a. Aluminized steel, 18-gauge tubes, and 16-gauge heater plates; all electric welded construction. Internal baffles are 0.032", Type 409 stainless steel with stainless steel tips (1-year warranty).
 - b. Type 409 (chrome) stainless steel; 0.044" tubes and 0.050" heater plates. Internal baffles are 0.032", Type 409 stainless steel with stainless steel tips (5-year warranty).
 - c. Type 321 (chrome-nickel) stainless steel; 0.041" tubes and 0.060" Type 409 heater plates. Internal baffles are 0.032", Type 409 stainless steel with stainless steel tips (10-year warranty).

4. Burners shall be made of 18-gauge aluminized steel with Type 430 stainless steel ribbon inserts.
5. Burner tray shall be so constructed as to slide out from compartment for easy service and maintenance.
6. Gas and electric components shall consist of not less than the following: main gas cock, main gas pressure regulator, main solenoid gas valve, pilot gas cock, pilot gas pressure regulator, pilot solenoid gas valve, intermittent spark ignition system, high limit control, and 24 volt control transformer. Manifold controls may be in combination.
7. The cabinet shall be weather-proof of 20-gauge aluminized steel construction with an enamel finish.
8. Heater shall be equipped with a power venter.

H. Roof curb:

1. Roof curb shall be designed and manufactured by the unit manufacturer and manufactured to National Roofing Contractors Association Guidelines. Curb shall be constructed of a minimum of 14-gauge galvanized steel with a nominal 2 x 2 nailer. Curb height shall be a minimum of 12" high and designed to compensate for roof slope to ensure a level unit placement. Curb shall support the entire unit and be fully insulated and formed to provide counter flashing. The supply and return air openings shall be gasketed.

I. Filter section:

1. Each unit shall be provided with 2" thick throw-away filters. Filters shall be such that the filter velocity is in accordance with the filter manufacturer's recommendations. Filters shall be standard commercial sizes and shall fit snugly to prevent by-pass, and arranged so all air handled by the unit fans shall pass through the filters before contacting fans and heater.

J. Electrical:

1. Unit shall be provided with a factory mounted, non-fused, disconnect switch mounted such that power supply wiring will be brought up through the bottom of unit inside the roof curb. Units shall be provided with short circuit protection of all internal electrical components, motor starters, contactors, overload protection, and control transformers.

K. Temperature control:

1. The temperature controls shall provide full electronic modulation, down to 30% of the rated input, providing constant leaving air temperature. A remote temperature selector mounted in the control cabinet shall permit adjustment of the leaving air temperature. A room thermostat shall control the space temperature for Day-Night operation.
2. Return air and outside air damper controls shall also be electronic.
3. Unit controls shall perform as outlined in Section 15950, Sequence of Operation.

L. Start up:

1. CONTRACTOR shall provide the services of a factory trained representative to facilitate the start-up of each unit and check all final connections and operation of all control devices and instruct the OWNER'S Operator in the proper care, operation, and maintenance of the system. CONTRACTOR shall have factory trained personnel available at all times for emergency service.

-06- INDOOR GAS FIRED DUCT FURNACES

A. General:

1. Units shall be a packaged indoor, indirect, natural gas-fired duct furnace completely factory assembled, piped, wired, and test fired. Units shall be as scheduled on the Drawings.
2. Each unit shall be AGA certified and conform to the latest ANSI standards for safe and efficient performance.
3. Each unit shall be provided with four-point suspension hangers.

B. Casing:

1. Casings shall be die-formed, 20-gauge galvanized steel, and finished in baked enamel. Bottom panel shall be easily removable to provide service access to the burners, pilot, and orifices. The pilot and high limit switch shall be accessible through side panel access plates.
2. Casing shall incorporate duct flanges for simple ductwork connections to both the air supply and discharge.

C. Heat exchanger:

1. Heater exchanger tubes shall be aluminized steel, 18-gauge tubes, and 16-gauge heater plates; all electric welded construction. Internal baffles are 0.032", Type 409 stainless steel with stainless steel tips (1-year warranty).
2. Heater exchanger tubes shall be Type 409 (chrome) stainless steel; 0.044" tubes and 0.050" heater plates. Internal baffles are 0.032", Type 409 stainless steel with stainless steel tips (5-year warranty).
3. Heater exchanger tubes shall be Type 321 (chrome-nickel) stainless steel; 0.041" tubes and 0.060", Type 409 heater plates.

D. Draft diverter:

1. Draft diverter shall be standard corrosion resistant aluminized steel.
2. Draft diverter shall be 409 stainless steel construction.

E. Burners:

1. Burners shall be made of 18-gauge aluminized steel with stainless steel port protectors.
2. Burners shall be individually removable for easy inspection and servicing.
3. Each burner shall be provided with an individually adjustable, manually rotated air shutter adjustment.

F. Controls:

1. Provide factory installed junction box for all power connections.
2. Gas valve shall be hydraulic modulation-type, providing modulated heat output from 50% to 100% rated input and shall be controlled by a discharge air sensing bulb. An automatic electric valve in series with the modulation gas valve shall cycle the unit in response to a low voltage, single-stage thermostat.
3. Controls shall also include a main operating valve and pilot safety shutoff, pressure regulator, manual main and pilot shutoff valve, adjustable pilot valve, a 24-volt control transformer, high-limit, and fan time delay relay. Gas valve shall be suitable for a maximum inlet pressure of 0.5 psi (14" W.C.) on natural gas.

-07- GAS FIRED UNIT HEATERS

A. General:

1. Units shall be a packaged indoor, indirect, natural gas-fired unit heaters completely factory assembled, piped, wired, and test fired. Units shall be as scheduled on the Drawings.
2. Each unit shall be AGA certified and conform to the latest ANSI standards for safe and efficient performance.
3. Each unit shall be provided with four-point suspension hangers.

B. Casing:

1. Casings shall be die-formed, 20-gauge galvanized steel and finished in baked enamel. Bottom panel shall be easily removable to provide service access to the burners, pilot, and orifices. The pilot and high limit switch shall be accessible through side panel access plates.
2. Casing shall incorporate independently adjustable horizontal louvers with stops to prevent total closure.

C. Heat exchanger:

1. Heater exchanger construction shall consist of seam welded, 20 gauge aluminized steel tubes, and 18-gauge aluminized steel headers.
2. Heater exchanger and draft hood assembly shall carry a 10-year warranty to be free from defective material and workmanship.

D. Draft diverter:

1. Draft diverter shall be standard corrosion resistant, aluminized steel.

E. Burners:

1. Burners shall be die-formed, corrosion resistant, aluminized steel with stainless steel port protectors.
2. Burners shall be individually removable for easy inspection and servicing.
3. Each burner shall be provided with an individually adjustable, manually rotated air shutter adjustment.

F. Fans:

1. Fan blades shall be of aluminum construction with an aerodynamic contour.
2. Fans shall be dynamically balanced for quiet, efficient operation.
3. Rubber-in-shear isolators shall be used to provide isolation between the fan/motor combination and the unit heater casing.

G. Motors:

1. All motors shall be 115v-1-60hz totally enclosed with built-in thermal overload protection.

H. Controls:

1. Provide factory installed junction box for all power connections.
2. Units shall be provided with a 24-volt combination, single-stage, automatic gas valve; including a main operating valve and pilot safety shutoff, pressure regulator, manual main and pilot shutoff valve, adjustable pilot valve, a 24-volt control transformer, high-limit, and fan time delay relay. Gas valve shall be suitable for a maximum inlet pressure of 0.5 psi (14" W.C.) on natural gas.

-08- GAS FIRED INFRARED UNIT HEATERS

- A. Gas-fired, vented, infrared heaters shall be as scheduled on Drawings.
- B. Heaters shall be furnished and installed in accordance with and shall meet federal, state, and local codes.
- C. Heaters shall be equipped with direct spark ignition, 100% safety shutoff control systems operating on 120 volt, single-phase, 60 hertz electrical power supply.
- D. Heat exchangers shall be 12-gauge block steel, 4" O.D. Combustion chamber shall be 14-gauge aluminized steel, fitted with a 1/4" thick steel inner liner.
- E. Reflectors shall be rotatable through any degree at any time without the necessity of disassembly of any parts and shall be removable without any loose nuts, bolts, or other parts.
- F. All 10' sections shall be factory pre-assembled, ready for immediate installation, without any loose nuts, bolts, or other parts.

- G. Heaters shall be complete with draft hood, reflectors, chain supports, and wall mounted thermostat.
- H. Heaters shall be design certified by the American Gas Association and shall carry a manufacturer's warranty covering the combustion chamber on all heat exchangers for a period of 2 years, and all burner components for a period of 1 year.

-09- GAS FURNACES

- A. Unit shall be a high-efficiency (propane/natural) gas-fired vertical discharge furnace of size and capacities as scheduled on the Drawings.
- B. Furnace shall have electronic pilot ignition.
- C. Combustion and exhaust air shall be vented directly to the outdoors terminating with the manufacturer's vent terminal kit.
- D. Unit shall include a side filter rack with throw-away filters.
- E. Unit shall include remote thermostat with ON-OFF auto switch.
- F. Furnace shall carry manufacturer's warranty.

-10- INSTALLATION

- A. Units shall be installed where shown on Drawings and suspended in a neat workmanlike manner.
- B. Installation of each unit shall be complete in accordance with the manufacturer's recommendations and meet federal, state, and local codes having jurisdiction.
- C. Controls shall operate as outlined in Section 15950, Sequence of Operation.

END OF SECTION

DIVISION 15

MECHANICAL

15800 AIR DISTRIBUTION

15815 DIRECT FIRED UNIT HEATERS

- INDEX: -01- General
-02- Submittals
-03- Gas Fired Infrared Unit Heaters
-04- Installation

-01- GENERAL

- A. CONTRACTOR shall furnish and install pipes, fittings, hangers, etc., and all equipment necessary for a complete installation of units as required and where shown on Drawings and specified herein.
- B. CONTRACTOR shall receive and store equipment upon delivery to insure good working condition. If equipment is damaged due to shipment CONTRACTOR shall immediately take the appropriate action to correct the situation and protect the OWNER from damaged equipment.

-02- SUBMITTALS

- A. In compliance with requirements established within these Specifications provide Shop Drawings on all equipment specified in the section including complete wiring diagrams with interlocks.

-03- GAS FIRED INFRARED UNIT HEATERS

- A. Gas fired vented infra-red heaters shall be as scheduled on Drawings.
- B. Heaters shall be furnished and installed in accordance with and shall meet federal, state and local codes.
- C. Heaters shall be equipped with direct spark ignition, 100% safety shut-off control systems operating on 120 volt/single phase/60 hertz electrical power supply.
- D. Heat exchangers shall be 12 gauge block steel - 4" O.D. Combustion chamber shall be 14

gauge aluminized steel, fitted with a 1/4" thick steel inner liner.

- E. Reflectors shall be rotatable through any degree at any time without the necessity of disassembly of any parts and shall be removable, without any loose nuts, bolts, or other parts.
- F. All 10' sections shall be factory pre-assembled, ready for immediate installation, without any loose nuts, bolts, or other parts.
- G. Heaters shall be complete with draft hood, reflectors, chain supports, and unit mounted thermostat.
- H. Heaters shall be design certified by the American Gas Association and shall carry a manufacturer's warranty covering the combustion chamber on all heat exchangers for a period of 2 years and all burner components for a period of 1 year.

-04- INSTALLATION

- A. Units shall be installed where shown on Drawings and suspended in a neat workman like manner.
- B. Installation of each unit shall be complete and meet federal, state, and local codes.

END OF SECTION

DIVISION 15

MECHANICAL

15800 - AIR DISTRIBUTION

15820 - FANS

- INDEX:
- 01- General
 - 02- Submittals
 - 03- Centrifugal In-Line Fan
 - 04- Centrifugal Down-Blast Roof Ventilators
 - 05- Centrifugal Up-Blast Roof Ventilators
 - 06- Propeller Up-Blast Roof Ventilator
 - 07- Propeller Type Wall Exhaust Fans
 - 08- Ceiling Type Exhaust Fans
 - 09- Cabinet Supply Fans
 - 10- Installation

-01- GENERAL

- A. CONTRACTOR shall furnish and install all equipment necessary for a complete installation of the fans where shown on the Drawings and specified herein. CONTRACTOR shall also coordinate all roof openings with the General CONTRACTOR.
- B. CONTRACTOR shall receive and store equipment upon delivery to ensure good working condition. If equipment is damaged due to shipment CONTRACTOR shall immediately take the appropriate action to correct the situation and protect the OWNER from damaged equipment.

-02- SUBMITTALS

- A. In compliance with requirements established within these Specifications, provide Shop Drawings on all equipment specified in this Section, including curves and complete wiring diagrams with interlocks.

-03- CENTRIFUGAL IN-LINE FAN

- A. The centrifugal in-line fans shall have V-belt drive. Connecting flanges shall be provided as an integral part of the unit for easy attachment to the ductwork.

- B. Motors shall be supported on the exterior of the round fan casing with bearings encased within the fan tube. All moving parts shall be provided with vibration isolation.
- C. Fan wheels shall be backward inclined, non-overloading, and constructed of aluminum. Inlets shall be deep spun for non-turbulent entrance conditions.
- D. Units shall be supported by support legs and shall have extended lubrication lines. A terminal box shall be mounted on the exterior of the casing for ready wiring.

-04- CENTRIFUGAL DOWN-BLAST ROOF VENTILATORS

- A. Roof exhaust fans shall be centrifugal, belt-driven type as scheduled on the Drawings.
- B. Fans shall be complete with back-draft damper being motor-operated where called for on Drawings, 12" high roof curb suitable for project's roof system, and everything necessary for a complete installation.
- C. Construction of fan housing shall be of heavy gauge span aluminum, with rolled bead edges for rigidity.
- D. The fan wheel shall be centrifugal-type, backward inclined blades with tapered inlet shroud, and all aluminum construction. Wheels shall be statically and dynamically balanced.
- E. Motor and drives shall be enclosed in a weather-tight compartment separate from the exhaust airstream. Air for cooling the motor shall be supplied to the motor compartment by means of an air passageway, from an area free of contaminated exhaust fumes.
- F. Motors shall be of the heavy-duty, permanently lubricated, sealed ball bearing-type. Drives shall be sized for a minimum of 160% of motor horsepower capabilities, cast iron-type, and keyed to the fan and motor shafts. Fan shall have variable pitched drives.
- G. Fan shaft shall be of steel construction, turned, ground, and polished to precise tolerances in relationship to the hub and bearings. Drive belts shall be of the oil-resistant, non-static, non-sparking, long life-type. Bearings shall be permanently lubricated, permanently sealed, ball bearing-type for long life. The entire drive assembly and wheel shall be removable from support structure without disassembling fan housing. The complete drive assembly shall be mounted on rubber vibration isolation.
- H. Fans shall bear the AMCA certified ratings performance seal and shall be licensed by AMCA to bear such label.
- I. Fan construction shall include a 5-year warranty.

-05- CENTRIFUGAL UP-BLAST ROOF VENTILATORS

- A. Roof exhaust blowers shall be centrifugal, belt-driven, up-blast, vertical discharge-type, as scheduled on Drawings.
- B. Fans shall be complete with back-draft damper being motor-operated where called for on Drawings, 12" high roof curb suitable for project roof system, and everything necessary for a complete installation.
- C. Construction of fan housing shall be of heavy gauge spun aluminum with rolled bead edges for rigidity.
- D. The fan wheel shall be centrifugal-type, backward inclined blades with tapered inlet shroud, and all aluminum construction. Wheels shall be statically and dynamically balanced.
- E. Motor and drives shall be enclosed in a weather-tight compartment separate from the exhaust airstream. Air for cooling the motor shall be supplied to the motor compartment by means of an air passageway, from an area free of contaminated exhaust air.
- F. Motors shall be of the heavy-duty, permanently lubricated, sealed ball bearing-type. Drives shall be sized for a minimum of 160% of motor horsepower capabilities, cast iron-type, and keyed to the fan and motor shafts. Fan shall have variable pitched drives.
- G. Fan shaft shall be of steel construction, turned, ground, and polished to precise tolerances in relationship to the hub and bearings. Drive belts shall be of the oil-resistant, non-static, non-sparking, long life type. Bearings shall be permanently lubricated, permanently sealed, ball bearing-type for long life. The entire drive assembly and wheel shall be removable from support structure without disassembling the fan housing. The complete drive assembly shall be mounted on rubber vibration isolation.
- H. Fans shall bear the AMCA certified ratings performance seal and shall be licensed by AMCA to bear such label.
- I. Fan construction shall include a 5-year warranty.
- J. Kitchen hood exhaust fans discharge shall be extended to terminate 4'-0" above roof.

-06- PROPELLER UP-BLAST ROOF VENTILATORS

- A. The propeller up-blast roof exhaust fans shall be aluminum construction and belt driven, as indicated on the Drawings

- B. Fans shall be provided with 12" high roof curb suitable for project's roof system, and everything necessary for a complete installation.
- C. Fan shall incorporate an extruded aluminum airfoil propeller for high static pressures. The blades shall be mounted in a cast aluminum hub, permitting the replacement of the blades without the necessity of replacing the entire propeller. The pitch setting of the blades shall be done at the factory and locked into place by means of a taper lock pin.
- D. Each fan shall be equipped with a set of butterfly dampers to be forced open by the exhaust air and closed by means of gravity. The butterfly dampers shall allow unrestricted air flow when the fan is running, yet providing positive weather-seal when the unit is not in operation.
- E. An integral electrical conduit shall be provided and it shall be weather-tight.
- F. Fan bearings shall be the greaseable-type with a minimum average life of 100,000 hours. The bearings shall be located out of the airstream along with the drive shaft belts, drivers, and motor. Grease tubes shall run from the bearings to the outside of the unit for ease of maintenance.
- G. Drivers and motors shall be designed for 165% of rated horsepower capacities. Motor drives through 5 HP shall be variable pitch and belts shall be oil resistant, non-static.
- H. Fan construction shall carry manufacturer's 1-year warranty.

-07- PROPELLER-TYPE WALL EXHAUST FANS

- A. Propeller wall exhaust fans shall be direct drive-type.
- B. The propeller shall consist of six steel blades securely attached to a heavy gauge steel spider by means of steel rivets and shall be heavily reinforced on each side. The stamped propeller must be of the same manufacturer as the fan. Propeller shall be statically and dynamically balanced.
- C. The fan frame and venturi shall be constructed of heavy gauge painted steel with the fan assembly bolted to the venturi for ease of removal and service. Fan bearings shall be of the ball bearing-type, with a minimum average life of 100,000 hours.
- D. All drives shall be designed for 165% of rated horsepower capabilities.
- E. The propeller wall exhaust fan shall be a packaged version which includes an all-aluminum, automatic shutter with a galvanized steel box, a guard on the motor side, and a 1/2" mesh screen covering the inlet. An adjustable anchor angle shall be furnished, which adjusts to the thickness of the wall for ease of installation.

F. Fan construction shall include a 1-year warranty.

-08- CEILING TYPE EXHAUST FAN

A. Ceiling exhaust fan shall be cabinet-type, direct-drive, and as scheduled on Drawings.

B. Cabinet shall be fabricated of galvanized steel and acoustically insulated.

C. Motor and blower shall be easily accessible without removing housing from the system and mounted on vibrator isolators. Motor shall be permanently lubricated. The blower shall be of the twin "squirrel cage" type. Terminal box shall be provided on the housing with cord, plug, and receptacle inside the housing.

D. Fan shall be complete with white finished exhaust grille, back-draft damper and roof jack, and roof jack adapter or a wall cap as indicated on the Plans.

E. Equipment supplier shall also provide a 12" high, 12" x 12" insulated roof curb to mount roof jack on top of.

F. Fans shall bear the AMCA certified ratings performance seal and shall be licensed by AMCA to bear such label.

G. Fans shall be factory tested and carry a full 1-year warranty against defects in workmanship and materials.

-09- CABINET SUPPLY FANS

A. Cabinet supply fan shall be cabinet-type, direct drive, and as scheduled on Drawings. Cabinet shall be fabricated of galvanized steel and acoustically insulated.

B. Motor and blower shall be easily accessible without removing housing from the system and mounted on vibrator isolators. Motor shall be permanently lubricated. The blower shall be of the twin "squirrel cage" type. Terminal box shall be provided on the housing with cord, plug, and receptacle inside the housing.

C. Fan shall be complete with inlet and outlet duct connections.

D. Fans shall bear the AMCA certified ratings performance seal and shall be licensed by AMCA to bear such label.

E. Fans shall be factory tested and carry a full 1-year warranty against defects in workmanship and materials.

-10- INSTALLATION

- A. Units shall be installed where shown on Drawings and mounted in a neat workmanlike manner.
- B. Installation of each unit shall be complete in accordance with the manufacturer's recommendations and meet federal, state, and local codes having jurisdiction.
- C. Controls shall operate as outlined in Section 15950, Sequence of Operation.

END OF SECTION

DIVISION 15

MECHANICAL

15800 - AIR DISTRIBUTION

15840 - DUCTWORK

- INDEX:
- 01- General
 - 02- Industry Standards
 - 03- Low Pressure Steel Ductwork
 - 04- Fiberglass Ductwork
 - 05- Flexible Insulated Ductwork
 - 06- Kitchen Hood Exhaust Ductwork
 - 07- Shop Fabricated Ductwork
 - 08- PVC Ductwork
 - 09- Installation

-01- GENERAL

- A. The types of ductwork specified in this Section are:
1. Supply air ductwork
 2. Return air ductwork
 3. Exhaust air ductwork
 4. Fresh air intake ductwork
 5. Combustion air ductwork
 6. Exhaust hood ductwork
- B. CONTRACTOR shall furnish and install complete ductwork systems as shown on Drawings and specified herein. All ductwork shall be neat, accurate, mechanically tight and rigidly constructed, smooth on the inside with joints neatly finished. All ductwork shall be constructed and installed in accordance with the latest SMACNA (Sheet Metal and Air Conditioning Contractors National Association) standards.
- C. Sizes of ducts shown on Drawings are inside dimensions. Where ductwork is lined with insulation, the ducts shall be oversized accordingly.

-02- INDUSTRIAL STANDARDS

- A. Comply with SMACNA “Low Pressure Duct Construction Standards” latest edition (herein after in this Section referred to as SMACNA Standard) for both fabrication and installation. A copy of this standard must be located in the fabrication shop and at the construction site and be available to workmen, supervision, and the OWNER’S Representative.

-03- LOW PRESSURE STEEL DUCTWORK

A. Sheet metal:

1. Shall be galvanized sheet steel complying with ASTM A-653.
2. All ductwork shall be constructed, erected, and supported in the first class and workmanlike manner in accordance with the latest “Low Velocity Duct Construction Standards”, published by the Sheet Metal and Air Conditioning Contractors National Association, Inc.

B. Gauges:

1. All square or rectangular ductwork shall be constructed of not lighter than the following U.S. Standard Sheet Metal gauges:

Width	U.S.S. Gauge
up to 12"	26
13" to 30"	24
31" to 54"	22
55" to 84"	20
85" to 120"	18
over 120"	16

2. All round ductwork shall be constructed of not lighter than the following U.S. Standard Steel metal gauges:

U.S.S. Gauge		
Round Diameter	with Grooved Longitudinal Seams	Prefabricated Spiral Duct
up to 12"	26	28
13" to 18"	24	26
19" to 28"	22	24
29" to 36"	20	22
37" to 52"	18	20

3. All ductwork used for the removal of non-flammable corrosive fumes and vapors shall be constructed in accordance with the NFPA-91 and any prevailing local codes.

C. Ductwork reinforcement:

Shall be as specified in SMACNA Standard for Low Pressure Ductwork (positive or negative).

D. Duct sealing:

Shall be as specified in SMACNA Standard for Seal Class "D".

E. Duct tape:

Shall be 3" wide, self-adhesive, U.L. labeled, as manufactured by United Sheet Metal, Arno, 3M Company, Mystic Tape Co., or equal.

F. Duct sealer:

Shall be U.L. labeled duct sealer as manufactured by 3M Company, United Sheet Metal, Benjamin Foster, or equal.

G. Duct fittings:

Shall be fabricated in accordance with SMACNA Standard and as follows:

1. Elbows: radius of 1½ times the diameter or square with double width turning vanes.

2. Transitions and offsets: SMACNA Standard Fig. 2-7.
3. Vanes: provide 15 degree turning vanes in main duct at each branch takeoff, except where branch is too short to accommodate balancing damper; and to allow proper air pattern in branch duct after damper, provide combination volume control and air straightener. Extend each operator as required to be accessible.
4. Branch take-offs: round duct branch connections to rectangular ducts shall be with Spin-in fittings. Rectangular duct branch connections shall be supplied with adjustable splitter-type control dampers.

-04- FIBERGLASS DUCTWORK

- A. Fiberglass ductwork shall be a heavy-density duct-board.
- B. Outward clinch staples 9/16" long and taped/sealed with a SMACNA dead-soft foil tape or a heat-sensitive SFK tape.

-05- FLEXIBLE INSULATED DUCTWORK

- A. CONTRACTOR shall use flexible insulated duct for round duct connections to supply diffusers where shown, having a maximum lineal length of 5'-0". Ducting shall be factory fabricated, pre-insulated assembly; consisting of non-porous inner sleeve, insulation, and an outer moisture barrier. The inner sleeve shall be constructed of a continuous galvanized spring steel wire helix bonded to a continuous liner of fiberglass fabric, impregnated and coated with neoprene. A 1" nominal thickness fiberglass insulating blanket shall encase the inner sleeve and be sheathed with an outer vapor barrier of 0.02 perm rating and consisting of a three-ply laminate of kraft, fiberglass scrim reinforcement, and outer aluminum foil.
- B. Duct shall be U.L. listed and comply with NFPA 90A and shall have a composite Class A fire hazard classification. Duct shall also comply with all federal, state, and local codes.
- C. Ducts shall be installed with slight extension to reduce static pressure and shall have a minimum of bends using long radius bends only.
- D. Ducts shall be installed with a galvanized sheet metal cuff cemented into the liner with a duct sealer. Ends of vapor barrier shall be taped with a reinforced foil tape to seal and form a continuous vapor barrier, and the duct shall be clamped to the cuff with a work drive clamp and stainless steel strap.

-06- KITCHEN HOOD EXHAUST DUCTWORK

- A. The exhaust ductwork shall be constructed in accordance with the National Fire Protection Association (NFPA) Standard 96 and any prevailing local codes.
- B. Ducts shall be constructed of not less than 16-gauge steel or 18-gauge stainless steel.
- C. All seams and joints, as well as connections to exhaust hoods, shall be continuously welded and liquid-tight.
- D. Ductwork shall be run as directly as possible to the exhaust fan and shall not be inter-connected with any other ventilation system.
- E. Air velocity in the duct shall be a minimum of 1500 FPM to a maximum of 2200 FPM.
- F. Where ductwork passes through walls, ceilings, partitions, or fire resistance-rated assembly, it shall be enclosed in a fire resistance-related shaft in accordance with NFPA 96. A minimum clearance of 6 inches shall be maintained between the shaft and duct. Access openings shall be provided at cleanout joints.
- G. Cleanouts shall be provided at each change in direction and every 6 feet in horizontal ductwork. Cleanouts shall be located on the side of the ducts having a minimum opening dimension of 12 inches or on the width of the duct when less than 12 inches. The opening shall be capable of being sealed and not affect the integrity of the ductwork.
- H. Hood shall be fully equipped with an automatic fire suppression system with an automatic and manual activation.

-07- SHOP FABRICATION DUCTWORK

- A. Shop-fabricate ductwork in 4, 8, 10, or 12 foot lengths unless otherwise indicated or required to complete runs. Use minimum number of joints possible. Pre-assemble work in the shop with accessories to the greatest extent possible. Disassemble system only to the extent necessary for shipping and handling. Match-mark sections for reassembly and coordination at construction site.

-08- PVC DUCTWORK

- A. Underground ductwork shall be solid PVC pipe and fittings. Tape joints with PVC tape.
- B. Above ground ductwork shall be light wall duct pipe and fittings designed for air distribution systems and suitable for design application.

- C. Pipe sizes are inside pipe diameters.
- D. Installation and the use of pipe hangers and anchors shall be as recommended by the manufacturer for type and use.

-09- INSTALLATION

- A. Installation shall be in accordance with SMACNA Standard to achieve air-tight and noiseless systems capable of performing each indicated service. Ducts shall be anchored securely to the building construction in an approved manner and shall be so installed as to be completely free from vibration under all operating conditions. Install each run with minimum of joints. Align ductwork accurately at connections, within 1/8" misalignment tolerance. Locate duct runs, except as otherwise indicated, vertically and horizontally, and avoid diagonal runs wherever possible. Locate runs as indicated by diagrams, details, and notations, or if not otherwise indicated, run ductwork in the shortest route which does not obstruct usable space or block access for servicing the building or equipment.
- B. Do not encase horizontal runs in solid partitions, except as specifically shown.
- C. Duct runs shall be coordinated with chases, walls, suspended ceilings, light fixtures, and similar finished work and other disciplines.
- D. Duct opening shall be covered during construction to prevent entrance of dust and debris.
- E. Bottom of fresh air intake ducts, combustion air intake ducts, and exhaust air ducts within 10' of outside air opening shall be made water-tight by sealing duct and painting bottom, and 12" up sides with two (2) coats of fire retardant bitumastic paint in accordance with manufacturer's recommendations. Pitch ducts toward vent cap, eave cap, or louver.
- F. All ducts in finished areas shall be concealed unless specifically otherwise indicated.
- G. All exhaust ducts in room with showers shall be aluminum.

END OF SECTION

DIVISION 15

MECHANICAL

15800 - AIR DISTRIBUTION

15850 - SPECIAL DUCTWORK SYSTEMS

- INDEX:
- 01- General
 - 02- Submittals
 - 03- Tailpipe Exhaust Systems
 - 04- Dust Collection Equipment
 - 05- Paint Spray Booth System Equipment
 - 06- Fume Collection System Equipment
 - 07- Type "B" Gas Vents (Metal Fab)
 - 08- Installation

-01- GENERAL

- A. CONTRACTOR shall furnish and install units and all equipment necessary for a complete installation of units as required and where shown on Drawings and specified herein.
- B. CONTRACTOR shall receive and store equipment upon delivery to ensure good working condition. If equipment is damaged due to shipment, CONTRACTOR shall immediately take the appropriate action to correct the situation and protect the OWNER from damaged equipment.

-02- SUBMITTALS

- A. In compliance with requirements established within these Specifications, provide Shop drawings on all equipment specified in this Section, including complete wiring diagrams with interlocks.

-03- TAILPIPE EXHAUST EQUIPMENT

- A. General:
 - 1. Vehicle carbon monoxide exhaust systems shall include all necessary equipment and controls for a complete installation.

B. Floor units:

1. Floor receptacles shall have a 1/4" boiler plate door, angle iron door frame, 20-gauge stainless steel body, and stainless steel saddle. The door shall have a hinged assembly and shall be bolted to the door frame so that the closed door is flush with the frame. The door shall lie flat on the floor when in the open position. The entire door frame assembly shall be welded to the floor body and painted with a rust inhibitive, air-dry paint. The floor body shall be inserted into a saddle having a telescoping height adjustment to allow proper positioning of the floor receptacle. The floor receptacle shall accommodate one or two flexible tube assemblies of specified diameter, whichever is applicable.
2. The flexible tubing assemblies shall consist of the following components:
 - a. A conical adapter fabricated of 20-gauge stainless steel with safety edge complete with spring steel retaining clip and gas analyzer port.
 - b. A cadmium plated, cone shaped guide ring consisting of eight #10 wire spokes welded to a 3/16" wire helix.
 - c. Flexible tubing shall be 10'-0" long silicone tubing fabricated of a high tensile strength weave, glass fiber cloth, fully impregnated with high temperature green silicone. The cloth shall have a 0.02" thickness and shall be lapped over a resilient core to form a single ply, double overlap joint clinched within an external stainless steel helix. No adhesives shall be used in the tubing construction. The flexible tubing shall be capable of withstanding a maximum temperature of 600 deg. F., interior and exterior, and shall be both flame retardant and oil resistant.
 - d. The flexible tubing assembly shall be factory assembled. Field assembly is not acceptable.

E. Tubing storage reels:

1. The tubing storage reels shall be the standard product of a carbon monoxide exhaust system manufacturer and shall consist of a structural angle iron frame, platform bearings, roller bearings, retractable tubing drum, motor operator, and a rotating outlet fitting for connection to the duct system.
2. The tubing drum shall be of 14-gauge steel construction welded to 3/16" steel sided plates, forming an air-tight cylinder with air entry fitting for attachment of Type CL tubing assembly with full gate blast gate and stainless steel tailpipe adapter.
3. The unit shall have an 8" outlet fitting diameter. Tubing storage reels shall be complete with 25 feet of Type CL tubing.

4. The tubing storage reel shall be furnished complete with an electrically powered motor operator. Operator shall incorporate a reversible gear motor, an adjustable limit switch, and the necessary electrical and mechanical devices required to comprise a completely self-contained unit. The only equipment external to the motor operator enclosure shall be a remote push button station. Motor shall operate on 115v-1-60hz and shall be interlocked with the adjustable limit switch so that the reel shall stop when the tubing has been fully extended or fully retracted. Motor operator shall be mounted directly on the tubing storage reel and have a V-belt drive system.

-04- DUST COLLECTION EQUIPMENT

- A. Furnish and install a cyclone dust collection system.
- B. Complete system shall be for indoor application and shall include dust collector with dust bin and exhaust after-filters, ductwork, flexible tubes, blast gates, floor sweeps, and machine collector hoods.
- C. Exhaust fan to be direct-drive with a totally enclosed motor and the fan wheel shall be mounted on the clean air side of the collector.
- D. Collector to be of 16-gauge painted steel construction with angle rig reinforcements.
- E. Dust storage bin to have a minimum capacity of 7.0 cubic feet.
- F. Each duct drop to a machine collector hood shall be 4" diameter and 12' long, 0.12" galvanized steel flexible tubes with 4" blast gates.
- G. Each drop to a floor sweep shall be 5" diameter ridged ductwork with a 5" blast gate.
- H. Each branch duct shall enter the main ductwork at a 45 degree angle.
- I. Ductwork shall be 24-gauge galvanized steel.

-05- PAINT SPRAY BOOTH SYSTEM EQUIPMENT

- A. Dry paint spray booth:
 1. The dry paint spray booth shall be a filtered floor-type.
 2. Booth shall be self-supporting, 18-gauge galvanized steel panels with heavy-gauge steel beam construction.

3. Panel sections shall be field assembled. Panels shall be precision-flanged and punched for easy field assembly. Flanges shall be exterior to provide a smooth interior surface.
4. All hardware shall be completely assembled for field installation.
5. Exhaust opening shall be at the top rear with a flanged connection.
6. Booth shall incorporate paint arrester pads for extended life.
7. Two (2) sets of 2" thick spun glass filters shall be supplied with each unit. Filters shall have a Class II listing by Underwriters Laboratories and shall be FM approved.
8. Booth shall be complete with two (2) light fixtures and a visible draft gauge.

-06- FUME COLLECTION SYSTEM EQUIPMENT

A. Kitchen Exhaust Hoods (*Wall Mounted Back shelf*):

1. Kitchen exhaust hoods shall be a wall-mounted, back-shelf ventilator type.
2. Hoods shall be an exhaust only, updraft vent-type complete with duct collars.
3. The vent ends shall be constructed of 16-gauge (min.) Type 304, stainless steel. The balance of the body shall be constructed of 20-gauge (min.), Type 304, stainless steel.
4. The assembly at joints and seams on hoods shall be liquid-tight. The exposed external welds shall be ground down, smoothed, and polished to match the original finish of the metal.
5. The hoods shall include a filter housing constructed of Type 304 stainless steel with stainless steel U.L. classified baffle grease filters of sufficient numbers and sizes to ensure optimum performance as specified by the filter manufacturer. Filters shall be installed at a minimum angle of 45 degrees to the horizontal and have a minimum area of 1 square inch for every 2 CFM of air exhausted.
6. The filter housing shall terminate into a pitched, internal, full-length stainless steel grease trough that shall drain into a removable recessed 1-cup capacity grease drawer.
7. Hoods shall be fabricated in accordance with NFPA Bulletin #96.

8. Hoods shall be protected with an automatic fire suppression system in accordance with all applicable building codes. System shall be capable of manual as well as automatic actuation. When actuated, the fire suppression system shall de-energize all kitchen exhaust fans and the make-up air units.

B. Kitchen Hood (*Internal Untempered Make-Up Air Hood*)

1. Hood shall be an exhaust and untempered make-up air hood of size listed on the Drawings. Hood shall bear the ETL label and be in full compliance with U.L. Standard 710 and NFPA 96 and bear the NSF seal of approval.
2. Hood shall be constructed of 18-gauge, Type 304 stainless steel. Internal make-up plenum shall be fully lined with 1" thick fiberglass insulation. Insulation shall be completely protected by galvanized insulation liner. The make-up air plenum shall be fully insulated and lined. The make-up plenum shall include factory installed, fusible link actuated, fire damper.
3. Make-up air diffusers shall be removable cartridge-style, providing access to the fusible link actuated fire damper and easy cleaning of plenum surfaces. Diffusers shall be of aluminum construction with solid back and perforated front face designed to provide low velocity, tamper-proof, make-up air discharge across the hood interior to push contaminants to and out of the grease filters.
4. The grease filters shall be of aluminum construction and labeled for centrifugal baffle style. Filter holding rod shall be positioned to provide easy access to all exhaust plenum surfaces when filters are removed. Filters shall include handles on the front and weep holes at the base for drainage of collected grease to the drip guard.
5. The drip guard shall be removable and pitched for drainage of grease to a removable catch pan. The pan lid shall be welded to the hood body.
6. Light fixtures shall be factory installed, 3'-0" on center and wired to a single connection on the top of the hood. Fixtures shall be incandescent and specifically listed for installation in commercial cooking hoods, and include plastic coated glass globes.
7. The ends of the hood shall have formed gutters pitched to the back-drip guard.
8. Hood shall carry the manufacturer's warranty.

-07- TYPE “B” GAS VENTS (*Metal Fab*)

- A. The gas vents shall be Type “B”, double-wall, gas vent piping; being U.L. listed and stamped. Size and locations shall be as indicated on the Drawings.
- B. Vent pipe shall run continuous from the appliance outlets into the gas vent cap.
- C. Vent piping shall be installed in full compliance with the terms of its listing, with the manufacturer’s installation instructions, and with local, state, and national building codes having jurisdiction.

-08- INSTALLATION

- A. Units shall be installed where shown on Drawings and mounted in a neat workman-like manner.
- B. Installation of each unit shall be complete in accordance with the manufacturer’s recommendations and meet all federal, state, and local codes having jurisdiction.
- C. Controls shall operate as outlined in Section 15950, Sequence of Operation.

END OF SECTION

DIVISION 15

MECHANICAL

15800 - AIR DISTRIBUTION

15860 - DUCT ACCESSORIES

- INDEX:
- 01- Flexible Connections
 - 02- Balancing Dampers
 - 03- Fire Dampers
 - 04- Metal Guards
 - 05- Access Doors
 - 06- Roof Top Equipment Support Rails
 - 07- Installation

-01- FLEXIBLE CONNECTIONS

- A. All duct connections to fans, blowers, air handling units, and other equipment with moving parts shall be made with flexible fabric that is UL listed, fire resistant, waterproof, and mildew resistant.
- B. Connections shall be no less than 4" wide, with at least 1" slack; and shall be secured with bolted collar bracing angle or suitable metal collar frame at each end of connection.

-02- BALANCING DAMPERS

- A. Provide accessible and adjustable volume control dampers in all supply, return, and exhaust branch ducts, in order to permit balancing of air flow.
- B. Dampers shall be of reinforced galvanized iron having approved locking hardware and quadrant position indicators.
- C. Multi-blade dampers of the opposed blade action-type shall be used where width of the damper blade is over 12".

-03- FIRE DAMPERS

- A. In 1-hour fire rated walls, furnish and install at locations shown on plans: fire dampers constructed and tested in accordance with U.L. Safety Standard 555. Each fire damper shall have 1-1/2 hour fire protection rating, 212 degree F. fusible link, and shall include

U.L. label in accordance with established U.L. labeling procedures. Dampers shall be tested in accordance with AMCA Standard 500D. Fire dampers shall be equipped for vertical or horizontal installation with curtain recessed and linked out of the airstream.

- B. Dampers shall be installed in wall and floor openings utilizing steel sleeves, angles, other materials and practices required to provide an approved U.L. installation as instructed by damper manufacturer.
- C. In 2-hour fire rated walls, furnish and install at locations shown on the plans, fire dampers constructed and tested in accordance with U.L. Safety Standards 555. Each fire damper shall have a 3-hour fire protection rating, 212 degree F. fusible link, and shall include U.L. label in accordance with established U.L. labeling procedures. Dampers shall be tested in accordance with AMCA Standard 500D. Fire dampers shall be equipped for vertical or horizontal installation with curtain recessed and linked out of the airstream. Dampers shall be installed in wall or floor openings utilizing steel sleeves, angles, other materials and practices required to provide an approved U.L. installation as instructed by damper manufacturer.

-04- METAL GUARDS

- A. Provide steel guards that comply with all applicable codes and OSHA regulations, fabricated so they are finger proof and easily removable, with a 3" diameter or 3" square access opening at the center line of each motor and equipment shaft for taking tachometer readings. Provide 4" diameter of 4" square cover plates over access openings and fasten with sheet metal screws.
- B. Provide at all motor drives and couplings that do not have metal guards furnished by the manufacturer. Provide access openings and cover plates in all guards furnished by HVAC equipment manufacturers.

-05- ACCESS DOORS

- A. Small doors in ducts shall be insulated.
- B. Install access doors for easy access to all equipment, including automatic and fire damper.

-06- ROOF TOP EQUIPMENT SUPPORT RAILS

- A. Equipment support rails shall be constructed of 18-gauge galvanized steel, unitized construction with integral base plate, continuous welded corner seams, pressure treated wood nailer, counterflashing with lag screws, and internally reinforced to conform with

load. Rails shall be a minimum of 8" high and shall be designed to ensure that the supported equipment sets level on the sloped roof design.

-08- INSTALLATION

- A. Units shall be installed in a neat workmanlike manner.
- B. Installation of each unit shall be complete in accordance with the manufacturer's recommendations and meet all federal, state, and local codes having jurisdiction.

END OF SECTION

DIVISION 15

MECHANICAL

15800 - AIR DISTRIBUTION

15870 - AIR OUTLETS AND INLETS

- INDEX:
- 01- General
 - 02- Submittals
 - 03- Variable Air Volume Control Units
 - 04- Variable Air Volume Dampers
 - 05- Grilles, Registers, and Diffusers
 - 06- Door Louvers
 - 07- Air Intake/Exhaust Louvers
 - 08- Air Intake/Relief Hoods
 - 09- Installation
 - 10- Testing and Balancing the System

-01- GENERAL

- A. CONTRACTOR shall furnish and install all equipment necessary for a complete installation of the air outlet and air inlet units where shown on Drawings and specified herein. CONTRACTOR shall also coordinate all openings with the General CONTRACTOR.
- B. CONTRACTOR shall receive and store equipment upon delivery to ensure good working condition. If equipment is damaged due to shipment, CONTRACTOR shall immediately take the appropriate action to correct the situation and protect the OWNER from damaged equipment.

-02- SUBMITTALS

- A. In compliance with requirements established within these specifications, provide Shop Drawings on all equipment specified in this Section, including sizes, pressure drops, noise criteria, and wiring diagrams.

-03- VARIABLE AIR VOLUME CONTROL UNITS

- A. The VAV control units shall be shut-off cooling control units, or an approved equal, and shall meet the requirements as scheduled on the Drawings.

- B. Casing shall be welded 22-gauge, galvanized steel with hanger holes at all four corners. All interior surface of each unit casing shall be acoustically and thermally lined with 1" thick, 2 lb. density glass fiber with foil face. All exposed edges shall be taped with foil tape. Insulation shall be U.L. listed and meet NFPA-90A and U.L. 181.
- C. Singular discharge units shall have straight flanged, rectangular discharge duct connections. Multiple discharge units shall have a multiple outlet discharge plenum with integral outlet connections of sizes per Drawings and factory installed balancing dampers.
- D. Unit shall incorporate an electronic cylindrical die-cast aluminum air flow control valve with a factory installed integral 24 VAC electronic actuator. Valve inlet shall be tapered to fit standard round flexible ductwork. Leakage rate losses shall be less than 1% at 4 in. w.g. inlet static pressure. Unit shall have integral multiple point averaging flow sensing ring capable of providing air flow measurement within 5% of unit rated airflow.
- E. Units shall be complete with factory mounted 24 VAC power transformer, remote, wall-mounted changeover thermostat.
- F. Each unit shall be installed with a minimum of 4'-0" of rigid straight round duct upstream of air inlet.

-04- VARIABLE AIR VOLUME DAMPERS

- A. Casing shall be a minimum of 18-gauge, galvanized, rolled, and seam welded steel. Both supply and discharge ends shall accommodate standard round ductwork with the discharge end being roll crimped.
- B. Damper blade shall be a minimum of 22 gauge, galvanized steel which seats against a single rolled bead in the casing.
- C. Damper operator shall be a 24 VAC electric actuator.
- D. The drive train shall be gear driven such that the drive is approximately 60 seconds. Microswitches shall stop the drive motor when the damper reaches its fully open and fully closed positions.
- E. The damper control module shall be direct digital controls which will communicate with the systems central control panel to maintain the zone temperature set-point.

-05- GRILLES, REGISTERS, AND DIFFUSERS

- A. Slot diffusers:

1. Slot diffusers shall meet the requirements as scheduled on the Drawings. Casings shall be constructed of 24-gauge galvanized steel. Slot edges shall be formed over, providing double thickness. Exposed surface of slot shall be finished with white enamel. Inlet connections shall be sized to fit standard, round, flexible duct. Interior surfaces shall be acoustically and thermally lined with 1/2" thick, 1-1/2 lb. density glass fiber with high density facing. Insulation shall be U.L. listed and meet NFPA-90A and U.L. 181.

B. Ceiling diffusers:

1. Ceiling diffusers shall be as scheduled on Drawings.

Diffusers shall be aluminum construction with louvered face and removable. Finish shall be smooth, off-white, baked-on enamel.

or

Diffusers shall be a round, steel constructed, adjustable round ceiling diffuser with a fully adjustable horizontal to vertical flow pattern, and removable core. Finish shall be smooth, off-white, baked-on enamel.

C. Supply Grilles:

1. Supply grilles shall be as scheduled on Drawings.
2. Grilles shall have airfoil shaped, solid aluminum supply blades. Both ends of each blade shall be mounted in friction pivots that allow individual blade adjustment without loosening or rattling.
3. Borders shall be formed from 20-gauge, heavy extruded aluminum and shall be surface mounted. The metal surfaces shall be degreased, phosphatized, and dried before finish is applied. Finish shall be smooth, off-white, baked-on enamel.

D. Return grilles

Return grilles shall be as scheduled on Drawings.

Square grid return grilles shall have a 1/2" square aluminum grid, egg-crate design with aluminum borders, and shall be surface mounted. The metal surfaces shall be degreased, phosphatized, and dried before finish is applied. Finish shall be smooth, off-white, baked-on enamel.

or

Louvered return grilles shall have 20-gauge formed steel blades. Blades shall be permanently fixed in place.

Borders shall be formed from 20-gauge, heavy extruded aluminum and shall be surface mounted.

E. Exhaust grilles

1. Exhaust grilles shall be as scheduled on Drawings.
2. Exhaust grilles shall have a 1/2" square aluminum grid, egg-crate design with aluminum borders, and shall be surface mounted. The metal surfaces shall be degreased, phosphatized, and dried before finish is applied. Finish shall be smooth, off-white, baked-on enamel.

-06- DOOR LOUVERS

- A. Provide 6" deep, weatherproof, flanged-type, extruded aluminum stationary, drainable louvers. Louver components shall be factory assembled. Louver sizes too large for shipping shall be built up by the CONTRACTOR from factory assembled louver sections. Louver to meet specifications as scheduled on Drawings.

Alternate Choice

- B. Provide 4" deep, weatherproof, flanged-type, extruded aluminum, stationary, drainable louvers. Louver components shall be factory assembled and meet specifications as scheduled on Drawings.
- C. Louver shall be provided with 1/2" mesh bird screen located on the inside face of louver.
- D. Louver design shall incorporate structural supports required to withstand a wind load of 20 lbs. per sq. ft. (Equivalent to a 90 mph wind).
- E. Louvers shall be architectural-style with continuous appearing drainable stationary blades.
- F. Louver shall pass a maximum-free area velocity of 1000 FPS with less than 0.2" w.g. pressure drop and carry less than 0.001 ounces of water per square foot during a 15 minute period when tested in accordance with AMCA Standard 500L. Louver shall carry the AMCA certified rating seal for both water penetration and air performance.
- G. Louvers shall receive finish color coating of baked acrylic enamel following thorough cleaning and pretreatment of the metal. Color shall match existing building. Finish shall have two (2) year warranty.

-08- AIR INTAKE/RELIEF HOODS

- A. Air intake hoods shall be as scheduled on Drawings.
- B. Hoods shall be of aluminum construction, low profile-type, and complete with bird screen, anti-condensate coating, motorized louver on intake hoods, and barometric relief damper on relief hoods and roof curb. Roof curb to extend a minimum of 12" above the roof and shall be suitable for project roof system.
- C. Hoods shall carry manufacturer's five (5) year warranty.

-09- INSTALLATION

- A. Units shall be installed where shown on Drawings and mounted in a neat workmanlike manner.
- B. Installation of each unit shall be complete in accordance with the manufacturer's recommendations and meet all federal, state, and local codes having jurisdiction.
- C. Controls shall operate as outlined in Section 15950, Sequence of Operation.

-10- TESTING AND BALANCING THE SYSTEM

- A. Before final acceptance, an independent AIR BALANCE CONTRACTOR shall test all air volumes delivered and/or exhausted through the air supply, return, and exhaust devices to the various rooms with approved, properly calibrated testing devices and balance, and adjust the air distribution systems as follows:
 - 1. Examine the air handling systems to see that they are free from obstructions. Determine that all dampers and registers are open, that all moving equipment is properly lubricated, that all filters are clean and functioning, and perform other inspection and maintenance activities necessary for the proper operation of the system.
 - 2. Demonstrate that the air handling equipment performs as specified. Adjust pulleys, volume and control dampers, and air pattern where necessary.
 - 3. Adjust dampers, diffusers, and air pattern devices to properly distribute the air with minimal noise and draft in all areas. Each grille, register, and diffuser shall deliver or remove air within (plus or minus) 10% of the designed CFM in the proper pattern.

4. Provide any balancing dampers as necessary to properly balance the system. Balancing of diffusers and grilles shall be done in accordance with manufacturer's recommendations.
5. Tabulate the results of testing on the approved forms and submit three (3) copies to ENGINEER for approval and record.
6. Perform this work in accordance with recommendations, procedures, and standards described in the "Manual for the Balancing and Adjustment of Air Distribution Systems", latest edition, as published by the Sheet Metal and Air Conditioning Contractors National Association, Inc. or latest edition of "National Standards for Field Measurement and Instrumentation" as published by the Associated Air Balance Council. Reports shall be made on the recommended SMACNA forms or facsimiles thereof.
7. Figure 3 Apparatus Test Report shall be completely filled out for each air handling unit, roof ventilator, and exhaust air fan. Figure 4 Outlet Test Report shall be completely filled out for each air supply outlet, return, and exhaust air grille.
8. Upon completion of the project, having submitted approved air balance test reports, CONTRACTOR shall demonstrate accuracy of such data by making spot checks where requested in the presence of the ENGINEER's Representative.

END OF SECTION

DIVISION 15

MECHANICAL

15800 - AIR DISTRIBUTION

15880 - AIR TREATMENT EQUIPMENT

- INDEX:
- 01- General
 - 02- Related Work
 - 03- Submittals
 - 04- Air Contamination Control System
 - 05- Installation

-01- GENERAL

- A. CONTRACTOR shall furnish and install all equipment necessary for a complete installation of the air outlet and air inlet units where shown on Drawings and specified herein. CONTRACTOR shall also coordinate all openings with the General CONTRACTOR.
- B. CONTRACTOR shall receive and store equipment upon delivery to ensure good working condition. If equipment is damaged due to shipment, CONTRACTOR shall immediately take the appropriate action to correct the situation and protect the OWNER from damaged equipment.

-02- RELATED WORK

- A. Electrical wiring — Division 16000.

-03- SUBMITTALS

- A. In compliance with requirements established within these specifications, provide Shop Drawings on all equipment specified in this Section; including sizes, electrical requirements, connection locations, and wiring diagrams.

-04- AIR CONTAMINATION CONTROL SYSTEM

- A. The air contamination control system shall be a self-contained standard unit shall be 18-gauge (minimum) paint grip, galvanized with bolted assembly including a hinged

access door with compressible-type neoprene trim seal gaskets. The standard unit includes the solid state power generator, high-voltage (HV) and high-frequency (HF) electrodes. HV and HF indicator lamps, circuit breaker, and ON/OFF switch, all factory assembled wired, and tested. The unit is equipped with an accessory plug for use of the remote lamp sets and the remote monitor options.

- B. Electrical requirements are 120v-1-60hz, 2-amp circuit, wired through the access door safety switch to interrupt power to the power generator when the access door is opened, per the manufacture wiring diagram and instructions. Maximum current usage is 50 watts per power generator. Mechanical and electrical installation procedures and materials used shall be in accordance with the manufacturer's instructions, submittal drawings, and wiring diagrams. All wiring shall be done in accordance with local and national electrical codes.
- C. Each power generator shall be equipped with instrumentation to monitor that the power generator HV and HF output is operational at any remote location. The manufacturer will supply the proper accessory plug to mate to the power generator. The installing contractor shall furnish 3-conductor wire for interconnection between the power generator and the remote indicator lamp unit. Installation procedures and materials used shall be in accordance with the manufacturer's instructions and wiring diagrams.

-05- INSTALLATION

- A. Units shall be installed where shown on Drawings and mounted in a neat workmanlike manner.
- B. Installation of each unit shall be complete in accordance with the manufacturer's recommendations and meet all federal, state, and local codes having jurisdiction.
- C. Controls shall operate as outlined in Section 15950, Sequence of Operation.

END OF SECTION

DIVISION 15

MECHANICAL

15900 - CONTROLS AND INSTRUMENTATION

15900 - CONTROLS AND INSTRUMENTATION

- INDEX:
- 01- General
 - 02- Submittals
 - 03- Control Equipment
 - 04- Work Included
 - 05- Work by Others
 - 06- Primary Control Devices
 - 07- Electrical Work
 - 08- Final Adjustments

-01- GENERAL

- A. The controls and instrumentation shall be the responsibility of the TEMPERATURE CONTROL CONTRACTOR herein referred to as the CONTRACTOR.
- B. Work required of this Section includes labor, materials, equipment, and supervision necessary to complete the CONTROL AND INSTRUMENTATION work in quantities required and at locations identified by the Drawings.
- C. CONTRACTOR shall receive and store equipment upon delivery to ensure good working condition. If equipment is damaged due to shipment, the CONTRACTOR shall immediately take the appropriate action to correct the situation and protect the OWNER from damaged equipment.

-02- SUBMITTALS

- A. In compliance with requirements established within these Specifications, provide Shop Drawings defining the Temperature Controls. This shall include diagrammatic layouts of all elements of system showing all control equipment and function of each part. Provide complete brochures showing all devices, including servicing instructions.

-03- CONTROL EQUIPMENT

- A. Equipment shall be in compliance with requirements established by this specification and the Drawings.

-04- WORK INCLUDED

- A. This CONTRACT comprises the furnishing and installing of a complete first class working system of electric temperature controls, complete with labor, materials, apparatus, transportation, tools, and appliances required for the installation of all room thermostats, controllers, relays, control valves, dampers, damper operators, and other accessory equipment and a complete system of electric control wiring to provide for the apparatus indicated in conformity with the Drawings, the Specifications, and the other Contract Documents, incorporating the highest standards of workmanship.
- B. MECHANICAL CONTRACTOR shall cooperate with the TEMPERATURE CONTROL CONTRACTOR in arranging and installing the temperature control apparatus to the best advantage. The system shall be installed by competent mechanics regularly employed by the manufacturer of the temperature control equipment. All equipment, unless otherwise specified, shall be fully proportioning.
- C. Equipment shall perform according to the Sequence of Operation as outlined on the Drawings.

-05- WORK BY OTHERS

- A. All automatic hot water heating control valves shall be furnished by the TEMPERATURE CONTROL CONTRACTOR and shall be installed by the MECHANICAL CONTRACTOR under the CONTROL CONTRACTOR'S supervision.
- B. Line wiring to all motors will be provided by ELECTRICAL CONTRACTOR who will wire through starters and disconnects.
- C. Electrical control wiring for the control system shall be provided by the TEMPERATURE CONTROL CONTRACTOR, except where provided as a package by unit manufacturer.
- D. Duct detectors provided and wired by ELECTRICAL CONTRACTOR and mounted by MECHANICAL CONTRACTOR.

-06- PRIMARY CONTROL DEVICES

- A. Thermostats:
 - 1. All thermostats provided by unit manufacturers shall be installed and wired by the TEMPERATURE CONTROL CONTRACTOR.

2. All remaining thermostats shall be provided, installed, and wired by the TEMPERATURE CONTROL CONTRACTOR and shall be electronic-type. Thermostats shall be 24-volt modulating, action-type, with concealed locking adjustment, adjustable sensitivity, provided with blank cover, and guard. All thermostats shall be properly and accurately calibrated before acceptance.
3. Room thermostats shall be set 5'-0" above finished floor in locations shown on Drawings, unless otherwise indicated or directed by the ENGINEER.
4. Capillary thermostats shall be liquid filled-type, with fully ambient compensated capillaries.
5. Outdoor thermostats shall be located not less than 8'-0" above ground, out of direct rays of the sun, and shall have protective guard.

B. Control dampers:

1. Intake louver dampers:
 - a. Furnish and install ultra low leakage dampers.
 - b. Frames shall be heavy gauge, extruded aluminum channels.
 - c. Blades shall be airfoil-shaped, heavy gauge, extruded aluminum, maximum of 6" wide.
 - d. Axis shall be 1/2" diameter plate steel hexagonal. Bearings shall be molded, synthetic, and linkage concealed in frame. Blade edge seals shall be extruded vinyl. Jamb seals shall be flexible metal compression-type.
 - e. When application requires more than one damper section to fill opening, sections shall be interconnected by appropriate jack shafting method.
2. Mixing dampers:
 - a. Provide interlocking opposed blade, low leakage-type, automatic dampers with 6" maximum wide blades, fabricated of 16-gauge steel, suitably reinforced and welded at the corners, free and easy operating, with molded synthetic bearings, as required for temperature control work. Dampers shall be sealed rubber gasketed-type. Linkage shall be concealed in frame.

C. Damper operators:

1. All damper operators shall be powered at double the power requirements and shall be equipped with pilot positioners. Damper operation shall be as outlined in its respective Sequence of Operation.
2. All damper motors are to be capacitor-type with oil immersed, totally enclosed gear trains sized to operate smoothly through the control range. All motors shall be located to provide convenient access for servicing outside of the airstream where possible. Motors shall be modulating-type with spring return for “fail safe” operation.

D. Barometric dampers:

1. Provide parallel blade, heavy duty extruded aluminum, counter-balanced backdraft dampers. Blades shall have extruded vinyl edge seals, Zytel bearings, and aluminum tie bars. Counterbalance shall be zinc plated and adjustable for final “on the job” setting. Unit shall have mill finish.

E. Control valves:

1. All control valves shall be with cast-brass bodies and stainless steel stems. Valves 2" and smaller can be either screwed or union connections as required. All valves for this control system shall be suitable for the medium being controlled. All control valves shall be furnished by the automatic temperature control subcontractor, but shall be installed by the heating, ventilating, and air conditioning contractor.

F. Thermostats and controllers:

1. All room thermostats shall be dual temperature electronic with adjustable range in all offices. Use tamper-proof locking setting thermostats in halls, vestibules, lunch room, toilets, etc.
2. Low limit thermostats shall be electric/electronic two-position-type, with 20 foot bulb and manual reset. String bulb across inlet face of RTU coil. It shall be capable of operating thermostat circuit if any 1-foot section of bulb is subjected to a temperature below set-point. Each thermostat shall have two circuits: one to shut down fan, another for alarm.

G. Time clocks:

1. Occupied — Unoccupied Control: with 365 day program capabilities, override control, and battery.

H. Carbon monoxide detectors:

1. Detectors shall be factory set to detect 100 ppm of CO, sampling and measuring air a minimum of every 2.5 minutes. Detector shall be stable across a wide temperature and humidity range. Detector shall operate on 24 VAC by U.L. listed and manufactured according to U.L. Standard 2034 for carbon monoxide detectors.

-07- ELECTRICAL WORK

- A. All line wiring through starters and safety switches to motors will be provided by the ELECTRICAL CONTRACTOR. All remaining electrical work, including any wiring and/or accessories required for the complete control system shall be furnished by the TEMPERATURE CONTROL CONTRACTOR. Installation shall be as required for similar work in this project.

-08- FINAL ADJUSTMENT

- A. TEMPERATURE CONTROL CONTRACTOR shall cooperate with the AIR BALANCE CONTRACTOR at time of air test, setting adjustments and linkage of automatic dampers and controls to operate as specified.
- B. When control system has been adjusted to a point where the TEMPERATURE CONTROL CONTRACTOR believes no further adjustment will be necessary, having submitted approved air balance test reports by the AIR BALANCE CONTRACTOR as outlined in Sections 15044 and 15870, he shall notify the ENGINEER, OWNER, and PRIME CONTRACTOR to that effect. No final payment on temperature control will be made prior to receipt of such notification.
- C. Immediately prior to expiration of the guarantee period, the TEMPERATURE CONTROL CONTRACTOR shall check the entire system for proper operation, making all adjustments necessary, and shall report on such inspection to the ENGINEER.

END OF SECTION

DIVISION 15

MECHANICAL

15900 - CONTROLS AND INSTRUMENTATION

15950 - SEQUENCE OF OPERATION

- INDEX:
- 01- General
 - 02- Chillers
 - 03- Boilers
 - 04- Make-Up Air Handling Units
 - 05- Packaged Roof Top Units
 - 06- Air Handling Units
 - 07- Blower Coils
 - 08- Fan Coil Units
 - 09- VAV Control Boxes
 - 10- Humidifier
 - 11- Exhaust Fans
 - 12- Unit Heaters
 - 13- Cabinet Heaters
 - 14- Water Source Heat Pump

-01- GENERAL

- A. This Section describes the “Sequence of Operation” for the previous pieces of equipment installed under Division 15.
- B. Controls and instrumentation described herein shall be the responsibility of the TEMPERATURE CONTROL CONTRACTOR.

-02- CHILLERS

- A. The chillers shall be controlled through a “HEATING-COOLING-AUTO-OFF” system switch located in the system Remote Control Panel. The system includes the chillers, condensing units, boilers, and chilled and heating water primary pumps.
- B. With the system switch in the “Heating” position, the chiller shall be de-energized, the chilled water pumps shall be de-energized, and the system 3-way isolation valves shall close not allowing water to pass through the chillers, and the boiler controls shall be energized.

- C. With the system switch in the “Cooling” position, the chiller controls shall be energized, the system 3-way isolation valves shall open to allow water to pass through the chillers.

-03- BOILERS

A. Steam:

1. During the heating season, the steam boiler shall maintain operating pressure.
2. The combustion supply air fan shall be interlocked with the boiler controls. Upon a decrease in boiler pressure, the operating controller shall first energize the combustion air fan. Once air flow into the boiler room is proven by means of an air flow switch in the discharge ductwork of, the boiler burner shall then be energized and the boiler brought up to operating pressure at which time the burner and combustion air fan shall be de-energized.
3. The pump controller shall cycle the condensate feed water pump to maintain proper water level within the boiler.
4. If the water level within the boiler should fall below a safe level, the Low-Water-Cut-Off shall prevent the burner from firing.

B. Hot Water Multi-Stage Boiler and Chiller (2-pipe changeover system):

1. The multi-stage boiler and chiller shall be controlled from a Remote Control Panel having an “ON-OFF” system switch, a “COOLING-AUTO-HEATING” selector switch, an outside temperature reset, and a two-stage outside air temperature sensor.
2. With the system switch in the “OFF” position, the boiler, chiller, and pumps shall be de-energized.
3. With the system switch in the “ON” position, the system pump shall be energized with P-2 in standby status. Pumps shall alternate standby status.
4. With the system switch in the “ON” position and the selector switch in the “Heating” position, the multi-stage boiler controls shall be energized and the chiller controls shall remain de-energized. The boiler combustion air fan shall be interlocked with the burner so that the combustion air fan shall be energized when the burner energizes. The two-stage boiler shall follow a lead-sag sequence for firing and alternate the lead burner. The boiler 3-way control valve shall modulate the system water temperature to maintain a minimum of 160° F. supply water temperature to avoid boiler shock on system changeover. Boiler water temperature shall reset by the outside air temperature controller.

5. With the system switch in the “ON” position and the selector switch in the “Cooling” position, the multi-stage boiler controls shall be de-energized and the chiller primary pump shall energize with in standby status. Pumps shall alternate standby status. The boiler 3-way control valve shall ensure that all system water bypasses the boiler. Upon proven water flow through the chiller, the chiller controls shall energize. The chiller primary pumps shall maintain minimum flow through the chiller. The chiller 3-way control valve shall modulate to maintain a minimum of 55° F. entering water temperature. The chiller controls shall step control the chiller and condenser to maintain 45° F. leaving water temperature.
6. With the system switch in the “ON” position and the selector switch in the “Auto” position, the boiler-chiller system shall automatically switch from heating to cooling based upon the two-stage outdoor temperature sensor. When the outdoor temperature reaches 70° F (adj.), the chiller controls shall be energized. When the outdoor temperature falls below 60° F (adj.), the boiler controls shall be energized.

-04- MAKE-UP AIR HANDLING UNITS

A. 2-Speed Make-Up Air Handler Interlocked with Exhaust Fans

1. MAU shall provide the heating and ventilating for the building and make-up air for kitchen hoods.
2. A wall mounted controller shall control the discharge air-stat (78° F. adj.) for MAU and provide for night setback and building warm up.
3. Kitchen hood exhaust fans shall be interlocked with MAU, along with hood fire suppression system.
4. When exhaust fans are energized, MAU supply fan shall run continuously at full speed (1800 RPM). The normally closed outside air damper, set at 15% O.A., shall be energized to its fully open, 100%, position. The normally open return air damper, 100% RA, shall be mechanically interlocked with the O.A. damper and shall be fully closed. The room controller shall modulate the discharge air-stat to maintain room air temperature.
5. When exhaust fans are de-energized, MAU supply fan shall reduce to ½ speed (900 RPM). The normally closed outside air damper shall remain in its minimum position of 15% O.A. The normally open return air damper shall remain fully open. The room controller shall cycle MAU to maintain room temperature, providing heating when room temperature falls below 68° F. (adj.) and ventilation when room temperature rises above 82° F. (adj.).

6. During the unoccupied time, the room temperature shall be set back to 65° F. (adj.). The building shall be brought back up to temperature one hour before occupancy.
7. Smoke detectors shall monitor both the return air and the supply air. Either one shall de-energize MAU upon detection of smoke.

B. Make-Up Air Handler, 100% O.A. with Pneumatic Steam Coil:

1. The make-up air unit shall be controlled by a pneumatic room thermostat with an “ON-OFF” switch. This unit shall provide 100% make-up air to the locker room.
2. The MAU two-speed supply fan shall be directly interlocked with both of the two-speed exhaust fans. When MAU is energized, the normally closed outside air damper shall fully open then allowing MAU supply fan along with exhaust fans to run continuously on low speed.
3. When the room temperature drops below 68° F. (adj.), the pneumatic steam control valve shall modulate to maintain room temperature. When the outside air stat records an O.A. temperature of 38° F. (adj.), the steam valve shall fully open and the room temperature shall be maintained by modulating the face and bypass dampers to prevent coil freeze up.
4. When the room temperature rises to 80° F. (adj.), the MAU supply fan, along with exhaust fans, shall increase to full speed providing more ventilation air. When the room temperature drops below 75° F. (adj.), MAU and the exhaust fans shall drop back to low speed.
5. A freeze stat located within MAU in front of the steam coil shall de-energize the unit upon a freeze condition and outside air damper shall return to its normally closed position.
6. A smoke detector located in the supply discharge duct of MAU shall de-energize MAU and the exhaust fans upon detection of smoke.

C. Heating and Ventilating Units:

1. The air handling unit controls shall provide for winter heating and summer ventilation. The unit controls shall be located in a Remote Control Cabinet and shall include an “ON-OFF-AUTO” system switch, a “Summer-Winter” automatic changeover switch, a 7-day time clock, outside air stat, remote temperature selector, and a Remote Indicating Panel mounted alongside of the control cabinet to indicate system mode, heating failure, and clogged filter.

2. The system shall automatically change over between Summer and Winter modes as the outside air temperature rises above or falls below the outside air stat's set point (adj.).
3. The system switch shall automatically switch between occupied and unoccupied periods by its 7-day time clock.
4. With the system switch in the "ON" position and the selector switch in the "Winter" position (this being for occupied periods), the gas heating section shall be energized and the supply fan shall run continuously. The outside air damper shall be at its minimum position and the return air damper at its fully open position. The adjustable discharge air stat shall then modulate the gas valve to maintain the discharge air temperature. If the room temperature falls below the room thermostat setting (adj.), the bypass gas valve shall open to provide full gas input. Once the room stat has been satisfied, the gas bypass valve shall fully close.
5. With the system switch in the "AUTO" position and the selector switch still in the "Winter" position (this being for unoccupied periods), the supply fan and heating section shall energize when the room thermostat calls for heat. The outside air damper shall be at its minimum position and the return air damper at its fully open position.
6. With the system switch in the "ON" position and the selector switch in the "Summer" position, the gas heating section shall be de-energized and the supply fan shall run continuously to provide Summer ventilation.
7. The outside and return air dampers shall be under the control of the outside air stat. If the outside air is above 60° F. (adj.), the outside air damper shall fully open and the return air damper shall fully close. If the outside air falls below the O.A. stat set point of 60° F. (adj.), the outside air damper shall return to its normally closed position and the return air damper shall return to its normally open position.
8. With the system switch in the "AUTO" position and the selector switch still in the "Summer" position, the supply fan shall energize whenever the space temperature rises above the space thermostat's ventilation set point (adj.).
9. With the system switch in the "OFF" position, the entire air handling system shall be de-energized.
10. The smoke detectors in both the return and supply air ductwork shall de-energize the unit upon detection of smoke.

D. Heating and Ventilating Unit:

1. The make-up air unit and exhaust fan shall provide ventilation for the parking garage.
2. The MAU, intake louver dampers, and exhaust fan shall be interlocked so that the intake louver dampers fully open and the exhaust fan is energized whenever the MAU supply fan is energized.
3. Controls shall include a discharge air stat, a remote temperature sensor, outside air stat, carbon monoxide sensors, and a 7-day time clock. Unit controls shall be located in a remote control panel which shall include an "ON-OFF" system switch.
4. During occupied time with the system switch in the "ON" position, the normally closed intake louver dampers shall fully open and the supply fan shall run continuously. The heating section shall energize whenever the outside air temperature falls below the outside air stat's set point (adj.). The modulating burner controls shall maintain the supply air temperature as set by the discharge air stat (adj.). If the space temperature falls below the remote temperature sensor's set point (adj.), the gas valve shall fully open until the space sensor's set point has been reached upon which control shall go back to the discharge air stat. When the outside air temperature rises above the outside air stat's set point, the MAU burner controls shall be de-energized.
5. During the unoccupied time with the system in the "ON" position, the supply fan shall cycle upon a call for heat from the space sensor or a call for ventilation from the carbon monoxide sensors. Upon a call for heat, the intake louver dampers shall fully open, the fans shall cycle, and the burner shall energize until the space temperature has been reached. The carbon monoxide sensors shall be wired in parallel so that when any one of them detects an unsafe condition, the MAU and exhaust fan controls shall energize to ventilate the space.
6. If the ventilation system fails to provide proven airflow when call for, an alarm shall sound.
7. The system switch shall automatically switch between occupied and unoccupied periods by its 7-day time clock.
8. With the system switch in the "OFF" position, the entire ventilating system shall be de-energized.
9. The smoke detectors in the discharge air ductwork shall de-energize the unit upon detection of smoke and sound an alarm.

-05- PACKAGED ROOF TOP UNITS

A. Rooftop Unit:

1. The roof top unit shall be controlled by a central control panel. Control panel shall be a combined standard thermostat subbase with heat, cool, off, fan-auto-on position. Four signal indicating lights shall indicate power, pilot outage, clogged filters, and reset relay.
2. During the cooling season, the enthalpy controlled economizer shall modulate the outside and return air dampers to maintain a discharge air temperature of 52° F. (adj.). When the outside air temperature rises above the enthalpy control setting, mechanical cooling shall be energized and the outside air damper shall return to its minimum position of 15% and the return air damper shall return to its fully open position. Compressor shall cycle on and off to maintain room temperature.
3. Unit controls shall provide reheat when the relative humidity rises above 55% (adj.).
4. During the heating season, the outside air damper shall remain in its minimum position (15%). Upon a call for heat, the supply fan shall be energized and then the 2-stage gas heating system shall be energized one stage at a time.
5. The roof top unit shall have a smoke detector in both the supply air and return air ductwork. Upon the detection of smoke, the RTU shall be de-energized.

B. Rooftop Units with Variable Air Volume Damper Controls and Economizer:

1. RTU shall be controlled by their own remote programmable central control panel which communicates with their zone thermostats to modulate the bypass dampers and the variable air volume zone dampers to satisfy the zone conditions. The programmable control panel shall provide for occupied/unoccupied periods, manual/auto changeover and heat/cool modes, and display status information.
2. During the cooling season, the enthalpy controlled economizer shall modulate the outside and return air dampers to maintain a discharge air temperature of 57° F. (adj.). When the outside air temperature rises above the enthalpy control setting, mechanical cooling shall be energized and the outside air damper shall return to its minimum position of 15% and the return air damper shall return to its fully open position. Compressor shall cycle on and off to maintain room temperature.
3. During the heating season, the outside air damper shall remain in its minimum position (15%). Upon a call for heat, the supply fan shall be energized and then the 2-stage gas heating system shall be energized one stage at a time.

4. In each system, the controller for a variable air volume control damper shall automatically detect and communicate back to the control panel the mode which the rooftop unit is in, whether heating or cooling so that the zone controllers can respond properly to space needs.
5. The control panel shall modulate the bypass dampers to maintain proper discharge air velocity.
6. The rooftop unit shall have a smoke detector in both the supply air and return air ductwork. Upon the detection of smoke, RTU shall be de-energized.

D. Rooftop Unit with Programmable Thermostat and Economizer:

1. The rooftop unit shall be controlled by a programmable thermostat which features an “ON-OFF” system switch, a “Heat-Cool-Auto” changeover switch, a 7-day time clock to program occupied/unoccupied periods, building warm-up, and 3-hour override.
2. During the heating cycle, the normally closed outside air damper shall remain in its minimum position of 15%, the normally open return air damper shall remain fully open, and the supply fan and heating section shall cycle to maintain space temperature as set by the space thermostat.
3. During the cooling cycle, upon a call for cooling, the fan shall cycle and the economizer shall first modulate the outside and return air dampers to maintain space temperature. When the outside air temperature rises above the enthalpy controller’s set point, the normally closed outside air damper shall return to its minimum position of 15% and the normally open return air damper shall fully open, and the condenser controls shall cycle the compressors to maintain space temperature.
4. The freeze stat shall close the outside air damper and energize the supply fan if the temperature falls below 34° F.
5. Unit shall have a smoke detector in the return air ductwork which shall de-energize the unit upon detection of smoke and sound an alarm.

-06- AIR HANDLING UNITS

A. Units with Economizers and VAV Boxes:

1. The air handler shall run continuously and shall have an economizer cycle and be controlled from a Remote Control Panel, including a “Cooling-Off-Heating”

system changeover switch, a 7-day time clock with night setback and building warm-up, and return air temperature controller.

2. With system in the “Cooling” position, the supply fan shall run continuously and the economizer shall modulate the outside and return air dampers to maintain a return air temperature of 70° F. (adj.). When the outside air temperature rises above the enthalpy control setting, the outside air damper shall return to its minimum position of 10%, the return air damper shall full open, and the 3-way chilled water control valve shall modulate to maintain a return air temperature of 70° F. (adj.). The remote adjustment for the return air temperature sensor shall be located in the Remote Control Panel.
3. With the system in the “Heating” position, the fan shall run continuously and the outside air damper shall remain in its minimum position of 10%. The 3-way hot water control valve shall modulate to maintain a return air temperature of 70° F. (adj.). During night setback, the return air temperature shall be reduced to 63° F. (adj.). The remote adjustment for the return air temperature sensor shall be located in the Remote Control Panel.
4. With the system switch in the “OFF” position, the air handling system shall be de-energized.
5. Unit controls shall provide reheat when the relative humidity rises above 55% (adj.).
6. The freeze stat shall close the outside air damper and open the 3-way hot water control valve if the temperature falls below 34° F.
7. Unit shall have a smoke detector in the return air duct which shall de-energize the unit upon detection of smoke.

B. Units with VAV Boxes only:

1. Air handler shall run continuously and be controlled from a remote control panel, including a “Cooling-Off-Heating” changeover switch, a 7-day time clock with night setback and building warm-up, and return air temperature controller.
2. With system in the “Cooling” position, the 3-way chilled water control valve shall modulate to maintain a return air temperature of 70° F. (adj.). The remote adjustment for the return air temperature sensor shall be located in the remote control panel.
3. With system in the “Heating” position, the 3-way hot water control valve shall modulate to maintain a return air temperature of 70° F (adj.) with remote

adjustment being in the remote control panel. During night setback, the return air temperature shall reduce to 63° F (adj.).

4. With the system in the “OFF” position, the air handling system shall be de-energized.
5. The freeze stat shall open the 3-way hot water control valve if the temperature falls below 34° F.
6. Unit shall have a smoke detector in the return air duct which shall de-energize the unit upon detection of smoke.

C. Air Handlers with Duct Furnace, VAV Boxes, Reheat, and Humidifiers

1. The air handling unit controls shall include an economizer cycle, a “Manual-Off-Auto” changeover switch, a “Heating-Cooling” selector switch, outside air reset thermostat, reheat for humidity control, and the unit shall be controlled from a remote control panel which shall also include indicating lights to indicate dirty filters, heating failure, heating/cooling mode, supply fan failure.
2. With the system in the “Auto” position, the controls will automatically change over from heating to cooling and back to heating again as needed to maintain space temperature. Controls shall be reset by the outside air stat and the supply fan shall run continuously.
3. When the system changes over to the “Cooling” mode, the duct furnace shall be de-energized. The economizer controls shall modulate the outside and return air dampers to maintain a discharge air temperature of 48° F (adj.), being reset by the outside air stat. When the outside air temperature rises above the enthalpy controller setting, the outside air damper shall return to its minimum position of 10%, the return air damper shall return to its maximum position of 90%, and the air cooled condenser shall be energized to maintain a discharge air temperature of 58° F (adj.), being reset by the outside air stat by step controlling the compressors.
4. If the space relative humidity rises above the adjustable set point, the duct furnace shall energize and the gas valve shall modulate until the humidistat has been satisfied.
5. When the system changes over to the “Heating” mode, the air cooled condenser shall be de-energized and the duct furnace shall be energized. With air flow having been proven, the discharge air stat shall modulate the duct furnace gas valve to maintain a return air temperature of 68° F. The outside air damper shall move to its position of 10% and the return air damper to its position of 90%.

6. With the system in the “Manual” position, the heating and cooling modes shall be manually selected and the supply fan shall run continuously.
7. With the system in the “OFF” position, the entire heating and cooling system shall be de-energized.
8. The freeze-stat located in the air handling unit in front of the cooling coil shall de-energize the air cooled condenser upon a freeze condition.
9. The smoke detectors located in both the 1st and 2nd floor return air ducts or the heat detector in the return air duct shall de-energize the air handling system upon detection of smoke or excessive heat and sound an alarm.

D. Air Handling Unit with Duct Furnace and Air Cooled Condenser

1. The air handling unit controls shall include an “ON-OFF” fan switch, an “Auto-Cooling-Off-Heating” system selector switch, outside air reset thermostat, and the unit shall be controlled from a remote control panel which shall include indicating lights to indicate dirty filters, heating/cooling mode, heating/cooling failure, supply fan mode, and failure. Controls shall also incorporate a 7-day time clock with night setback.
2. During occupied times with the fan switch in the “ON” position, the fan shall run continuously. When in the “Auto” position, the fan shall cycle. During unoccupied times, the fan shall cycle no matter what position the fan switch is in.
3. With the system in the “Auto” position, the controls shall automatically change over from heating to cooling and back to heating again as needed to maintain space temperature. Controls shall be reset by the outside air stat.
4. When the system changes over to the “Cooling” mode, whether automatically or manually, the duct furnace shall be de-energized and the air cooled condenser controls shall be energized to maintain a discharge air temperature of 58° F (adj.), being reset by the outside air stat by step controlling the compressors.
5. When the system changes over to the “Heating” mode, whether automatically or manually, the air cooled condenser shall be de-energized and the duct furnace controls shall be energized. With air flow having been proven, the two-stage room thermostat’s first stage shall cause the duct furnace to fire at the low fire rate of 50%. The second-stage of the room thermostat shall cause the duct furnace to fire at the full firing rate of 100% to satisfy the room thermostat. When the space temperature has been satisfied, the duct furnace burner controls shall de-energize.
6. When the system is in the “OFF” position, the entire heating and cooling system shall be de-energized.

7. A freeze-stat located in the air handling unit in front of the cooling coil shall de-energize the air cooled condenser upon a freeze condition.
8. Smoke detectors located in the supply and return air ducts shall de-energize the air handling system upon detection and sound an alarm.

-07- BLOWER COIL UNITS

A. Two Pipe Heating/Cooling System with Economizer:

1. The blower coil units shall have an economizer cycle and be controlled from a remote thermostat with subbase having a “Cooling-Auto-Heating” system switch, an “On-Off-Auto” fan switch, an auto-changeover sensor, and an outside air enthalpy controller.
2. With the fan switch in the “ON” position, the supply fan shall run continuously. It shall cycle when the fan switch is in the “Auto” position.
3. The auto-changeover sensor shall sense the supply water to the coil and determine if the system is in the “Heating” or “Cooling” mode.
4. Upon a call for COOLING, the economizer controller shall modulate the outside and return air dampers to maintain a space temperature of 70° F (adj.). When the outside air temperature rises above the enthalpy control setting, the outside air damper shall return to its minimum position of 10%, the return air damper shall fully open, and the 3-way control valve shall modulate to maintain space temperature if the supply water temperature is 5 degrees or more below the space temperature.
5. Upon a call for HEAT, the outside air damper shall open to its minimum position, and the 3-way control valve shall modulate to maintain space temperature if the supply water temperature is 5 degrees or more above the space temperature.
6. With the system switch in the “OFF” position, the blower coil controls shall be de-energized.
7. A freeze stat located in the front of the coil shall close the outside air damper if the mixed air temperature falls below 36° F.
8. A smoke detector located in the return air ductwork shall de-energize the blower coil upon detection of smoke and send an alarm signal to the building’s alarm system.

B. Two Pipe Heating/Cooling System:

1. The blower coil units shall be controlled from a remote thermostat with subbase having a “Cooling-Auto-Heating” system switch, an “On-Off-Auto” fan switch, and an auto-changeover sensor.
2. With the fan switch in the “ON” position, the supply fan shall run continuously. It shall cycle when the fan switch is in the “Auto” position.
3. The auto-changeover sensor shall sense the supply water to the coil and determine if the system is in the “Heating” or “Cooling” mode.
4. Upon a call for COOLING, the outside air damper shall open to its minimum position and the 3-way control valve shall modulate to maintain space temperature if the supply water temperature is 5 degrees or more below the space temperature.
5. Upon a call for HEAT, the outside air damper shall open to its minimum position and the 3-way control valve shall modulate to maintain space temperature if the supply water temperature is 5 degrees or more above the space temperature.
6. With the system switch in the “OFF” position, the blower coil controls shall be de-energized.
7. A freeze stat located in the front of the coil shall close the outside air damper if the mixed air temperature falls below 36° F.
8. A smoke detector located in the return air ductwork shall de-energize the blower coil upon detection of smoke and send an alarm signal to the building’s alarm system.

C. Four Pipe Heating/Cooling System with Economizer:

1. The blower coil units shall have an economizer cycle and be controlled from a remote thermostat with subbase having a “Cooling-Auto-Heating” system switch, an “On-Off-Auto” fan switch, an auto-changeover sensor, an outside air enthalpy controller, and humidistat.
2. With the fan switch in the “ON” position, the supply fan shall run continuously. It shall cycle when the fan switch is in the “Auto” position.
3. The auto-changeover sensor shall automatically change the system over between the “Heating” and “Cooling” modes as determined by the space temperature.
4. Upon a call for COOLING, the economizer controller shall modulate the outside and return air dampers to maintain a space temperature of 70° F (adj.). When the

outside air temperature rises above the enthalpy control setting, the N.C. outside air damper shall return to its minimum position of 10%, the N.O. return air damper shall fully open, and the 3-way control valve shall modulate to maintain space temperature.

5. Upon a call for HEAT, the outside air damper shall open to its minimum position and the 3-way control valve shall modulate to maintain space temperature.
6. With the system switch in the "OFF" position, the blower coil controls shall be de-energized.
7. In the COOLING mode, the heating coil 3-way valve shall modulate to keep the space humidity from rising above the humidity set point of 55% (adj.).
8. A freeze stat located in the front of the coil shall close the outside air damper if the mixed air temperature falls below 36° F.
9. A smoke detector located in the return air ductwork shall de-energize the blower coil upon detection of smoke and send an alarm signal to the buildings alarm system.

-08- FAN COIL UNITS

A. Two Pipe Heating/Cooling System with Electric Auxiliary Reheat:

1. Unit shall be controlled from a stand-alone, wall mounted thermostat module zone sensor featuring automatic heat/cool mode detection, continuous/cycling fan operation, occupied/unoccupied operation, a zone set point selector, and system selector.
2. The fan shall run continuously when the system is in occupied mode and cycle in the unoccupied mode.
3. Upon a call for HEAT, the outside air damper shall open to its minimum position and the 3-way control valve shall modulate to maintain space temperature if the water temperature is 5 degrees or more above the space temperature. When the space temperature has been satisfied, the outside air damper shall close and the 3-way valve shall close, returning the heating supply water to the return piping system bypassing the coil. If the water temperature is less than 5 degrees above the space temperature, the 3-way valve shall remain closed and the electric heat shall be energized to maintain space temperature.
4. Upon a call for COOLING, the outside air damper shall open to its minimum position and the 3-way control valve shall modulate to maintain space temperature

if the water temperature is 5 degrees or more below the space temperature. When the space temperature has been satisfied, the outside air damper shall close and the 3-way valve shall close, returning the cooling supply water to the return piping system bypassing the coil.

5. With the system switch in the "OFF" position, the fan coil controls shall be de-energized and the 3-way valve shall remain in the closed position allowing system supply water to bypass the coil.

B. Two Pipe Heating/Cooling System:

1. Unit shall be controlled from a stand-alone wall mounted thermostat module zone sensor featuring automatic heat/cool mode detection, continuous/cycling fan operation, occupied/unoccupied operation, a zone set point selector, and system selector.
2. The fan shall run continuously while the system is in the occupied mode and cycle in the unoccupied mode.
3. Upon a call for HEAT, the outside air damper shall open to its minimum position and the 3-way control valve shall modulate to maintain space temperature if the water temperature is 5 degrees or more above the space temperature. When the space temperature has been satisfied, the outside air damper shall close and the 3-way valve shall close, returning the heating supply water to the return piping system bypassing the coil. If the water temperature is less than 5 degrees above the space temperature, the 3-way valve shall remain closed.
4. Upon a call for COOLING, the outside air damper shall open to its minimum position and the 3-way control valve shall modulate to maintain space temperature if the water temperature is 5 degrees or more below the space temperature. When the space temperature has been satisfied, the outside air damper shall close and the 3-way valve shall close returning the cooling supply water to the return piping system bypassing the coil.
5. With the system switch in the "OFF" position, the fan coil controls shall be de-energized and the 3-way valve shall remain in the closed position allowing system supply water to bypass the coil.

C. Two Pipe Heating/Cooling System with Economizer:

1. Unit shall be controlled from a stand-alone, wall mounted thermostat module zone sensor featuring automatic heat/cool mode detection, economizer, continuous/cycling fan operation, occupied/unoccupied operation, a zone set point selector, and system detector.

2. The fan shall run continuously while the system is in the occupied mode and cycle in the unoccupied mode.
3. Upon a call for HEAT, the outside air damper shall open to its minimum position and the 3-way control valve shall modulate to maintain space temperature if the water temperature is 5 degrees or more above the space temperature. When the space temperature has been satisfied, the outside air damper shall close and the 3-way valve shall close, returning the heating supply water to the return piping system bypassing the coil. If the water temperature is less than 5 degrees above the space temperature, the 3-way valve shall remain closed.
4. Upon a call for COOLING, the outside air damper shall first modulate to maintain space temperature. If the discharge air temperature is greater than 65° F. (adj.), then the outside air damper shall return to its minimum position and the 3-way control valve shall modulate to maintain space temperature if the water temperature is 5 degrees or more below the space temperature. When the space temperature has been satisfied, the outside air damper shall close and the 3-way valve shall close, returning the cooling supply water to the return piping system bypassing the coil. If the 3-way control valve does not function due to high water temperature, then the outside and return air dampers shall modulate to maintain space temperature.
5. With the system switch in the “OFF” position, the fan coil controls shall be de-energized and the 3-way valve shall remain in the closed position allowing system supply water to bypass the coil.

F. Four Pipe Heating/Cooling System:

1. Unit shall be controlled from a stand-alone, wall mounted thermostat module zone sensor featuring automatic heat/cool mode detection, continuous/cycling fan operation, occupied/unoccupied operation, a zone set point selector, and system selector.
2. The fan shall run continuously while the system is in the occupied mode and cycle in the unoccupied mode.
3. Upon a call for HEAT, the outside air damper shall open to its minimum position and the heating 3-way control valve shall modulate to maintain space temperature. When the space temperature has been satisfied, the outside air damper shall close and the 3-way valve shall close, returning the heating supply water to the return piping system bypassing the coil.
4. Upon a call for COOLING, the outside air damper shall open to its minimum position and the cooling 3-way control valve shall modulate to maintain space. When the space temperature has been satisfied, the outside air damper shall close

and the 3-way valve shall close, returning the cooling supply water to the return piping system bypassing the coil.

5. With the system switch in the "OFF" position, the fan coil controls shall be de-energized and the 3-way valves shall remain in their closed positions allowing system supply water to bypass the coils.

D. Four Pipe Heating/Cooling System with Economizer:

1. Unit shall be controlled from a stand-alone wall mounted thermostat module zone sensor featuring automatic heat/cool mode detection, economizer, continuous/cycling fan operation, occupied/unoccupied operation, a zone set point selector, and system selector.
2. The fan shall run continuously while the system is in the occupied mode and cycle in the unoccupied mode.
3. Upon a call for HEAT, the outside air damper shall open to its minimum position and the heating 3-way control valve shall modulate to maintain space temperature. When the space temperature has been satisfied, the outside air damper shall close and the 3-way valve shall close, returning the heating supply water to the return piping system bypassing the coil.
4. Upon a call for COOLING, the outside air damper shall first modulate to maintain space temperature. If the discharge air temperature is greater than 65° F (adj.), then the outside air damper shall return to its minimum position and the cooling 3-way control valve shall modulate to maintain space temperature. When the space temperature has been satisfied, the outside air damper shall close and the 3-way valve shall close, returning the cooling supply water to the return piping system bypassing the coil.
5. With the system switch in the "OFF" position, the fan coil controls shall be de-energized and the 3-way valves shall remain in their closed positions allowing system supply water to bypass the coils.

-09- VAV CONTROL BOXES

- A. The room thermostat shall modulate the supply air quantity to maintain the desired room temperature by electronically modulating the variable air volume control box.

-10- HUMIDIFIER

- A. The humidifier shall be controlled by a room humidistat. When the humidity falls below the adjustable set point, having proven air flow, the humidistat shall energize the electric steam humidifier until the room humidistat has been satisfied.
- B. Air flow switch shall be located in the supply air duct.

-11- EXHAUST FANS

- A. Kitchen Hood Exhaust Fans Interlocked with Make-Up Air Unit:
 - 1. Exhaust fans shall be interlocked with each other, the make-up air unit and the fire suppression system. They shall be mechanically energized from one on-off switch.
 - 2. When exhaust fans are energized, the MAU supply fan shall increase from half speed to full speed, the (15%) outside air damper shall move to its fully open (100%) position, and the return air damper shall fully close (0%).
 - 3. When exhaust fans are de-energized, MAU shall return to its normal mode of operation. The supply fan shall decrease from full speed to half speed. The outside air damper shall return to its minimum position of 15%, and the return air damper shall return to its fully open position.
 - 4. When the automatic/manual fire suppression system in any kitchen exhaust hoods is energized, the exhaust fans and the make-up air unit shall be de-energized.
- B. Toilet Exhaust Fans:
 - 1. Interlocked with light switch:
 - a. Toilet exhaust fan shall be interlocked with its toilet room light switch. When the light is energized, exhaust fan shall also be energized. When the light is de-energized, exhaust fan shall also be de-energized.
 - 2. These exhaust fans shall be individually controlled by a separate space T-stat and a remote "ON-OFF-SUMMER" system switch.
 - 3. With the system switch in the "Summer" position, the exhaust fans shall be individually controlled by their space T-stat. When the space temperature rises above the T-stat set point of 90° F (adj.), the exhaust fan shall energize, its normally closed back-draft damper and fresh air intake louver dampers shall fully open.

When the T-stat is satisfied, the exhaust fan shall be de-energized and the dampers shall return to their fully closed position.

4. With the system switch in the “ON” position, the N.C. back-draft damper and the fans fresh air intake louver dampers shall fully open and the exhaust fans shall run continuously.
5. With the system switch in the “OFF” position, the ventilation system shall remain de-energized.

-12- UNIT HEATERS

A. Gas Fired:

1. The gas fired unit heaters shall be controlled by an “ON-OFF” system switch and a unit mounted thermostat.
2. With the system switch in the “ON” position, the unit controls shall be energized. When the space temperature falls below the thermostat set point, the burner shall fire and the fan shall energize to maintain space temperature. When the thermostat has been satisfied, the burner shall de-energize and the fan shall de-energize after the heat exchanger has cooled down to 100° F.
3. With the system switch in the “OFF” position, the unit controls shall remain de-energized.

B. Infrared Unit Heaters:

1. Each infrared unit heater shall be controlled from a 24v remote thermostat in connection with its exhauster. The remote thermostat shall energize its exhauster, then upon proven air flow, each infrared unit heater connected to said exhauster shall energize until its thermostat is satisfied.

-13- CABINET HEATERS

A. Steam:

1. All cabinet heaters shall be equipped with pneumatic low-limit switches.
2. Upon a call for heat from the pneumatic room thermostat, the pneumatic steam control valve shall open. When the room thermostat has been satisfied, the control valve shall close.

3. If the return air to the cabinet heater steam coils falls below the low-limit switches' set point (adj.), the low-limit switch shall override the room thermostat and modulate the pneumatic steam control valve until the low-limit set point has been satisfied.

-14- WATER SOURCE HEAT PUMPS

A. Source Side:

1. The source side consists of the well pumps, heat exchanger, source side of the water-to-water heat pumps, and the source circulation pumps. Each submersible well pump shall have an in-line compression tank connected to the casing below grade and piped with a common header to the heat exchanger. The discharge from the heat exchanger shall have a normally closed modulating control valve with a 1/2" bypass loop to maintain water temperature at the temperature sensor.
2. The well pumps shall be controlled by a pressure sensor in the source water supply line to the heat exchanger. The well pumps shall energize at 20 psi (adj.) and de-energize at 50 psi (adj.). The system is based upon a well water temperature of 55° F. With the system in the "Cooling" mode, the control valve on the heat exchanger discharge shall modulate open to maintain a discharge water temperature of 69.6° F (adj.).
3. With the system in either the "Heating" or "Cooling" mode, the lead source pump shall run continuously with the second source pump in stand-by mode. The two source pumps shall alternate lead and stand-by whenever the system is restarted or switched between "Heating" to "Cooling" modes. Should the lead pump fail to prove flow, an indicator light shall show pump failure and the stand-by pump shall energize.
4. Flow switches located in the source and load pump discharges shall first prove water flow and then energize the water source heat pump controls.

B. Load Side:

1. The controls for the water source heat pumps shall incorporate a "HEATING-OFF-COOLING" system switch, discharge water temperature sensors and flow switches, and LED indicator lights to indicate system mode, pump operation, boiler, and WSHP operation.
2. With the system switch in either the "Heating" or "Cooling" mode, the lead load pump shall run continuously with the second pump in stand-by. These pumps shall alternate lead and stand-by positions whenever the system is changed over

from “Heating” to “Cooling” mode and back again. Should the lead pump fail to prove flow, an indicator light shall show pump failure and the stand-by pump shall energize.

3. With the system switch in the ‘heating’ mode and proven through the WSHP’s, the WSHP’s shall load and unload upon demand to maintain 133° F (adj.) discharge water temperature. The WSHP’s shall load and unload in such a manor that the lead WSHP continuously changes. They shall sequence through their numbers with the first WSHP to load shall also be the first to unload. For example: WSHP-1 starts, followed by #2 and #3, at which time, due to the overloading, #1 de-energizes. Upon a call for more heating or cooling, #4 shall be energized. When the demand is met and there is a call to de-energize, #2 shall de-energize. With another call for heating or cooling, #5 shall energize. Then when the demand has been met, #3 shall de-energize and this sequence shall continue to ensure that no one WSHP is over worked in the lead position.
4. With the system switch in the “Heating” mode, the boilers shall provide stand-by and supplemental heating for the WSHP’s. Should all of the WSHP’s fail to maintain a 133° F. leaving water temperature for a period of 5 minutes (adj.), the lead boiler control shall energize, bringing the boiler water up to temperature (160° F., adj.), and the 3-way valve shall modulate, diverting enough supply water through the boilers to maintain the supply water temperature. The boilers shall fire one at a time in a sequential lead-lag sequence to maintain the supply water temperature.
5. With the system switch in the “Cooling” mode and proven water flow through the WSHP’s, the WSHP’s shall load and unload in such a manner that the lead WSHP continuously changes as described above. During the “Cooling” mode, the boiler controls shall be locked out.
6. The normally closed two-position isolation control valve in the finned tube radiation loop shall fully open whenever the system is in the “Heating” mode. With the system switch in the “Cooling” mode, the normally closed two-position isolation valve shall remain closed to keep chilled water from circulating through the radiation.

END OF SECTION

DIVISION 16

ELECTRICAL

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ELECTRICAL

16010 GENERAL-PROVISIONS

16011 GENERAL PROVISIONS

INDEX: -01- General

-01- GENERAL

- A. All work included in this Division of the work and its sections is coordinated with and complementary to all the requirements and conditions set forth in other Divisions and sections of the Specifications, and associated Drawings wherever applicable to the Electrical work. This applies to CONTRACTOR, Subcontractor and Surety.
- B. The work covered by this Division of the Specifications includes the furnishing of all labor, materials, tools, transportation, permits, certificates, temporary protection and storage required to complete the Electrical work.
- C. Wherever the words "the ELECTRICAL CONTRACTOR", "CONTRACTOR" or "this CONTRACTOR" appear in this Division of the Specifications, they apply specifically to the ELECTRICAL CONTRACTOR.
- D. The CONTRACTOR shall read the entire Specification including "Notice to Contractors", "Information for Bidders", and the "General and Special Conditions" and the "Contract Form", all of which contain provisions equally applicable to the successful bidder and his subcontractors. The CONTRACTOR shall also thoroughly examine all the project plans and the proposed construction site as he will be required to do all of the work belonging to this branch of the work whether or not specifically mentioned herein or shown on the Electrical Drawings.
- E. It shall be the ELECTRICAL CONTRACTOR'S responsibility to notify other CONTRACTORS to arrange clearances and access openings for all large electrical equipment.
- F. The successful bidder will not be allowed any extra compensation by reason of any matter or thing concerning which such bidder might have informed himself prior to the bid opening.

- G. It shall be understood that the act of submitting a bid by the CONTRACTOR carries with it the agreement to all items and conditions referred or indicated or implied on the drawings and the specifications and no consideration will be granted for any alleged misunderstanding of materials to be furnished for work to be done.
- H. Electrical equipment delivered to the jobsite sectionalized for shipping purposes shall be assembled according to manufacturer's instructions. This shall include interconnecting busswork and all other wiring and removal of bracing and supports installed to safeguard devices during shipment.
- I. The ELECTRICAL CONTRACTOR shall be responsible for unloading, placing into storage, if necessary, removal from storage and setting in place all equipment and material required for completion of the electrical installation.

END OF SECTION

DIVISION 16

ELECTRICAL

16010 GENERAL PROVISIONS

16025 CODES AND FEES

INDEX: -01- General

-01- GENERAL

- A. The electrical installation shall comply with rules and regulations of the latest edition of the Occupational Safety and Health Act, National Electrical Code, State Electrical Code, local Municipal Code, the Electrical Utility furnishing electrical energy to this project and any other board having jurisdiction over the electrical installation.
- B. The ELECTRICAL CONTRACTOR shall not assume that any Drawing or Specification forming a part of the contract documents authorizes the violation of any Code, Regulation or Standard. Where conflicts arise, it shall be deemed that the CONTRACTOR has estimated the cost of all work to be completed in accord with the prevailing Code.
- C. The ELECTRICAL CONTRACTOR shall be licensed to perform electrical work in the municipality in which the project is located.
- D. The CONTRACTOR shall obtain all necessary permits for electrical work and shall pay all required fees and sales or use tax as applicable to this branch of work.
- E. Upon completion of the work, the CONTRACTOR shall deliver to the OWNER without cost all required certificates of inspection and approval.

END OF SECTION

DIVISION 16

ELECTRICAL

16010 GENERAL PROVISIONS

16026 DRAWINGS AND SPECIFICATIONS

INDEX: -01- General

-01- GENERAL

- A. All work called for in these Specifications, but not shown on the Drawings in their present form or vice versa, and work not specified in either Contract Specifications or Drawings, but involved in carrying out their intent or necessary for complete and proper execution of the work, is required and shall be performed as though it were specifically outlined or described.
- B. The intent and object of these Specifications and Drawings is to include a complete wiring system from service entrance to each and every outlet indicated or specified, including connecting all electrical devices and/or equipment furnished by the OWNER or other CONTRACTORS.
- C. Any conflict between the Electrical Drawings and the Mechanical and/or Architectural Drawings, or between the Electrical Specifications and the Mechanical and/or General Specifications shall be deemed to have been estimated the more expensive way of doing the work, unless the CONTRACTOR asks and receives a decision in writing as to which shall govern, prior to submitting his bid. The specifications on the drawings shall govern.
- D. The Drawings, which constitute a part of the Contract, are diagrammatic and indicate the general arrangement or circuits and outlets, location of switches, panel board and other work, but extreme accuracy is not guaranteed and field verification of all locations and dimensions is directed.
- E. The Drawings will not show all structural and installation details. It shall be the responsibility of the CONTRACTOR to make a complete and satisfactory installation in accordance with the best modern practice and methods.
- F. CONTRACTOR shall be responsible for all dimensions required for laying out and installing his work. Any information involving accurate measurements of the building shall be taken from the Architectural and Structural Drawings, or at the building.

- G. Generally, outlets shall be located as required for proper installation of equipment or Code requirements such as to be coordinated with equipment of other trades. The CONTRACTOR shall consult the ENGINEER and refer to all details, sections, elevations and equipment plans and the plans of other trades for exact location.
- H. The ENGINEER reserves the right to make reasonable changes in the location of outlets, apparatus or equipment up to the time of roughing-in. Such changes as directed shall be made by the CONTRACTOR without additional compensation.

END OF SECTION

DIVISION 16

ELECTRICAL

16010 GENERAL PROVISIONS

16027 SHOP DRAWINGS REVIEW

INDEX: -01- General

-01- GENERAL

- A. CONTRACTOR shall submit to the ENGINEER for review five (5) copies outline and general arrangement drawings, data sheets and wiring diagrams where applicable for each of the following, but not limited to:
 - 1. Light Fixtures and outlets
 - 2. Panel boards, switches, motor starters, etc. All electrical equipment supplied by ELECTRICAL CONTRACTOR.
- B. Shop drawings submitted for review, such as lighting fixtures, special systems, panel boards and other apparatus, shall be submitted complete with an index sheet covering all items included.
- C. Review of manufacturer's drawings constitutes acceptance of general design only and will not release the CONTRACTOR from fulfilling the terms and intent of the Drawings and Specifications.

END OF SECTION

DIVISION 16

ELECTRICAL

16010 GENERAL PROVISIONS

16028 CLEANUP AND PAINTING

INDEX: -01- General

-01- GENERAL

- A. The ELECTRICAL CONTRACTOR shall periodically remove from the site all debris and rubbish accumulating as a result of the electrical installation. Upon completion of the project, he shall dispose of all debris and rubbish and shall:
1. Leave electrical equipment rooms broom clean.
 2. Clean interior of all panel cabinets, pull boxes and other equipment enclosures.
 3. Wash and wipe clean all lighting fixtures, lamps and other electrical equipment which may have become soiled during the installation.
- B. If, during the installation, the finish of any electrical equipment has deteriorated or has been damaged, the ELECTRICAL CONTRACTOR shall restore its condition and appearance to the satisfaction of the OWNER.

END OF SECTION

DIVISION 16

ELECTRICAL

16010 GENERAL PROVISIONS

16040 IDENTIFICATIONS AND INSTRUCTIONS

- INDEX: -01- General
-02- Final Tests and Demonstrations

-01- GENERAL

- A. Each distribution and lighting panel board shall be equipped with a typewritten directory accurately indicating rooms and/or equipment being served.
- B. On branch circuits, use shall be made of all standard colors available. Where wires of different systems junction in a common box, each cable shall be grouped with its own system and identified using tags or identification strips.
- C. All control, instrumentation, graphic display, alarm and other special system wires shall be clearly identified by description and location, using tags or identification strips.
- D. All panel boards, cabinets, safety switches, circuit breakers, motor starters, remote control stations, etc. shall be identified with pressure embossed tapes.
- E. The ELECTRICAL CONTRACTOR shall furnish to the ENGINEER, for transmittal to the OWNER, six (6) copies of instruction books for all complex electrical equipment including motor control, instrumentation, etc. Instruction books shall include a list of recommended spare parts where applicable.

-02- FINAL TESTS AND DEMONSTRATIONS

- A. The CONTRACTOR shall test all his work and all equipment installed by him, to ensure its proper and safe operation in accordance with the true intent of the Drawings and Specifications. The CONTRACTOR shall check all interlocking and automatic control sequences, and shall test the operation of all safety and protective devices. He shall rectify all defects. He shall cooperate in this work with the Power Company, supplier's representatives and all other persons as directed by the OWNER or his representatives, in order to achieve the proper and intended operation of all equipment.

- B. The CONTRACTOR shall test, adjust and record operating voltages at each system level before energizing branch circuit. Transformer taps must be adjusted to obtain as near as possible nominal system voltage. Where transformer is under Utility jurisdiction, obtain services of Utility to correct voltage. The CONTRACTOR shall be responsible for replacement of all devices and equipment damaged due to failure to comply with this requirement.
- C. The CONTRACTOR shall balance load among feeder conductors at each panel board, switchboard or substation and shall reconnect loads as may be necessary to obtain a reasonable balance of load on each phase. Electrical unbalance shall not exceed 7-1/2%.
- D. The CONTRACTOR shall provide all instruments and equipment necessary to perform required tests.
- E. All checks and tests shall be permanently recorded and made available to the OWNER or his representatives. The tests shall include:
 - 1. System grounding.
 - 2. Fuses.
 - a. Equipment nameplate requirement
 - b. Actual Fuse Rating
 - 3. Breakers.
 - a. Nameplate
 - b. Actual rating
 - 4. Motors.
 - a. Nameplate
 - b. Overload relay element
 - c. Protective relay (if any) - setting
 - d. Voltage and current phase readings
 - e. Direction of rotation
 - 5. 500 Volt Megger check on equipment up to 2000 volts.
 - 6. Ampere readings on any cable operating in parallel to insure an even division of current.
 - 7. Solid state equipment shall not be Megger checked.

- F. The CONTRACTOR shall, upon request, demonstrate proper operation of all electrical systems and equipment in the presence of the ENGINEER and/or other designated persons.

END OF SECTION

DIVISION 16

ELECTRICAL

16010 GENERAL PROVISIONS

16041 RECORD DRAWINGS

INDEX: -01- General

-01- GENERAL

- A. CONTRACTOR shall keep up-to-date set of "Record Drawings" kept current on a daily basis. Such drawings shall be available to the ENGINEER or his representatives at the job site at all times.
- B. Record Drawings shall show:
 - 1. Location and size of all feeder conduits and wire, pull boxes, panels, etc., starting with the service entrance and then throughout the project.
 - 2. Locations and sizes of conduit and wire and number of conductors in each outlet for:
 - a. All branch wiring.
 - b. All motor control wiring installed under this contract.
- C. Upon completion of the contract, turn over to the OWNER one complete, clear and concise set of marked prints.

END OF SECTION

DIVISION 16

ELECTRICAL

16010 GENERAL PROVISIONS

16042 TEMPORARY LIGHT AND POWER

INDEX: -01- General

-01- GENERAL

- A. The ELECTRICAL CONTRACTOR shall furnish, install, maintain and remove after construction is completed, a temporary electrical service rated as follows:
 - 1. 100 ampere, 120/240 volt, single phase, 3 wire.
- B. Temporary light and power system shall be as further described under Specification Section 01500 - Temporary Facilities.

END OF SECTION

DIVISION 16

ELECTRICAL

16100 BASIC MATERIALS AND METHODS

16100 BASIC MATERIALS AND METHODS

- INDEX: -01- General
-02- Quality Assurance
-03- Submittals
-04- Products
-05- Execution

-01- GENERAL

- A. Work Included: The work to be performed under this Division is shown on the Drawings and included in these specifications and encompasses, but may not be limited to the following:
1. Installation of electrical service to buildings, structures, site lighting, equipment, appurtenances, etc. as indicated on the Drawings.
 2. Installation of motor controls and disconnects for various items of mechanical equipment. Specified in Division 15 - MECHANICAL.
 3. Installation of grounding systems and connections.
 4. Calibrating and testing installed systems.
 5. Cleaning, painting and marking.
 6. Providing manuals and instructions for installed systems and equipment.

-02- QUALITY ASSURANCE

- A. Codes and Standards: Work shall comply with the National Electrical Code (NEC), current Edition.
- B. Permits: Electrical permit shall be purchased from the local authority having jurisdiction. The work shall be inspected and the inspection certificate issued by the same agency.

-03- SUBMITTALS

- A. Shop Drawings: Submit Shop Drawings and brochures on all items listed in this Section with the exception of raceways, ordinary wiring devices, wire connectors, boxes, fittings, etc.

-04- PRODUCTS

A. Raceways

1. General

- a. All interior wiring shall be in U/L listed raceways and enclosures throughout.
- b. Conduit concealed in stud walls and above ceilings shall be electrical metallic tubing (EMT), intermediate metal conduit (IMC), rigid metal conduit (RMC), or metal clad cable (MC).
- c. Conduit below grade, embedded in concrete, or in masonry shall be RMC or RNC schedule 40 or 80 as indicated on the Drawings.
- d. Exposed interior and exterior conduits shall be IMC or EMT.
- e. Final connections to vibrating equipment and motors shall be liquid tight, jacketed flexible steel conduit.
- f. Final connections to lighting fixtures above ceilings may be flexible steel conduit.

2. Rigid metal Conduit

- a. Rigid metal conduit (RMC) shall conform to UL Standard UL6 and American National Standards Institute (ANSI) Specification C.80.1. Zinc coating shall be applied inside and out by hot dip galvanizing after threading. Each length of conduit shall be furnished with a coupling assembled on one end and a plastic thread protector on the other end. Minimum size shall be 3/4" unless shown otherwise on the Drawings.

3. Intermediate Metal Conduit

- a. Intermediate metal conduit (IMC) shall be hot dip galvanized and manufactured in accordance with UL 1242 and NEC requirements.
- b. Minimum size shall be 3/4" unless shown otherwise on the Drawings.

4. Electrical Metallic tubing
 - a. Electrical metallic tubing (EMT), where permitted, shall conform to NEC requirements and be UL listed. The tubing shall be hot dip galvanized.
 - b. Minimum size shall be 1/2" unless shown otherwise on the drawings.
5. Flexible Steel Conduit
 - a. Flexible steel conduit shall be of the single strip interlocked type, galvanized inside and outside and shall be U/L listed.
6. Liquid Tight Flexible Conduit
 - a. Formed from spirally wound galvanized steel strip with successive convolutions securely interlocked. A polyvinyl chloride jacket shall be extruded over the lining to produce a flexible watertight raceway.

B. Raceway Fittings

1. General: Fittings shall be suitable for the application and designed for the purpose for which they are used. Hot dipped galvanized fittings and parts shall be used for RMC and IMC conduit.
2. Unions: Unions shall be Types UNF and UNY.
3. Locknuts: Locknuts shall be extra heavy hot dip galvanized steel.
4. Bushings: Bushings shall be hot dip galvanized iron with insulating collar.
5. Hubs: Appleton Uni-Seal, or approved equal, for connection of conduit to sheet steel enclosures.
6. Conduit Supports: One hole type hot dipped galvanized malleable iron.
7. EMT conduit fittings shall be set screw type. Cast body or indented fittings are not permitted.

C. Boxes

1. Device Boxes: Galvanized stamped with conduit knockouts. Where surface mounted devices are necessary, cast metal boxes with a corrosion resistant finish shall be used. Do not use stamped steel boxes for these applications. Where more than one device is shown at a location, single piece multi-gang boxes shall be used.

2. Junction Boxes: Stamped galvanized steel. All junction boxes and pull boxes used in damp locations, outdoors, or below grade shall be hot dipped galvanized or cadmium plated cast type boxes with watertight gasketed covers.
3. Outlet Boxes: Four inch square or four inch octagonal stamped galvanized steel with conduit knockouts and plaster rings installed as needed.

D. Wiring Devices

1. All wiring devices of a single type (switches, plates, receptacles, etc.) shall be of one manufacturer and shall be delivered to the project in the original cartons. Devices shall be in accordance with the Electrical Symbol Legend.
2. Switches: Wall switches shall be "Quiet Switches" of the heavy duty specifications grade type meeting current NEMA codes and performance requirements.
3. Receptacles: General purpose receptacles shall be NEMA 5-20R configuration rated 20 amps at 125 volts. The receptacles shall be U/L listed and meet NEMA WD-1 "Heavy Duty" performance standards. All Receptacles shall be white in color. All switch and receptacle plates shall be stainless steel.
4. Ground Fault Receptacles: Ground fault receptacles shall have built-in Class A, Group 1 ground fault protection. The receptacles shall be UL listed per current UL Standards. The receptacles shall be of the feed through type to protect additional downstream standard receptacles or the end-of-the-line type as required. Built in test and reset buttons shall be provided with visible ground trip indication.

E. Wire and Cable

1. Wire and cable shall conform to ASTM standards for Class B concentric stranding. All wire and cable shall bear UL listing mark, 600 volt insulated copper wire shall be used unless otherwise shown.
2. All wire and cable shall be new and shall be delivered to project in unbroken and undamaged cartons and reels.
3. Use copper conductors at the following types:
 - a. Type THHN/THWN, solid or stranded for interior wiring for sizes #12 through #10.
 - b. Type THW, THHN/THWN or USE/RHH/RHW stranded for interior wiring size #8 and larger.

- c. Type UF or USE for underground applications as noted.
- 4. Wire Connectors: "Sta-Kon" as manufactured by Thomas and Betts, "Scotchlox Spring" connectors as manufactured by Minnesota Mining and Manufacturing Company, or approved equal.

F. Panel boards

- 1. Circuit Breaker Panel boards: Panel boards shall be dead front safety conform to standard of NEMA Publication PBI and shall be of the type and size shown on the Drawings. Each cabinet shall be complete with a locking metal door and a card holder for a directory.

All locks shall be fitted to the same key. Cabinets shall have a standard factory finish.

All panel boards shall be of the same manufacture and shall be factory assembled. Load center type panel boards will be acceptable. All internal connections in panel boards shall be bus bars, cables will not be permitted. Panels shall be fully bussed.

All breakers shall be quick make, quick break thermal magnetic, plug-in type, with visible trip position. Provide QO-HID breakers for high pressure sodium lighting circuits. Breakers that are rated between 10 and 100 amps shall be suitable for use with 60°C or 75°C conductors.

The panel board bus assembly shall be enclosed in a steel cabinet. The size of the wiring gutters and gage of steel shall be in accordance with current NEMA Standards and UL Standards for panel boards. Fronts shall include doors and a circuit directory frame and card with a clear plastic covering shall be provided on the inside of the door. Fronts shall be of code gauge, full finished steel with rust inhibiting primer and baked enamel finish.

G. Motor and Circuit Disconnects

- 1. Motor and circuit disconnect switches shall be Square D or approved equal heavy duty fusible or non-fusible, in a NEMA 1 enclosure for indoor applications and NEMA 3R for outdoor applications, rated as shown on the plans.

H. Motor Controls and Protection

- 1. Where buss fustat protection for fractional horsepower motors are shown on the plans provide Buss Fusetron Box Cover Units with dual element time delay Type S fuses sized according to the manufacturer's recommendations and NEC requirements for motor running overload protection. Where motors have built-in

thermal protection, size the fuses to approximately 150% of full load amperage. Provide switched Box Cover Units where shown.

2. Fuse protection for motors with fusible combination starters or fusible branch switches shall be UL Class RK-1 dual element, time delay fuses sized as noted on the plans. Fuses shall be Bussman "Low Peak" LPN-RK for 250 volt application or LPS-RK for 600 volt applications.
3. Motor starters shall be combination or non-combination full voltage magnetic starters in NEMA 1 enclosures for indoor applications and NEMA 3R enclosures for outdoor applications. As a minimum, starters shall be equipped with a 2 or 3 pole magnetic contactor and three thermal overload relays of the melting alloy type with a manual reset button. Additional items including fuses or non-fused disconnect switches, circuit breakers, on/off or hand/off/auto selector switches, start/stop pushbuttons, and pilot lights shall be provided as shown on the plans.

Each starter shall be equipped with a 120-volt control transformer with a fused, grounded secondary control circuit and 120 volt operating coil.

Each starter shall be provided with a minimum of one normally open auxiliary contact and additional normally open or normally closed auxiliary contacts as required for interlocking circuits.

Non-combination starters shall be Square D Class 8536 or approved equal. Combination starters shall be Square D Class 8538 or Class 8539 or approved equal.

4. FHP manual motor starters shall be Square D Class 2510 Type FG-2, double pole type with one thermal overload relay and surface mounted NEMA 1 enclosure.

I. Grounding Materials

1. Ground Rods ... 3/4" x 10' copper clad steel, UL listed by Copperweld, Weaver or approved equal.
2. Rod Clamps ... J. A. Weaver U-Bolt clamp Type UG, Type GC 110/111, or approved equal.
3. Ground Cables (Not Grounding Conductors) ... Shall be bare, stranded copper of 98% conductivity. Grounding electrode and equipment grounding conductors shall be sized according to Article 250 of the NEC.
4. Pipe Clamps ... J. A. Weaver Type J or approved equal.

-05- EXECUTION

- A. General: All devices and equipment shall be located and mounted as indicated on the plans. Small deviations may be made to avoid interference with others devices or equipment; however, any major relocations will require the approval of the ENGINEER.

- B. Raceways and Fittings.
 - 1. Exposed conduit shall be installed in neat symmetrical lines parallel with the center lines of the structure adjacent to beams, walls, etc. and not across open bays.
 - 2. Metal conduits below grade or embedded in concrete shall be painted with two coats of asphalt based paint to six inches above grade.
 - 3. Provide locknuts and insulated throat bushings at enclosures.
 - 4. Fittings exposed to the weather shall be UL listed watertight and equipped with gasketed covers.
 - 5. Provide UL listed watertight hubs or seals at connections to exterior boxes and enclosures.
 - 6. Provide appropriate steel sleeves for conduits passing through concrete floors and walls. Seal conduits with grout.
 - 7. Flexible steel conduit may be used for final connection to vibrating equipment in dry locations only. Flexible steel conduit shall not exceed 24-inches in length and shall not be used as a general purpose raceway.

- C. Wire Connectors and Terminating Devices
 - 1. Joints will be permitted only in junction and outlet boxes. All joints shall be firmly bonded together and taped, or shall be made with mechanical connectors.
 - 2. Limit the number of conductors in boxes so that the maximum number does not exceed the number permitted by the National Electrical Code.
 - 3. Support conductors in vertical raceways in accordance with the National Electrical Code.

D. Cutting and Patching

1. The Electrical Contractor shall do all cutting and patching necessary for the installation of electrical work and all such cutting and patching shall be done with the approval and under the supervision of the ENGINEER.
2. Cutting or patching shall not impair the strength or function of work being cut, i.e, structural members shall not be weakened and holes through exterior walls and ground floor shall be waterproofed. Use rotary type drilling tools and concrete cutting saws to cut concrete and masonry walls. Do not use torches for cutting steel.

E. Equipment and Device Locations

1. Wall Switches ... 48-inches above finished floor unless otherwise noted.
2. Locate Branch Circuit Boards as shown on the plans and at such a height that no circuit breaker is more than 72 inches above the finished floor.
3. Disconnect switches shall be located so that the operators are not more than 48 inches above the finished floor.

F. Identification and Marking

1. Equip lighting panel with a typewritten directory accurately indicating rooms and/or equipment being serviced.
2. Branch circuits shall be identified as to phase with the following colors as standard:
 - (a) 150 volts or less to ground: black, red, blue, white.
 - (b) 150 – 300 volts to ground: brown, orange, yellow, gray.
3. Feeders shall be identified as to phase at all terminals with tape colors corresponding to branch circuit colors.
4. Apply touch up paint to all equipment marred in the course of construction.

G. Ground and Bonding

1. Service Grounding ... The service neutral conductor shall be grounded at the main disconnect to the metal well casing by an approved means. Additionally, two (2) 3/4" x 10'-0" copper clad ground rod shall be driven and bonded to the grounding electrode conductor, spaced according to the NEC. In no case shall an underground metallic cold water piping system service as the sole service grounding means. Measured resistance of the grounding electrode system to absolute earth shall not

exceed 5 ohms. Additional ground rods shall be driven at 10 foot spacing to obtain a ground resistance of less than 5 ohms.

H. Testing

1. Upon completion of the electrical work, test all parts of the electrical system in the presence of the ENGINEER. The CONTRACTOR shall demonstrate to the ENGINEER that all equipment and systems function as intended and shall make any adjustments or changes required.
2. All systems shall be free of shorts, opens and grounds and each phase conductor on each circuit shall be megged to ground before final connections are made. Minimum acceptable reading is 100 megohms.

END OF SECTION

DIVISION 16

ELECTRICAL

16100 BASIC MATERIALS AND METHODS

16101 GENERAL

INDEX: -01- General

-01- GENERAL

- A. Where materials, equipment, apparatus, or other products are specified by manufacturer, brand name, type or catalog number, such designation is to establish standards of desired quality and style and shall be the basis of the bid.
- B. Materials and equipment of the types for which there are National Board of Fire Underwriters (UL) listings and label service shall be so labeled and shall be used by the CONTRACTOR.
- C. All materials used for the electrical installation shall be new and unused, except as otherwise indicated, and shall be uniform in type and manufacture for the entire electrical installation.
- D. All material shall be suitable for the conditions and duties imposed upon them in service and shall be the latest standard catalog products of reputable manufacturers.

END OF SECTION

DIVISION 16

ELECTRICAL

16100 BASIC MATERIALS AND METHODS

16111 CONDUITS

- INDEX: -01- General
-02- Conduit Support
-03- Expansion Anchors
-04- Fittings

-01- GENERAL

- A. Furnish and install a complete conduit raceway system for all feeders, branch circuits, control, instrumentation and communication circuits, unless otherwise indicated in the Specifications or on the Drawings.
- B. All conduit shall be furnished in manufactured lengths and, except as otherwise specified, shall be full-weight, heavy wall, rigid steel conduit, protected inside and out by a coating of metallic zinc and shall comply with Underwriters' Laboratories Standard for Rigid Steel Conduit.
1. Electrical metallic tubing (EMT) may be used for branch circuit wiring only in trade size through 1" where it can be concealed in the hollow spaces of walls above grade or above suspended ceilings and shall be galvanized outside with lacquer coating inside. All exposed conduit must be full-weight, heavy wall.
- C. All conduit installed directly under floor slabs, under grade floor slabs or underground shall be totally encased in at least 3" of concrete or as indicated on Drawings. No conduit shall be in direct contact with the earth.
- D. Conduits shall be of size required to accommodate the number of conductors in accordance with the tables given in the current edition of the Michigan State Electrical Code, National Electrical Code, or as noted on the drawings, whichever is larger. Minimum conduit size shall be 3/4" except as follows:
1. Conduit for lighting switch legs containing switched conductors only may be 1/2" minimum size.
2. As otherwise noted on the Drawings.

- E. All conduit shall be run concealed except that exposed surface conduit may be installed where noted on the Drawings or where concealment is found to be impractical or impossible and only with approval of the ENGINEER.
- F. Concealed conduits shall be run in as direct a line and with as long bends as possible. Exposed conduits shall be run parallel to or at right angles with the lines of the building. Bends and offsets shall be made with a hockey or power bender without kinking or destroying the smooth bore of the conduit.
- G. Conduits shall be continuous from outlet to outlet, and from outlet to cabinets, junction or pull boxes, and shall enter and be secured to all boxes in such a manner that each system shall be electrically continuous from point of service to all outlets. Joints shall be cut square, reamed smooth and drawn up tight.
- H. Entire raceway system shall be made watertight where installed in wet places, underground or where buried in masonry or concrete.
- I. Conduit runs that extend through areas of different temperature or atmospheric conditions, or that are partly indoors and partly outdoors, shall be sealed and installed in a manner that will prevent drainage of condensed or entrapped moisture into cabinets, motors or equipment enclosures. Overhead conduits shall be provided with seal and drain fittings to provide continuous automatic drainage.

-02- CONDUIT SUPPORT

- A. All conduit shall be securely fastened to structural part of the building in a manner acceptable to the ENGINEER. Supporting devices shall be specifically designed for the application. Perforated hanger iron is NOT acceptable.
- B. Furnish and install concrete inserts as required, with spacings as recommended by manufacturer. Install continuous slot or T-slot concrete insert channel with anchor and caps, insert joiner clips and closer seals as required.

-03- EXPANSION ANCHORS

- A. Expansion anchors shall be of the cinch anchor or self-drilling type. Installation methods shall be in conformance with the manufacturer's recommendations for maximum holding power, but in no case shall the depth of hole be less than four bolt diameters. Minimum distance between the center of any expansion anchor and an edge of exterior corner of concrete shall be not less than 4-1/2 times the diameter of the hole in which it is installed. All bolts shall be cadmium zinc electroplated.

-04- FITTINGS

- A. Conduit terminations at cabinets and boxes shall be rigidly secured with galvanized locknuts and bushing as required by Code.
- B. Couplings and connectors as follows:
 - 1. Terminations for rigid heavy wall steel conduits shall be liquid-tight, made of steel with insulated throats and double locknuts.
 - 2. Connectors and couplings for electrical metallic tubing shall be all steel or cast iron (no die cast), threaded, insulated throat, gland compression type.
- C. Running threads will not be permitted. When required, use manufactured threadless conduit unions. Set screw type are not acceptable.
- D. Install conduit expansion fittings complete with bonding jumper in the following locations:
 - 1. Conduit runs which cross a structural expansion joint.
 - 2. Conduit runs attached to two separate structures.
- E. Install conduit expansion deflection fittings in all 1" and larger conduit runs where movement perpendicular to axis of conduit may be encountered.
- F. Provide wall entrance seal as dictated by application where conduits or direct burial conductors pass through foundation walls below grade.
- G. Conduit outlet bodies shall be complete with threaded hubs.

END OF SECTION

DIVISION 16

ELECTRICAL

16100 BASIC MATERIALS AND METHODS

16120 WIRES AND CABLES

- INDEX: -01- General
-02- Conductors
-03- Joints, Taps and Splices

-01- GENERAL

- A. All wire sizes and all conduit sizes shown on the Drawings are for copper conductors. Aluminum conductors shall not be used.

-02- CONDUCTORS

- A. Conductors for feeders, branch circuits, control and other circuits 600 volts and below shall have 600 volt insulation; color coded as required by Code. All wire and cable shall be new and shall be as follows:
1. Type THHN/THWN solid or stranded in all general areas for sizes #12 and #10 AWG branch circuit wiring.
 2. Type THHN/THWN stranded for all wire #8 AWG and larger.
 3. Type AVA, 110°C. for all wiring in fluorescent fixture channels and all wiring to equipment mounted on boiler, incinerator, exhaust hoods and elsewhere where high ambient temperature conditions exist.
 4. Type MTW Machine Tool Wire, 90°C. dry, 19 strand, standard wall, extra flexible, #14 AWG minimum for all control wiring and final termination of all motor circuits and other machinery subject to vibration.
- B. Conductors in vertical raceways shall be supported using suitable cable supports such that supports are located so that each 25'-0" length of conductor in a vertical raceway will be complete with such support.

- C. Fixture outlets shall be wired using conductor with insulation suitable for the current, voltage and temperature to which the conductor will be subjected. Wiring shall conform to Code Requirements and the following:
 - 1. #12 wire size minimum for conductors supplying power to a single fixture. 600 volt insulation minimum for circuits exceeding 150 volts to ground and for wiring between ballasts and lamp holders.
 - 2. Insulation suitable for operation at 100°C. minimum for lighting fixtures with integral ballast, mogul base sockets, quartz lamps or otherwise where subject to excessive temperatures.

-03- JOINTS, TAPS, AND SPLICES

- A. Joints, taps and splices in conductors #10 AWG and smaller shall be made with compression type solderless connectors with plastic cover.
- B. Joints, taps and splices in conductors #8 AWG and larger shall be made with solderless compression type connectors similar to Burndy, Thomas & Betts Company or equal and of a type that will not loosen under vibration or normal strains.
- C. Each tap, joint or splice in conductors #8 AWG and larger shall be taped with two half-lap layers of vinyl plastic electrical tape and a finish wrap of color coding tape, where required by Code.

DIVISION 16

ELECTRICAL

16100 BASIC MATERIALS AND METHODS

16121 WIRE CONNECTIONS AND DEVICES

INDEX: -01- General

-02- Motor Wiring and Wiring for Other Trades

-01- GENERAL

- A. All wiring devices shall be from one manufacturer.
- B. General use switches shall be sized according to switched load and shall be as follows:
 - 120 Volt Circuits
 - 1. Up to 1200 watts load, 15 ampere.
 - 2. 1300 up to 1800 watts load, 20 ampere.
- C. Weatherproof switches and covers shall be NEC and UL rated for outdoor applications.
- D. Switches controlling equipment, the operation of which is not evident from the switch position, shall include flush neon pilot light in conjunction with proper switch. Each switch shall be complete with engraved plate to identify equipment being controlled.
- E. All general purpose receptacles shall be of specification grade rated for the capacity and characteristics of the equipment serviced and grounding type.
 - 1. Duplex Receptacles: heavy duty, 15 ampere, or 20 ampere as required.
 - 2. Duplex Weatherproof Receptacles: shall be NEC and UL rated for outdoor applications.
 - 3. Twist Lock Receptacles: 15A, 120V, 1 pole; 20A, 250V, 2 pole; 20A, 250V, or 3 pole, as required.
 - 4. Refer to Drawings for signal devices and other special devices.

-02- MOTOR WIRING AND WIRING FOR OTHER TRADES

- A. The ELECTRICAL CONTRACTOR shall check the Drawings and Specifications of all other Divisions of work such as Heating, Ventilating, Air Conditioning, Plumbing, Mechanical Equipment, Alarm Systems, etc. for equipment and work which must be included whether or not shown on the electrical drawings, in order to provide a complete electrical installation.
- B. Unless otherwise indicated on the Drawings or in the Specifications, all motors shall be furnished, set in place and connected to the driven equipment by others who shall also be responsible to prepare the motor for operation. The ELECTRICAL CONTRACTOR shall be responsible for final connection for proper phase relationship to achieve proper motor rotation.
- C. Prior to energizing any equipment whether installed by him or not, the CONTRACTOR shall first make a thorough inspection of it, and remove all packing, braces and shipping supports and thoroughly blow out with compressed air all dirt and debris. Before energizing any motor, he shall first rotate the motor manually at least one complete revolution, after having observed the foregoing precautions. No motor shall be operated without having first obtained the authority to do so from the OWNER or his appointed representatives and the person responsible for the machinery or equipment to which it is connected and tests are performed as specified.
- D. All associated starters, motor controls, pilot devices, etc. furnished by others shall be delivered to the ELECTRICAL CONTRACTOR who shall receive, handle, set, mount and install this equipment. The ELECTRICAL CONTRACTOR shall furnish all brackets, supports or other fittings required for mounting this equipment.
- E. Where the electrical Drawings show the required conductor and conduit size for motor circuits, they are sized for the motor requirements only. CONTRACTOR may, at his option, include associated control conductors in the same conduit providing the conduit size is adjusted to meet Code requirements for percentage of fill.
- F. CONTRACTOR shall extend motor circuits in accordance with schedule on the drawings and Code requirements from the source of supply to the associated motor starter and from same to the motor terminal box including all necessary and required intermediate connections.
- G. Final connections at motors shall be made with flexible metal conduit with electro-galvanized single strip steel armor and equipped with integral copper ground conductor and separate ground conductor as described elsewhere.
- H. All motor control wiring less than 120 volts associated with heating, ventilating, mechanical equipment shall be considered "low voltage wiring" and shall be done by the

ELECTRICAL CONTRACTOR. The ELECTRICAL CONTRACTOR shall also be responsible for all low voltage wiring associated with building service motors such as door operators, alarm, instrumentation, etc. Wiring shall be in full compliance with the Plans and Specifications established under Architectural, Heating, Ventilating and Mechanical Equipment Divisions of the project.

- I. All motor control wiring 120 volts and greater shall be considered "line voltage wiring" and shall be furnished, installed, wired and connected by the ELECTRICAL CONTRACTOR in full compliance with the Drawings and Specifications established under the Architectural, Heating, Ventilating, Air Conditioning, Plumbing and Mechanical Equipment division of the project.
- J. It shall be the responsibility of the ELECTRICAL CONTRACTOR to obtain manufacturer's wiring diagrams of all electrical equipment furnished by other contractors and he shall not proceed to wire the equipment without this information.
- K. The ELECTRICAL CONTRACTOR shall check all Drawings and Specifications to determine the requirements for motor disconnect switches. Whether or not specifically indicated on the Drawings or in the Specifications, the ELECTRICAL CONTRACTOR shall be responsible for furnishing motor disconnect switches to conform with all Code requirements.

END OF SECTION

DIVISION 16

ELECTRICAL

16100 BASIC MATERIAL AND METHODS

16130 OUTLET BOXES

- INDEX: -01- General
-02- Lighting Boxes
-03- Floor Boxes
-04- Locations

-01- GENERAL

- A. Standard, sheet-metal, outlet and junction boxes shall be non-gangable type, constructed of code gauge, galvanized sheet steel and shall be used for concealed work only. The size of each box shall not be less than that required by the National Electrical Code.
- B. Exposed boxes for switches, receptacles and other surface mounted devices shall be corrosion-resistant malleable iron type FS or FD, with gasketed cast iron covers and stainless steel screws.
- C. All outlet boxes shall be set parallel to construction, securely mounted and adjusted to set true and flush with the finished surface. Back to back and through boxes are not allowed.
- D. In precast and wood deck areas, use 4" octagonal concrete boxes 1/2" to 1" deeper than deck as determined by thickness of insulation. Where multiple layer insulation is used, top of boxes shall not penetrate top layer of insulation. Use offset concrete tight connectors for conduit connection at outlet box.
- E. In concrete construction use 4" octagonal concrete boxes having a minimum depth of 3".
- F. For the mounting of local switches in metal door jambs, use Raco single gang, two gang tandem and three gang tandem partition boxes, or equal.

- G. When a lighting fixture or any item of equipment requires a special outlet box, or when a special outlet box is recommended by the manufacturer of the equipment, it shall be provided by the CONTRACTOR in lieu of other types.
- H. For the mounting of single receptacles, single or double switch outlets in plaster or concrete walls, use 4" square boxes fitted with 3/4" raised plaster covers. More than two switches shall be installed in multiple gang switch box.
- I. In un-plastered brick or block walls, use masonry boxes except for single gang outlets in 4" square shallow boxes with square cut device covers of thickness to suit block, brick to tile.
- J. For the mounting of weatherproof switches and devices, use type FS or FD cast conduit bodies complete with weather cast spring lid cover and gasket. Seal conduit at entrance to box.
- K. All wall boxes shall be located in corner of nearest brick or block to keep cutting to a minimum.

-02- LIGHTING BOXES

- A. All concealed ceiling lighting boxes shall be 4" square variety with cover so as the raised edge of the cover is flush with the finished surface.
- B. Lighting outlet boxes shall be securely mounted with approved type bar hangers spanning structural members so they will support the weight of the fixture. Conduit will not be considered as adequate support. Boxes are to be equipped with both 3/8" fixture studs and tapped fixture ears.

-03- FLOOR BOXES

- A. Floor outlet boxes shall be fully adjustable, dual level, cast iron, watertight, Class 1, boxes suitable for use with pedestal of flush type outlets.

-04- LOCATION OF OUTLETS AND EQUIPMENT

- A. Location of outlets and equipment as shown on the Drawings is approximate and exact location is to be verified by the CONTRACTOR and will be determined by:
 - 1. Construction or Code requirements.
 - 2. Conflict with equipment of other trades.

3. Equipment manufacturer's drawings.
- B. Minor modification in the location of outlets and equipment is considered a part of this Specification and shall be made with no additional compensation.
 - C. Mounting heights for all mounted devices and equipment to be measured from finished floor to center line of device and unless otherwise noted on the Drawings shall be as follows:
 1. Switches: 4'-0" above floor.
 2. AC receptacles and telephone outlets: per Code requirements.
 3. Wall bracket lighting fixtures: per Code requirements.
 4. Push buttons: 4'-0" above floor.
 5. Thermostats: 5'-0" above floor.

END OF SECTION

DIVISION 16

ELECTRICAL

16100 BASIC MATERIALS AND METHODS

16131 JUNCTION BOXES AND ACCESS PANELS

INDEX: -01- General

-01- GENERAL

- A. Junction boxes and access panels shall be installed at locations as shown on the Drawings and at such additional locations as may be required to facilitate installation of cable/wire and where required by Code.
- B. Boxes shall be supported independently of conduits entering them. Brackets, rod hangers, bolts or other suitable supporting methods may be used.
- C. General purpose junction and pull boxes for concealed work only shall be fabricated from code gauge galvanized steel with screw covers held in place by corrosion resistant machine screws. Box size shall be as required by Code for the number of conduits and conductors entering and leaving it.
- D. Exposed junction and pull boxes shall be cast iron, hot-dipped galvanized inside and outside with threaded conduit connections and watertight gasket covers.
- E. Access panels should be of type necessary for the particular wall or ceiling construction in which they occur. Panels shall be complete with screwdriver cam locking device.

END OF SECTION

DIVISION 16

ELECTRICAL

16100 BASIC MATERIALS AND METHODS

16170 DISCONNECT SWITCHES

INDEX: -01- General

-01- GENERAL

- A. Furnish and install fusible and non-fusible disconnect switches of types scheduled and at locations shown on the Drawings. In addition, the CONTRACTOR shall furnish and install other disconnect switches as required for the application.
- B. All switch enclosures shall have metal nameplates, front cover mounted that contain a permanent record of switch type, catalog number and HP ratings, handle whose position is easily recognizable and lockable in the OFF position. Switches shall have defeatable door interlocks that prevent the door from opening when the operating handle is in the ON position.
- C. All switches shall be furnished in NEMA type enclosures as required for the application and shall be Underwriters' Laboratories listed, HP rated, meet Federal and NEMA Specifications, and shall be heavy duty type, arranged to accept rejection type fuses only.

END OF SECTION

DIVISION 16

ELECTRICAL

16100 BASIC MATERIALS AND METHODS

16181 FUSES

INDEX: -01- General

-01- GENERAL

- A. The ELECTRICAL CONTRACTOR shall furnish an initial supply of fuses for all fusible devices, and if used, current limiters for all circuit breakers.
 - 1. Circuits 600 ampere and below - Type LPN-RK (250 volts) or Type LPS-RK (600 volt) current limiting, Dual-Element, rejection type, 200,000 amperes Rms Symmetrical, UL Class RK1.

END OF SECTION

DIVISION 16

ELECTRICAL

16000 ELECTRICAL

16200 BASIC MATERIALS & METHODS

-01- WIRING METHODS:

Wiring shall be insulated conductors.

Conduit shall be electrical metallic tubing (EMT) (ANSI Specification C80.3) or rigid schedule 40 PVC.

Liquid tight, flexible metal conduit shall be installed for final connections to all motors located outdoors or in wet areas. One-half inch (1/2") minimum size flexible metal conduits shall be installed for final connections to all other motors. Building service conductors to meter location shall be insulated copper conductors in rigid PVC conduit underground. Feeders from meter to new panel board shall be insulated copper conductors in PVC conduit.

-02- FITTINGS:

Provide all miscellaneous fittings required or grounding conductor to provide a complete raceway system with ground continuity.

Fittings for flexible steel conduit shall be multiple point type, threading into internal wall of the conduit convolutions, and shall have insulated throat.

-03- BOXES:

Boxes shall be galvanized steel or molded PVC. Galvanized steel interior outlet wiring boxes shall be of the type, shape and size, including depth of box, to suit each respective location and installation; constructed with stamped knockouts in back and sides, and with threaded holes with screws for securing box covers or wiring devices. Non-metallic outlet boxes shall be molded PVC units of the type, shape, size and depth to suit location and application.

Provide outlet box accessories as required for each installation, including mounting brackets, wallboard hangers, extension rings, fixture studs, cable clamps, and metal straps for supporting outlet boxes, compatible with outlet boxes being used and meeting requirements of individual wiring situations.

Provide galvanized sheet steel or PVC junction and pull boxes, with screw-on covers; of the type and shape and size to suit each respective location and installation.

-04- CONDUCTORS:

INSULATION:

All conductors shall be copper and shall be insulated for 600 volts.

Conductor insulation shall be as follows:

Size #14 through #10 type THHN/THWN or THWN
Sizes #8 and larger type THW, THHN, or THWN

-05- WIRE SIZE:

Minimum conductor sizes shall be as follows:

- #14 control circuits associated with relays, contactors, starters, etc.
- #12 branch circuits of any kind including motor branch wiring.
- #10 All home runs over 100'.
- #8 all home runs over 200'.

-07- INSTALLATION OF CABLES, RACEWAYS AND FITTINGS:

Conduit Sizes

EMT in trade sizes up through 1-1/2" may be employed in dry locations, in interior partitions and above suspended ceilings.

EMT shall not be used in the following applications: In earth, exposed to weather, in floor slabs, in concrete walls, or where mechanical protection is required, in sized larger than 1 1/2".

PVC conduit shall be installed in the preceding applications.

Minimum conduit sizes shall be 1/2" except where in concrete or under floor slabs where minimum size shall be 3/4".

-08- PVC CONDUIT:

All PVC conduit runs shall have a ground wire, sized per the National Electrical Code, installed.

Support of Conduit

The electrical raceway system shall be independently supported or attached to structural parts of construction in accordance with good industry practice in a manner acceptable to the ENGINEER. Supports and attachments provided shall be specifically designed for the applications.

Conduit shall be supported as follows:

Single Horizontal Runs

On Vertical Surfaces: Hot-dipped galvanized heavy duty sheet steel or PVC straps. Back straps to be provided for all exposed conduit and conduit on exterior walls.

On Horizontal Surfaces: Hot-dipped galvanized heavy duty two hole steel or PVC.

Multiple Horizontal Runs

On Vertical Surfaces: Horizontal or vertical rack channel with conduit straps as required.

On Horizontal Surfaces: Single or double rack channel trapeze, complete with conduit straps as required, all supported with threaded hanger rods.

Preparation of Conduit

Damaged conduit will not be allowed. Any kinked or crushed conduit shall be removed and new conduit installed before pulling wires.

Conduit shall be reamed smooth at ends, capped upon installation, rigidly attached to structural parts of the building and securely fastened to all outlet boxes, panel cabinets, junction boxes, pull boxes, safety switches and other components of the raceway system.

Installation

Conduit shall be run concealed so as to avoid adverse conditions such as heat and moisture, to permit drainage, and to avoid all materials and equipment of other trades. Conduit may be run exposed only where specific approval is obtained from the ENGINEER or in mechanical areas. Exposed conduit shall be run in a neat workmanlike manner, grouped and run parallel or perpendicular to construction.

Concealed conduits shall be run in as direct a line and with as long bends as possible. Exposed conduits shall be run parallel to or at right angles with the lines of the building. Bends and offsets shall be made with a hickey or power bender without kinking or destroying the smooth bore of the conduit.

Each conduit extending through roof shall pass through a ceiling box at the roof line and this Contractor shall provide 14 gauge minimum copper box complete with watertight soldered seams and flanged to serve as pitch pocket for each conduit. Conduit and pitch pocket shall be installed in advance of GENERAL CONTRACTOR'S roofing work.

Conduit runs that extend through areas of different temperature or atmospheric conditions, or that are partly indoors and partly outdoors, shall be sealed and installed in a manner that will prevent drainage of condensed or entrapped moisture into cabinets, motors or equipment enclosures. Overhead conduits shall be provided with seal and drain fittings to provide continuous automatic drainage.

Where conduits or cables pass through fire rated walls or ceilings, penetrations shall be sealed to maintain the fire rating. Penetrations shall be sealed flanged conduit fire seal series sized for the conduit or cable being installed.

Entire conduit system shall be completed before conductors are drawn in. Conduit shall be capped with conduit bushings and slugged immediately upon installation to prevent their being filled with debris. Contractor shall attend the conduit during the pour and placing of concrete.

Conduit Terminations

Conduits shall be secured to cabinets, junction boxes, pull boxes, and outlet boxes by bonding type locknuts.

EMT installations may have a single locknut on the inside of the enclosure, made up wrench tight. Conduit connections shall not be made to junction box covers.

-09- BOXES:

Outlet boxes shall be set parallel to construction, independently attached to same and in the case of flush type boxes, adjusted to set level with the finished surface. Back-to-back and thru boxes are not allowed.

Mount outlet boxes flush in all areas.

For boxes mounted in exterior walls, make sure that there is insulation behind outlet boxes to prevent condensation in boxes.

Locate pull boxes and junction boxes above removable ceilings such that boxes will be accessible after completion of building. Provide pull boxes or junction boxes to limit conduit runs to 100 feet and to limit angles to equivalent of 270°. Additional pull boxes may be provided to facilitate wire pulling. Locate covers on the largest access side of the box.

Provide knockout closures to cap unused knockout holes where blanks have been removed.

-10- INSTALLATION OF CONDUCTORS:

Splices

Joints, taps and splices of wires sizes #10 and smaller shall be made by means of Ideal nut connectors or Scotchlok spring connectors, or approved equal. Joints, taps and splices of wire size #8 and larger shall be taped with tape providing insulation not less than that of the conductor, and not less than two half lapped layers each.

-11- GROUNDINGS:

Wire

Ground all equipment and enclosures. Provide a separate green grounding conductor for all motors sized per the National Electrical Code. Flexible conduits are not accepted as a grounded conduit system.

General Requirements

All ground connections must be exposed and visible for inspection at all times. No insulation shall be installed over ground connections. All ground connection surfaces shall be cleaned and all connections shall be made secure.

Install a separate ground wire from panel board ground bus to all electrical equipment.

-12- MOTORS:

General

Motors will be furnished and installed by others ready for connections. This CONTRACTOR shall be responsible for connections, proper phase relationships and motor rotations, and shall provide all required switches and motor overload relays.

Work by Others

The CONTRACTOR furnishing the motor shall furnish all remote control equipment such as: pushbutton stations, selector switches, relays, speed switches, time clocks, thermostats, etc.

Power Wiring

The Electrical Contractor will:

1. Furnish and install all motor starters except those furnished as an integral part of the equipment or where stated on the drawings.
2. Provide motor circuit wiring for each motor from source of supply to the associated motor starter and from the starter to the motor terminal box including all necessary and required intermediate connections.
3. Furnish and install all motor disconnect switches.

Control Wiring

All control wiring - low and line voltage - between remote control device and the magnetic motor starter or contactor will be furnished and installed by the CONTRACTOR furnishing the motor.

All other low voltage control wiring will be furnished and installed by the CONTRACTOR furnishing the motor.

Line voltage control wiring which is installed from a remote control device directly to the motor; such as from a speed switch, time clock, thermostat, etc.; shall be furnished and installed by the ELECTRICAL CONTRACTOR. Where this CONTRACTOR is wiring the remote control device, he shall install and wire the control device furnished by others.

Motor Disconnects

Safety switches shall be fused or non-fused as shown on the Drawings, heavy-duty with solid neutral. In general switches shall be in a NEMA 1 enclosure. Switches installed outdoors or in wet/damp environment shall be in a NEMA 3R enclosure.

Where motor starters are located not within sight of or more than 50 feet from the circuit protective device and the starter does not have an integral disconnect switch, the ELECTRICAL CONTRACTOR shall furnish and install a safety switch at the starter.

END OF SECTION

DIVISION 16

ELECTRICAL

16000 ELECTRICAL

16400 EXECUTION

-01- INSTRUCTIONS AND MANUALS:

This CONTRACTOR must instruct the OWNER and his representatives in the proper operating techniques of the system. The ENGINEER must be informed beforehand as to when the instructions will be held.

This CONTRACTOR shall prepare three (3) operating and maintenance manuals. Each maintenance manual shall be bound in a three ring binder with index tabs dividing sections. The maintenance manuals must include the following:

- List of equipment with manufacturer's name
- Local distributors and phone numbers
- Diagrammatic drawing of system
- Manufacturer's operating and maintenance instructions
- Description of operation of system
- Lubrication instructions, lubricants, and amounts
- Copies of manuals shall be submitted to the ENGINEER for approval.
- Required changes shall be promptly incorporated in manual.

-02- CUTTING AND REPAIRING:

The ELECTRICAL CONTRACTOR will be required to leave or cut openings in ceilings, floors, partitions, roof, etc., as required to install the electrical work as specified or shown on the Drawings.

All cutting and patching in existing construction shall be by this CONTRACTOR, if applicable. Finish all patched areas to match the surrounding finishes.

The ENGINEER'S decision as to the value of work and materials entailed in making such repairs shall be binding on the parties concerned.

Excavation and backfilling materials and methods for all electrical work shall be in accordance with Earthwork Section of the specifications.

-03- IDENTIFICATION:

Label all starters, panels, disconnect switches, and control devices in accordance with areas or loads they serve. Nomenclature shall be as shown on Drawings.

-04- MOTOR STARTERS:

General

The ELECTRICAL CONTRACTOR shall furnish and install the starters for all equipment, HVAC, plumbing, etc., except those equipments furnished with integral packaged starters.

Equipment

The starters shall be a combination non-fused switch/magnetic motor starter. All starters shall be manufactured in accordance with the latest published NEMA standards, sizes and horsepower ratings.

The disconnect handle shall always be in control of the disconnect device at all times. The handle shall be lockable in the "OFF" position, be mounted in the mullion to the side of the door (not door mounted) and clearly indicate the "ON" and "OFF" position, non-teasible, positive quick-make, quick-break mechanism with defeatable door interlocks that prevent the door from opening when the operating handle is in the "ON" position. The switch shall disconnect all equipment and control power when in the "OFF" position.

The magnetic starter shall have thermal-overload protection in each phase of the unit, low voltage protection, plus auxiliary contacts as may be required for controls. Starter shall have 120 volt coil with the 120 volt power being supplied by a control power transformer mounted in the starter. Transformer shall be fused.

The starter shall be horsepower rated, sized and with the voltage characteristics as shown on the Drawings.

All control devices such as: stop-start pushbuttons, hand-off-auto switches, pilot lights, etc., shall be mounted in the door of the unit.

Starters installed indoors shall be in a NEMA 1 enclosure while those installed outdoors shall be in a NEMA 3R enclosure.

Installation

This CONTRACTOR shall install motor starters near the motor and provide power wiring from the panel to the starter and starter to the motor.

Install a permanently attached engraved plastic nameplate, identifying the equipment served, on each starter.

Shop Drawings

Furnish complete shop drawings of all starters and accessories

-05- TESTING:

Upon completion of the electrical work and prior to final acceptance, this CONTRACTOR shall test the entire electrical system to his satisfaction and to that of the ENGINEER to make sure that it is complete and operational and fulfills the contract completely. Any testing of mechanical equipment prior to permanent energization shall be done only with the permission of the MECHANICAL CONTRACTOR.

Special equipment testing and connections requiring authorized factory or technical supervision shall be part of this contract, and accomplished with or by a manufacturer's authorized factory agent.

-06- CLEANING AND FINISHING:

During the progress of the work and when directed by the ENGINEER, the CONTRACTOR shall remove from the building site, rubbish, dirt and other debris caused by his work.

After all tests have been made and the systems pronounced satisfactory, the CONTRACTOR shall go over all his work and clean equipment, fixtures, etc., and leave clean and in complete working order at final completion of the project.

-07- REMOVAL OF RUBBISH:

The CONTRACTOR shall regularly remove from the site all surplus earth and rubbish resulting from his work.

The building shall be kept free from piles or debris during progress of construction.

END OF SECTION

DIVISION 16

ELECTRICAL

16400 SERVICE AND DISTRIBUTION

16410 ELECTRICAL SERVICE AND METERING

INDEX: -01- General

-01- GENERAL

- A. The Electric Service characteristics for this project shall be as indicated on the Drawings and as provided by local Electric Utility.
- B. The ELECTRICAL CONTRACTOR shall check with Electric Utility indicated to verify all service information specified herein and shown on the Drawings before submitting his bid. Any required deviation from these Drawings and/or Specifications shall be included in the Base Bid price.
- C. Unless indicated otherwise, the ELECTRICAL CONTRACTOR shall make arrangements with the Utility Company regarding service entrance requirements and metering equipment and, if required, shall install metering equipment and empty conduit for metering conductors to meet standards and requirements of the Utility Company.
- D. The ELECTRICAL CONTRACTOR shall include in his Base Bid price all Utility charges for the additional work involved in any deviation from standard overhead service. This includes any and all charges by the utility for having to install a different transmission main to the building site, if applicable.

END OF SECTION

DIVISION 16

ELECTRICAL

16400 SERVICE AND DISTRIBUTION

16450 GROUNDING

- INDEX: -01- General
-02- Conduits
-03- Receptacles and Light Fixtures

-01- GENERAL

- A. The electrical system and equipment is to be grounded as required by Code, Utility Company, local ordinances, and to requirements herein.
- B. Water system ground is required and ground wire must attach to point ahead of water meter or service shutoff valve. If the buried portion of the metallic piping system is less than 50' excluding well casings, or has a resistance to ground of more than 3 ohms, the piping system ground shall be augmented by Code approved made electrodes so as to achieve an effective ground resistance as required by Code.
- C. The main grounding conductor shall be continuous without splice from water service ground to driven grounds (if used) and service equipment. A suitable jumper or shunt shall be installed around the meter.
- D. Grounding conductors shall be so installed as to permit shortest and most direct path from equipment to ground. Where grounding conductor runs through metallic conduit, it shall be securely bonded to the conduit at the entrance and exit and the conduit shall be fitted with a bolted clamp to secure same to water pipe.
- E. Ground fittings shall be interlocking clamp type fabricated from high strength corrosion resistant metal with high strength silicon bronze U-bolt, nuts and lock washers.

-02- CONDUITS

- A. All metallic conduits, supports, cabinets and other equipment shall be grounded so that the ground will be electrically continuous from service to all outlet boxes. Provide grounding conductor in all non-metallic conduit to complete equipment ground continuity.

- B. Flexible metallic conduit is not to be considered an effective grounding conductor. In all cases where flexible metallic conduit is used, a grounding conductor shall be installed.

-03- RECEPTACLES AND LIGHT FIXTURES

- A. All receptacles are to be of the grounding type with a positive ground connection to the outlet box, except the insulated grounding type if noted on the Drawings.
- B. All lighting fixtures shall be effectively grounded. Particular care shall be taken to provide a good and permanent ground to fluorescent fixture bodies. Fixtures mounted in continuous rows shall have metal-to-metal contact between fixtures.
- C. CONTRACTOR shall install separate Code rated grounding conductors to all pole mounted lighting fixtures and to all special equipment and activity areas as required by Code.

END OF SECTION

DIVISION 16

ELECTRICAL

16400 SERVICE AND POWER PANEL BOARDS

16470 LIGHTING AND POWER PANEL BOARDS

- INDEX: -01- General
-02- Circuit Breakers
-03- Bus Bar
-04- Miscellaneous

-01- GENERAL

- A. Furnish and install lighting panels and power panel boards as shown on the Drawings, incorporating switching and protective devices of the number, rating and type noted herein or shown on the Drawings. Panel boards shall be rated for the intended voltage and shall be in accordance with the Underwriters' Laboratories, Inc. "Standard for Cabinets and Boxes" and "Standard for Panel boards" and shall be so labeled where procedures exist. Where panel boards are to be used as service entrance equipment, they shall be so labeled. Panel boards shall also comply with NEMA Standard for Panel boards, and the National Electric Code. A nameplate shall be provided listing panel type and rating.

-02- CIRCUIT BREAKERS

- A. Circuit breakers shall be quick-make, quick-break, thermal-magnetic, trip indicating and have common trip on all multiple breakers. Trip indication shall be clearly shown by the breaker handle taking position between ON and OFF when the breaker is tripped. Connections to the bus shall be plug-on for voltages up to 250 volts, bolt-on for voltages over 250 volts. Circuit breakers shall be U.L. listed and meet the requirements of Class 1.

-03- BUS BAR

- A. Bus bar connections to the branch circuit breakers shall be the "distributed phase" or "phase sequence" type. Single phase, three wire panel board bussing shall be such that any two adjacent single pole breakers are connected to opposite polarities in such a manner that two pole breakers can be installed in any location. Three phase, four wire bussing shall be such that any three adjacent single pole breakers are individually

connected to each of the three different phases in such a manner that two or three pole breakers can be installed at any location. All current-carrying parts of the bus assembly shall be plated. Mains ratings shall be as shown in the panel board schedule on the Drawings.

- B. The panel board bus assembly shall be enclosed in a steel cabinet. The size of the wiring gutters and gauge of steel shall be in accordance with NEMA and U.L. Standards for Panel boards. The box shall be fabricated from galvanized steel or equivalent rust-resistant steel.
- C. Terminals for feeder conductors to the panel board mains and neutral shall be U.L. listed as suitable for the type of conductor specified. Terminals for branch circuit wiring, both breaker and neutral, shall be U.L. listed as suitable for the type of conductor specified.

-04- MISCELLANEOUS

- A. Panel board circuit numbering shall be such that starting at the top, odd numbers shall be used in sequence down the left-hand side and even numbers shall be used in sequence down the right-hand side.
- B. Fronts shall include doors and have flush, brushed, steel, cylinder tumbler-type locks with catches and spring-loaded door pulls. The flush lock shall not protrude beyond the front of the door. All panel board locks shall be keyed alike. Fronts shall have adjustable indicating trim clamps which shall be completely concealed when the doors are closed. Doors shall be mounted by completely concealed steel hinges. Fronts shall not be removable with door in the locked position. A circuit directory frame and card with a clear plastic covering shall be provided on the inside of the door. The directory card shall provide a space at least 1/4" high x 3" long or equivalent for each circuit. The directory shall be typed to identify the load fed by each circuit. Fronts shall be of code gauge, full finished steel with rust-inhibiting primer and baked enamel finish and arranged for flush or surface mounting as indicated on the plans.
- C. Provide a separate panel board for equipment outlet insulated grounding terminals. Grounding bus shall be insulated from metal of panel board to prevent circulating ground currents as required by telephone equipment and testing.
- D. Insulated ground wires shall be brought to this panel board for final grounding. The ground bus shall be grounded to an N.E.C. approved ground.

END OF SECTION

DIVISION 16

ELECTRICAL

16400 SERVICE AND DISTRIBUTION

16471 BRANCH CIRCUITS

INDEX: -01- General
-02- Wire Size

-01- GENERAL

- A. Furnish and install a complete branch circuit and control wiring system as indicated on the Drawings. No conductor shall be drawn into conduits until building is enclosed and watertight and until all work which may cause cable damage has been completed.
- B. Circuit numbers as shown on the Drawings are for the CONTRACTOR to plan his wiring and for estimating purposes. Numbers shown are not necessarily consecutive numbers of the panel board circuit breakers. Balanced load on the panel board bus is to be the determining factor in arrangement of circuits. Panel board loading shall be balanced to $\pm 7-1/2\%$.
- C. Note that the electrical Drawings do not designate the number of conductors in conduit nor does the location of branch circuits and switch legs, as indicated on the drawings, designate the location or routing of same in place.
- D. Unless otherwise noted on the Drawings or herein specified, this CONTRACTOR shall route all branch circuits and switch legs at his discretion or otherwise as dictated by construction, these Specifications or instructions from the ENGINEER. Conduit, outlet boxes and other raceway system components shall be sized in accordance with the Code with the requirements herein considered minimum.

-02- WIRE SIZE

- A. No wire smaller than #12 AWG (unless otherwise noted) shall be used for branch circuit wiring including motor circuits. Branch circuits must be sized for length of run on the following basis:

120 Volt Circuits

1. 0 to 100 foot run from panel board to first outlet: #12 AWG minimum.
2. 101 to 175 foot run: increase one wire size to #10 AWG.
3. 176 to 250 foot run: increase two wire sizes to #8 AWG.

END OF SECTION

DIVISION 16

ELECTRICAL

16400 SERVICE AND DISTRIBUTION

16480 FEEDER CIRCUIT

INDEX: -01- General

-01- GENERAL

- A. Furnish, install and connect feeders in accordance with information on the Drawings with conductor insulation to conform with requirements of these Specifications. Feeders shall be extended at full capacity from origin to termination. No conductors shall be drawn into conduits until building is enclosed and watertight and until all work which may cause cable damage has been completed.
- B. Each conduit raceway shall contain only those conductors constituting a single feeder circuit. Where multiple raceways are used for a single feeder, each raceway shall contain a conductor of each phase and the neutral where one is used. An exception to this rule applies to high voltage concentric wound primary cable where used and separately specified.
- C. Where feeder conductors are run in multiple, all conductors shall be of the same length, of the same conductor material, circular-mil area, same insulation type and terminated in the same manner. Where run in separate raceways, the raceways shall have the same physical characteristics.
- D. Wherever possible, feeders shall follow most accessible routes concealed in construction in finished areas exposed to the minimum temperature gradient and to minimum temperature fluctuation. Feeders shall be confined to insulated portions of the building, feeder conduits shall not be exposed to earth, and trapped runs without facilities for continuous drainage shall be avoided.
- E. Where impractical to do otherwise and with approval of the project's superintendent, feeder conduits may be installed in, or under, ground floor slabs subject to the requirement that they be totally encased on concrete.

END OF SECTION

DIVISION 16

ELECTRICAL

16500 LIGHTING

16501 GENERAL

- A. The ELECTRICAL CONTRACTOR shall make his own count and furnish and install lighting fixtures as called for in the "Fixture Schedule".
- B. Basic catalog number only is given for fixtures. Plaster rings, fixture ends or caps, suspension units, mounting brackets and/or all other auxiliary parts necessary to make a complete fixture shall be provided.
- C. All fixtures must be installed in a workmanlike manner. Care must be taken in the placement of outlets, surface-mounted, recessed or semi-recessed fixtures to maintain the alignment, spacing, layout and general arrangement shown on the Drawings. The CONTRACTOR may vary these dimensions slightly in order to clear obstructions. Any major changes in the arrangement must be approved by the ENGINEER.
- D. All fixtures must be supported from ceiling suspension or structural system, not from ceiling material. All stem mounted fixtures shall be suspended with swivel hangers.
- E. Stems supporting continuous rows of fluorescent-type fixtures shall be symmetrically spaced about the row center. Generally, there shall be one more support than the number of individual channels per row, and same shall be sliding, clamp type with intermediate supports located at the junction of channels and providing direct support to each.
- F. In all instances, CONTRACTOR shall verify stem length of fixtures with ENGINEER. Where stems are furnished by fixture manufacturer, he shall verify same prior to releasing for shipment. Where stems are furnished by the CONTRACTOR, he shall verify same prior to installation.
- G. Should any parts of the fixtures be found to be bent or not in accord with their designed position, the CONTRACTOR shall adjust, repair or replace the affected items as required and subject to ENGINEER'S approval.
- H. Each lighting fixture furnished by this CONTRACTOR for installation on the project shall conform to U.L. requirements and bear the U.L. label and the manufacturer, upon request, shall supply a copy of the U.L. test report.

END OF SECTION

DIVISION 16

ELECTRICAL

16900 CONTROLS AND INSTRUMENTATION

16902 PUSHBUTTONS, PILOT DEVICES AND MISCELLANEOUS MOTOR CONTROLS

INDEX: -01- General

-01- GENERAL

- A. The ELECTRICAL CONTRACTOR shall install and wire all remote pushbutton stations, motor control and other pilot devices and in addition shall furnish all such devices indicated on the Drawings or in the Specifications and not furnished by others. CONTRACTOR shall refer to Drawings for specific use of momentary contact and maintained contact control stations.
- B. All pilot devices and miscellaneous motor control shall be of one manufacture. Reference to Square D has been used as a means of establishing grade and type for use on the project and all such equipment shall be Square D equal.
- C. Pushbutton stations shall be grouped wherever practical and shall be securely mounted on building columns or equivalent fixed structure. They shall be so located so that they are in direct line of sight of the equipment they control.
- D. Where it is required that remote pushbuttons or other pilot devices coordinate with the annunciator alarm system, they shall be furnished with multiple contact arrangements as indicated on the Drawings or as required for the specific annunciator system used.
- E. Local pushbutton stations shall consist of "start" pushbutton, "stop" pushbutton, and "motor run" indicating light in one NEMA 3-4, 13 cast enclosure. Pushbuttons shall be heavy duty, oil-tight, rated 600 volt, 10 ampere, and grouped as required. Pilot light shall be located at the top of the control station and shall incorporate a 120 volt transformer socket, 6 volt lamp, and red lens for "running" indication.
- F. Pushbutton stations used outdoors, momentary contact type, shall be heavy duty type T oil tight in NEMA 3-4, 13 cast enclosure with weather resistant boots position.
- G. The ELECTRICAL CONTRACTOR must furnish and install all brackets, pipe or angle supports and any other fittings required for mounting the pilot devices indicated on the Drawings or in the Specifications even though the pilot device is furnished by others.

- H. The Electrical Contractor shall furnish and install engraved nameplates for each individual pushbutton station and local manual starter. .
- I. Pushbutton stations used in hazardous locations, maintained or momentary contact type, shall be heavy duty Type H in NEMA 7D-9EFG enclosures with provisions to padlock in the stop position. In corrosive atmosphere furnish NEMA 4X corrosion resistant enclosures.

END OF SECTION