TOWN OF BEECH MOUNTAIN

NEW PUBLIC WORKS FACILIITIES

AVERY COUNTY, NORTH CAROLINA

JUNE 28, 2019

Prepared by:

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Town of Beech Mountain
403 Beech Mountain Parkway
Beech Mountain, NC 28604

New Public Works Facilities

ADVERTISEMENT FOR BIDS

Sealed Bids for the construction of the **New Public Works Facilities** will be received, by the **Town of Beech Mountain**, at the office of the **Beech Mountain Town Hall located at 403 Beech Mountain Parkway; Beech Mountain, NC 28604**, until **2:00 PM,** local time on **Thursday, August 15, 2019,** at which time the bids received will be publically opened and read. The Project consists of constructing **a 12,000 square-foot pre-engineered metal building with three vehicle maintenance bays, one wash bay, and offices; a 2,000 square-foot pre-engineered metal building for salt storage; a solid waste recycling center consisting of one container shelter, two compactors with shelters, and a cardboard baling shelter with attendant office; along with various site improvements including 1,453 linear feet of street construction.**

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

The Issuing Office for the Bidding Documents is **West Consultants, PLLC; 405 South Sterling Street; Morganton, NC 28655, the contact person is Kathy Jordan, phone: (828) 522-4725, email: kjordan@west-consultants.com.** Prospective Bidders may examine the Bidding Documents at the Issuing Office on Mondays through Fridays between the hours of **8 AM and 5 PM**, and may obtain copies of the Bidding Documents from the Issuing Office as described below.

Bidding Documents also may be examined at:

-ConstructConnect– online at www.iSqFt.com; www.cmdgroup.com; www.bidclerk.com; www.cdcnews.com; www.constructconnect.com
-McGraw-Hill Construction/Dodge – online at www.construction.com/dodge
-Hispanic Contractors Association of the Carolinas (HCAC) – online at www.hcacarolinas.org
-The Blue Book – online at www.thebluebook.com

And at the **Town of Beech Mountain; 403 Beech Mountain Parkway, Beech Mountain, NC 28604**, on Mondays through Fridays between the hours of **9 AM and 5 PM**.

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 **$50** including shipping via overnight express service. Alternatively, printed Bidding Documents may be obtained from the Issuing Office 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 **$300** per set, payable to "**West Consultants, PLLC**". Upon Issuing Office's receipt of payment, printed Bidding Documents will be sent via the Issuing Office's delivery method of choice. An additional charge will be required for special shipping services requested by a Prospective Bidder. 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.

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A **mandatory** pre-bid conference will be held at **2:00 PM** local time on **Tuesday, July 30, 2019** at the **town hall**.

Bid security shall be furnished in accordance with the Instructions to Bidders.

Bidders must hold a valid North Carolina General Contractors license with a classification of "Building" or "Unclassified".

Owner: **Town of Beech Mountain**

By: _____

Tim Holloman

Title: **Town Manager**

Date: July 15, 2019

+ + END OF ADVERTISEMENT FOR BIDS + +

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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.

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 To demonstrate Bidder's qualifications to perform the Work, within 10 days of Owner's request, Bidder shall submit written evidence such as financial data, previous experience, present commitments, **and such other data as may be pertinent, if not already submitted with the Bid.**

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.

3.05 Minority Business Enterprise Solicitation Requirements:

All Bidders must comply with NCGS 143-128.2 with regard to solicitation of Minority Business Enterprises (MBE). Good Faith Effort Compliance Forms shall be used as evidence in complying with this law. A minority business shall be certified by the NC Dept. of Administration Office of Historically Underutilized Business, NCDOT, or any North Carolina local government in order to qualify. The address of the Office for Historically Underutilized Business is 1336 Mail Service Center; Raleigh, NC 27699-1336 (e-mail: HUBOFFICE.DOA@ncmail.net). All Bid Forms shall be accompanied by the "Good Faith Efforts Form." Unless self-performing all of the Work the total number of points shall be at least 50 or else the Bidder may be considered non-responsive. In addition, minority businesses that will be used, if any, shall be listed on the "Table A: Prime Contractor and list of selected subcontractors" form and submitted with the Bid Form. The goal of the Owner for this Project is 10% participation by minority businesses.

The definition of a Minority Business is:

(a) The term "minority business" means a business:

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i. **In which at least fifty-one percent (51%) is owned by one or more minority persons or socially and economically disadvantaged individuals, or in the case of a corporation, in which at least fifty-one percent (51%) of the stock is owned by one or more minority persons or socially and economically disadvantaged individuals; and**

ii. **Of which the management and daily business operations are controlled by one more of the minority persons or socially and economically disadvantaged individuals who own it.**

(b) The term "minority person" means a person who is a citizen or lawful permanent resident of the United States and who is:

i. **Black, that is, a person having in any of the black racial groups in Africa.**

ii. **Hispanic, that is, a person of Spanish or Portuguese culture with origins in Mexico, South or Central America, or the Caribbean Island, regardless of race.**

iii. **Asian American, that is, a person having origins in any of the original peoples of the Far East, Southeast Asia and Asia, the Indian subcontinent, or the Pacific Islands;**

iv. **American Indian, that is, a person having origins in any of the original Indian peoples of North America; or**

v. **Female.**

(c) The term "socially and economically disadvantaged individual" means the same as defined in 15 USC 637.

Bid Forms submitted without the required MBE documentation may be considered nonresponsive. Bidders that have been found guilty of discrimination within two years prior to the scheduled date of the Bid opening are debarred from bidding.

Within 72 hours of the Bid opening, the apparent Successful Bidder shall submit to Engineer either "Affidavit C – Portion of the Work to be Performed by Minority Firms" or "Affidavit D – Good Faith Efforts", whichever is applicable, unless Affidavit B has been submitted with the Bid Form.

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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 contiguous 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.

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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

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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 required 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. 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.

7.02 Addenda may be issued to clarify, correct, supplement, or change the Bidding Documents.

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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 **and the requirements of NC General Statute 143-129.**

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 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, if awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents, and those "or-equal" or substitute 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 15 days prior to the date for receipt of Bids in the case of a proposed substitute and 5 days prior in the case of a proposed "or-equal." 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. Substitutes and "or-equal" materials and equipment may be proposed by Contractor in accordance with Paragraphs 7.04 and 7.05 of the General Conditions after the Effective Date of the Contract.

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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 If required by the Bidding Documents, 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 portions of the work of which the value of labor and materials is $10,000 or more.

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, without an increase in Bid price.

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 not 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.

12.05 Contractor shall not be required to employ any Subcontractor, Supplier, individual, or entity against whom Contractor has reasonable objection.

12.06 The Contractor shall not award work to Subcontractor(s) in excess of the limits stated in SC 7.06.

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

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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 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 official address of the firm shall be shown.

13.04 A Bid by an individual shall show the Bidder's name and official address.

13.05 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 official address of the joint venture shall be shown.

13.06 All names shall be printed in ink below the signatures.

13.07 The Bid shall contain an acknowledgment of receipt of all Addenda, the numbers of which shall be filled in on the Bid Form.

13.08 Postal and e-mail addresses and telephone number for communications regarding the Bid shall be shown.

13.09 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 Base Bid with Alternates

A. Bidders shall submit a Bid on a lump sum basis for the base Bid and include a separate price for each alternate described in the Bidding Documents and as provided for in the Bid Form. The price for each alternate will be the amount added to or deleted from the base Bid if Owner selects the alternate.

B. In the comparison of Bids, alternates will be applied in the same order of priority as listed 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.

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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 "BID ENCLOSED." A mailed Bid shall be addressed to the Owner.

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, unless obviously non-responsive, 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.

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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 If Owner awards the contract for the Work, such award shall be to the responsible Bidder submitting the lowest responsive Bid.

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. For determination of the apparent low Bidder(s) when sectional bids are submitted, Bids will be compared on the basis of the aggregate of the Bids for separate sections and the Bids for combined sections that result in the lowest total amount for all of the Work.

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

21.01 When Owner issues a Notice of Award to the Successful Bidder, it shall be accompanied by the unexecuted counterparts of the Agreement along with the other Contract Documents as identified in the Agreement. 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

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Bidder, together with printed and electronic copies of the Contract Documents as stated in Paragraph 2.02 of the General Conditions.

ARTICLE 22 – SALES AND USE TAXES

22.01 Owner is exempt from North Carolina state sales and use taxes on materials and equipment to be incorporated in the Work. Nevertheless, all said taxes shall be included in the Bid.

ARTICLE 23 – CONTRACTS TO BE ASSIGNED (OMITTED)

ARTICLE 24 – WAGE RATE REQUIREMENTS (OMITTED)

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BID FORM

Town of Beech Mountain
403 Beech Mountain Parkway
Beech Mountain, NC 28604

New Public Works Facilities

Bid Submitted by: _____

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Bid Recipient

1.01 This Bid is submitted to:

Town of Beech Mountain
403 Beech Mountain Parkway
Beech Mountain, NC 28604

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 90 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

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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:

Addendum No.	**Addendum, Date**

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.

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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 anything 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.

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ARTICLE 5 – BASIS OF BID

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

	Item	Quantity	Unit	Unit Price	Total Bid
1.	Public Works Facilities, Complete (all work required by the Contract Documents not otherise itemized)	1	Lump Sum		$_____
2.	Rock Excavation - Mass	4,000	CY	$_____	$_____
3.	Rock Excavation - Trench	400	CY	$_____	$_____
4.	Unsuitable Soil Removal/Replacement	10	CY	$_____	$_____
	Total Bid				$_____

Bidder acknowledges that (1) each Bid Unit Price includes an amount considered by Bidder to be adequate to cover Contractor's overhead and profit for each separately identified item, and (2) estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all unit price Bid items will be based on actual quantities, determined as provided in the Contract Documents.

Bonds required under Paragraph 6.01 of the General Conditions will be based on the Contract Price.

ARTICLE 6 – TIME OF COMPLETION

6.01 Bidder agrees that the Work will be substantially complete within **360** calendar days after the date when the Contract Times commence to run as provided in Paragraph 4.01 of the General Conditions and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions within **390** calendar days after the date when the Contract Times commence to run.

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. Evidence of Authority to Sign, if applicable, in accordance with Article 13 of the Instructions to Bidders;

B. Required Bid security;

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C. List of Proposed Subcontractors and the approximate value of each subcontract;

D. 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;

E. Contractor's License number and classification and limitation, or Evidence of Bidder's ability to obtain the necessary State Contractor's License and a covenant by Bidder to obtain said license within the time for acceptance of Bids;

F. Identification of Minority Business Participation form, if applicable; and

G. "Affidavit A – Listing of Good Faith Efforts" or "Affidavit B – Intent to Perform Contract with Own Workforce", as applicable.

H. Iran Divestment Certification

***Bids not containing the required Attachments and information may be considered "Non-Responsive."**

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.

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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)

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RFP Number (if applicable): _____

Name of Vendor or Bidder: _____

_____

IRAN DIVESTMENT ACT CERTIFICATION REQUIRED BY N.C.G.S. 143C-6A-5(a)

As of the date listed below, the vendor or bidder listed above is not listed on the Final Divestment List created by the State Treasurer pursuant to N.C.G.S. 143-6A-4.

The undersigned hereby certifies that he or she is authorized by the vendor or bidder listed above to make the foregoing statement.

_____

Signature Date

_____

Printed Name Title

Notes to persons signing this form:

N.C.G.S. 143C-6A-5(a) requires this certification for bids or contracts with the State of North Carolina, a North Carolina local government, or any other political subdivision of the State of North Carolina. The certification is required at the following times:

- When a bid is submitted
- When a contract is entered into (if the certification was not already made when the vendor made its bid)
- When a contract is renewed or assigned

N.C.G.S. 143C-6A-5(b) requires that contractors with the State, a North Carolina local government, or any other political subdivision of the State of North Carolina must not utilize any subcontractor found on the State Treasurer's Final Divestment List.

The State Treasurer's Final Divestment List can be found on the State Treasurer's website at the address www.nctreasurer.com/Iran and will be updated every 180 days.

MINORITY BUSINESS FORMS

Identification of Minority Business Participation

Affidavit A – Listing of Good Faith Efforts

Affidavit B – Intent to Perform Contract with Own Workforce

Affidavit C – Portion of the Work to be Performed by Minority Firms

Affidavit D – Good Faith Efforts

Identification of Minority Business Participation

I,_____,
(Name of Bidder)

do hereby certify that on this project, we will use the following minority business enterprises as construction subcontractors, vendors, suppliers or providers of professional services.

Firm Name, Address and Phone #	Work type	*Minority Category

*Minority categories: Black, African American (**B**), Hispanic (**H**), Asian American (**A**) American Indian (**I**), Female (**F**) Socially and Economically Disadvantaged (**D**)

The total value of minority business contracting will be ($)_____.

MBForms 2002-Revised
March, 2005

State of North Carolina AFFIDAVIT A – Listing of Good Faith Efforts

County of _____

(Name of Bidder)

Affidavit of_____

I have made a good faith effort to comply under the following areas checked:

Bidders must earn at least 50 points from the good faith efforts listed for their bid to be considered responsive. (1 NC Administrative Code 30 I.0101)

- ❑ **1 – (10 pts)** Contacted minority businesses that reasonably could have been expected to submit a quote and that were known to the contractor, or available on State or local government maintained lists, at least 10 days before the bid date and notified them of the nature and scope of the work to be performed.
- ❑ **2 --(10 pts)** Made the construction plans, specifications and requirements available for review by prospective minority businesses, or providing these documents to them at least 10 days before the bids are due.
- ❑ **3** – **(15 pts)** Broken down or combined elements of work into economically feasible units to facilitate minority participation.
- ❑ **4 – (10 pts)** Worked with minority trade, community, or contractor organizations identified by the Office of Historically Underutilized Businesses and included in the bid documents that provide assistance in recruitment of minority businesses.
- ❑ **5** – **(10 pts)** Attended prebid meetings scheduled by the public owner.
- ❑ **6** – **(20 pts)** Provided assistance in getting required bonding or insurance or provided alternatives to bonding or insurance for subcontractors.
- ❑ **7 – (15 pts)** Negotiated in good faith with interested minority businesses and did not reject them as unqualified without sound reasons based on their capabilities. Any rejection of a minority business based on lack of qualification should have the reasons documented in writing.
- ❑ **8** – **(25 pts)** Provided assistance to an otherwise qualified minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letters of credit, including waiving credit that is ordinarily required. Assisted minority businesses in obtaining the same unit pricing with the bidder's suppliers in order to help minority businesses in establishing credit.
- ❑ **9** – **(20 pts)** Negotiated joint venture and partnership arrangements with minority businesses in order to increase opportunities for minority business participation on a public construction or repair project when possible.
- ❑ **10** - **(20 pts)** Provided quick pay agreements and policies to enable minority contractors and suppliers to meet cash-flow demands.

The undersigned, if apparent low bidder, will enter into a formal agreement with the firms listed in the Identification of Minority Business Participation schedule conditional upon scope of contract to be executed with the Owner. Substitution of contractors must be in accordance with GS143-128.2(d) Failure to abide by this statutory provision will constitute a breach of the contract.

The undersigned hereby certifies that he or she has read the terms of the minority business commitment and is authorized to bind the bidder to the commitment herein set forth.

Date:_____ Name of Authorized Officer:_____

Signature:_____

Title:_____

SEAL

State of_____, County of_____

Subscribed and sworn to before me this _____day of _____20____

Notary Public_____

My commission expires _____

MBForms 2002-Revised
March, 2005

State of North Carolina --AFFIDAVIT B-- Intent to Perform Contract with Own Workforce.

County of _____

Affidavit of _____
(Name of Bidder)

I hereby certify that it is our intent to perform 100% of the work required for the _____

_____ contract.
(Name of Project)

In making this certification, the Bidder states that the Bidder does not customarily subcontract elements of this type project, and normally performs and has the capability to perform and will perform all elements of the work on this project with his/her own current work forces; and

The Bidder agrees to provide any additional information or documentation requested by the owner in support of the above statement.

The undersigned hereby certifies that he or she has read this certification and is authorized to bind the Bidder to the commitments herein contained.

Date: _____ Name of Authorized Officer: _____

Signature: _____

Title: _____

SEAL

State of _____, County of _____

Subscribed and sworn to before me this _____ day of _____ 20___

Notary Public _____

My commission expires _____

State of North Carolina - AFFIDAVIT C - Portion of the Work to be Performed by Minority Firms

County of _____

(Note this form is to be submitted only by the apparent lowest responsible, responsive bidder.)

If the portion of the work to be executed by minority businesses as defined in GS143-128.2(g) is equal to or greater than 10% of the bidders total contract price, then the bidder must complete this affidavit. This affidavit shall be provided by the apparent lowest responsible, responsive bidder within **72 hours** after notification of being low bidder.

Affidavit of _____ I do hereby certify that on the
(Name of Bidder)

_____
(Project Name)

Project ID#_____ Amount of Bid $_____

I will expend a minimum of _____% of the total dollar amount of the contract with minority business enterprises. Minority businesses will be employed as construction subcontractors, vendors, suppliers or providers of professional services. Such work will be subcontracted to the following firms listed below. Attach additional sheets if required

Name and Phone Number	*Minority Category	Work description	Dollar Value

*Minority categories: Black, African American (**B**), Hispanic (**H**), Asian American (**A**) American Indian (**I**), Female (**F**) Socially and Economically Disadvantaged (**D**)

Pursuant to GS143-128.2(d), the undersigned will enter into a formal agreement with Minority Firms for work listed in this schedule conditional upon execution of a contract with the Owner. Failure to fulfill this commitment may constitute a breach of the contract.

The undersigned hereby certifies that he or she has read the terms of this commitment and is authorized to bind the bidder to the commitment herein set forth.

Date:_____ Name of Authorized Officer:_____

SEAL

Signature:_____

Title:_____

State of _____, County of _____

Subscribed and sworn to before me this _____day of _____20____

Notary Public_____

My commission expires_____

State of North Carolina AFFIDAVIT D – Good Faith Efforts

County of _____

(Note this form is to be submitted only by the apparent lowest responsible, responsive bidder.)

If the goal of 10% participation by minority business **is not** achieved, the Bidder shall provide the following documentation to the Owner of his good faith efforts:

Affidavit of _____ I do hereby certify that on the
(Name of Bidder)

_____
(Project Name)

Project ID#_____ Amount of Bid $_____

I will expend a minimum of _____% of the total dollar amount of the contract with minority business enterprises. Minority businesses will be employed as construction subcontractors, vendors, suppliers or providers of professional services. Such work will be subcontracted to the following firms listed below. (Attach additional sheets if required)

Name and Phone Number	*Minority Category	Work description	Dollar Value

*Minority categories: Black, African American (**B**), Hispanic (**H**), Asian American (**A**) American Indian (**I**), Female (**F**) Socially and Economically Disadvantaged (**D**)

Examples of documentation that may be required to demonstrate the Bidder's good faith efforts to meet the goals set forth in these provisions include, but are not necessarily limited to, the following:

A. Copies of solicitations for quotes to at least three (3) minority business firms from the source list provided by the State for each subcontract to be let under this contract (if 3 or more firms are shown on the source list). Each solicitation shall contain a specific description of the work to be subcontracted, location where bid documents can be reviewed, representative of the Prime Bidder to contact, and location, date and time when quotes must be received.

B. Copies of quotes or responses received from each firm responding to the solicitation.

C. A telephone log of follow-up calls to each firm sent a solicitation.

D. For subcontracts where a minority business firm is not considered the lowest responsible sub-bidder, copies of quotes received from all firms submitting quotes for that particular subcontract.

E. Documentation of any contacts or correspondence to minority business, community, or contractor organizations in an attempt to meet the goal.

F. Copy of pre-bid roster.

G. Letter documenting efforts to provide assistance in obtaining required bonding or insurance for minority business.

H. Letter detailing reasons for rejection of minority business due to lack of qualification.

I. Letter documenting proposed assistance offered to minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letter of credit, including waiving credit that is ordinarily required.

Failure to provide the documentation as listed in these provisions may result in rejection of the bid and award to the next lowest responsible and responsive bidder.

Pursuant to GS143-128.2(d), the undersigned will enter into a formal agreement with Minority Firms for work listed in this schedule conditional upon execution of a contract with the Owner. Failure to fulfill this commitment may constitute a breach of the contract.

The undersigned hereby certifies that he or she has read the terms of this commitment and is authorized to bind the bidder to the commitment herein set forth.

Date:_____ Name of Authorized Officer:_____

Signature:_____

Title:_____

SEAL

State of _____, County of _____

Subscribed and sworn to before me this _____ day of _____ 20____

Notary Public_____

My commission expires _____

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 *(Name and Address)*:

BID

Bid Due Date:

Description *(Project Name— Include Location)*:

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.

BIDDER	**SURETY**
_____ (Seal)	_____ (Seal)
Bidder's Name and Corporate Seal	Surety's Name and Corporate Seal
By: _____	By: _____
Signature	Signature (Attach Power of Attorney)
_____	_____
Print Name	Print Name
_____	_____
Title	Title
Attest: _____	Attest: _____
Signature	Signature
Title	Title

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.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

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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

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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. §§5501 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.

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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

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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

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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.

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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:

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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 **may** ~~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.

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B. If the Contract does not establish protocols for electronic or digital transmittals, then Owner, Engineer, and Contractor **may** ~~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 **any and all** prior negotiations, representations, and agreements, whether written or oral.

E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein. **The work shall conform to the Contract Documents to the satisfaction of the Engineer, which shall not be unreasonably withheld.**

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.

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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, **or a reasonable Contractor under similar circumstances should have known of the conflict, error, ambiguity, or discrepancy.**

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.

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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

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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.

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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.

H. **In the event the Owner and Contractor are unable to agree in writing to the amount of additional time, if any, Contractor should be allowed under items A or C of this paragraph, the Engineer shall set the amount of additional time, which shall be binding upon the parties.**

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

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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

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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.

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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

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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;

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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

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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.H shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

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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.

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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**, in addition to any and all other remedies available to Owner.**

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

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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.

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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.

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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

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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 **additional** ~~other~~ insured.

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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~~

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~~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.

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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;

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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 considered 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.

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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 **satisfactory to Owner prior to the use of the 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.

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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 **ten** ~~five~~ days **written notice to Owner**.

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.

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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

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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

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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

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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.

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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.

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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.

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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

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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 **and seal** 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.

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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 **or damage** 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 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

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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.

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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 **or for defects in Contractor's work**.

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.

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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.

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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.

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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. **Change Orders and Work Change Directives must be in writing signed by the Owner in order to be binding upon the Owner, except in cases of Emergencies as defined in Paragraph 7.15.**

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.

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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, **in writing and signed by the Owner,** 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*: **For additional work performed as a result of a Change Order approved in writing by the Owner,** ~~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:

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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 11.01.C.2.a and 11.01.C.2.b is that the Contractor's fee shall be based on: (1) a fee of 10 ~~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

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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 **written** 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

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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.

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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

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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.

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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, expediters, 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

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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.

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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.

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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. **This subsection shall not be construed to relieve Contractor of its obligation to provide work which is not defective.**

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 special 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

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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 **by Owner** 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.

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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

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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.

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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 **or claims upon funds by subcontractors that** 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

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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 **thirty** ~~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

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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

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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 **and Owner are** ~~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 **and all work is completed to the satisfaction of the Owner.**

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

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and approved by the USDA and Owner (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 **two** ~~one~~ year**s** 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

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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 **substantially** 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,

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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

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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. **The parties agree and stipulate that the State Courts located in Watauga County, North Carolina shall be the exclusive venue for the filing and resolution of any such dispute.**

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.

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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. **The Contractor further waives and releases Owner and Engineer from any claims for incidental or consequential damages which may arise from any breach of this Contract.**

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**s of the State of North Carolina.** ~~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.

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Supplementary Conditions

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract, EJCDC® C-700 (2013 Edition). All provisions that are not so amended or supplemented remain in full force and effect.

The terms used in these Supplementary Conditions have the meanings stated in the General Conditions. Additional terms used in these Supplementary Conditions have the meanings stated below, which are applicable to both the singular and plural thereof.

The address system used in these Supplementary Conditions is the same as the address system used in the General Conditions, with the prefix "SC" added thereto.

SC-2.02.A. Amend the first sentence of Paragraph 2.02.A. to read as follows:

Owner shall furnish to Contractor 5 (five) copies of the Contract Documents (including one fully executed counterpart of the Agreement), and one copy in electronic portable document format (PDF).

SC-5.03 Add the following new paragraphs immediately after Paragraph 5.03.B:

C. The following reports of explorations and tests of subsurface conditions at or adjacent to the Site are known to Owner:

Report of Geotechnical Exploration, Town of Beech Mountain Public Works Facilities, Beech Mountain. North Carolina, S&ME Project No. 1243-18-051, dated February 11, 2019

D. The following drawings of physical conditions relating to existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities) are known to Owner: None

SC 5.06 Delete Paragraphs 5.06.A and 5.06.B in their entirety and insert the following:

A. No reports or drawings related to Hazardous Environmental Conditions at the Site are known to Owner.

B. Not Used.

SC 6.03 Add the following new paragraph immediately after Paragraph 6.03.J:

K. The limits of liability for the insurance required by Paragraph 6.03 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations:

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1. **Workers' Compensation, and related coverages under Paragraphs 6.03.A.1 and A.2 of the General Conditions:**

State:		**Statutory**
Federal, if applicable (e.g., Longshoreman's):		**Statutory**
Jones Act coverage, if applicable:		
Bodily injury by accident, each accident	**$**	**n/a**
Bodily injury by disease, aggregate	**$**	**n/a**
Employer's Liability:		
Bodily injury, each accident	**$**	**500,000**
Bodily injury by disease, each employee	**$**	**500,000**
Bodily injury/disease aggregate	**$**	**500,000**
For work performed in monopolistic states, stop-gap liability coverage shall be endorsed to either the worker's compensation or commercial general liability policy with a minimum limit of:	**$**	**n/a**
Foreign voluntary worker compensation		**Statutory**

2. **Contractor's Commercial General Liability under Paragraphs 6.03.B and 6.03.C of the General Conditions:**

General Aggregate	**$**	**2,000,000**
Products - Completed Operations Aggregate	**$**	**1,000,000**
Personal and Advertising Injury	**$**	**1,000,000**
Each Occurrence (Bodily Injury and Property Damage)	**$**	**1,000,000**

3. **Automobile Liability under Paragraph 6.03.D. of the General Conditions:**

Combined Single Limit of	**$**	**1,000,000**

4. **Excess or Umbrella Liability:**

Per Occurrence	**$**	**5,000,000**
General Aggregate	**$**	**5,000,000**

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5. Contractor's Pollution Liability:

Each Occurrence	**$ n/a**
General Aggregate	**$ n/a**

☒ **If box is checked, Contractor is not required to provide Contractor's Pollution Liability insurance under this Contract**

6. Additional Insureds: In addition to Owner and Engineer, include as additional insureds the following:

Michael Watts, PE
Watts Engineers, PLLC

7. Contractor's Professional Liability:

Each Claim	**$ n/a**
Annual Aggregate	**$ n/a**

SC-7.02.C. Add the following new paragraph immediately after Paragraph 7.02.B:

Contractor shall be responsible for the cost of any overtime pay or other expense incurred by the Owner for Engineer's services (including those of the Resident Project Representative, if any), Owner's representative, and construction observation services, occasioned by the performance of Work on Saturday, Sunday, any legal holiday, or as overtime on any regular work day. If Contractor is responsible but does not pay, or if the parties are unable to agree as to the amount owed, then Owner may impose a reasonable set-off against payments due under Article 15.

SC 7.09 Add a new paragraph immediately after Paragraph 7.09.A:

B. Owner is exempt from payment of sales and compensating use taxes of the State of North Carolina and of cities and counties thereof on all materials to be incorporated into the Work.

1. All such sales taxes shall not be included in the bid as separate pay items but rather shall be included in the various bid items listed in the Bid. The Contractor shall submit a signed statement of all sales taxes paid for materials with each Application for Payment. State and local sales taxes shall be separated on the Statement. Invoice receipts are required to be attached to each Statement.

2. Owner's exemption does not apply to construction tools, machinery, equipment, or other property purchased by or leased by Contractor, or to supplies or materials not incorporated into the Work.

SC-10.03 Add the following new paragraphs immediately after Paragraph 10.03.A:

B. The Resident Project Representative (RPR) will be Engineer's representative at the Site, will act as directed by and under the supervision of Engineer, and will confer with Engineer regarding RPR's actions.

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1. **General: RPR's dealings in matters pertaining to the Work in general shall be with Engineer and Contractor. RPR's dealings with Subcontractors shall only be through or with the full knowledge and approval of Contractor. RPR shall generally communicate with Owner only with the knowledge of and under the direction of Engineer.**

2. **Schedules: Review the progress schedule, schedule of Shop Drawing and Sample submittals, and Schedule of Values prepared by Contractor and consult with Engineer concerning acceptability.**

3. **Conferences and Meetings: Attend meetings with Contractor, such as preconstruction conferences, progress meetings, job conferences, and other Project-related meetings, and prepare and circulate copies of minutes thereof.**

4. **Liaison:**

    a. **Serve as Engineer's liaison with Contractor. Working principally through Contractor's authorized representative or designee, assist in providing information regarding the provisions and intent of the Contract Documents.**

    b. **Assist Engineer in serving as Owner's liaison with Contractor when Contractor's operations affect Owner's on-Site operations.**

    c. **Assist in obtaining from Owner additional details or information, when required for proper execution of the Work.**

5. **Interpretation of Contract Documents: Report to Engineer when clarifications and interpretations of the Contract Documents are needed and transmit to Contractor clarifications and interpretations as issued by Engineer.**

6. **Shop Drawings and Samples:**

    a. **Record date of receipt of Samples and Contractor-approved Shop Drawings.**

    b. **Receive Samples which are furnished at the Site by Contractor, and notify Engineer of availability of Samples for examination.**

    c. **Advise Engineer and Contractor of the commencement of any portion of the Work requiring a Shop Drawing or Sample submittal for which RPR believes that the submittal has not been approved by Engineer.**

7. **Modifications: Consider and evaluate Contractor's suggestions for modifications in Drawings or Specifications and report such suggestions, together with RPR's recommendations, if any, to Engineer. Transmit to Contractor in writing decisions as issued by Engineer.**

8. **Review of Work and Rejection of Defective Work:**

    a. **Conduct on-Site observations of Contractor's work in progress to assist Engineer in determining if the Work is in general proceeding in accordance with the Contract Documents.**

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b. Report to Engineer whenever RPR believes that any part of Contractor's work in progress is defective, will not produce a completed Project that conforms generally to the Contract Documents, or will imperil the integrity of the design concept of the completed Project as a functioning whole as indicated in the Contract Documents, or has been damaged, or does not meet the requirements of any inspection, test or approval required to be made; and advise Engineer of that part of work in progress that RPR believes should be corrected or rejected or should be uncovered for observation, or requires special testing, inspection or approval.

9. Inspections, Tests, and System Start-ups:

a. Verify that tests, equipment, and systems start-ups and operating and maintenance training are conducted in the presence of appropriate Owner's personnel, and that Contractor maintains adequate records thereof.

b. Observe, record, and report to Engineer appropriate details relative to the test procedures and systems start-ups.

10. Records:

a. Prepare a daily report or keep a diary or log book, recording Contractor's hours on the Site, Subcontractors present at the Site, weather conditions, data relative to questions of Change Orders, Field Orders, Work Change Directives, or changed conditions, Site visitors, deliveries of equipment or materials, daily activities, decisions, observations in general, and specific observations in more detail as in the case of observing test procedures; and send copies to Engineer.

b. Record names, addresses, fax numbers, e-mail addresses, web site locations, and telephone numbers of all Contractors, Subcontractors, and major Suppliers of materials and equipment.

c. Maintain records for use in preparing Project documentation.

11. Reports:

a. Furnish to Engineer periodic reports as required of progress of the Work and of Contractor's compliance with the Progress Schedule and schedule of Shop Drawing and Sample submittals.

b. Draft and recommend to Engineer proposed Change Orders, Work Change Directives, and Field Orders. Obtain backup material from Contractor.

c. Immediately notify Engineer of the occurrence of any Site accidents, emergencies, acts of God endangering the Work, force majeure or delay events, damage to property by fire or other causes, or the discovery of any Constituent of Concern or Hazardous Environmental Condition.

12. Payment Requests: Review applications for payment with Contractor for compliance with the established procedure for their submission and forward with recommendations to Engineer, noting particularly the

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relationship of the payment requested to the Schedule of Values, Work completed, and materials and equipment delivered at the Site but not incorporated in the Work.

13. **Certificates, Operation and Maintenance Manuals: During the course of the Work, verify that materials and equipment certificates, operation and maintenance manuals and other data required by the Contract Documents to be assembled and furnished by Contractor are applicable to the items actually installed and in accordance with the Contract Documents, and have these documents delivered to Engineer for review and forwarding to Owner prior to payment for that part of the Work.**

14. **Completion:**

    a. **Participate in Engineer's visits to the Site to determine Substantial Completion, assist in the determination of Substantial Completion and the preparation of a punch list of items to be completed or corrected.**

    b. **Participate in Engineer's final visit to the Site to determine completion of the Work, in the company of Owner and Contractor, and prepare a final punch list of items to be completed and deficiencies to be remedied.**

    c. **Observe whether all items on the final list have been completed or corrected and make recommendations to Engineer concerning acceptance and issuance of the notice of acceptability of the work.**

C. **The RPR shall not:**

1. **Authorize any deviation from the Contract Documents or substitution of materials or equipment (including "or-equal" items).**

2. **Exceed limitations of Engineer's authority as set forth in the Contract Documents.**

3. **Undertake any of the responsibilities of Contractor, Subcontractors, or Suppliers.**

4. **Advise on, issue directions relative to, or assume control over any aspect of the means, methods, techniques, sequences or procedures of Contractor's work.**

5. **Advise on, issue directions regarding, or assume control over security or safety practices, precautions, and programs in connection with the activities or operations of Owner or Contractor.**

6. **Participate in specialized field or laboratory tests or inspections conducted off-site by others except as specifically authorized by Engineer.**

7. **Accept Shop Drawing or Sample submittals from anyone other than Contractor.**

8. **Authorize Owner to occupy the Project in whole or in part.**

SC 13.03.E Delete Paragraph 13.03.E in its entirety and insert the following in its place:

E. **The unit price of an item of Unit Price Work shall be subject to reevaluation and adjustment under the following conditions:**

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1. **if the extended price of a particular item of Unit Price Work amounts to 5 (five) percent or more of the Contract Price (based on estimated quantities at the time of Contract formation) and the variation in the quantity of that particular item of Unit Price Work actually furnished or performed by Contractor differs by more than 25 (twenty-five) percent from the estimated quantity of such item indicated in the Agreement; and**

2. **if there is no corresponding adjustment with respect to any other item of Work; and**

3. **if Contractor believes that Contractor has incurred additional expense as a result thereof, Contractor may submit a Change Proposal, or if Owner believes that the quantity variation entitles Owner to an adjustment in the unit price, Owner may make a Claim, seeking an adjustment in the Contract Price.**

SC-17.02 Add the following new paragraph immediately after Paragraph 17.01.

SC-17.02 Dispute Resolution

A. Either Owner or Contractor may request mediation of any Claim submitted to Engineer for a decision under Paragraph 11.06 before such decision becomes final and binding. The mediation will be governed by the "Rules Implementing Mediated Settlement Conferences in North Carolina Public Construction Contracts", as adopted by the State Building Commission February 26, 2002. These Rules will govern dispute resolution for the Contractor, first-tier and lower tier Subcontractors, Engineer, and Owner for any amount in controversy over $15,000. The costs for the process shall be equally shared by the parties in dispute, with the Owner paying at least one-third, if Owner is a party to the dispute. Timely submission of the request shall stay the effect of Paragraph 11.06.A.3.

B. Owner and Contractor shall participate in the mediation process in good faith. The date of termination of the mediation shall be determined by application of the mediation rules referenced above.

C. If the Claim is not resolved by mediation, Engineer's action under Paragraph 11.06.A.2 or a denial pursuant to Paragraph 11.06.A.3 shall become final and binding 30 days after termination of the mediation unless, within that time period, Owner or Contractor:

1. **gives to the other party written notice of intent to submit the Claim to a court of competent jurisdiction, or**

2. **agrees with the other party to submit the Claim to another dispute resolution process.**

D. Notwithstanding any applicable statute of limitations, a party giving notice under Paragraph SC-17.02.C.1 shall commence an action on the Claim within one year of giving such notice. Failure to do so shall result in the Claim being time-barred and Engineer's action or denial shall become final and binding.

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

THIS AGREEMENT is by and between Town of Beech Mountain ("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:

New Public Works Facilities

1.02 The Project, of which the Work under the Contract Documents is a part, is generally described as follows:

Town of Beech Mountain
New Public Works Facilities
Avery County, North Carolina

ARTICLE 2 – ENGINEER

2.01 The Project has been designed by West Consultants, PLLC

2.02 The Owner has retained West Consultants, PLLC ("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 3 – CONTRACT TIMES

3.01 *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.

3.02 *Contract Times: Days*

A. The Work will be substantially completed within **360** calendar days and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions within **390** calendar days.

3.03 *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 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

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proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty):

1. Substantial Completion: Contractor shall pay Owner **$500** 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 Time (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.

ARTICLE 4 – CONTRACT PRICE

4.01 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. For all Work, at the prices stated in Contractor's Bid, attached hereto as an exhibit.

ARTICLE 5 – PAYMENT PROCEDURES

5.01 *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.

5.02 *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 15th 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).

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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 250 percent {reference NC General Statutes 143-134.1(b1)(4)} 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.

5.03 *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 6 – INTEREST

6.01 All amounts not paid when due shall bear interest at the rate of *8* percent per annum.

ARTICLE 7 – CONTRACTOR'S REPRESENTATIONS

7.01 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.

E. Contractor has considered the information known to Contractor itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and the Site-related reports and drawings identified in the Contract 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 Contractor; and (3) Contractor's safety precautions and programs.

F. Based on the information and observations referred to in the preceding paragraph, Contractor agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.

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G. Contractor 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 Contract Documents.

H. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.

I. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

J. Contractor's entry into this Contract constitutes an incontrovertible representation by Contractor that without exception all prices in the Agreement are premised upon performing and furnishing the Work required by the Contract Documents.

ARTICLE 8 – CONTRACT DOCUMENTS

8.01 *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. General Conditions (pages 1 to 65, inclusive).
5. Supplementary Conditions (pages 1 to 7, inclusive).
6. Specifications as listed in the table of contents of the Project Manual.
7. Drawings (not attached but incorporated by reference) consisting of ____ sheets with each sheet bearing the following general title:

   Town of Beech Mountain
   New Public Works Facility
   Avery County, North Carolina

8. Addenda (numbers ___ to ___, inclusive).
9. Exhibits to this Agreement (enumerated as follows):
   a. Contractor's Bid (pages 1 to ___, inclusive).

   b. Documentation submitted by Contractor prior to Notice of Award (pages ____ to ____, Inclusive).

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10. 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.

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 9 – MISCELLANEOUS

9.01 *Terms*

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

9.02 *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.

9.03 *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.

9.04 *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.

9.05 *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:

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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 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.

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:
Town of Beech Mountain	
By:	By:
Title:	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:
Town of Beech Mountain	
403 Beech Mountain Parkway	
Beech Mountain, NC 28604	
	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.)

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STATE OF NORTH CAROLINA

AFFIDAVIT

TOWN OF BEECH MOUNTAIN

****

I, _____(the individual attesting below), being duly authorized by and on behalf of _____ (the entity bidding on project hereinafter "Employer") after first being duly sworn hereby swears or affirms as follows:

1. Employer understands that E-Verify is the federal E-Verify program operated by the United States Department of Homeland Security and other federal agencies, or any successor or equivalent program used to verify the work authorization of newly hired employees pursuant to federal law in accordance with NCGS §64-25(5).

2. Employer understands that Employers Must Use E-Verify. Each employer, after hiring an employee to work in the United States, shall verify the work authorization of the employee through E-Verify in accordance with NCGS§64-26(a).

3. Employer is a person, business entity, or other organization that transacts business in this State and that employs 25 or more employees in this State. (mark Yes or No)

   a. YES _____, or

   b. NO _____

4. Employer's subcontractors comply with E-Verify, and if Employer is the winning bidder on this project Employer will ensure compliance with E-Verify by any subcontractors subsequently hired by Employer.

This ____ day of _____, _____.

_____

Signature of Affiant

Print or Type Name: _____

State of North Carolina County of _____

Signed and sworn to (or affirmed) before me, this the _____

day of _____, _____.

My Commission Expires: _____

_____

_____

Signature of Notary Printed Name of Notary

(Affix Official/Notarial Seal)

EJCDC
ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

PERFORMANCE BOND

CONTRACTOR *(name and address)*:

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

OWNER *(name and address)*:

Town of Beech Mountain
403 Beech Mountain Parkway
Beech Mountain, NC 28604

CONSTRUCTION CONTRACT

Effective Date of the Agreement:
Amount:
Description *(name and location)*:

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

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

By: _____
Signature

_____
Print Name

_____
Title

Attest: _____
Signature

_____
Title

SURETY

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

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

_____
Print Name

_____
Title

Attest: _____
Signature

_____
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.

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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.

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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:

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EJCDC
ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

PAYMENT BOND

CONTRACTOR *(name and address)*:

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

OWNER *(name and address)*:

Town of Beech Mountain
403 Beech Mountain Parkway
Beech Mountain, NC 28604

CONSTRUCTION CONTRACT

Effective Date of the Agreement:
Amount:
Description *(name and location)*:

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

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

By: _____
Signature

_____
Print Name

_____
Title

Attest: _____
Signature

_____
Title

SURETY

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

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

_____
Print Name

_____
Title

Attest: _____
Signature

_____
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.

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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.

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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:

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ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

NOTICE OF AWARD

Date of Issuance:

Owner:	Town of Beech Mountain	Owner's Contract No.:	
Engineer:	West Consultants, PLLC	Engineer's Project No.:	18041
Project:	New Public Works Facilities	Contract Name:	New Public Works Facilities

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:

_____. (See attached copy of Bid.)

The Contract Price of the awarded Contract is: _____

Three (3) 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.

☒ 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 receipt of this Notice of Award:

1. Deliver to Owner four (4) 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:	Town of Beech Mountain	Contractor:	
	_____		_____
	Authorized Signature		Authorized Signature
By:	Tim Holloman	By:	_____
Title:	Town Manager	Title:	_____

Copy: Engineer

EJCDC
ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

NOTICE TO PROCEED

Owner:	Town of Beech Mountain	Owner's Contract No.:	
Contractor:		Contractor's Project No.:	
Engineer:	West Consultants, PLLC	Engineer's Project No.:	18041
Project:	New Public Works Facilities	Contract Name:	New Public Works Facilities
		Effective Date of Contract:	

TO CONTRACTOR:

Owner hereby notifies Contractor that the Contract Times under the above Contract will commence to run on [_____, 20__].

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**:**	Town of Beech Mountain	Contractor:	
	_____	(Acknowledged)	_____
	Authorized Signature		Authorized Signature
By:	_____	By:	_____
Title:	Town Manager	Title:	_____

Copy: Engineer

EJCDC
ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

Contractor's Application for Payment No.

	Application Period:	Application Date:
To (Owner): Town of Beech Mountain	From (Contractor):	Via (Engineer): West Consultants, PLLC
Project: New Public Works Facilities	Contract: New Public Works Facilities	
Owner's Contract No.:	Contractor's Project No.:	Engineer's Project No.: 18041

Application For Payment

Change Order Summary

Approved Change Orders		
Number	Additions	Deductions
TOTALS		
NET CHANGE BY CHANGE ORDERS		

1. ORIGINAL CONTRACT PRICE	**$**
2. Net change by Change Orders	**$**
3. Current Contract Price (Line 1 ± 2)	**$**
4. TOTAL COMPLETED AND STORED TO DATE (Column F total on Progress Estimates)	**$**
5. RETAINAGE:	
a. X _____ Work Completed	**$**
b. X _____ Stored Material	**$**
c. Total Retainage (Line 5.a + Line 5.b)	**$**
6. AMOUNT ELIGIBLE TO DATE (Line 4 - Line 5.c)	**$**
7. LESS PREVIOUS PAYMENTS (Line 6 from prior Application)	**$**
8. AMOUNT DUE THIS APPLICATION	**$**
9. BALANCE TO FINISH, PLUS RETAINAGE (Column G total on Progress Estimates + Line 5.c above)	**$**

Contractor's Certification

The undersigned Contractor certifies, to the best of its knowledge, the following:
(1) All previous progress payments received from Owner on account of Work done under the Contract have been applied on account to discharge Contractor's legitimate obligations incurred in connection with the Work covered by prior Applications for Payment;
(2) Title to all Work, materials and equipment incorporated in said Work, or otherwise listed in or covered by this Application for Payment, will pass to Owner at time of payment free and clear of all Liens, security interests, and encumbrances (except such as are covered by a bond acceptable to Owner indemnifying Owner against any such Liens, security interest, or encumbrances); and
(3) All the Work covered by this Application for Payment is in accordance with the Contract Documents and is not defective.

Contractor Signature

By:	Date:

Payment of: $ _____
(Line 8 or other - attach explanation of the other amount)

is recommended by: _____ _____
(Engineer) (Date)

Payment of: $ _____
(Line 8 or other - attach explanation of the other amount)

is approved by: _____ _____
(Owner) (Date)

Approved by: _____ _____
Funding or Financing Entity (if applicable) (Date)

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Progress Estimate - Lump Sum Work

Contractor's Application

For (Contract): New Public Works Facilities	Application Number:
Application Period:	Application Date:

			Work Completed		E	F		G
A		B	C	D				
Specification Section No.	Description	Scheduled Value ($)	From Previous Application (C+D)	This Period	Materials Presently Stored (not in C or D)	Total Completed and Stored to Date (C + D + E)	% (F / B)	Balance to Finish (B - F)
	Totals							

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Progress Estimate - Unit Price Work

Contractor's Application

For (Contract): New Public Works Facilities								Application Number:			
Application Period:								Application Date:			
A					B	C	D	E	F		
Item		Contract Information				Estimated Quantity Installed	Value of Work Installed to Date	Materials Presently Stored (not in C)	Total Completed and Stored to Date (D + E)	% (F / B)	Balance to Finish (B - F)
Bid Item No.	Description	Item Quantity	Units	Unit Price	Total Value of Item ($)						
	Totals										

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Stored Material Summary

Contractor's Application

For (Contract):	New Public Works Facilities	Application Number:
Application Period:		Application Date:

A		B	C		D		E		F		G
					Stored Previously				Incorporated in Work		
Bid Item No.	Supplier Invoice No.	Submittal No. (with Specification Section No.)	Storage Location	Description of Materials or Equipment Stored	Date Placed into Storage (Month/Year)	Amount ($)	Amount Stored this Month ($)	Subtotal Amount Completed and Stored to Date (D + E)	Date (Month/ Year)	Amount ($)	Materials Remaining in Storage ($) (D + E - F)
				Totals							

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CONTRACTOR'S SALES TAX REPORT

N.C. STATE & LOCAL SALES TAXES PAID

CONTRACTOR: _____ OWNER: _____

ADDRESS: _____ PROJECT: _____

_____ FOR PERIOD: _____TO _____

VENDOR	ADDRESS	MATERIAL PURCHASED	*INVOICE NUMBER	DATE	INVOICE AMOUNT	N.C. TAX	COUNTY TAX	NAME OF COUNTY

**INVOICE COPIES MUST BE ATTACHED TO THIS REPORT*

TOTALS _____

I _____, hereby certify that the foregoing statement of sales tax paid in connection with the referenced contract does not contain sales or use taxes paid on purchases of tangible personal property purchased by such contractors for use in performing the contract which does not annex to, affix to or in some manner become a part of the building or structure being erected, altered, or repaired for the governmental entities as defined by G.S. 105-164.14(c) and is the best of his/her belief, true and correct.

Sworn to and Subscribed before me, this _____ day of _____, 20___. By: _____

_____ Notary Title: _____

My Commission expires_____.

EJCDC
ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

Work Change Directive No.

Date of Issuance:	Effective Date:
Owner:	Owner's Contract No.:
Contractor:	Contractor's Project No.:
Engineer:	Engineer's Project No.:
Project:	Contract Name:

Contractor is directed to proceed promptly with the following change(s):

Description:

Attachments: *[List documents supporting change]*

Purpose for Work Change Directive:

Directive to proceed promptly with the Work described herein, prior to agreeing to changes on Contract Price and Contract Time, is issued due to: *[check one or both of the following]*

☐ Non-agreement on pricing of proposed change.

☐ Necessity to proceed for schedule or other Project reasons.

Estimated Change in Contract Price and Contract Times (non-binding, preliminary):

Contract Price $ [increase] [decrease].

Contract Time days [increase] [decrease].

Basis of estimated change in Contract Price:

☐ Lump Sum ☐ Unit Price

☐ Cost of the Work ☐ Other

RECOMMENDED:	AUTHORIZED BY:	RECEIVED:
By:	By:	By:
Engineer (Authorized Signature)	Owner (Authorized Signature)	Contractor (Authorized Signature)
Title:	Title:	Title:
Date:	Date:	Date:

Approved by Funding Agency (if applicable)

By: Date:

Title:

EJCDC
ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

Change Order No. _____

Date of Issuance:		Effective Date:	
Owner:	Town of Beech Mountain	Owner's Contract No.:	
Contractor:		Contractor's Project No.:	
Engineer:	West Consultants, PLLC	Engineer's Project No.:	18041
Project:	New Public Works Facilities	Contract Name:	New Public Works Facilities

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** *[note changes in Milestones if applicable]*
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: _____	By: _____	By: _____
Engineer (if required)	Owner (Authorized Signature)	Contractor (Authorized Signature)
Title: _____	Title _____	Title _____
Date: _____	Date _____	Date _____

Approved by Funding Agency (if applicable)

By: _____ Date:

Title: _____

EJCDC
ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

CERTIFICATE OF SUBSTANTIAL COMPLETION

Owner:	Town of Beech Mountain	Owner's Contract No.:	
Contractor:		Contractor's Project No.:	
Engineer:	West Consultants, PLLC	Engineer's Project No.:	18041
Project:	New Public Works Facilities	Contract Name:	New Public Works Facilities

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: _____ (Authorized signature)	By: _____ Owner (Authorized Signature)	By: _____ Contractor (Authorized Signature)
Title: _____	Title: _____	Title: _____
Date: _____	Date: _____	Date: _____

SECTION 01 45 33
CODE REQUIRED SPECIAL INSPECTIONS AND PROCEDURES

PART 1 – GENERAL

1.01 SUMMARY

A. This section covers special inspection requirements in accordance with Chapter 17 of the 2018 North Carolina Building Code for the main building only (not the salt storage or recycle center buildings). Special inspections under this section are in addition to those required elsewhere by the Contract Documents. Owner will provide at its expense the services of special inspectors under this section. Determinations made by such special inspectors do not alter Contractor's responsibility to comply with all Contract Documents.

1.02 REFERENCES

Building Code – 2018 North Carolina Building Code

1.03 SUBMITTALS

A. General – Submit under provisions of the General Conditions.

B. Action Submittals
   1. Statement of Responsibility: Submit statement of responsibility to Owner and building official prior to commencement of work on any foundation soils or structural portions of the Work, in accordance with Section 1704 of the Building Code. The statement of responsibility shall contain acknowledgement of awareness of the special inspections required and a commitment to cooperate with and accommodate special inspectors so as to not hinder the inspections nor the progress of the Work.
   2. Schedule of Work: Submit schedule of planned starting dates and duration for portions of work subject to special inspections, so that Owner's special inspectors may plan their inspection times accordingly. Update this schedule as often as it may change and submit to Engineer.

1.04 STATEMENT OF SPECIAL INSPECTIONS

A. General – Special inspections, continuous or periodic, shall be made by Owner's approved agencies for the following portions of the Work:
   1. Wind per section 1704.6.2
   2. Structures per section 1705.1.3
   3. Roof and wall cladding per section 1705.11.3
   4. Concrete per section 1705.3
   5. Soils per section 1705.6

B. Steel Frame Construction – the following special inspections will be made (note: all of the structural steel, threaded rod, and anchor bolt connections are part of the wind-force-resisting system).

Verification and Inspection	Continuous or Periodic
1. Materials verification of high-strength bolts, nuts and washers	
a. Identification markings to conform to ASTM standards specified in the approved construction documents.	Periodic
b. Manufacturer's certificate of compliance required.	Periodic
2. Inspection of high-strength bolting:	
a. Snug-tight joints.	Periodic
3. Material verification of structural steel:	
a. For structural steel, identification markings to conform to AISC 360.	Periodic
b. For other steel, identification markings to conform to ASTM standards specified in the approved construction documents.	Periodic
c. Manufacturer's certified test reports.	Periodic
4. Material verification of weld filler materials:	
a. Identification markings to conform to AWS specification in the approved construction document.	Periodic
b. Manufacturer's certificate of compliance required.	Periodic
5. Inspection of welding:	
a. Structural steel (applicable only if Contractor elects to use welded connections which shall be determined during the shop drawing approval process).	
1. Complete and partial joint penetration groove welds.	Continuous
2. Multipass fillet welds.	Continuous
3. Single-pass fillet welds > 5/16"	Continuous
4. Plug and slot welds.	Continuous
5. Single-pass fillet welds $\leq$ 5/16"	Periodic
6. Inspection of steel frame joint details for compliance:	
a. Details such as bracing and stiffening.	Periodic
b. Member locations.	Periodic
c. Application of joint details at each connection.	Periodic

C. Roof and Wall Cladding – the following inspections will be made.

Verification and Inspection	Continuous or Periodic
1. Verify roof panels, wall panels, window frames and glazing are labelled and meet specifications and approved submittals.	Periodic
2. Roof cladding, attachments.	Periodic
3. Wall cladding and windows, attachments.	Periodic

D. Concrete construction – the following inspections will be made:

Verification and Inspection	Continuous or Periodic
1. Inspection of reinforcing steel and placement.	Periodic
2. Inspection of bolts to be installed in concrete prior to and during placement of concrete.	Continuous
3. Inspection of anchors installed in hardened concrete.	Periodic
4. At the time fresh concrete is sampled to fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete.	Continuous
5. Inspection of concrete placement for proper application techniques.	Continuous
6. Inspection for maintenance of specified curing temperature and techniques.	Periodic
7. Inspect formwork for shape, location and dimensions of the concrete member being formed.	Periodic

E. Soils - the following inspections will be made:

Verification and Inspection	Continuous or Periodic
1. Verify materials below shallow foundations are adequate to achieve the design bearing capacity.	Periodic
2. Verify excavations are extended to proper depth and have reached proper materials.	Periodic
3. Perform classification and testing of compacted fill materials.	Periodic
4. Verify use of proper materials, densities and lift thicknesses during placement and compaction of compacted fill.	Continuous
5. Prior to placement of compacted fill, observe subgrade and verify that site has been prepared properly.	Periodic

PART 2 – PRODUCTS - Not used.

PART 3 - EXECUTION

A. Scheduling – regularly communicate with Engineer and the Owner's special inspectors so as to give advance notice (48 hours minimum) prior to beginning each phase of the Work subject to special inspections.

B. Access – allow Owner's special inspectors regular access to all portions of the Work subject to special inspections, including the use of scaffolding or other temporary devices as may be in place for construction purposes. Special inspectors will provide their own personal protective equipment and will be subject to Contractor's safety policies for the site.

C. Concealment – do not conceal portions of the Work subject to special inspections until special inspectors have completed the applicable inspections and have reported to the Owner and the building official that there are no unresolved compliance issues.

END OF SECTION

SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 3 – EXECUTION

3.01 PRESERVATION OF NATURAL FEATURES

Confine all operations to within the work limits of the project. Exercise special care to maintain natural surroundings undamaged.

3.02 HOUSEKEEPING

A. Keep project neat, orderly, and in a safe condition at all times. Immediately remove all hazardous rubbish. Do not allow rubbish to accumulate. Provide on-site containers for collection of rubbish or dispose of it at frequent intervals during progress off work.

B. Wet down dry materials and rubbish to prevent blowing dust.

C. Keep volatile wastes in covered containers.

3.03 DISPOSAL OF RUBBISH

Dispose of waste materials, legally, at public or private dumping areas. Town recycle center is located on adjacent property.

3.04 AIR AND WATER POLLUTION CONTROL

A. Take all necessary reasonable measures to reduce air and water pollution by any material or equipment used during construction.

B. Do not dispose of volatile wastes or oils in storm or sanitary drains, nor allow such materials to reach streams or other surface waters.

C. Do not allow waste materials to be washed into the bed of a stream.

D. When excavations are made, immediately utilize resultant loose earth by filling and compacting in place, or dispose of it off the site.

E. Sod or seed slopes as specified as soon as possible to prevent erosion and deposit of earth into any storm sewer, drainage ditch, or stream. If it is impossible to prevent erosion, the Engineer may require construction of sedimentation basins to prevent water pollution. The facility shall be constructed in accordance with the North Carolina Sedimentation Pollution Control Act. See erosion control plan.

3.05 CLEARING OPERATIONS

Small areas such as new fence lines shall be cleared of woody vegetation as needed. No clearing shall be done elsewhere unless necessary for the execution of the Work and only by permission of the Engineer.

If burning is not permitted, all brush and trees shall be removed from the area and disposed of by the Contractor in an approved manner. Trees and brush other than Wild Cherry may be mulched with an approved mulching machine and the residue distributed over natural areas.

3.06 EARTHWORK

All material excavated on the Site not to be incorporated into the Work shall be disposed of legally off site. When it is necessary to haul material over the streets or pavements, the Contractor shall provide suitable tight vehicles so as to prevent deposits on the streets or pavements. In all cases where any materials are dropped from the vehicles, the Contractor shall clean up the same as often as directed by the Engineer and keep all crosswalks, streets, and pavements clean and free from dirt, mud, stone, and other hauled material. The Contractor shall bear all costs related to the work described herein as this work is considered incidental to the work covered by the various contract items.

3.07 CONSTRUCTION SURVEYING

All work shall be constructed in accordance with the lines, grades and elevations shown on the plans or as given by the Engineer in the field. The Contractor shall be fully responsible for maintaining alignment and grade. Principle controlling points for locating the principle components of the work together with a suitable number of benchmarks adjacent to the work will be provided by the Engineer. From this information, the Contractor shall verify benchmarks and develop and make all detail surveys needed for construction and shall re-establish, at his own expense, any marks which are removed or destroyed due to his construction operations. Contractor shall also maintain enough staking at all times for inspection verification of site work.

Additionally, Contractor shall provide record (as-built) drawings of completed work and, in the case of gravity sewers, shall use the services of a professional surveyor to create the record drawings. Gravity sewer record drawings shall show actual manhole locations, invert in and out elevations, rim elevation, and the calculated slope between manholes. It is not necessary to survey the ground surface elevations (profile) between manholes, unless in the opinion of the Engineer the surface elevations were significantly altered from that shown on the Drawings. All service laterals shall be accurately shown on the record drawings.

3.08 CONTROL OF EROSION, SILTATION, AND POLLUTION

The Contractor shall take whatever measures are necessary to minimize soil erosion and siltation, water pollution, and air pollution caused by his operations. The Contractor shall also comply with the applicable regulations of all legally constituted authorities relating to pollution prevention and control. The Contractor shall keep himself fully informed of all such regulations which in any way may affect the conduct of the work, and shall at all times observe and comply with all such regulations. In the event of conflict between such regulations and the requirements of the specifications, the more restrictive requirements shall apply.

All erosion control measures, if any, shall be constructed in accordance with the North Carolina Sedimentation Pollution Control Act. Exposed areas shall not remain unprotected for more than seven days unless a sedimentation and erosion control plan approved by the State of North Carolina is implemented.

The Contractor shall control dust throughout the life of the project within the project area and at all other areas affected by the construction of the project, including, but not specifically limited to, unpaved secondary roads, haul roads, access roads, disposal sites, borrow and material pits, and production sites. Dust control shall not be considered effective where the amount of dust creates a potential or actual unsafe condition, public nuisance, or condition endangering the value, utility, or appearance of any property.

The Contractor will not be directly compensated for any dust control measures necessary, as this work will be considered incidental to the work covered by the various contract items.

The Contractor shall perform all inspections and record keeping as required by the NPDES General Stormwater Permit No. NCG010000 and as required by the NC Division of Land Resources, Land Quality Section Self-Inspection Program (forms included herein).

3.09 UTILITY CONFLICTS

Prior to the beginning of construction, the Contractor will notify all utility owners known to have facilities affected by the construction of the project and will make arrangements for the necessary location of all affected public or private utility facilities.

The Contractor shall use special care in working around and near all existing utilities that are encountered during construction, protecting them where necessary so that they will give uninterrupted service.

The Contractor shall cooperate with the utility owner, and/or the owner's representative in the adjustment or placement of utility facilities when such adjustment or placement is made necessary by the construction of the project or has been authorized by the Owner.

In the event that the Contractor interrupts utility services, the Contractor shall promptly notify the owners and shall cooperate with the owners and/or owner's representative in the restoration of service in the shortest time possible.

3.10 EXISTING FACILITIES

The Contractor shall maintain in operating condition and protect from damage all existing facilities including utilities, roads, streets, sidewalks, drives, power and telephone lines, gas lines, waterlines, sewers, gutters, and other drains encountered, and repair to the satisfaction of the Engineer any aerial, surface or subsurface facilities damaged during the course of the work. Contractor shall also make reasonable and satisfactory provisions for the maintenance of traffic on streets, drives, walkways and at street crossings and, if necessary, provide temporary walkways and bridges for crossing of open trenches as directed.

To protect persons from injury and to avoid property damage, adequate barricades, construction signs, torches, red lanterns, and guards as required shall be placed and maintained during the progress of the construction work and until it is safe for resuming normal use of the area. All material piles, equipment and pipe that may serve as obstructions to traffic shall be enclosed by fences or barricades and shall be protected by proper lights when the visibility is poor.

Temporary support, adequate protection, and maintenance of all underground and surface structures and other obstructions encountered in the progress of the work shall be furnished by the Contractor at his expense. Any structures that have been disturbed shall be restored upon completion of the work.

Trees, shrubbery, fences, poles, and all other property and surface structures shall be protected unless their removal is shown on the Drawings or authorized by the Engineer.

3.11 LOCATION OF SEWERS IN RELATION TO WATER MAINS

Adequate provision shall be made for protection potable water supplies from possible leakage from sewer mains located near water lines. To accomplish this purpose, the following design features are required where feasible. Conditions may be encountered necessitating other special design. Such design may be approved upon submission of a description of the specific problems and of acceptable evidence that the proposed construction will provide adequate protection.

Horizontal Separation: Whenever possible, sewer mains should be laid at least ten feet horizontally from any existing or proposed water main.

Should local conditions prevent a lateral separation of ten feet, a sewer main may be installed nearer to a water main if:

A. It is laid in a separate trench, with the outside diameter of the sewer at least 18 inches below the outside diameter of the water main, or if

B. It is laid in the same trench as the sewer with the water main located at one side on a bench of undisturbed earth, and with the elevation of the bottom of the water main at least 18-inches above the top of the sewer.

Sewer Crossing Under Water Main: Whenever it is necessary for a sewer main to cross under a water main, the sewer shall be laid at such an elevation that the outside diameter of the sewer is at least 18 inches below the outside diameter of the water main. If the local conditions prevent an 18 inch vertical separation, then the water main shall be relocated to provide this separation.

Sewer Crossing Over Water Main: Whenever it is necessary for a sewer to cross over a water main, or whenever the above requirements for horizontal and vertical separation cannot be met, both the water main and sewer shall be constructed of ductile iron pipe with mechanical type joints.

3.12 BUILDING PERMITS

Any building permits required by the county or the city having authority shall be secured by the Contractor. The payment for these permits will be made by the Contractor.

END OF SECTION

GENERAL SECTION 03 31 13
NORMAL WEIGHT CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

1.02 REFERENCES

ACI 117	Specification for Tolerances for Concrete Construction and Materials
ACI 224.3	Joints in Concrete Construction
ACI 301	Specifications for Structural Concrete for Buildings
ACI 302.1R	Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials
ACI 305	Recommended Practice for Hot Weather Concreting
ACI 306	Recommended Practice for Cold Weather Concreting
ACI 308.1	Specification for Curing Concrete
ACI 318	Building Code Requirements for Structural Concrete
ACI 347	Guide to Formwork of Concrete
ACI 504R	Guide to Sealing Joints in Concrete Structures
AISC 303	Code of Standard Practice for Structural Steel Buildings
ASCE 7	Minimum Design Loads for Buildings and Other Structures
ASTM A185	Standard Test Method for Air Content of Hydraulic Cement Mortar
ASTM A615	Standard Specification for Deformed and Plain Billet Steel Bars For Concrete Reinforcement
ASTM C31	Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C33	Standard Specification for Concrete Aggregates
ASTM C39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C42	Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM C94	Standard Specification for Ready-Mixed Concrete
ASTM C138	Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
ASTM C143	Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C150	Standard Specification for Portland Cement
ASTM C172	Standard Practice for Sampling Freshly Mixed Concrete
ASTM C173	Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM E 1155	Standard Test Method for Determining Floor Flatness and Levelness
ASTM E 1643	Standard Practice for Water Vapor Retarders used under Concrete Slabs
CRSI	Concrete Reinforcing Steel Institute

1.03 PRE-INSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at project site.

1. After submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

a. Contractor's superintendent.
b. Independent testing agency responsible for concrete testing.
c. Ready-mix concrete manufacturer (and mix designer if different).
d. Concrete Installer.
e. Special Concrete Finisher.

2. Review: special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, joint fillers, forms and form removal limitations, shoring and reshoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, methods for achieving specified floor and slab flatness and levelness, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.04 SUBMITTALS

A. General – Submit listed submittals in accordance with Submittal Procedures of the General Conditions.

B. Action Submittals:
Submit complete information for methods and materials, including:

1. Physical properties and details demonstrating compliance with the Specifications and suitability for the intended use.
2. Ready-mix batch design for each mix proposed, signed by the qualified mix designer, based on the amount of reinforcement and dimensions per the Drawings and per Contractor’s foundation designs for pre-engineered metal buildings.
3. Concrete Supplier shall provide test results, corresponding with construction schedule (below), methods of curing, temperature, humidity and delivery time limitations as part of mix design approval process.
4. Any clarifications or exceptions to these Specifications.
5. The Contractor shall submit for approval, prior to the beginning of the work, his proposed concrete construction schedule, corresponding method of curing (coordinated with test above), associated protection and finishing methods.
6. Preconstruction (Pre-installation) meeting schedule (after mixture design approval).
7. Bar Schedule, Lists and Diagrams:
Submit any supplemental bar schedules, bar list, or bar bending diagrams required to accomplish the fabrication and placement of reinforcement. The Contractor shall furnish prints of any such lists or diagrams to the Engineer.
8. Locations of Construction joints not already shown on the Drawings.
9. Qualification Data for installer, manufacturer and testing agency.
10. Material Certificates: For each of the following, signed by manufacturers:
a. Cementitious materials.
b. Admixtures.

c. Form materials and form-release agents.
d. Steel reinforcement and accessories.
e. Curing compounds.
f. Floor and slab treatments.
g. Vapor retarders.
h. Joint filler.
i. Joint-filler strips.
j. Repair materials.

11. Material Test Reports: For the following, from a qualified testing agency:
    a. Aggregates: Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.
12. Minutes of pre-installation conference.

C. Interim Submittals:

1. All test results in accordance with this Section.
2. Field quality-control reports.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94 requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Testing Agency Qualifications: An independent agency, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel conducting field tests (provided by Owner) shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.
3. Preconstruction Testing Service (provided by Contractor): Engage a qualified testing agency to perform preconstruction testing on concrete mixtures.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 - PRODUCTS

2.01 CONCRETE, GENERAL

A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301
2. ACI 117

2.02 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

B. Pan-Type Forms: Glass-fiber-reinforced plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation.

C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

D. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

E. Form Ties: Factory-fabricated, removable or snap-off glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal. Immediately following the removal of forms, the projecting ties shall be removed and all holes filled with grout flush with the wall. Care shall be taken to use the same brand of cement and same mix proportions used in the wall to prevent shrinkage differences.

1. Furnish units that leave no corrodible metal closer than 1-1/2 inch to the plane of exposed concrete surface.
2. Furnish ties that, when removed, leave holes no larger than 1 inch in diameter in concrete surface.

2.03 STEEL REINFORCEMENT

A. General:
Bar reinforcement shall be intermediate grade new billet steel conforming to the requirements of ASTM Designation A-615. Unless otherwise noted, all reinforcing bars shall be Grade 60. Wire fabric reinforcement shall consist of steel wire conforming to the requirements of ASTM Designation A 185-latest revision. Anchor bolts and miscellaneous steel items to be embedded in concrete shall be accurately placed, and adequately secured in position to prevent dislodgement during concrete placing operations. Anchor bolts shall be protected after concrete has been placed and set by daubing with grease and wrapping with burlap.

B. Bending:
Metal reinforcing shall be properly fabricated, supported, and securely held in place so that it will be in the correct position after the concrete has been placed and compacted. Bars shall be bent in the shop to the shapes shown or required. Field bending shall be done only with the written approval of the Engineer.

Hooks and bends in reinforcing shall be fabricated in accordance with ACI 318.

All bars shall be bent cold.

Bars shall not be bent or straightened in a manner that will injure the material. Bars with kinks, cracks, or improper bends will be rejected.

2.04 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

1. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.05 CONCRETE MATERIALS

A. Cementitious Materials:

1. Portland Cement: ASTM C 150, Type I low alkali with a maximum 15 percent amount of tricalcium aluminate, or Type II low alkali.

a. For concrete mixed with only Portland Cement, the total alkalis in the cement (calculated as the percentage of K2O) shall not exceed 0.40% unless aggregates to be used meet the requirements for non-reactivity with alkalis stated below.

b. For concrete mixed with Portland Cement and an appropriate amount of fly ash (as stated below), the total alkalis in the Portland Cement (calculated as the percentage of NA2O plus 0.658 times the percentage of K2O) shall not exceed 0.85% unless aggregates to be used meet the requirements for non-reactivity with alkalis stated below.

c. Use one brand of cement throughout the project, unless otherwise acceptable to Engineer.

B. Pozzolan (Fly Ash)

1. ASTM C 618, Class C or F with the optional requirements for multiple factor, drying shrinkage, and uniformity from Table 3 of ASTM C 618. Requirement for maximum alkalies from Table 1 of ASTM C 618 shall apply. If pozzolan is used, it shall never be less than 15 percent nor more than 25 percent by weight of the total cementitious material.

2. Where fly ash is included in the concrete mix to waive the 0.4% alkali requirement of the Portland Cement, the fly ash shall be set between 15% and 25% of the total weight of the combined Portland Cement and fly ash. The percentage of fly ash shall be set so that the mean mortar bar expansion of the

cement-fly ash mix shall be 0.08% or less when tested at 16 days in accordance with ASTM C 1260. The Portland Cement and aggregates used in the mix for this test shall be the Portland Cement and aggregates submitted for use on the job

3. Only 70% of the fly ash by weight may be counted as cement in computing W/C ratio. Fly ash shall not be used with expansive cement.

B. Normal-Weight Aggregates: ASTM C 33. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Coarse-Aggregate Size: **1-1/2 inches** nominal.

2. Coarse aggregate shall conform to ASTM C 33, Class 5S.

3. When aggregates which are non-reactive with alkalis are desired in order to waive the alkali content requirement of cement as stated above, the following test shall be performed:

a. A petrographic analysis in accordance with ASTM C 295 shall be performed to identify the constituents of the fine and course aggregates. Aggregates containing more than the following quantities of constituents shall be considered potentially reactive:

1. Optically strained, microfractured, or microcrystalline quartz exceeding 5.0%.

2. Chert or chalcedony exceeding 3.0%.

3. Tridymite or cristobalite exceeding 1.0%.

4. Opal exceeding 0.5%.

5. Natural volcanic glass in volcanic rocks exceeding 3.0%.

b. Aggregate shall be evaluated by ASTM C 1260. Aggregate sources that exhibit mean mortar bar expansions at 16 days greater than 0.08% shall be considered potentially reactive. Tests shall be made with cement proposed for use on the job.

4. Aggregates having a lithology which is essentially similar to that of sources in the same region that have been found to be reactive in service shall be considered potentially reactive, and the alkali content requirement of cement stated above shall apply regardless of the results of the tests above.

5. The Contractor shall submit a new trial mix to the Engineer for approval whenever a different aggregate or gradation is proposed.

C. Air-Entraining Admixture: ASTM C 260.

D. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

E. Water: ASTM C 94 and potable.

2.06 WATERSTOPS -NA

A. Flexible PVC Waterstops: with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following; or equal:

2. Profile:
3. Dimensions:

2.07 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E-1745, Class A, not less than 10 mils thick. Included manufacturer's recommended adhesive or pressure sensitive joint tape.

2.08 FLOOR AND SLAB TREATMENTS (Building Only)

A. Refer to Section 09 91 01 Painting.

B. Floor Hardener: Compatible with other floor treatments. A Surface Hardener shall be applied to the surface of all exposed concrete finish floors.

2.09 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309.

F. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315.

2.10 JOINT TREATMENT MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751.

B. Joint Sealants: Two-Component Polyurethane, provide the following:

1. Urethane, NS: Two-component, plus 50 percent and minus 50 percent movement capability, urethane joint sealant; ASTM C 920, Type M, Grade NS, Class 25, Uses T, NT, M, G, A, and O.

2.11 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Use fly ash, pozzolan, slag cement, and silica fume as needed to reduce the total amount of portland cement.

C. Admixtures: Use admixtures according to manufacturer's written instructions.

2.12 CONCRETE MIXTURES

A. Normal-weight concrete.

1. Minimum Compressive Strength unless otherwise noted shall be **5,000 psi** at 28 days; for unexposed footings shall be 3**,000 psi;** and for exterior sidewalk shall be **4,000 psi.** Refer to Drawings for further information. Also, higher compressive strengths may be required, if selected by Contractor's designer for building foundations.
2. Maximum W/C Ratio: 0.45 for all water retaining structures.
3. Slump Limit: Slabs on grade Max 4"- Min 3", Footings Max 5" – Min 3", All other Max 4" - Min 3", final per mix designer.
4. Air Content: 6.0 percent, plus or minus 1.0 percent, final per Mix Designer.
5. Exposure Category: F3

2.13 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.14 CONCRETE MIXING

A. Per Mix designer to achieve required test results. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, and furnish batch ticket information.

PART 3 - EXECUTION

3.01 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 306.1 "Recommended Practice for Cold Weather Concreting" and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures. Adequate equipment shall be provided for heating the concrete

materials and protecting the concrete during freezing weather or near-freezing weather. No frozen materials or materials containing ice shall be used. Special attention is drawn to the minimum required placing and curing temperatures.

Concrete damaged by freezing shall be removed and replaced at the Contractor's own expense.

1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 305 "Recommended Practice for Hot Weather Concreting" and as follows: Care shall be taken to protect the concrete or schedule the operations to avoid problems incurred with flash set or too-rapid drying conditions.

During hot weather, consideration shall be given to maintaining the temperature of cement aggregates and mixing water, such that the temperature of the concrete at the time of delivery to the job site shall in no case exceed 90 degrees Fahrenheit. When the concrete temperature exceeds 80 degrees Fahrenheit, an approved retarder shall be incorporated into the mix design.

1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.02 FORMWORK INSTALLATION

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads. The Contractor shall be fully responsible for the adequacy and safety of the forms.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117. All forms shall be built and maintained in an excellent condition, so that, when removed, the concrete will be left with a smooth, presentable surface, free from offsets, fins, ridges, and other unsightly defects. Initially and before re-use, forms shall be cleaned and a thin coat of form oil applied. Care shall be taken to avoid splashing oil on reinforcing steel or existing concrete.

C. Forms for exposed concrete shall be given special attention to provide a smooth surface free from defects and form marks so that rubbing and finishing will be kept to a minimum.

D. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:

1. **1/8 inch** for smooth-formed finished surfaces.

E. Construct forms tight enough to prevent loss of concrete mortar.

F. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces.

1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Forms for suspended slabs and beams shall be cambered 1/4 –inch in 15 feet of span to allow for deflection,

J. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

K. Prior to placement of concrete, the forms and subgrade shall be free of chips, sawdust, debris, water, ice, snow, extraneous oil, mortar, or other harmful substance or coatings. Any oil on the reinforcing steel or other surfaces required to be bonded to the concrete shall be removed. Rock surfaces shall be cleaned by air-water cutting, wet sandblasting or wire brush scrubbing, as necessary, and shall be wetted immediately prior to placement of concrete. Earth on mud, dried earth, un-compacted fill or frozen subgrade will not be permitted.

L. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

M. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

N. Unless otherwise specified, when concrete is to be placed over drain fill, the contact surface of the drain fill shall be covered with a layer of asphalt-impregnated building paper or polyvinyl sheeting prior to placement of the concrete. Forms for weepholes shall extend through this layer into the drain fill

3.03 EMBEDDED ITEM INSTALLATION

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.

B. Openings in concrete formwork shall be provided to accommodate work from other trades. Openings not shown on Drawings are subject to Engineer’s approval.

3.04 INSPECTION

A. Forms shall be inspected by the Engineer prior to concreting and notice shall be given 24 hours in advance of the pour so that an inspection can be scheduled. No concreting may be done in the absence of the Engineer without written permission of the Engineer.

3.05 REMOVING AND REUSING FORMS

A. Care shall be exercised to prevent damage of concrete during the removal of forms. The following schedule shall be considered the minimum period under normal conditions when Type I cement is used; but its use shall not in any way relieve the Contractor of responsibility for the safety and appearance of the structure.

Temperature	**60+ Deg.**	**50-60 Deg.**	**40-50 Deg.**
General Construction	3 Days	5 Days	7 Days
Columns and Walls under 5'high	24 Hrs.	36 Hrs.	72 Hrs.
Columns and Walls 5'1"-10' high	3 Days	5 Days	7 Days
Columns and Walls over 10' high	5 Days	7 Days	10 Days
Beam and Girder Side Forms	24 Hrs.	36 Hrs.	72 Hrs.
Bottom Forms for Slabs for 6' Span or Less**	5 Days	7 Days	14 Days
Bottom Forms Beams and Girders	14 Days	18 Days	21 Days
**For slabs of more than 6' span, add twelve (12) hours for each additional foot over 6 feet.			

When the temperature to which form or concrete surfaces are exposed drops below 40 degrees Fahrenheit the forms shall remain in place an additional time equal to the time of sub-40 degree exposure. If form insulation is used, concrete surface temperatures shall apply.

The Engineer may modify the form removal schedule if compressive tests indicate the in-place concrete to be of sufficient strength. Methods of field curing the cylinders shall simulate that of the concrete and shall be approved by the Engineer. All such tests shall be at the option and expense of the Contractor.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material are not acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Engineer.

3.06 SHORING AND RESHORING INSTALLATION

A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.

1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.

C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.07 VAPOR-RETARDER INSTALLATION

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches and seal with manufacturer's recommended tape.

2. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.08 STEEL REINFORCEMENT INSTALLATION

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Splices in reinforcing not otherwise shown and detailed shall be in accordance with ACI 318 and are subject to Engineer’s approval. However, splices not otherwise detailed or noted shall lap a minimum of 40 diameters. Welded wire fabric shall be spliced in the following manner:

1. Adjacent sections shall be spliced end to end by either:
   a. Overlapping the two pieces of fabric one full mesh (measured from the ends of the longitudinal wires in one piece to the ends of the longitudinal wires in the other piece) securing two pieces together with wire ties placed at intervals of 18 inches; or,
   b. Overlapping the two pieces of fabric so that the end crosswire of each piece comes in contact with the next-to-end crosswire of the other piece and securing the two pieces together only as required to keep the fabric in place and to prevent it from curling.

2. Adjacent sections of fabric shall be spliced side to side by either:
   a. Placing the two selvage wires (the longitudinal wires at the edges of the fabric) one alongside and overlapping the other and securing the two pieces together with wire ties placed at intervals of three feet; or,
   b. Placing each selvage in the middle of the first mesh of the other section of fabric and securing it to the other section by means of wire ties placed on the selvage wires alternately at intervals of 5 feet.

F. Reinforcement shall not be placed until the prepared site has been inspected and approved by the Engineer. After placement of the reinforcement, concrete shall not be placed until the reinforcement has been inspected

and approved by the Engineer (such inspection does not relieve Contractor of responsibility to comply with Contract Documents and approved submittals).

G. Reinforcement shall be accurately placed and secured in position in a manner that will prevent its displacement during the placement of concrete. The placing of reinforcement shall be completed before the commencement of concreting. Tack welding of bars will not be permitted. Bars shall be fastened together with annealed wire of not less than 18 gauge or other approved method. Metal chairs, metal hangers, metal spacers and concrete chairs may be used to support the reinforcement. Metal hangers, spacers, and ties shall be placed in such manner that they will not be exposed in the finished concrete surface. The legs of metal chairs that may be exposed at the lower face of slabs or beams shall be galvanized.

3.09 EMBEDDED ITEMS

A. The Contractor shall build into the concrete such items of reinforcing steel, inserts, sleeves, water stops, etc. as shown on the Drawings or called for herein. All embedded items shall be accurately located and securely fastened in place to prevent displacement during placing of concrete.

B. If in the judgment of the Engineer, embedded items are located or grouped in a manner that will weaken the structure, the Contractor shall take the necessary corrective steps.

C. No aluminum conduit or other aluminum items shall be embedded in concrete unless specifically required or permitted. All aluminum embedded or in contact with concrete shall be isolated by painting with unthinned bitumastic paint or other approved methods.

D. For openings that are left in new concrete or where made in existing concrete for the insertion of wall castings, pipes, or other fixtures, the space shall be filled with link seals and with a non-shrink mortar compatible with the shrinkage compensating mix design.

3.10 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Engineer.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.

2. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.

3. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.

4. Space vertical joints in walls. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.

D. Sawed Joints (for Concrete Pavements):

1. Utilize early entry saw to cut control joints to a minimum depth of 1-1/4 inches (for slabs up to 9 inches thick) immediately after final finishing when cutting action will not tear, ravel, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

E. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface.

F. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.11 WATERSTOP INSTALLATION - NA

A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.

3.12 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by mix Designer.

C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as approved by Engineer. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete

embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

D. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

3.13 FINISHING FORMED SURFACES

A. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections on formed-surface irregularities.

B. Rubbed Finish: Apply the following to smooth-formed-finished as-cast concrete on all surfaces exposed to view:

1. Smooth-Rubbed Finish: Not later than four hours after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process. Power tools shall be used for rubbing with hand work limited to inaccessible corners and very small areas.

C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.14 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces to receive trowel finish.

C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces exposed to view or to be covered with paint, or another thin-film-finish coating system.
2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface.
3. Finish and measure surface, so gap at any point between concrete surface and an unleveled, freestanding, 10-ft. long straightedge resting on two high spots and placed anywhere on the surface does not exceed **1/8 inch**.

D. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces. While concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.

F. Coordinate required final finish with Engineer before application.

G. After final floating, apply a trowel finish if required.

H. Cure concrete with curing compound and apply immediately after final finishing.

3.15 MISCELLANEOUS CONCRETE ITEM INSTALLATION

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

3.16 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 305 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

    a. Water.
    b. Continuous water-fog spray.
    c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. The use of water sprays is acceptable provided care is exercised to avoid dry areas and alternating wetting and drying.

3. Vertical surfaces shall have their forms left or they shall be covered with wet burlap and the burlap kept continuously saturated during the curing period.

4. All floor slabs shall be cured with curing paper or with minimum 10 mil polyethylene sheets. The sheets shall be lapped a minimum of 6 inches at edges and the joints shall be continuously taped.

5. Any tears resulting from subsequent operation on the slab within the specified curing period shall be taped or the curing paper or sheet shall be replaced. Water shall be added periodically as required or as ordered by the Engineer such that all surfaces remain thoroughly saturated.

6. Care shall be exercised during subsequent work such that concrete is not damaged from mechanical disturbances, heavy shock or excessive vibration during the early portion of the curing period.

3.17 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

1. Defer joint filling until concrete has aged, as recommended by manufacturer. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.

C. Install joint filler full depth in saw-cut joints and formed joints.

3.18 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Engineer. Remove and replace concrete that cannot be repaired and patched to Engineer's approval.

B. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to

concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white Portland cement and standard Portland cement so that, when dry, patching mortar matches surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Engineer.

C. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
5. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

D. Perform structural repairs of concrete, subject to Engineer's approval, using epoxy adhesive and patching mortar.

E. Repair materials and installation not specified above may be used, subject to Engineer's approval.

3.19 FIELD QUALITY CONTROL

A. The Engineer will request the performance of all tests as outlined below during the construction of the project. The Owner shall arrange for and pay for all required field and laboratory tests and all tests shall be performed by a certified testing laboratory approved by the Engineer. The Contractor shall reimburse the Owner for all retesting of defective and non-compliant work. The testing coordination shall be by the Contractor.

B. Written reports shall be issued immediately after testing is complete; however, should any of the results be questionable, the Engineer shall be notified immediately so that corrective steps may be taken.

C. Should core testing or load testing be necessary due to inadequate strength results, the Contractor shall bear this cost also.

D. The following tests will be performed by the methods indicated:

Method Test	ASTM Designation
Sampling	C 172*
Slump Test	C 143*
Air Content	C 231* or C 173*
Compression Test Specimens	C 31* or C 42
Compressive Strength	C 39+ or C 42
Unit Weight	C 138

*Tests of a portion of a batch may be made on samples representative of that portion for any of the following purposes:

1. Determining uniformity of the batch.
2. Checking compliance with requirement for slump and air content when the batch is discharged over an extended period of time.
3. Checking compliance of the concrete with the specifications when the whole amount being placed in a small structure, or a distinct portion of a larger structure, is less than a full batch. Additional Test samples shall be made for in-situ environmental and curing methods.
4. For each strength test of specimens made according to ASTM Designation C 31, 4 standard 6" diameter test specimens shall be made. The test result, for acceptance, shall be the average of the strengths of 2 specimens, tested at 28 days.

E. Four test specimens (cylinders) shall be made for each mixture placed during the day and every corresponding 50 yards of concrete portion thereof or less. One shall be tested at seven (7) days for information, two shall be tested at twenty-eight (28) days for acceptance and one in reserve for later testing if required.

3.20 WATER TIGHTNESS TEST - NA

3.21 PROTECTION OF LIQUID FLOOR TREATMENTS

A. Protect liquid floor treatment, if any, from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments manufacturers and installer.

END OF SECTION 03 31 13

SECTION 04 73 00
MANUFACTURED STONE VENEER

PART 1 – GENERAL

1.01 SUMMARY

This section includes the materials to be furnished and installed where manufactured stone veneer is indicated on the Drawings.

1.02 REFERENCES

A. ASTM C 39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
B. ASTM C 67 - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile.
C. ASTM C 177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
D. ASTM C 192 - Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory.
E. ASTM C 482 - Standard Test Method for Bond Strength of Ceramic Tile to Portland Cement.
F. ASTM C 1670 - Standard Specification for Adhered Manufactured Stone Masonry Veneer Units.
G. ASTM C 1780 - Standard Practice for Installation Methods for Adhered Manufactured Stone Masonry Veneer
H. UL 723 - Standard for Safety for Surface Burning Characteristics of Building Materials.
I. ICC ES AC 51 Acceptance Criteria for Manufactured Stone Veneer
J. Masonry Veneer Manufactures Association (MVMA): Installation Guide for Adhered Manufactured Stone Veneer

1.03 SUMBITTALS

A. Submit under provisions of the General Conditions.

B. Action Submittals
   1. Product Data: Manufacturer's data sheets on each product to be used, including:
      a. Preparation instructions and recommendations.
      b. Storage and handling requirements and recommendations.
      c. Installation standards and methods.
   2. Shop Drawings: Submit drawings depicting proper installation and flashing techniques. Coordinate locations with those found on the Drawings.
   3. Selection Samples: For each finish product specified, two complete sets of color sample representing manufacturer's full range of available colors and textures.
   4. Verification Samples: For each finish product specified, two samples, minimum size 8 inches (203 mm) square, representing actual product, color, and texture.
   5. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

C. Closeout Submittals:
   1. Provide manufacturer's maintenance instructions that include recommendations for cleaning and repair of components.

2. Manufacturer's standard warranty, and any project-specific warranty, if elsewhere required. Warranties that extend beyond the Contractor's correction period shall be project-specific documents executed by the manufacturer and shall clearly indicate beginning and ending dates of the warranty period.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer who is a current member of Masonry Veneer Manufacture's Association (MVMA) with a minimum of 5 years documented experience manufacturing and marketing all Manufactured Stone products of the type specified in this section.

B. Installer Qualifications: Company with documented experience in installation of manufactured masonry of the type specified including at least five projects within a 400 mile (650km) radius of the Project.

C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
1. Minimum size 3 foot by 3 foot and showing transition to adjacent materials anticipated.
2. Do not proceed with remaining work until workmanship, color, texture and pattern are approved by Engineer.

1.05 DELIVERY, STORAGE AND HANDLING

A. Store and handle products in conformance with the manufacturer's requirements and recommendations.

B. Store products off the ground on pallets in manufacturer's unopened packaging until ready for installation.

C. Protect materials from precipitation and freezing temperatures. Product with visible frozen moisture should not be installed.

1.06 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

B. Cold weather installations: Maintain materials and ambient temperature at minimum 40 degrees F (4 degrees C) prior to, during, and 48 hours after installation.

C. Hot weather installations: Mist water on the scratch coated surface and the backs of the masonry veneer for installations that exceed 90 degrees (32 degrees C).

1.07 WARRANTY

A. Provide manufacturer's 50-year limited warranty.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer: Cultured Stone by Boral, StoneFacade by CertainTeed/Saint-Gobain, Imperial Stack by Veneerstone of Bowling Green, Kentucky, or equal.

2.02 MANUFACTURED STONE VENEER - GENERAL

A. Manufactured Stone Veneer Performance Requirements: Conforming to ASTM C 1670 and as follows:
   1. Compressive Strength: Not less than 1800 psi (12.4 MPa) average for 5 specimens and not less than 2100 psi (14.4 MPa) for individual specimen when tested in accordance with ASTM C 39 & ASTM C 192.
   2. Bond Between Manufactured Masonry Unit, Mortar and Backing: Not less than 50 psi (345 kPa) when tested in accordance with ASTM C 482 using Type S mortar.
   3. Thermal Resistance: R-value of not less than 0.355 per inch (25.4 mm) of thickness when tested in accordance with ASTM C 177.
   4. Freeze/Thaw: No disintegration and less than 3 percent weight loss when tested in accordance with ASTM C 67.
   5. Water Absorption: Tested in accordance with UBC 15-5 9-22% depending on density value.
   6. Unit Weight: Not more than 15 psf (73 kg/m2) saturated.
   7. Surface Burning Characteristics: Not more than the following when tested in accordance with UL 723:
      a. Flamespread: 25.
      b. Smoke Development: 450.
   8. UV Stable - Mineral oxide pigments.

B. Certifications:
   1. ICC ES AC 51 Acceptance Criteria for Manufactured Stone Veneer
   2. ICC Evaluation Service - ASTM C 1670

2.03 MANUFACTURED STONE – STYLE

A. Style and dimensions of manufactured stone shall be Boral Cultured Stone “Country Ledgestone”, or equal and includes matching corner pieces.
   1. Heights: Variable from 1-1/2 inches to 6 1/2 inches (38 mm to 162 mm).
   2. Lengths: Variable from 4-3/4 inches to 22 inches (120 mm to 560 mm).
   3. Color shall be selected by Owner (preliminary selection is Boral “Bucks County”).
   4. Walls: Provide with single color and texture throughout.

2.04 ARCHITECTURAL TRIM STONES

A. Provide cap stones, trim stones, and special shapes of the same manufacturer and style, where indicated on the Drawings and as needed for finished appearance at all edges and interruptions.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared in conformance with ASTM C 1780 for the backup wall system indicated on the Drawings.

B. If substrate preparation is the responsibility of another installer, notify Engineer of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install manufactured stone masonry veneer in accordance with MVMA Installation Guide for Adhered Manufactured Stone Veneer, ASTM C 1780 and applicable Codes.

C. Install/Apply Related Materials in accordance with type of substrate and manufactured stone veneer manufacture's installation instructions.

D. General:
   1. Walls: Provide with Single Color and Texture throughout.

   2. Special Shapes: Color to match stones specified.
      a. Provide Stones manufactured specifically for installation at corners where located on the Drawings.
      b. Install Quoins on corners as indicated on the Drawings.
   3. Mortar Joints
      a. Style:
         1) Tight fit joints.
         2) Standard 1/2 inch tooled
         3) Wide joint
         4) Wide overgrout
      b. Strike all grout joints flush.
      c. Tool all grout joints.
      d. Overgrout all grout joints.
   4. Stone Direction:
      a. Random placement
      b. Horizontal placement
      c. Vertical placement
   5. Windows, Doors & Wall Openings:
      a. Butt field stones to wall opening.

b. Install specified trim stones where located on the Contract Drawings.

6. Sills: Install Sills where located on the Drawings.
7. Caps: Install Capstones where located on the Drawings.

D. Seal all joints at wall openings and penetrations with a sealant approved for use with masonry products.

E. Flashing: Coordinate with Flashings specified elsewhere.

3.04 CLEANING

A. Clean manufactured masonry in accordance with manufacturer's installation instructions

3.05 PROTECTION

A. Protect finished work from rain and work on either side of the wall during and for 48 hours following installation.

B. Protect installed products until completion of project.

C. Clean prior to project closeout.

D. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 05 40 00
COLD-FORMED METAL FRAMING

PART 1 – GENERAL

1.01 SUMMARY

This section covers the construction and supply of cold-formed metal stud walls and floor joists where indicated on the Drawings. For non-load-bearing, interior partition walls refer to Section 09 05 13.13.

1.02 REFERENCES

AISI S100 "North American Specification for the Design of Cold-Formed Steel Structural Members."
AISI S200 "North American Standard for Cold-Formed Steel Framing - General Provisions."
AISI S201 "North American Standard for Cold-Formed Steel Framing - Product Standard."
AISI S202 "Code of Standard Practice for Cold-Formed Steel Structural Framing."
AISI S240 "North American Standard for Cold-Formed Steel Structural Framing."
2018 NC State Building Code

1.03 SUBMITTALS

A. General – Submit listed submittals in accordance with the General Conditions.

B. Action Submittals:
   1. Product Data: Submit manufacturer's complete product literature for specified products and accessories, including:
      a. Physical properties demonstrating compliance with the Specifications and suitability for the intended use.
      b. Manufacturer's storage, handling, and application requirements and recommendations.
      c. All certifications per QUALITY ASSURANCE requirements of this section.
      d. Any clarifications or exceptions.
   2. Shop Drawings:
      a. Provide Shop Drawings prepared by cold-formed metal framing manufacturer and based on design by professional engineer employed by manufacturer.
      b. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
      c. Indicate as applicable: reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

C. Closeout Submittals:
   1. Manufacturer's standard warranty, and any project-specific warranty, if elsewhere required. Warranties that extend beyond the Contractor's correction period shall be project-specific documents executed by the manufacturer and shall clearly indicate beginning and ending dates of the warranty period.

1.04 QUALITY ASSURANCE

A. Manufacturing Facility Inspection Agency Qualifications: Qualified according to IAS Accreditation Criteria for Inspection Agencies (AC98) and has demonstrated compliance with ISO/IEC Standard 17020, Conformity assessment - Requirements for the operation of various types of bodies performing inspection for testing indicated.

B. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment, indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

C. Welding Qualifications, if applicable: Qualify procedures and personnel according to the following:
   1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
   2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

D. Comply with the AISI specifications and standards listed in Paragraph 1.02.

E. Installer: Installation of cold-formed steel framing shall be done by workmen experienced in this trade.

F. Manufacturer’s Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.

G. Manufacturer’s Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.

1.05 DELIVERY AND STORAGE OF MATERIALS

All materials shall be delivered in their original unopened packages, containers, and bundles bearing the name of the manufacturer. Protect and store cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling as required in AISI's "Code of Standard Practice." Damaged or deteriorated materials shall be removed from the premises.

PART 2 – PRODUCTS

2.01 MANUFACTURER

A. All materials included herein shall be manufactured by companies regularly engaged in producing such materials and shall be installed where indicated and as specified. Product names and numbers listed herein are used to establish the type and performance required but do not restrict experienced manufacturers from being allowed. Subject to compliance with requirements, provide cold-formed steel framing products by ClarkDietrich, CEMCO, Super Stud Building Products, or equal.

2.02 PERFORMANCE REQUIREMENTS

A. Engage a qualified professional engineer to design cold-formed steel framing (shop drawings).

B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.
   1. Design Loads: As indicated on Structural Drawings, and in accordance with applicable Building Code.
   2. Deflection Limits: For deflection calculations, wind pressures may be reduced in accordance with International Building Code (IBC) table 1604.3, footnote f. Design framing systems to withstand design loads without deflections greater than the following:
      a. Exterior Load-Bearing and Exterior Non-Load-Bearing Wall Framing: Horizontal deflection depending upon type of cladding supported:
         1) Brick or Stone or Masonry Veneer: l/600 of wall height.
         2) Stucco or Portland Cement Plaster or Tile or Thin Brick: 1/360 of wall height.
         3) Exterior Insulation and Finish System (EIFS): 1/240 of the wall height.
         4) Aluminum composite metal (ACM) or similar metal panel systems: 1/240 of the wall height.
      b. Interior Load-Bearing Wall Framing: Horizontal deflection of 1/240 of the wall height under a horizontal load of 5 lbf/sq. ft.
      c. Floor Joist Framing: Vertical deflection of 1/360 for live loads and l/240 for total loads of the span.
      d. Roof Rafter Framing: Vertical deflection of 1/240 of the horizontally projected span for live loads.
   3. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
   4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live and snow load deflection of primary building structure as follows:
      a. Upward and downward movement of 1-inch.
   5. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

C. Cold-Formed Steel Framing Standards: Unless more stringent requirements are indicated, framing shall comply with AISI S100 and AISI S240.

D. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Indicate design designations for UL's "Fire Resistance Directory" or from the listings of another qualified testing agency acceptable to authorities having jurisdiction.

2.03 COLD-FORMED STEEL FRAMING, GENERAL

A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
   1. Grade: for 33 and 43 mil thickness: ST33H. For 54 mil and greater thickness: ST50H.
   2. Coating: ASTM A653 G60 standard. Heavier galvanizing is permitted.

B. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
   2. Grade: 50.
   3. Coating: G90.

2.04 LOAD-BEARING AND EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated on Drawings, punched, with stiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: 0.0329 inch. (33 mil, structural 20 gauge)
   2. Flange Width: 1-3/8 inches minimum.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:
   1. Minimum Base-Metal Thickness: 0.0329 inch.
   2. Flange Width: 1-1/4 inches minimum.

C. Steel Box or Back-to-Back or L-Headers: Manufacturer's standard C-shapes or L-shapes used to form header beams, of web depths indicated, unpunched, with stiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: 0.0329 inch.
   2. Flange Width: 1-3/8 inches minimum for C-shapes, and top flange width minimum 2 inches for L-shapes.

D. Vertical Deflection Clips: Manufacturer's standard bypass and head-of-wall clips, capable of accommodating 1.5 inch upward and downward vertical displacement of primary structure (with total vertical movement of 3 inches) through positive mechanical attachment to stud web. Minimum deflection clip thickness: 97 mil (12 gauge).

E. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:
   1. Minimum Base-Metal Thickness: 0.0428 inch (43 mil, 18 gauge).
   2. Flange Width: 1 inch plus the design gap, or 1.5 inches, whichever is greater.

2.05 FLOOR JOIST FRAMING

A. Steel Joists: Manufacturer’s standard C-shaped steel joists, of web depths indicated, with stiffened flanges, and as follows:
   1. Minimum Base Metal Thickness: 0.0428 inch (43 mil, 18 gauge).
   2. Flange Width: 1-5/8 inches minimum.

B. Steel Joist Trace: Manufacturer’s standard U-shaped steel joist track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: Matching steel joists.
   2. Flange Width: 1-1/4 inches minimum.

2.06 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.
B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
   1. Supplementary framing.
   2. Bracing, bridging, and solid blocking.

3. Web stiffeners.
4. Anchor clips.
5. End clips.
6. Foundation clips.
7. Gusset plates.
8. Joist hangers and end closures.
9. Hole reinforcing plates.
10. Backer plates.

2.07 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

B. Anchor Bolts: ASTM F 1554, Grade 36 minimum, threaded carbon-steel bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.

D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.

E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
   1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

2.08 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint must comply with one of the following: SSPC-Paint 20, MIL-P-21035B, or ASTM A 780.

B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, Portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107/C 1107M, with fluid consistency and 30-minute working time.

D. Shims: Load bearing, high-density multimonomer plastic, and nonleaching; or of cold-formed steel of same grade and coating as framing members supported by shims.

E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.09 FABRICATION

A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to code-referenced American Iron and Steel Institute (AISI) specifications and standards, manufacturer's written instructions, and requirements in this Section.
   1. Fabricate framing assemblies using jigs or templates.
   2. Cut framing members by sawing or shearing; do not torch cut.
   3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.

      a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
      b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by no fewer than three exposed screw threads.

   4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.

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

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:

   1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
   2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Before sprayed fire-resistive materials are applied, if any, attach continuous angles, Z-Furring, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

B. After applying sprayed fire-resistive materials, if any, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials

below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

C. Install load bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch to ensure a uniform bearing surface on supporting concrete or masonry construction.

D. Install sealer gaskets at the underside of wall bottom track or rim track at the top of foundation wall or slab at stud or joist locations.

3.03 INSTALLATION, GENERAL

A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed steel framing according to ASTM C1007 and to manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
   1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
   1. Cut framing members by sawing or shearing; do not torch cut.
   2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
      a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
      b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.

H. Install insulation, if specified elsewhere, in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

I. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
   1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.04 LOAD-BEARING WALL INSTALLATION

A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and anchor at spacings to match stud spacing, or as shown on Shop Drawings.

B. Squarely seat studs against top and bottom tracks with gap not exceeding 1/8 inch between the end of wall framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs at maximum 16” on center, or as indicated on approved shop drawings.

C. Set studs plumb, except as needed or required for nonplumb walls or curved surfaces and similar configurations.

D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.

E. Align floor and roof framing over studs according to AISI S200, Section C1. Where framing cannot be aligned, continuously reinforce track to transfer loads.

F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.

G. Install headers over wall openings wider than stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.
   1. Frame wall openings with not less than a double stud at each jamb of frame as indicated on Shop Drawings. Fasten jamb members together to uniformly distribute loads.
   2. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.

H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.

I. Install horizontal bridging in stud system, spaced vertically as indicated on Shop Drawings. Fasten at each stud intersection.
   1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of two screws into each flange of the clip angle for framing members up to 8 inches deep.
   2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.

J. Where required for overall structural shear wall lateral bracing, install steel sheet diagonal bracing straps to both stud flanges, terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.

K. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.05 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs at maximum 24” on center, or as indicated on approved shop drawings.

C. Set studs plumb, except as needed or required for nonplumb walls or curved surfaces.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
   1. Install single deep-leg deflection tracks and anchor to building structure.
   2. Connect vertical deflection clips to bypassing and infill studs and anchor to building structure.
   3. Connect drift clips to cold-formed metal framing and anchor to building structure.

E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings. Fasten at each stud intersection.
   1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 24 inches of top single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges. At bridging line, install solid blocking at each end of bridging straps, and at a maximum spacing of 120 inches on center.
   2. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
   3. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges. At bridging line, install solid blocking at each end of bridging straps, and at a maximum spacing of 120 inches on center.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.06 JOIST INSTALLATION

A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.

B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track, or use end stiffeners for joist/track connection where attachment to one flange is not accessible.
   1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches.
   2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections as indicated on Shop Drawings.

C. Space joists not more than 2 inches from abutting walls. Joist spacing shall be as indicated on approved shop drawings, but not more than 24 inches.

D. Frame openings with built-up joist headers consisting of joist and joist track, or another combination of connected joists if indicated.

E. At bearing walls and interior supports, provide web stiffeners and solid blocking as required or indicated on Shop Drawings, to transfer both vertical and lateral forces from walls above.

F. Install bridging at intervals indicated on Shop Drawings. Fasten bridging at each joist intersection as follows:
   1. Bridging: Joist-track or proprietary solid blocking of width and thickness indicated, secured to joist webs.
   2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated, and joist-track or proprietary solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs. At bridging line, install solid blocking at each end of bridging straps, and at a maximum spacing of 120 inches on center.

G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.

H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.07 REPAIRS AND PROTECTION

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

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 05 50 01
METAL FABRICATIONS

PART 1 – GENERAL

1.01 SUMMARY

This section includes all miscellaneous metal work not specified under other sections and includes such items as grating, railing, stairways, and other fabricated items.

1.02 REFERENCES

ASTM A-36	Structural Steel
Miscellaneous Steel	Mild Steel
ASTM A-307, Grade B	Bolts
ASTM A-325 Steel	Strength Bolts
ASTM A-502	Rivets
ASTM A 525	Hot-dip Galvanizing
ASTM A 563, Grade A	Hex Nuts
ASTM A-53, Grade B	Structural Steel Pipe
ASTM A-48	Gray Iron Castings
ASTM B-308	Aluminum Structural Shapes
ASTM B-221	Aluminum Extrusions
ASTM B-209	Aluminum Sheets & Plates
ASTM B-26	Aluminum Castings
AWS Spec for Arc Welding	Welding Rods
ASTM A-276-Type 304, And Type 316 Condition A	Stainless Steel
NAAMM Std. AMP 510	National Association of Architectural Metal Manufacturers "Metal Stairs Manual", latest edition
NAAMM Std. AMP 521	National Association of Architectural Metal Manufacturers "Pipe Railing Systems Manual", latest edition

1.03 SUBMITTALS

A. General – Submit listed submittals in accordance with the General Conditions.

B. Action Submittals:
Product Data: Submit manufacturer's (or fabricator's) complete product information for the specified materials including:
1. Physical properties and dimensions demonstrating compliance with the Specifications and suitability for the intended use. For the interior stairs, including, anchor bolts, platforms, columns, and rails, submit shop drawings.
2. Manufacturer's storage, handling, and installation requirements and recommendations.
3. Project-specific information
4. Any clarifications or exceptions.

C. Closeout Submittals:
1. Manufacturer's standard warranty, and any project-specific warranty, if elsewhere required. Warranties that extend beyond the Contractor's correction period shall be project-specific documents executed by the manufacturer and shall clearly indicate beginning and ending dates of the warranty period.

PART 2 – PRODUCTS

2.01 GENERAL

All materials shall meet the requirement of the latest edition of the reference standards, listed in Article 1.02, unless otherwise designated elsewhere.

2.02 INTERIOR STAIRS, RAILS AND LANDINGS

Interior stairs shall be of structural steel construction, with aluminum grating type treads, platforms and landings, complete with double stair rails on newels, and all reinforcement, struts, brackets, headers, connectors, etc., necessary to fabricate and erect stairs to conform with lines, dimensions, elevations, and details indicated on the Drawings and herein. Stairs may be shop and field fabricated or prefabricated and pre-erected at Contractor's option, installed to conform with pertinent codes and ordinances, and with NAAMM publication "Metal Stairs Manual". Stairs and appurtenances shall meet the North Carolina State Building Code, and shall support minimum live loads as indicated on the Appendix B building code design summaries on the structural Drawings.

In the absence of load design criteria on the Appendix B summaries, use the following minimum criteria:

Vertical (downward) Live Load: 100 PSF (300 lb. concentrated)
Seismic Design Category: B Site Classification: C
Other criteria as recommended in the NAAMM Manual, based on Industrial Class Stairs

In addition to design details indicated on the Drawings, the exterior stairway structure shall provide the following:

Nominal Tread Width: 11”
Stairway clear width: 48”
Tread type: Aluminum grating with cast abrasive nosing (McNicols Type C or equal)

2.03 GRATINGS

Aluminum Grating: Furnish and install all aluminum grating and frames as required and where shown on the Contract Drawings.

Material: All grating and frames shall be 6063-T6 or 6061-T6 aluminum alloy as required. Finish shall be standard mill with acidic detergent cleaning.

Gratings shall be designed for supporting 150 pounds per square foot uniform load with a maximum deflection of ¼-inch.

Gratings shall be pressure lock or welded type with straight bearing bars and crossed bars. Unless other noted, I-Bar bearing bars shall be a minimum of 3/16-inch thick by 2-inch deep and shall be spaced not more than 1 and 3/16-inches on center. Cross bars shall be spaced not more than 4 inches on center.

The edges of all sections shall be edge banded on all four sides. Edge banding shall be welded to all grating bars. Provide reinforcing as required around openings and holes so that capacity of deck is not reduced.

Gratings shall be accurately fabricated, free from warps, twists, or other defects which affect the appearance and serviceability of the grating.

Angle frames for grating shall be aluminum to match the grating material.

Floor gratings shall be erected in place on supporting angles, as shown on the Drawings, and shall have a full and uniform bearing on the supports, without rocking. Wedges or shimming devices will not be permitted. Grating panels shall be locked securely in place with removable hold-down fastenings (minimum of four per panel).

All gratings shall be designed and fabricated such that not more than ¼-inch clearance shall exist between gratings and frames.

All surfaces in contact with concrete or structural steel shall be painted with unthinned bitumastic paint or otherwise effectively insulated against concrete.

2.04 PIPE RAILINGS

Pipe railings shall be designed and installed to conform with pertinent codes and ordinances, with NAAMM AMP 521 publication "Pipe Railing Systems". Railing shall support a minimum live load of 50 pounds per linear foot, applied in any direction to the top rail, and a 200 pound concentrated load applied in any direction at any point.

Pipe railings shall be aluminum or galvanized steel, whichever is indicated on the Drawings.

All aluminum castings shall be alloy 214.

All exposed fastenings in aluminum railings shall be stainless steel or aluminum. Stainless steel fittings shall be satin finished.

Cover flanges, floor and angle flanges, wall brackets, end caps, and other fittings necessary for a complete installation shall be standard fittings as manufactured by Julius Blum and Company, Inc., Wagner, Thompson Fabricating, LLC or equal, and shall be of the material of the railing.

Aluminum pipe railings shall receive a caustic etch and clear anodized finish AA-C22-A41.

Welded alloys for aluminum railing shall be selected to match the color of the railings. A color matching lacquer spray may be used at welds if specifically approved by the Engineer prior to fabrication.

Railings shall be formed to the design shown on the drawings in the pipe size indicated. All connections shall be welded and dressed smooth. Vertical members shall not be more than 6 ft. 0 in. on center and shall be located not more than 1 ft. 0 in. from ends of railings or changed in direction. Top of railing should be 3 ft. 6 in. above deck and as shown on stair details. The system shall be composed of two horizontal rails equally spaced.

Railings mounted on concrete walls or floors shall be installed in 6-inch deep galvanized pipe sleeves and the joints shall be filled with an approved quick setting anchor cement. Alternative designs using cast aluminum plates with Type 304 stainless steel concrete wedge anchors will be allowed, subject to review and approval by Engineer.
Horizontal pipe rails terminating at columns or walls shall be secured with flush, concealed fastening wall flanges. End caps shall be provided at any exposed ends of pipe railings.

Strength of posts, railings, and connections shall comply with requirements of both OSHA and North Carolina State Building Code.

An expansion joint and gap shall be provided in every top rail on a maximum of 25 ft. 0 in. Use 1/8-inch gap between bottom rail and each fitting.

Provide weep holes in all posts set in concrete or otherwise closed at bottom and in bends and elbows at low points.

Alternative railing systems of equivalent design, using concealed mechanical connections may be used, subject to review and approval by Engineer.

PART 3 – EXECUTION

3.01 FIELD MEASUREMENTS

Measurements shall be verified in the field for all work fabricated to fit field conditions. Adjoining work shall be examined before work is started. Necessary corrective work shall be done to adjoining work to insure a proper fit.

Where prefabricated stairs must fit new construction, verify dimensions in the field prior to fabrication to assure fit up.

3.02 SHOP AND FIELD PAINTING

All ferrous metal, except stainless steel, galvanized surfaces and castings, shall be properly cleaned and shall be given one shop coat of primer compatible with the finish paint.

Anchors that are built into concrete and/or masonry shall be coated with asphalt paint unless specified to be galvanized. Metal work to be encased in concrete shall be left unpainted unless specified or noted otherwise.

Where hot-dip galvanized or zinc-coated metal is specified or shown, it shall not be shop primed. Castings that are to be left unpainted shall be cleaned and coated with a coal-tar pitch varnish. Shop paint at piece marks shall not be omitted.

Field abrasions, welds and other places where shop coat has been broken shall be painted in the field with the same paint as that used for the shop coat.

Aluminum in contact with masonry, concrete or dissimilar metals shall be back painted with two coats of unthinned bitumastic before installation or otherwise effectively isolated.

Field painting shall be in accordance with the Section 09 91 01 headed "Painting".

Hot-dip galvanizing shall conform to ASTM A525 and shall have a minimum coating as specified in designation G165 unless otherwise noted.

3.03 FABRICATION AND INSTALLATION

Fabrication and installation shall be in accordance with the latest edition of the following standard references: AISC "Specification for the Design, Fabrication and Erection of Structural Steel for Buildings", and "Code of Standard Practice for Steel Buildings and Bridges".

National Association of Ornamental Metal Manufacturers Handbook.

The Aluminum Association "Specifications for Structures of Aluminum Alloys", "Standards of Anodically Coated Aluminum Alloys for Architectural Applications", and "Designation System for Aluminum Finishes".

All metal work shall have smooth finished surfaces. Joints shall be ridged and adjoining welded joints shall be continuously welded unless otherwise specified or shown. The face of welds shall be dressed flush and smooth.

Wherever possible, welding shall be on the unexposed side in order to prevent pitting or discoloration. Exposed joints shall be close fitting and jointed where 1east conspicuous.

Connections and accessories shall be of sufficient strength to safely withstand stresses and strains to which they will be subjected. Steel accessories and connections to steel or cast iron shall be steel unless otherwise specified.

Fastenings shall be concealed where practicable. Threaded connections shall be made so that the threads are concealed by fittings. Connections and accessories for exterior work shall be galvanized unless otherwise specified or indicated.

Joints exposed to weather shall be formed true to detail, with clean, straight, sharply defined profiles, and smooth surfaces of uniform color, and texture, and shall be free from defects impairing strength of durability.

Unless otherwise specified, exposed aluminum surfaces, except nosings and thresholds, shall be free from die markings, scratchings, welding and discolorations, "leave off marks", or other surface blemishes and shall be given an anodic oxide treatment in accordance with AA-M10-C22-A41 Aluminum Association standard finishes.

A coating of metharylate lacquer shall be applied to the aluminum before shipment from the factory.

Work to be built in with masonry shall be of the form required for anchorage or shall be provided with suitable anchors. In general, anchorage to hollow masonry shall be with masonry strap anchors or toggle bolts and anchorage to concrete or solid masonry shall be with strap anchors or metal expansion bolts unless otherwise shown or specified. Fastening to wood or plastic plugs in masonry will not be permitted.

All supporting members, fastening, hangers, bracing, brackets, straps, bolts, clip angles and other items required to connect the work rigidly and properly to the masonry, concrete, structural steel or other construction shall be provided.

3.04 CLEANING AND PROTECTION

During and after erection, suitable precautionary methods shall be employed to adequately protect exposed surfaces of installed items from damage due to the installation of other work, damage from lime, acid, cement or other harmful compounds.

All aluminum shall be thoroughly cleaned with clear water and an approved commercial cleaner. No abrasive cleaning agent shall be used. Any work which has been damaged, discolored, defaced or does not otherwise comply with these specifications will not be accepted.

END OF SECTION

SECTION 06 11 00
WOOD FRAMING

PART 1 – GENERAL

1.01 SUMMARY

This section includes heavy timber framing of exterior shelters and porch roof, along with decking and trim to be connected to these structures and to steel structures.

1.02 REFERENCES

DOCPS 20	Department of Commerce Voluntary Product Standard PS 20-10
SPIB	Southern Pine Inspection Bureau
NC Building Code	
AWPA Standards U1 and M4	American Wood Protection Association U1-Interior Dry M4-Standard for the Care of Preservative-Treated Wood Products

1.03 SUBMITTALS

A. General – Submit listed submittals in accordance with the General Conditions.

B. Action Submittals:
   1. Product Data: Submit literature showing proposed suppliers of wood, product details and evidence of compliance with these specifications, along with the same for attachment devices and other components.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

Protect wood products during transit, delivery, storage and handling to prevent damage, soiling and deterioration.

PART 2 – PRODUCTS

2.01 GENERAL

A. Markings: All wood and wood products used for load-supporting purposes shall bear the grade mark of a lumber grading or inspection agency that has been approved by an accreditation body that complies with DOCPS20. For rough-sawn lumber and for sizes 5-inches or greater in nominal width, a certificate of inspection as to species and grade may be submitted in lieu of markings on the wood.

B. Framing Lumber: Where wood framing from 2 inches to 5 inches (but not including 5 inches) in nominal thickness, and 2 inches or more in nominal width is shown or scheduled: Provide lumber complying with grading rules which conform to the requirements of the “National Grading Rule for Dimension Lumber” of the American Lumber Standards Committee established under PS 20.

C. Framing lumber, except as otherwise specified or noted on the drawings for specific items (2 inches to 4 inches thick and 2 inches to 4 inches wide): Provide Southern Pine (SPIB), “Standard” grade for light framing.

D. Boards, General: Where lumber less than 2” in nominal thickness and 2” or more in nominal width is shown or specified, provide boards complying with dry size requirements of PS 20.

E. Plywood Standard: For each use, comply with the requirements for "Softwood Plywood/Construction and Industrial" PS 1 by the US Department of Commerce. Plywood shall be produced by a member of the American Plywood Association. Use grade "A" where exposed. Use grade "D" face where completely concealed.

F. All products shall comply with the NC Building Code Chapter 23, unless otherwise noted, and shall be preservative treated in accordance with applicable requirements of AWPA Standard U1 and M4.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Install plumb, level, true and straight with no distortions.

B. Cut to fit unless specified to be shop-fabricated or shop-cut to exact size.

C. Follow instruction of product manufacturers, applicable codes, and "Heavy Timber Construction" publication of the American Wood Council.

END OF SECTION

SECTION 06 40 01
ARCHITECTURAL WOODWORK

PART 1 – GENERAL

1.01 SUMMARY

The extent of each type of architectural woodwork is shown on the Drawings and in schedules.

A. "Architectural Woodwork" is defined to include (in addition to items so designated on the Drawings) all miscellaneous exposed wood members commonly known as Finish Carpentry, Millwork, and Casework, unless such items are specified under another section of these specifications.

B. Types of Architectural Woodwork include, but are not limited to the following:
   1. standing and running trim
   2. wood shelving
   3. cabinet work
   4. counter tops

1.02 REFERENCES

AWI	Architectural Woodwork Institite Quality Standards
ALSC	American Lumber Standards Committee, American Softwood Lumber Standard PS 20
LMA	Laminated Materials Association
SPIB	Southern Pine Inspection Bureau
BHMA	Builders Hardware Manufacturers Association

1.03 SUBMITTALS

A. General – Submit listed submittals in accordance with the General Conditions.

B. Action Submittals:
   1. Product Data: Submit shop drawings showing location of each item, dimensioned plans and elevations, large scale details, attachment devices and other components. Submit shop Drawings for the following:
      a. Cabinet work complete to include counters and hardware.
   2. Manufacturer's storage, handling, and installation requirements and recommendations.
   3. Certification: Indicate compliance with specified AWI Quality Standard and Grade and other specified requirements for materials and workmanship.
   4. Any clarifications or exceptions to the Specifications or Drawings.
   5. Samples: Samples will be reviewed by the Owner and Engineer for color, and texture and pattern to include appearance and finish. Compliance with all other requirements is the exclusive responsibility of the Contractor. Submit the following samples:
      a. Counter Tops: 2 samples
      b. Cabinets: 2 samples
      c. Cabinet Hardware: 2 samples
      d. Trim: 2 samples

C. Closeout Submittals:
   1. Manufacturer's standard warranty, and any project-specific warranty, if elsewhere required. Warranties that extend beyond the Contractor's correction period shall be project-specific documents executed by the manufacturer and shall clearly indicate beginning and ending dates of the warranty period.

1.04 QUALITY ASSURANCE

A. Source Limitations for Cabinets: Obtain cabinets through one source from a single manufacturer.

B. Quality Standards: Except as otherwise shown or specified, comply with specified provisions of the Architectural Woodwork Institute (AWI) "Quality Standards". Any reference to Premium, Custom, or Economy in this section shall be defined in latest edition of AWI "Quality Standards". All cabinet work shall be performed in a cabinet shop equipped with necessary tools for making furniture-like cabinets.

C. Lumber Standards: For each use, comply with the "American Softwood Lumber Standard" PS 20 by the US Department of Commerce. Nominal sizes are shown or specified; provide actual sizes complying with the minimum size requirements of PS 20 for the moisture content specified for each use. Provide dressed lumber, S4S, unless otherwise shown or specified.

D. Measurements: Before proceeding with woodwork required to be fitted to other construction, obtain measurements and verify dimensions and any shop drawing details as required for accurate fit. The Contractor and the Woodwork manufacturer shall cooperate to establish and maintain these field dimensions.

E. Optimum Moisture Content: Kiln dry woodwork to an average moisture content within the following ranges, or as otherwise recommended by applicable Quality Standards for the regional climatic conditions involved: interior woodwork – 5% to 10%

1.05 DELIVERY, STORAGE AND HANDLING

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

B. Do not deliver woodwork until building is enclosed, painting, wet work, grinding and similar operations which could damage, coil or deteriorate woodwork have been completed in installation areas and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period. If, due to unforeseen circumstances, woodwork must be stored in other than installation areas, store only in areas which meet the requirements specified for installation areas.

PART 2 – PRODUCTS

2.01 FRAMING LUMBER

Where wood framing from 2 inches to 5 inches (but not including 5 inches) in nominal thickness, and 2 inches or more in nominal width is shown or scheduled: Provide lumber complying with grading rules which conform to the requirements of the "National Grading Rule for Dimension Lumber" of the American Lumber Standards Committee established under PS 20.

Framing lumber, except as otherwise specified or noted on the Drawings for specific items (2 inches to 4 inches thick and 2 inches to 4 inches wide): Provide Southern Pine (SPIB), "Standard" grade for light framing.

2.02 BOARDS, GENERAL

Where lumber less than 2" in nominal thickness and 2"or more in nominal width is shown or specified, provide boards complying with dry size requirements of PS 20.

2.03 PLYWOOD STANDARD

For each use, comply with the requirements for "Softwood Plywood/Construction and Industrial" PS 1 by the US Department of Commerce. Plywood shall be produced by a member of the American Plywood Association. Use grade "A" where exposed. Use grade "D" face where completely concealed.

2.04 SHELVING

Stain finish shall be AWI Quality Standards Section 600, Custom Grade. Unless otherwise shown, provide ¾" thick wood board, or plywood shelves at the Contractor's option. For Custom Grade plywood shelves, fabricate exposed edges with glued, solid wood edge bands.

2.05 COUNTER TOPS

Counter Tops shall be Plastic Laminate as manufactured by Formica Corporation, Laminart equal, Nevamar Corporation equal, or other approved equal. Colors, texture and pattern shall be selected by owner from manufacturer's full range for these characteristics.

2.06 CABINETS

A. Acceptable Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
Cabinets:
a. Shenandoah Cabinetry. (Dominion – Oak, Tawny; Edgeworth – Maple, Cognac)
b. Diamond Cabinetry. (Anaheim – Maple, Cattail; Vancouver – Oak, Natural)

B. Exposed Materials: Comply with the following:
1. Veneered construction:
a. Species: Maple, Oak.

b. Veneer thickness: Minimum 1/52" after sanding.

c. Adjacent exposed faces shall be similar in color, grain, figure, and natural character markings.

2. Solid Wood:
a. Species: Maple, Oak.

b. Lumber grade: AWI Grade free of defects, selected for compatible grain and color.

3. Plywood: Hardwood plywood complying with HPVA HP – 1 face veneer of species indicated with Grade A faces and Grade C backs of same species as faces.

4. Edge banding: Exposed edges with minimum 1/8 inch (3 mm) thick, solid-wood edging of same species as face veneer.

B. Semi-exposed Materials: Unless otherwise noted, provide the following:

1. Plywood: Hardwood plywood complying with HPVA HP-1 with Grade C faces and backs stained to be compatible with exposed surfaces.

C. Concealed Materials: Comply with the following:
   1. Plywood: Any hardwood or softwood species, with no defects affecting strength or utility.

2.07 CABINET HARDWARE

A. General: Manufacturer's standard units complying with BHMA A156.9, type, material, size, and finish as selected from manufacturer's standard choices.

B. Hinges: Concealed European-style, 6-way adjustable hinges.

C. Pulls: Routed Finger Pulls or Pull Tabs. Style shall be selected by owner from manufacturer's options.

D. Drawer Guides: Undermount, self-closing drawer guides, designed to prevent rebound when drawers are closed; with nylon-tired, ball bearing rollers; and complying with BHMA A156.9, type B05091.

   1. Full extension runners with easy-release mechanism.

2.08 CABINET CONSTRUCTION

A. Architectural cabinets shall comply with AWI Standards, Section 400.

B. Face Style: Reveal overlay: door and drawer faces partially cover body or face frame.

C. Face Frames: 3/4-by-1 1/2-inch (19-by-38-mm) solid wood.

D. Door and Drawer Fronts: Solid wood stiles and rails, 3/4-inch (19mm) thick, with 5/8-inch (16mm) thick, solid-wood center panels.

E. Exposed Cabinet Ends: 3/4-inch (19mm) thick, veneer-faced plywood with natural birch veneer interior.

F. Cabinet Tops and Bottoms: 1/2- inch (12.7mm) thick natural birch veneer-faced plywood, supported by and secured in rabbits in end panels and front face frame.

G. Base Unit Top Rails: 3/4 by 2 3/4-inch solid wood, interlocking with end panels, and secured under pressure with glue and with mechanical fasteners.

H. Wall-Hung Unit Top and Bottom Rails: 1/2 by 2 1/2-inch solid wood, interlocking with end panels, and secured with glue and mechanical fasteners.

I. Wall-Hung Unit Backs: 3/16-inch thick plywood or 1/8-inch hardboard, captured on the end panels and fastened to the top and bottom rails.

J. Front Face Frame Drawer Rails: 3/4-by-1 1/2-inch solid wood fastened into face frame.

K. Drawers: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
   1. Join subfronts, backs, and sides with glued dovetail joints.
   2. Subfronts, backs, and sides: 3/4-inch (19mm)-thick solid wood.

L. Shelves: 5/8-inch-(16mm)-thick plywood.

M. Joinery: Rabbet backs flush into end panels and secure with concealed mechanical fasteners. Connect tops and bottoms of wall cabinets and bottoms of base cabinets to ends and dividers with mechanical fasteners. Rabbet tops bottoms, and backs into end panels.

N. Factory Finishing: To the greatest extent possible, finish cabinets at the factory. Defer only final touch up until after installation.

PART 3 – EXECUTION

3.01 JOB CONDITIONS

A. Examination of Substrate and Conditions: Installer must examine the substrate and the conditions under which the work under this section is to be performed, and notify the Contractor in writing of any unsatisfactory conditions. Do no proceed with work under this section until satisfactory conditions have been corrected in a manner acceptable to the installer.

B. Installer shall advise Contractor of temperature and humidity requirements for woodwork installation areas. Do not install woodwork until the required temperature and relative humidity have been stabilized in installation areas.

C. Maintain temperature and relative humidity as required for tolerance of plus or minus 1% of the specified optimum moisture content until woodwork receives specified finishes. Maintain temperature and humidity conditions until acceptance of the work by the Owner.

D. Protect installed woodwork from damage by other trades until Owner's acceptance of the work. Advise Contractor of required protection procedures.

3.02 PREPARATION

A. Condition woodwork to average prevailing humidity conditions in installation areas prior to installing.

B. Backprime woodwork on all surfaces which will be concealed with one coat of primer. Schedule delivery to allow time for application and drying of backprime coat before installation of woodwork.

C. Fabricate cabinet work in the shop, in sections as large as practical, as indicated on Drawings and in accordance with requirements of AWI Quality Standards Section 400, for Custom Quality Casework.

3.03 INSTALLATION

A. Install plumb, level, true and straight with no distortions. Shim as required using concealed shims.

B. Cut to fit unless specified to be shop-fabricated or shop-cut to exact size. Where woodwork abuts to other finished work, scribe and cut for accurate fit. Before making cut-outs, drill pilot holes at corners.

C. Distribute defects allowed in the quality grade specified to the best overall advantage, when installing job assembled woodwork items.

3.04 FINISH CARPENTRY

A. All joints shall be left in suitable condition for the painter to completely conceal without the use of any non-detailed mold.

B. All rabbets will be neatly done and carefully glued with waterproof glue to assure watertight seal.

C. Coordinate efforts with the painter to back prime all unexposed surfaces where danger of water penetration exists.

D. Blind nail wherever possible. Where it is not possible, use casing or finish nails and set for putty.

E. All work shall be straight, true, plumb and level. All joints shall be neat.

F. Built-up sections shall be made of longest practical lengths of material and joints in adjacent pieces staggered. All corners to be mitered, angles coped. All work shall be braced.

G. Plywoods shall be neatly jointed.

H. Where dissimilar materials join, work is to be performed in such a manner that neat joints may be obtained without use of molds unless detailed specifically.

I. Workmanship: Of the highest quality, done to established standards by skilled and experienced craftsman. Poor quality results will be cause for rejection.

3.05 ADJUST AND CLEAN

A. Repair damaged or defected work as directed.

B. Adjust and lubricate hardware for proper operation.

C. Clean exposed interior and exterior surfaces.

D. Clean shop finished woodwork, touch-up finish as required and remove and refinished damaged soiled areas of finish.

END OF SECTION

SECTION 07 21 05
THERMAL INSULATION

PART 1 – GENERAL

1.01 SUMMARY

This section includes the supply and installation of all insulation shown on the Drawings and/or specified.

1.02 REFERENCES

2018 North Carolina State Building Code: Energy Conservation Code.

1.03 SUBMITTALS

A. Submit under provisions of the General Conditions.
B. Action Submittals
    1. Manufacturer's data sheets on each product to be used, including:
        a. Preparation instructions and recommendations.
        b. Storage and handling requirements and recommendations.
        c. Material type, thickness and facing.
        d. Installation methods.

PART 2 – PRODUCTS

2.01 RIGID INSULATION

Rigid Insulation shall be Styrofoam SM/TG as manufactured by Dow Chemical Company or equal. Insulation shall have high density and skin and tongue and groove edges.

2.02 THERMAL EFFICIENCY OF INSULATION

Refer to Mechanical Plans for the Building Envelope Requirements, according to 2018 NC Energy Code.

2.03 GLASS FIBER INSULATION

Insulation shall be CWI-FRK faced, or un-faced as applicable, glass fiber insulation blanket as manufactured by Owens-Corning or equal. Where specified, facing shall be reinforced white vinyl. R-value shall be 19.0 unless otherwise specified.

2.04 INSULATION FILL FOR C.M.U. WALL

Insulation fill for C.M.U. wall, if any, shall be perlite loose fill insulation poured in to C.M.U. cores. Fill shall be installed in accordance with the recommendation of Perlite Institute. Fill shall extend the full height of all C.M.U. walls. Alternately, insulation in C.M.U. walls may be foam equal to Core-Fill 500 by Tailored Chemical Company. All recommendations or instructions by the foam supplier for installation shall be followed.

PART 3 – EXECUTION

3.01 GENERAL

Installation shall be in strict accordance with the manufacturer's instructions and recommendations, applicable codes, and the Drawings.

END OF SECTION

SECTION 07 41 13
METAL ROOF PANELS, GUTTERS, AND SNOW BARS
(ACCESSORY STRUCTURES)

PART 1 – GENERAL

1.01 SUMMARY

A. Standing seam roof panels where indicated on the Drawings (recycle center shelters and attendant building). Also included, are all necessary trims, fasteners and sealants as required for a weathertight installation, gutter system, and snow bars. Panels shall be secured to the structure with concealed clips, mechanically closed single lock at the standing seam for weather tightness.
   1. Steel factory profiled panels with compatible joinery.
   2. Sealants between panels and their intersection.
   3. Mechanically closed single lock standing seam at side joint.
   4. Aluminum gutters and downspouts.
   5. Snow retention system clipped to standing seams of roof panels.

1.02 REFERENCES

A. Structural Performance
   1. ASTM E 1592 – Structural Performance of Metal Roof and Siding Systems by Uniform Static Air Pressure Difference
   2. UL 580 – Uplift Resistance of Roof Assemblies
   3. UL 1897 – Uplift Test for Roof Covering Systems

B. Vapor Barrier Performance
   1. ASTM E 1646 – Water Penetration of Exterior Metal Roof Panel Systems by Static Air Pressure Difference
   2. ASTM E 1680 – Rate of Air Leakage Through Exterior Metal Roof Panel Systems

C. Metal Coatings
   1. ASTM A 653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
   2. ASTM A 792 – Standard Specification for Steel Sheet, Aluminum-Zinc Alloy Coated Steel by the Hot-Dip Process
   3. ASTM A 924 – General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process

1.03 SUBMITTALS

A. Submit under provisions of the General Conditions.

B. Action Submittals
   1. Manufacturer’s data sheets on each product to be used, including:
      1. Preparation instructions and recommendations.
      2. Storage and handling requirements and recommendations.
      3. Material type, metal thickness and finish.
      4. Installation methods.
   2. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer’s full range of available colors and patterns.
   3. Panel Sample: Submit 1’ (305 mm) high joint panel sample for each profile specified indicating the metal, texture and finish.

4. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
5. Installer qualifications.

C. Closeout Submittals
1. Manufacturer's standard warranty, and any project-specific warranty, if elsewhere required. Warranties that extend beyond the Contractor's correction period shall be project-specific documents executed by the manufacturer and shall clearly indicate beginning and ending dates of the warranty period.
2. Maintenance data and instructions for roof panels.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Installed by a company with a minimum of five (5) years' experience with this type of construction, and documentation indicating successful completion of contracts for projects of similar size, scope and materials.
B. Manufacturer's Qualifications: The manufacturer shall have a minimum of ten (10) years' experience in production of factory profiled standing seam metal roof panels.

1.05 PERFORMANCE REQUIREMENTS

A. Structural Tests
1. Underwriters Laboratory (UL) Uplift Tests for Roof Assemblies: UL Class 90 uplift in accordance with UL 580.
2. Static Air Pressure Difference: Conducted in accordance with ASTM E 1592 Structural Performance of Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.

C. Vapor Barrier
1. Water and Air Penetration: The panel assembly when tested in accordance with ASTM E 1646 Water Penetration of Exterior Metal Roof Panel Systems by Static Air Pressure Difference and ASTM E 1680 Rate of Air Leakage Through Exterior Metal Roof Panel Systems shall not exceed standard penetrations.

1.06 DELIVERY, STORAGE AND HANDLING

A. Protect products of metal roof panel system during shipping, handling, and storage to prevent staining, denting, deterioration of components or other damage.
B. Deliver, unload, store, and erect insulated metal wall panels and accessory items without misshaping panels or exposing panels to surface damage from weather or construction operations.
C. Store in accordance with Manufacturer's written instruction.
D. Store products off the ground, with panels sloped for drainage and covered to protect factory finishes from damage. Stack bundles no more than two (2) high.

1.07 WARRANTY

A. Submit manufacturer's written two (2) year limited warranty providing panels to be free from defects in materials and workmanship, beginning from the date of substantial completion excluding coil coatings (paint finishes) that are covered under a separate warranty.
B. The installer shall issue a separate one (1) year warranty against defects in installed materials and workmanship, beginning from the date of substantial completion of the installation.
C. Submit Manufacturer's minimum twenty (20) year limited warranty on the exterior paint finish for adhesion to the metal substrate and minimum twenty (20) year limited warranty on the exterior paint finish for chalk and fade.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURER

A. Roof Panels as manufactured by MBCI (SuperLok), Centria equal, Kingspan equal, or other approved equal.

2.02 PANEL DESIGN

A. Roof Panels: Standing Seam Roof Panels; 12 or 16 inches wide net coverage, with minimum 2 inches high major ribs formed at the panel side laps, formed for field seaming using electrically operated seaming machine.
   1. Side joints: Factory applied sealant for field seaming.
   2. Material: Galvalume steel or G90 galvanized steel.
   3. Thickness: 24 gage (0.58 mm).
   4. Side laps: Two factory-formed interlocking ribs, with one weather sealed joint, field seamed into place to form a double-folded 360 degree seam.
   5. Length: Continuous from eave to ridge up to 52 feet (15.9 m) in length.
   6. End laps, where required: 4 inches wide, located at a support member.
   7. Panel-to-roof purlin structural attachments: clips with moveable tabs which interlock with seamed panel ribs and provide for 1-5/8 inches (441 mm) of panel movement in either direction from center of clip to compensate for thermal effects.
   8. Ridge assembly for high end of slopes: draw formed aluminum seam caps factory-attached to ridge panels that are seamed together along the center of the ridge, utilizing only one weather sealed joint and providing a true expansion joint for panel movement.
   9. Rake edge of roof shall be attached to the building structure in a manner which will allow thermal expansion of the roof panels along the gables and will provide the uplift resistance required by code.
   10. Roof assembly will meet the requirements for UL Class 90 uplift and FM Class 1-60, 1-75, 1-90, and 1-120. Certification includes IAS.
   11. Exterior Finish: One coat 70% polyvinylidene fluoride (PVDF) coil coating, nominal 0.7 mil (0.02 mm), over 0.2 mil (0.005 mm) primer; color as selected (by Owner) from manufacturer's standard colors.

B. Flashing and trim shall be brake-formed sheet metal in the same thickness and finish to match the panels.

2.03 GUTTER SYSTEM

Unless otherwise indicated on the Drawings, provide and install commercial-grade galvanized or aluminum-zinc clad painted steel gutters and downspouts on both eaves. Gutters to be nominal 5-inch SMACNA Type D with two 4"x4" downspouts per side, with minimum 0.032" thickness. Gutter shall have same material, finish and color as exterior facings of panels, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch long sections, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual". Furnish gutter supports spaced a maximum of 36-inches o.c., fabricated from same metal as gutters. Provide wire ball strainers of compatible metal at outlets. Provide at least one expansion joint per side. Downspouts shall be from the same material, finish, and color as exterior facings of roof panels. Fabricate in 10-foot long sections, complete with formed elbows and offsets, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual". Finish downspouts to match roof panels. Gutter system shall be designed to withstand snow loading.

2.04 SNOW RETENTION SYSTEM

Provide and install snow retention system on roof panels to prevent accumulated snow from suddenly sliding off roof during melting. Use only systems that clamp to standing seams with no penetration of roof panel metal by any fasteners. Provide a one rail system (or number recommended by manufacturer), with one assembly over the exterior wall and one assembly at the middle of the slope, for a total of two assemblies per slope. Clamps and bars (or pipes) shall be selected based on 30 pounds per square foot snow load and 4:12 roof pitch. All material shall be galvanized steel, aluminum, or stainless steel, and principal components that are visible (from 50 feet away and at same elevation as eave) shall be painted to match color of roof panels. The system must be compatible with roof panel system without interfering with thermal movement of panels. The roof panel manufacturer must approve the snow retention system. The system shall be substantially equivalent to S-5! Color Gard.

PART 3 – EXECUTION

3.01 GENERAL

Installation shall be in strict accordance with the manufacturer's instructions and recommendations.

3.02 EXAMINATION

A. Panel installer shall examine all structural steel before beginning installation to ensure that all supporting members are straight, level, plumb, properly braced and satisfactory for panel installation.
B. Proper alignment of the roof framing members is necessary to ensure proper fit up and performance of the roof assembly. Alignment tolerances required are specified below.
    1. Out of Square: The roof system can accommodate ¼" of saw tooth tolerance at the eave and end laps.
    2. Structural Length: The roof system can accommodate an overall +/- 2″ rake to rake tolerance or +/- 1″ at each rake.
    3. Structural Width: The roof system can accommodate an overall +/- 1″ eave to ridge tolerance, or +/- ½" at the eave, end lap and ridge.
    4. Vertical Alignment: The roof system can accommodate a vertical deviation from the nominal roof plane of +/- 1/8″ in any 5′ length, +/- ¼" in any 20′ length and +/- ½" over the entire roof area.
C. Do not begin installation until unsatisfactory conditions are corrected.

3.03 INSTALLATION

A. Installation of panels shall be made in accordance with manufacturer's recommended procedures, approved shop drawings, installation guide book and manufacturer's handbook of construction details.
B. Flashing and trim shall be installed true and in proper alignment. Sealant shall be installed where indicated or needed, without skips and voids, to insure weather tightness and integrity of the vapor barrier.

3.04 DAMAGED MATERIAL

A. Replace damaged panels and other components of work that cannot be repaired by finish touch-up or similar minor repair. Owner reserves the right to reject scratched panels since touch-up paint cannot equal factory finish.
B. The panel installer shall inspect and approve each completed wall area and the Contractor shall be responsible for protection of completed work from damage by other trades.

3.05 CLEANING

A. Wipe finished surfaces clean of any filings caused by drilling or cutting to prevent rust staining.
B. Protective film on trim should be removed before exposure to sunlight.

END OF SECTION

SECTION 07 41 13.23
INSULATED METAL ROOF PANELS, GUTTERS, AND SNOW BARS
(OFFICE AND SHOP)

PART 1 – GENERAL

1.01 SUMMARY

A. Pre-insulated standing seam roof panels where indicated on the Drawings. Also included, are all necessary trims, fasteners and sealants as required for a weathertight installation, gutter system, and snow bars. Panels shall be secured to the structure with concealed clips, mechanically closed single lock at the standing seam for weather tightness.
   1. Steel faced factory foamed-in-place profiled panels with compatible joinery.
   2. Sealants between panels and their intersection.
   3. Mechanically closed single lock standing seam at exterior side joint. Interior side joint is a single tongue and groove interlock.
   4. Aluminum gutters and downspouts.
   5. Snow retention system clipped to standing seams of roof panels.

1.02 REFERENCES

A. Fire Performance
   1. ASTM E 84 – Standard Test Method for Surface Burning Characteristics of Building Materials
B. Structural Performance
   1. ASTM E 1592 – Structural Performance of Metal Roof and Siding Systems by Uniform Static Air Pressure Difference
   2. FM Approval Standard 4471 – Class 1 Exterior Roof Structure Performance
   3. UL 580 – Uplift Resistance of Roof Assemblies
   4. UL 1897 – Uplift Test for Roof Covering Systems
C. Vapor Barrier Performance
   1. ASTM E 1646 – Water Penetration of Exterior Metal Roof Panel Systems by Static Air Pressure Difference
   2. ASTM E 1680 – Rate of Air Leakage Through Exterior Metal Roof Panel Systems
D. Thermal Performance
   1. ASTM C 518 – Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
E. Metal Coatings
   1. ASTM E 18 – Test Methods for Rockwell Hardness of Metallic Finishes
   2. ASTM A 653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
   3. ASTM A 792 – Standard Specification for Steel Sheet, Aluminum-Zinc Alloy Coated Steel by the Hot-Dip Process
   4. ASTM A 924 – General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
F. Canadian Certifications
   1. CAN/ULC S102 – Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies
   2. CAN/ULC S126 – Fire Spread Under Roof-Deck Assemblies
   3. CAN/ULC S138 – Fire Growth of Insulated Building Panels in a Full-Scale Room Configuration
G. Special Approvals
   1. City of Los Angeles – Product Approval for City/County of Los Angeles
   2. Miami Dade Roof – Product Approval for City of Miami and Dade County

H. Foam Properties
   1. ASTM D 1621 – Compressive Properties of Rigid Cellular Plastics
   2. ASTM D 1622 – Apparent Density of Rigid Cellular Plastics
   3. ASTM D 1623 – Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics
   4. ASTM C 273 – Shear Properties of Sandwich Core Materials

1.03 SUBMITTALS

A. Submit under provisions of the General Conditions.
B. Action Submittals
   1. Manufacturer's data sheets on each product to be used, including:
      1. Preparation instructions and recommendations.
      2. Storage and handling requirements and recommendations.
      3. Material type, metal thickness and finish.
      4. Installation methods.
   2. Shop Drawings: Including elevations, fastening patterns, sections of each condition and details as required.
   3. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
   4. Panel Sample: Submit 1' (305 mm) high joint panel sample for each profile specified indicating the metal, texture and finish.
   5. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
   6. Installer qualifications.
C. Closeout Submittals
   1. Manufacturer's standard warranty, and any project-specific warranty, if elsewhere required. Warranties that extend beyond the Contractor's correction period shall be project-specific documents executed by the manufacturer and shall clearly indicate beginning and ending dates of the warranty period.
   2. Maintenance data and instructions for roof panels.

1.04 QUAILTY ASSURANCE

A. Installer Qualifications: Installed by a company with a minimum of five (5) years' experience with this type of construction, and documentation indicating successful completion of contracts for projects of similar size, scope and materials.
B. Manufacturer's Qualifications: The manufacturer shall have a minimum of ten (10) years' experience in production of factory foamed-in-place insulated metal panels.

1.05 PERFORMANCE REQUIREMENTS

A. Structural Tests
   1. FM Approval Standard 4471: The panel meets requirements for I-60 or I-90 windstorm classifications and a hailstorm classification of Class 1-SH.
   2. Underwriters Laboratory (UL) Uplift Tests for Roof Assemblies: UL Class 90 uplift in accordance with UL 580, 16 gauge support members at 7′-0″, maximum spacing. Uplift resistance of 166 psf at 5′-0″ and 140 psf at 7′-0″ in accordance with UL 1897, using 16 gauge support members.
   3. Static Air Pressure Difference: Conducted in accordance with ASTM E 1592 Structural Performance of Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.
B. Thermal Performance
   1. Testing in accordance with ASTM C 518, "Measurement of Steady State Thermal Transmission", the panels shall provide a K-factor of .140 btu/sf/hr/deg. F at 75° F (24° C) mean temperature.

C. Vapor Barrier
   1. Water and Air Penetration: The panel assembly was tested in accordance with ASTM E 1646 Water Penetration of Exterior Metal Roof Panel Systems by Static Air Pressure Difference and ASTM E 1680 Rate of Air Leakage Through Exterior Metal Roof Panel Systems. Both tests were found in compliance with the test methods.

D. Fire
   1. FM Approval Standard 4471: The panel meets requirements of a Class 1A fire classification.
   2. Surface Burning Characteristics: The insulated core shall have been tested in accordance with ASTM E 84 for surface burning characteristics. The core shall have a maximum flame spread of 25 and a maximum smoke developed rating of 450.

1.06 DELIVERY, STORAGE AND HANDLING

A. Protect products of metal roof panel system during shipping, handling, and storage to prevent staining, denting, deterioration of components or other damage.
B. Deliver, unload, store, and erect insulated metal wall panels and accessory items without misshaping panels or exposing panels to surface damage from weather or construction operations.
C. Store in accordance with Manufacturer's written instruction.
D. Shield foam insulated metal wall panels from direct sunlight until installation.
E. Store products off the ground, with panels sloped for drainage and covered to protect factory finishes from damage. Stack bundles no more than two (2) high.

1.07 WARRANTY

A. Submit manufacturer's written two (2) year limited warranty providing panels to be free from defects in materials and workmanship, beginning from the date of substantial completion excluding coil coatings (paint finishes) that are covered under a separate warranty.
B. The installer shall issue a separate one (1) year warranty against defects in installed materials and workmanship, beginning from the date of substantial completion of the installation.
C. Submit Manufacturer's forty (40) year limited warranty on the exterior paint finish for adhesion to the metal substrate and thirty (30) year limited warranty on the exterior paint finish for chalk and fade.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURER

A. CFR Roof Panels as manufactured by Metl-Span of Lewisville, TX, Green Span equal, King Span equal, Firestone equal, MBCI equal, Centria equal, or other approved equal.

2.02 PANEL DESIGN

A. Panel – General Requirements: Roof Panel – Roll-formed exterior and interior steel sheet faces chemically bonded to continuously foamed-in-place polyurethane core; laminated panels are not acceptable.
   1. Exterior Face: G-90 galvanized stucco embossed painted steel, minimum Grade 50 and/or AZ-50 Aluminum-Zinc stucco embossed, painted steel and minimum thickness 26 ga (0.0187"); unless otherwise required to meet the load and deflection limits.

2. Interior Face: G-90 galvanized stucco embossed painted steel, minimum Grade 33 and/or AZ-50 Aluminum-Zinc stucco embossed, painted steel minimum Grade 33 and minimum thickness 24 ga (0.0236"); unless otherwise required to meet the load and deflection limits.
3. Longitudinal Joint Sealants: Field Applied
4. Foam Core: Non-CFC, Non-VOC, Class I polyurethane.
5. Exterior Finish: One coat 70% polyvinylidene fluoride (PVDF) coil coating, nominal 0.7 mil (0.02 mm), over 0.2 mil (0.005 mm) primer; color as selected from manufacturer's standard colors and shall be similar to Metl-Span's "Classic Green".
6. Interior Finish: One coat factory applied Polyester coil coating, nominal 0.7 mil (0.02 mm) in white or off-white color selected by Owner from manufacturer's standard colors, over 0.2 mil (0.005 mm) primer.

B. Roof Panel: The insulated metal roof panel shall have a tongue and groove interlock at the base of the panel and a mechanically closed standing seam at the exterior surface of the panel. The roof panel shall be attached to the structure with a clip and fasteners concealed within the side joint of the panel and the installation shall be completely from the exterior side of the building envelope. Exposed through fasteners into the ribs or flat areas of the panel from the exterior side are not acceptable. The roof panels shall be factory notched and swaged to facilitate endlapping of the panels, and the endlap extensions shall be factory cut and have all foam removed. Field notching, swaging and cutting of endlap extensions shall not be accepted. Endlaps shall also have factory installed backer plates to insure proper fit-up of the exterior faces for maximum water tightness.
   1. Exterior Profile: 2" high mechanically closed standing seam; with an 1/8" deep profile between the seams (similar to Metl-Span's "Mesa Wave").
   2. Interior Profile: Metl-Span Mesa Wave Pattern, 1/8" deep or Light Mesa Wave Pattern, 1/16″ deep; or similar offerings by other manufacturers and as selected by Owner.
   3. Module Width: 42"
   4. Thickness: 5"
   5. Foam core shall be continuously foamed-in-place min 92% closed cell structure, Non-CFC, Non-VOC polyurethane.
C. Flashing and trim shall be brake-formed sheet metal in the same thickness and finish to match the panels.

2.03 GUTTER SYSTEM

Unless otherwise indicated on the Drawings, provide and install commercial-grade galvanized or aluminum-zinc clad painted steel gutters and downspouts on both eaves. Gutters to be nominal 6"x6" SMACNA Type D with two 4"x4" downspouts per side, with minimum 0.032" thickness. Gutter shall have same material, finish and color as exterior facings of panels, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch long sections, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual". Furnish gutter supports spaced a maximum of 36-inches o.c., fabricated from same metal as gutters. Provide wire ball strainers of compatible metal at outlets. Provide at least one expansion joint per side. Downspouts shall be from the same material, finish, and color as exterior facings of roof panels. Fabricate in 10-foot long sections, complete with formed elbows and offsets, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual". Finish downspouts to match wall panels. Gutter system shall be designed to withstand snow loading.

2.04 SNOW RETENTION SYSTEM

Provide and install snow retention system on roof panels to prevent accumulated snow from suddenly sliding off roof during melting. Use only systems that clamp to standing seams with no penetration of roof panel metal by any fasteners. Provide a one rail system, with one assembly over the exterior wall and one mid-way down from

the peak, per side (four total assemblies). Clamps and bars (or pipes) shall be selected based on 30 pounds per square foot snow load and 4:12 roof pitch. All material shall be galvanized steel, aluminum, or stainless steel, and principal components that are visible (from 50 feet away and at same elevation as eave) shall be painted to match color of roof panels. The system must be compatible with roof panel system without interfering with thermal movement of panels. The roof panel manufacturer must approve the snow retention system. The system shall be substantially equivalent to S-5! Color Gard.

PART 3 – EXECUTION

3.01 GENERAL

Installation shall be in strict accordance with the manufacturer's instructions and recommendations.

3.02 EXAMINATION

A. Panel installer shall examine all structural steel before beginning installation to ensure that all supporting members are straight, level, plumb, properly braced and satisfactory for panel installation.
B. Proper alignment of the roof framing members is necessary to ensure proper fit up and performance of the roof assembly. Alignment tolerances required are specified below.
   1. Out of Square: The roof system can accommodate ¼" of saw tooth tolerance at the eave and end laps.
   2. Structural Length: The roof system can accommodate an overall +/- 2″ rake to rake tolerance or +/- 1″ at each rake.
   3. Structural Width: The roof system can accommodate an overall +/- 1″ eave to ridge tolerance, or +/- ½" at the eave, end lap and ridge.
   4. Vertical Alignment: The roof system can accommodate a vertical deviation from the nominal roof plane of +/- 1/8″ in any 5′ length, +/- ¼" in any 20′ length and +/- ½" over the entire roof area.
C. Do not begin installation until unsatisfactory conditions are corrected.

3.03 INSTALLATION

A. Installation of panels shall be made in accordance with manufacturer's recommended procedures, approved shop drawings, installation guide book and manufacturer's handbook of construction details.
B. Flashing and trim shall be installed true and in proper alignment. Sealant shall be installed where indicated or needed, without skips and voids, to insure weather tightness and integrity of the vapor barrier.

3.04 DAMAGED MATERIAL

A. Replace damaged panels and other components of work that cannot be repaired by finish touch-up or similar minor repair. Owner reserves the right to reject scratched panels since touch-up paint cannot equal factory finish.
B. The panel installer shall inspect and approve each completed wall area and the Contractor shall be responsible for protection of completed work from damage by other trades.

3.05 CLEANING

A. Wipe finished surfaces clean of any filings caused by drilling or cutting to prevent rust staining.
B. Protective film on trim should be removed before exposure to sunlight.

END OF SECTION

SECTION 07 42 13.13
METAL WALL PANELS
(OFFICE)

PART 1 – GENERAL

1.01 SUMMARY

A. Fluted-profile, concealed fastener, lap-seam metal wall panels where indicated on the Drawings. Also included are all necessary trims, fasteners, sealants and gaskets as required for a weathertight installation. Panels shall be secured to the structure with concealed clips and fasteners.

1.02 REFERENCES

A. American Architectural Manufacturer's Association (AAMA): www.aamanet.org:
   1. AAMA 621 - Voluntary Specifications for High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) & Zinc-Aluminum Coated Steel Substrates.
   2. AAMA 809.2 Voluntary Specification Non-Drying Sealants.

B. American Society of Civil Engineers (ASCE): www.asce.org/codes-standards:
   1. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.

C. ASTM International (ASTM): www.astm.org:
   1. ASTM A653 - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   2. ASTM A755 - Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.
   3. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
   4. ASTM C920 - Specification for Elastomeric Joint Sealants.
   5. ASTM D2244 - Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
   6. ASTM D4214 - Test Methods for Evaluating Degree of Chalking of Exterior Paint Films.
   7. ASTM E1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.

D. International Accreditation Service (IAS):
   1. IAS AC472 Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems, Part B.

1.03 SUBMITTALS

A. Submit under provisions of the General Conditions.

B. Action Submittals
   1. Manufacturer’s data sheets on each product to be used, including:
      a. Preparation instructions and recommendations.
      b. Storage and handling requirements and recommendations.
      c. Material type, metal thickness and finish.
      d. Installation methods.
   2. Shop Drawings: Including elevations, fastening patterns, sections of each condition and details as required.

3. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
4. Panel Sample: Submit 1' (305 mm) long by full width sample panel for each profile specified indicating the metal, texture and finish.
5. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
6 Installer Qualifications.

C. Closeout Submittals:
1. Maintenance data and instructions for wall panels and for windows.
2. Manufacturer's standard warranty, and any project-specific warranty, if elsewhere required. Warranties that extend beyond the Contractor's correction period shall be project-specific documents executed by the manufacturer and shall clearly indicate beginning and ending dates of the warranty period.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing of metal panels of the type specified herein with a minimum documented experience of ten (10) years.
B. Installer Qualifications: Company specializing in installation of the products specified for projects of similar size and scope with minimum five (5) years documented experience.

1.05 DELIVERY, STORAGE, HANDLING

A. Protect products of metal roof panel system during shipping, handling, and storage to prevent staining, denting, deterioration of components or other damage.
B. Deliver, unload, store, and erect insulated metal wall panels and accessory items without misshaping panels or exposing panels to surface damage from weather or construction operations.
C. Store in accordance with Manufacturer's written instruction.
D. Store products off the ground, with panels sloped for drainage and covered to protect factory finishes from damage. Stack bundles no more than two (2) high.

1.06 WARRANTY

A. Manufacturer's Warranty: Manufacturer's two (2) year limited warranty that panels are free from defects in materials and workmanship, beginning from the date of shipment of panels, but excluding coil coatings (paint finishes) covered under a separate warranty.
B. The installer shall issue a separate one (1) year warranty against defects in installed materials and workmanship, beginning from the date of substantial completion of the installation.
C. Submit Manufacturer's forty (40) year limited warranty on the exterior paint finish for adhesion to the metal substrate and thirty (30) year limited warranty on the exterior paint finish for chalk and fade.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURER

A. Metal Wall Panels as manufactured by Metl-Span, Green Span equal, King Span equal, Firestone equal, MCBI equal, Centria equal, or other approved equal.

2.02 PERFORMANCE REQUIREMENTS

A. General: Provide metal panel system meeting performance requirements as determined by application of specified tests by a qualified testing facility on manufacturer's standard assemblies.
B. Structural Performance: Provide metal panel assemblies capable of withstanding the effects of indicated loads and stresses within limits and under conditions indicated, as determined by ASTM E1592:
   1. Wind Loads: Determine loads based on uniform pressure, importance factor, exposure category, and basic wind speed indicated on Drawings.
      a. Wind Negative Pressure: Certify capacity of metal panels by actual testing of proposed assembly.
   2. Deflection Limits: Withstand inward and outward wind-load design pressures in accordance with applicable building code with maximum deflection of 1/180 of the span with no evidence of failure.
   3. Seismic Performance: Comply with ASCE 7 Sections 9, "Earthquake Loads."

C. Thermal Movements: Allow for thermal movements from variations in both ambient and internal temperatures. Accommodate movement of support structure caused by thermal expansion and contraction. Allow for deflection and design for thermal stresses caused by temperature differences from one side of the panel to the other.

2.03 FORMED METAL WALL PANELS

A. Fluted-Profile, Concealed Fastener Metal Wall Panels: Structural metal panels consisting of formed metal sheet with vertical panel edges and tapered inverted intermediate rib 5-1/2 by 1-1/2 inches (140 by 38 mm), with flush joints between panels, field assembled with nested lapped edges, and attached to supports using concealed fasteners.
   1. Basis of Design: Metl-Span, ShadowRib.
   2. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A792/A792M, structural quality, Grade 50, Coating Class AZ50 (Grade 340, Coating Class AZM150), prepainted by the coil-coating process per ASTM A755/A755M.
      a. Minimum Thickness: 24 gage coated thickness, with smooth surface.
         1) Exterior Finish: Fluoropolymer two-coat system.
         2) Color: As selected by Owner from manufacturer's standard colors.
   3. Panel Width: 16 inches (406 mm).
   4. Panel Thickness: 3 inch (76 mm).

2.04 MISCELLANEOUS MATERIALS

A. General: Provide complete metal panel assemblies incorporating trim, copings, fasciae, gutters and downspouts, and miscellaneous flashings. Provide required fasteners, closure strips, and sealants as indicated in manufacturer's written instructions.
B. Flashing and Trim: Match material, thickness, and finish of metal panels.
C. Panel Clips: ASTM A653/A653M, G90 (Z180) hot-dip galvanized, one-piece clips, configured for concealment in panel joints, enabling installation of fasteners from exterior, and identical to clips utilized in tests demonstrating compliance with performance requirements.
D. Panel Fasteners: Self-tapping screws and other acceptable fasteners recommended by metal panel manufacturer. Where exposed fasteners cannot be avoided, supply corrosion-resistant fasteners with heads matching color of metal panels by means of factory-applied coating, with weathertight resilient washers.
E. Panel Sealants:

1. VOC Content of Interior Sealants: Sealants used inside the weatherproofing system shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
    a. Architectural Sealants: 250 g/L.

2.05 FABRICATION

A. General: Provide factory fabricated and finished metal panels, trim, and accessories meeting performance requirements, indicated profiles, and structural requirements.
B. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's written instructions, approved shop drawings, and project drawings.

2.06 FINISHES

A. Finishes, General: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
B. Fluoropolymer Two-Coat System: 0.2 – 0.3 mil primer with 0.7 - 0.8 mil 70 percent PVDF fluoropolymer color coat, AAMA 621.
    1. Basis of Design: Fluoropolymer Two-Coat System.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine metal panel system substrate with Installer present. Inspect for erection tolerances and other conditions that would adversely affect installation of metal panels.
    1. Inspect framing that will support insulated metal panels to determine if support components are installed as indicated on approved shop drawings and are within tolerances acceptable to metal panel manufacturer and installer. Confirm presence of acceptable framing members at recommended spacing to match installation requirements of metal panels.
B. Correct out-of-tolerance work and other deficient conditions prior to proceeding with insulated metal panel installation.

3.02 METAL PANEL INSTALLATION

A. Concealed-Fastener Formed Metal Panels: Install metal panel system in accordance with manufacturer's written instructions, approved shop drawings, and project drawings. Install metal panels in orientation, sizes, and locations indicated. Anchor panels and other components securely in place. Provide for thermal and structural movement.
B. Attach panels to metal framing using clips, screws, and sealants recommended for application by metal panel manufacturer.
    1. Fasten metal panels to supports with fasteners at each location indicated on approved shop drawings, at spacing and with fasteners recommended by manufacturer.
    2. Cut panels in field where required using manufacturer's recommended methods.
    3. Provide weatherproof jacks for pipe and conduit penetrating metal panels.
    4. Dissimilar Materials: Where elements of metal panel system will come into contact with dissimilar materials, treat faces and edges in contact with dissimilar materials as recommended by metal panel manufacturer.

5. Interior Fastener Attachment: Nest panel flanges and drill through support framing and overlapped panel flanges, and secure to structure using manufacturer's expansion fastener.
6. Exterior Clip Attachment: Attach leading panel flange to structural support using manufacturer's standard clip secured with self-tapping screw faster. Nest panel flange of subsequent panel fully in secured panel flange, ensuring panel faces are flush, and secure subsequent panel to previous panel using manufacturer's recommended fastener.
7. Vertical Panel Joint Sealants: Apply continuous bead of manufacturer's recommended elastomeric Joint Sealants in concealed joint between panels.

C. Attach panel flashing trim pieces to supports using recommended fasteners.

3.03 ACCESSORY INSTALLATION

A. General: Install metal panel accessories with positive anchorage to building and weather tight mounting; provide for thermal expansion. Coordinate installation with flashings and other components.
1. Install components required for a complete metal panel assembly, including trim, copings, flashings, sealants, closure strips, and similar items.
2. Comply with details of assemblies utilized to establish compliance with performance requirements and manufacturer's written installation instructions.
3. Set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently weather resistant.

3.04 CLEANING AND PROTECTION

A. Clean finished surfaces as recommended by metal panel manufacturer.
B. Replace damaged panels and accessories that cannot be repaired to the satisfaction of the Engineer.

END OF SECTION

SECTION 07 42 13.19
INSULATED METAL WALL PANELS
(SHOP)

PART 1 – GENERAL

1.01 SUMMARY

A. Pre-insulated metal panel cladding where indicated on the Drawings. Also included are all necessary trims, fasteners, sealants and gaskets as required for a weathertight installation. Panels shall be secured to the structure with concealed clips and fasteners in the sidejoints.

1. Steel faced factory foamed-in-place with compatible joinery.
2. Sealants between panels and their intersection.
3. Extruded aluminum trim related to the walls and its intersection with adjacent materials.

1.02 REFERENCES

A. AAMA 501.1 – Standard Test Method for Exterior Windows, Curtain Walls and Doors for Water Penetration Using Dynamic Pressure.
B. ASTM A 653– Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
C. ASTM A 792 – Standard Specification for Steel Sheet, Aluminum-Zinc Alloy Coated Steel by the Hot-Dip Process.
D. ASTM C 518 – Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
E. ASTM E 72 – Standard Test Methods of Conducting Strength Tests of Panels for Building Construction
F. ASTM E 84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
G. ASTM E 283 – Standard Method for Determining the Rate of Air Leakage Through Exterior Window, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
H. ASTM E 330-02 - Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference
ASTM E 331 – Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Wall by Uniform Static Air Pressure Difference
I. CAN/ULC S102 – Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.03 SUBMITTALS

A. Submit under provisions of the General Conditions.
B. Action Submittals
1. Manufacturer’s data sheets on each product to be used, including:
a. Preparation instructions and recommendations.
b. Storage and handling requirements and recommendations.
c. Material type, metal thickness and finish.
d. Installation methods.
2. Shop Drawings: Including elevations, fastening patterns, sections of each condition and details as required.
3. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer’s full range of available colors and patterns.

4. Panel Sample: Submit 1’ (305 mm) long by full width sample panel for each profile specified indicating the metal, texture and finish.
5. Manufacturer’s Certificates: Certify products meet or exceed specified requirements.
6 Installer Qualifications.

C. Closeout Submittals:
1. Maintenance data and instructions for wall panels and for windows.
2. Manufacturer’s standard warranty, and any project-specific warranty, if elsewhere required. Warranties that extend beyond the Contractor’s correction period shall be project-specific documents executed by the manufacturer and shall clearly indicate beginning and ending dates of the warranty period.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing factory foamed-in-place insulated metal panels with a minimum documented experience of ten (10) years.
B. Installer Qualifications: Company specializing in installation of the products specified for projects of similar size and scope with minimum five (5) years documented experience.

1.05 PERFORMANCE REQUIREMENTS

A. Structural Tests: The design load/deflection criteria shall be verified from tests per ASTM E 72 “Air Bag Method” using a 20 psf (.96 kPa) simulated wind load. A deflection limit of L/180 shall apply to wall panels.
B. Thermal Transmission: Testing in accordance with ASTM C 518, “measurement of steady state thermal transmission”, the panels shall provide a K-factor of .140 btu/sf/hr/deg. F at 75° F. (24° C) mean temperature (air films are not included).
C. Vapor Barrier
1. Air Infiltration: Air infiltration shall not exceed .06 cfm per square foot of wall area when tested per ASTM E 283 at a static pressure of 12.0 psf (.576 kPa).
2. Static Water Penetration: There shall be no uncontrolled water penetration through the panel joints at a static pressure of 20.0 psf (.96 kPa) when tested per ASTM E 331.
3. Dynamic Water Penetration: There shall be no uncontrolled water penetration through the panel joints when subjected to a 95 mph (153 kph) slipstream airflow and application of water for 15 minute period in accordance with AAMA 501.1.
D. Fire
1. Surface Burning Characteristics: The insulated core shall have been tested in accordance with ASTM E 84 for surface burning characteristics. The core shall have a maximum flame spread of 25 and a maximum smoke developed rating of 450.
2. FM Approval Standard 4880, 50’ (15.24 m) High Corner Test for Unlimited Height Structures: The panel assembly shall not support a self-propagating fire which reaches any of the limits of the 50’ (15.24 m) high corner test structure as evidenced by flaming or material damage of the ceiling of the assembly.
E. Bond Strength
1. Fatigue Test: The panel shall withstand deflection cycling at L/180 to two (2) million alternate cycles with no evidence of delamination, core cracking or permanent bowing.
2. Freeze/Heat Cycling: The panel shall exhibit no delamination, surface blistering or permanent bowing when subjected to cyclic temperature extremes of –20º F (-28º C) to +180º F (+82º C) for twenty-one (21) eight hour cycles.
3. Humidity Test: The panel shall exhibit no delamination or metal corrosion at interface when subjected to a +140° F (+60° C) temperature and 100% relative humidity for a total of 1000 hours.

4. Autoclave Test: The panel shall exhibit no delamination of the foam core from metal skins when exposed to 2 psi (.122 kg/sq. cm) pressure at a temperature of +212° F (+100° C) for a total of 2½ hours.

1.06 DELIVERY, STORAGE, HANDLING

A. Protect products of metal roof panel system during shipping, handling, and storage to prevent staining, denting, deterioration of components or other damage.
B. Deliver, unload, store, and erect insulated metal wall panels and accessory items without misshaping panels or exposing panels to surface damage from weather or construction operations.
C. Store in accordance with Manufacturer's written instruction.
D. Shield foam insulated metal wall panels from direct sunlight until installation.
E. Store products off the ground, with panels sloped for drainage and covered to protect factory finishes from damage. Stack bundles no more than two (2) high.

1.07 WARRANTY

A. Manufacturer's Warranty: Manufacturer's two (2) year limited warranty that panels are free from defects in materials and workmanship, beginning from the date of shipment of panels, but excluding coil coatings (paint finishes) covered under a separate warranty.
B. The installer shall issue a separate one (1) year warranty against defects in installed materials and workmanship, beginning from the date of substantial completion of the installation.
C. Submit Manufacturer's forty (40) year limited warranty on the exterior paint finish for adhesion to the metal substrate and thirty (30) year limited warranty on the exterior paint finish for chalk and fade.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURER

A. Santa Fe® Insulated Metal Wall Panels as manufactured by Metl-Span, Green Span equal, King Span equal, Firestone equal, MCBI equal, Centria equal, or other approved equal.

2.02 PANEL DESIGN

A. Panel – General Requirements: Wall Panel – Roll-formed exterior and interior steel sheet faces chemically bonded to continuously foamed-in-place polyurethane core; laminated panels are not acceptable.
   1. Exterior Face: G-90 galvanized heavy stucco embossed painted steel, minimum Grade 33 and/or AZ-50 Aluminum-Zinc heavy stucco embossed painted steel, minimum Grade 33 and minimum thickness 26 gauge (0.0187"). unless otherwise required to meet the load and deflection limits.
   2. Interior Face: G-90 galvanized stucco embossed painted steel, minimum Grade 33 and/or AZ-50 Aluminum-Zinc stucco embossed painted steel, minimum Grade 33 and minimum thickness 24 gauge (0.0250"), unless otherwise required to meet the load and deflection limits.
   3. Longitudinal Joint Sealants: Field applied.
   4. Foam Core: Non-CFC, Class I, polyurethane.
   5. Exterior Finish: Exterior face sheet shall be treated with a nominal 0.2 mil (5 microns) base primer, followed by a nominal 0.7 mil (17.5 microns) finish coat of full strength PVF2 fluoropolymer in manufacturer's standard colors.

6. Interior Finish: The interior face sheet shall be a nominal 0.2 mil (5 microns) primer followed by a nominal 0.7 (17.5 microns) polyester coating in white or off-white color selected by Owner from manufacturer's standard colors.

B. Wall Panel: Concealed fastener wall panels with offset double tongue and groove joinery and an extended metal shelf allowing fasteners to penetrate both metal faces with clips concealed in the sidejoint.
C. Exterior Profile: No Profile; Heavy Stucco Embossed
D. Interior Profile: Metl-Span Mesa Wave pattern, nominal 1/8″ deep; Light Mesa Wave pattern, nominal 1/16″ deep or similar offerings by other manufacturers and as selected by Owner.
E. Module Width: 42", Module Length: As shown on Drawings
F. Thickness: 3", Low E, hermetically sealed, with both panes heat-strengthened and/or reinforced as required to meet the structural requirements herein specified.
G. Color: Owner to select from manufacturers standard colors.
H. Foam core shall be continuously foamed-in-place, Non-CFC polyurethane.
I. Flashing and trim shall be brake-formed sheet metal in the same thickness and finish to match the panels. Laminated panels shall not be accepted.

PART 3 – EXECUTION

3.01 GENERAL

Installation shall be in strict accordance with the manufacturer's instructions and recommendations.

3.02 EXAMINATION

A. Panel installer shall examine all structural steel before beginning installation to insure that all supporting members are straight, level, plumb and satisfactory for panel installation.
   1. 0 to 1/4″ outward of the actual wall framing plane for members at 10′ or greater spacing.
   2. 0 to 1/8″ outward of the actual wall framing plane for members at 5′ to 10′ spacing.
   3. 0 to 1/16″ outward of the actual wall framing plane for members at less than 5′ spacing.
B. Do not begin installation until unsatisfactory conditions are corrected.

3.03 INSTALLATION

A. Installation of panels shall be made in accordance with manufacturer's recommended procedures, approved shop drawings, installation guide book and manufacturer's handbook of construction details.
B. Flashing and trim shall be installed true and in proper alignment. Sealant shall be installed where indicated, or needed, without skips and voids, to insure weather tightness and integrity of the vapor barrier.
C. Corners shall be mitered and the joints shall be concealed on interior and exterior with trim.

3.04 DAMAGED MATERIAL

A. Replace damaged panels and other components of work that cannot be repaired by finish touch-up or similar minor repair. Owner reserves the right to reject scratched panels since touch-up paint cannot equal factory finish.
B. The panel installer shall inspect and approve each completed wall area and the Contractor shall be responsible for protection of completed work from damage by other trades.

3.05 CLEANING

A. Wipe finished surfaces clean of any filings caused by drilling or cutting to prevent rust staining.
B. Protective film on trim should be removed before exposure to sunlight.

END OF SECTION

SECTION 08 11 13
HOLLOW METAL DOORS, FRAMES AND HARDWARE

PART 1 – GENERAL

1.01 SUMMARY

This section shall include all hollow metal doors, door frames, and door hardware that are indicated on the Drawings and as specified herein. The building has been laid out using "Modular Masonry Construction" Standards.

Types, sizes, design, and location of hollow metal doors and frames, and accessories shall be as shown on the Drawings. Doors, hardware, and frames in the existing building shall be fully replaced even if not included in schedules.

1.02 REFERENCES

ASTM B633	Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel
ASTM B879	Standard Specification for Steel Sheet, Zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface
HMMA 840	Guide Specification for Installation and Storage of Hollow Metal Doors and Frames

1.03 SUBMITTALS

A. General – Submit listed submittals in accordance with the General Conditions.

B. Action Submittals:
Product Data: Submit manufacturer's complete product literature for specified door, frames, and hardware, including:
1. Physical properties and dimensions demonstrating compliance with the Specifications and suitability for the intended use.
2. Manufacturer's storage, handling, and installation requirements and recommendations.
3. Project-specific information.
4. Any clarifications or exceptions.

PART 2 – PRODUCTS

2.01 MATERIALS

Steel shall be commercial quality, carbon steel sheets, free from scale, pitting, and surface defects. Gauges shall be U.S. Standard. Electrolytic, zinc-coated sheets shall conform to ASTM-B633. Steel for face sheets of hollow metal doors, and for broad frame faces, shall be stretcher-leveled.

Shop-coat primer shall be manufacturer's standard rust inhibitive baked primer over phosphatizing treatment. Electro zinc plating where required, shall be not less than 0.1 ounce of zinc per square foot, and conform to ASTM B633.

B. Hollow Metal Doors:

Hollow metal doors shall be flush type, 1 ¾-inch thick, formed of 16 gauge, stretcher-leveled, cold-rolled steel, sheets on both faces. In addition, exterior doors shall be fabricated from zinc-coated, bonderized sheets.

Finished work shall be free from warpage, bulge, or buckle. Corner bends shall be true, straight, and as sharp as possible for the gauge of metal used. Doors shall have no visible seams or joints on faces or stile edges.

Stiffen face sheets by continuous, vertical formed, sheet steel sections occupying full depth of interior space between door faces. Stiffeners shall be not less than 22 gauge, spaced not more than 6 inches apart, and securely attached to both face sheets by spot welds at not more than 6" on centers. Fill spaces between stiffeners for full height of door with a .6 to .7 pound density, inorganic, non-combustible batt-type material to sound-deaden and insulate door.

Join faces at stile edges by a continuous weld extending full height of door. Welds shall be ground, filled, and dressed smooth to make them invisible; and to provide a smooth, flash surface.

Close top and bottom edges of doors with a continuous, recessed steel channel of not less than 16 gauge sheet steel. Extend channel full width of door, and spot weld to both faces. Provide exterior doors with an additional flush closure at top edge. Where required for attaching weather-stripping, provide a flush closure at bottom edges, also. Space holes in bottom closure of exterior doors to permit escape of entrapped moisture.

Provide profiles on both stiles of door as follows:

Single-acting Swing Doors	Beveled 1/8" in 2"
Double-acting Swing Doors	Rounded on 2 1/8" radius

Mortise, reinforce, drill, and tap doors at factory for fully templated hardware in accordance with approved hardware schedule and with templates supplied by the hardware supplier. Reinforcement shall be welded within door. Where surface-mounted hardware is to be applied, provide only reinforcing plates in door. Drill and tap for hardware at factory for both mortised and surface hardware not subject to field relocation due to project conditions.

Treat all surfaces chemically to insure cleaning and maximum adhesion of finish. Install shop coat of rust-inhibitive primer. For exterior doors, clean off and touch-up all welds and areas where zinc-coating has been damaged. Touch-up with zinc-rich primer.

C. Glazing:
Provide insulated safety glass where view lites are indicated, including wire reinforcement as required for fire-rated doors.

D. Hardware:
Finished hardware, unless otherwise noted, necessary to complete building, must be furnished by the Contractor. Incidental hardware that may not be listed herein shall nevertheless be provided, to make each door assembly complete and functional. Any hardware not specifically mentioned must be equal in quality and design to that which is specified. All hardware must be of ample size to perform the duties for which it is intended and must conform with the finished shape or member-taking hardware.

The numbers used in the following hardware set schedule have been taken from the catalogs of Assa Abloy Dss, Inc.; McKinney, Corbin Russwin, Markar; or equal.

Finish:

Finishes shall be US 26D and US 32D, except as otherwise specified herein.

Keying:

All locks shall be identically keyed with the existing caustic building door (including for replacement doors). Furnish six keys total.

Hardware shall be delivered to the Contractor with a checking list in perfect condition properly packed and marked for the location in which it is to be installed and accompanied by a list of instructions in such form as will facilitate a proper installation. At completion of work, all hardware shall be cleaned, all damaged or broken parts replaced and all hardware left in perfect working order.

E. Door Schedule:

No.	Location	Description	Hardware Set No.
1,2	Main Entrance, Front	Quad 3’0” x 7’0” (HM)(GP)(XOXX)	1
15	Exterior Office Door	3’0” x 7’0” (HM) (GP)	1
18, 22, 25, 29	Exterior Doors	3’0” x 7’0” (HM)	2
3,7,	Hall, Parts	3’0” x 7’0” Flush Solid Wood Core (Paint Grade) w/(HM - Frames)	3
5,6	Restrooms	3’0” x 7’0” Flush Solid Wood Core (Paint Grade) w/(HM - Frames)	4
10-14, 32	Office Storage, Comm. Rm., Offices (2-4), Plumbing Storage,	3’0” x 7’0” Flush Solid Wood Core (Paint Grade) w/(HM - Frames)	5
4, 16	Break Rm., Conference Room	3’0” x 7’0” Flush Solid Wood Core (Paint Grade) w/(HM - Frames)	6
8,9,17,31	Office 5, Shop, Laundry, 2nd Flr	3’0” x 7’0” (HM)	7
19-21, 23, 24, 26-28	Shop Bay Doors	Upward Acting Sectional Door	8

Legend: HM = Hollow Metal, VL = View Lite, GP = Glass Panel

F. Hardware Schedule:

Quantity	Description	Catalog No.	Finish	Manufacturer
Hardware Set #1				
1	Continuous Hinge	HG305 with adjust-a screw fasteners	630	MA
1	Lockset	As Required	626	CR
1	Door Closer	DC6210 X A12 with prop open feature	689	CR
1	Set Weatherstrip	303APK		PE
1	Door Bottom Sweep	3452 CNB		PE
1	Threshold			PE

Hardware Set #2				
1	Continuous Hinge	HG305 with adjust-a screw fasteners	630	MA
1	Lockset	ML2065 NSA	US32D	CR
1	Kickplate	K1050 8” x 2” LDW	US32D	RO
1	Door Closer	DC6210 X A12	689	CR
1	Set Weatherstrip	303APK		PE
1	Door Bottom Sweep	3452 CNB		PE
1	Threshold	171A		PE
Hardware Set #3				
1	Continuous Hinge	HG305 with adjust-a screw fasteners	630	MA
1	Lockset	5010CWL	26D	K
1	Kickplate	K1050 8” x 2” LDW	US32D	RO
1	Door Closer	DC6210 X A12	689	CR
1	Set Weatherstrip	303APK		PE
1	Door Bottom Sweep	3452 CNB		PE
1	Threshold	171A		PE
Hardware Set #4				
3	Hinges	TA2714	26D	MC
1	Privacy Lockset	ML2030 NSA	630	CR
1	Door Closer	DC6200	689	CR
1	Kick Plate	KP1050 8” X 2” LDW	32D	MC
1	Wall Stop	406	32D	RO
3	Door Silencers	608		RO
Hardware Set #5				
3	Hinges	TA2714	26D	MC
1	Lockset	ML2051 NSA	26D	CR
1	Wall Stop	406	32D	RO
3	Door Silencers	608		RO
Hardware Set #6 Same as HW set #5				
1	Lockset	ML2010 NSA	26D	CR
Hardware Set #7 Same as HW set #5				
1	Lockset	ML2051 NSA (Doors 8,9,31)	26D	CR
1	Lockset	ML2010 NSA (Door 17)	26D	CR
1	Door Closer	DC6210 x A12	689	CR
Hardware Set #8				
1	Cylinder	AS REQUIRED	626	CR

Finish Legend	
26D	Satin Chrome
32D	Satin Stainless Steel
630	Satin Stainless Steel
689	Aluminum Painted
US32D	Stainless Steel, Dull
626	Satin Chrome

Manufacturer Legend	
CR	Corbin Russwin
MC	McKinney
MA	Markar
RO	Rockwood
PE	Pemko
K	Kaba

PART 3 – EXECUTION

3.01 INSTALLATION

Follow guidelines of HMMA 840.

Install frames, plumb, rigid, and in true alignment. Brace properly until built into wall. Inspect frames for plumbness and correct positioning before being tied finally into wall structure. Frames installed out of correct position shall be torn out and replaced.

Secure door frames to floor with countersunk expansion device at each jamb. If applicable, build adjustable anchors into masonry walls as the work progresses.

Hang metal doors plumb and true, with doors making uniform contact with metal frames on all sides. Metal doors that cannot be hung to fit evenly on all sides shall be removed and replaced.

END OF SECTION

SECTION 08 51 13
ALUMINUM WINDOWS

PART 1 – GENERAL

1.01 SUMMARY

This section covers supply of aluminum framed windows and glazing.

1.02 REFERENCES

AAMA	American Architectural Manufacturers Association
ASTM E-283	Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
ASTM E-331	Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
ASTM E-330	Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference

1.03 SUBMITTALS

A. General – Submit listed submittals in accordance with the General Conditions.

B. Action Submittals:
Product Data: Submit manufacturer's complete product literature for specified products and accessories, including:
1. Physical properties demonstrating compliance with the Specifications and suitability for the intended use.
2. Manufacturer's storage, handling, and application requirements and recommendations.
3. Project-specific information
4. Any clarifications or exceptions.
5. Samples of all window frames and glazing shall be submitted to the Engineer for approval.

C. Closeout Submittals:
1. Manufacturer's standard warranty, and any project-specific warranty, if elsewhere required. Warranties that extend beyond the Contractor's correction period shall be project-specific documents executed by the manufacturer and shall clearly indicate beginning and ending dates of the warranty period.

PART 2 – PRODUCTS

2.01 WINDOWS

A. Frames and Sashes:
Thermal-efficient windows shall have extruded aluminum frames with extruded aluminum sash of 6063-T5 alloy, meeting or exceeding AAMA specifications. Frames and sash shall have overlapping corners, fully secured with fasteners and sealed, drainage to outside by means of factory fabricated weep holes. All frame and sash members shall be thermally broken and utilize high-density, low thermal conductive polyurethane structural material that shall structurally combine the inner and outer frame and sash sections. The sash members shall provide for one-inch "drop-in" glazing to allow convenient reglazing when required. All hardware such as fasteners that are exposed shall be of aluminum or stainless steel non corrosive material

with aluminum. All weather stripping shall conform to AAMA specifications and shall be high density poly-pile with mylar seal. Air infiltration shall be in accordance with ASTM E-283. Water resistance shall be in accordance with ASTM E-331. All frame and sash members shall be factory anodized finished, medium or dark bronze color, final color selection by Owner. All windows shall be completely assembled, ready for installation. Finish shall meet AAMA 2605 (10-year finish warranty).

B. Glazing:
   1. Glazing to be thermal-efficient 1" insulated type, Low E, hermetically sealed, with both panes heat-strengthened and/or reinforced as required to meet the structural requirements herein specified.
   2. Tinting: Glazing of outer pane to be tinted, medium to dark bronze, final selection by Owner.
   3. All glazing shall be tempered.

C. Wind Zone:
   1. Window assemblies shall be designed in accordance with the Building Code for wind loads (45 psf negative design pressure) and shall be labeled in accordance with AAMA A440 or shall be tested in accordance with ASTM E330. Test shall be for 10 seconds at a load equal to 1.5 times the design pressure.
   2. Windows shall meet the wind load provisions for the building codes special wind region. The wind zone is (V ult.) 170 mph LRFD/strength design as per ASCE7-10, NC Building code 2018. Risk Category IV. Wind exposure should be C.

PART 3 – EXECUTION

3.01 GENERAL

All installation shall be as recommended by product manufacturers, applicable codes, and the Drawings.

END OF SECTION

SECTION 09 05 13.13
INTERIOR FINISHES

PART 1 – GENERAL

1.01 SUMMARY

This section covers the construction and supply of various interior components for the main building office section and the Attendant office with restroom.

1.02 REFERENCES

NC Building Code
ASTM F1066 Class 2 “through” pattern
ASTM E662 Smoke Chamber Test.
ASTM 1280 Standard Specification for Application of Gypsum Sheathing
ASTM C36 Standard Specification for Gypsum Wallboard
ASTM C474 Standard Test Methods for Joint Treatment Materials for Gypsum Board Construction
ASTM C475 Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board
Fed Spec. SS-J-570a, Type I, Type II, and Type III
End-Joint Compounds and Tape Wallboard (For Gypsum Wallboard Construction)

1.03 SUBMITTALS

A. General – Submit listed submittals in accordance with the General Conditions.

B. Action Submittals:
Product Data: Submit manufacturer’s complete product literature for specified products and accessories, including:
1. Physical properties demonstrating compliance with the Specifications and suitability for the intended use.
2. Manufacturer’s storage, handling, and application requirements and recommendations.
3. Project-specific information
4. Any clarifications or exceptions.
5. Samples of all ceramic tile, lvt, base and acoustical tile and suspension system shall be submitted to the Owner and Engineer for approval.
6. Samples of all acoustical tile and suspension system shall be submitted to Engineer for approval.

C. Closeout Submittals:
1. Manufacturer’s standard warranty, and any project-specific warranty, if elsewhere required. Warranties that extend beyond the Contractor’s correction period shall be project-specific documents executed by the manufacturer and shall clearly indicate beginning and ending dates of the warranty period.

1.04 DELIVERY AND STORAGE OF MATERIALS

All materials shall be delivered in their original unopened packages, containers, and bundles bearing the name of the manufacturer and the brand name. Materials shall be stored in an enclosed shelter providing protection from damage and exposure to the elements. Damage or deteriorated materials shall be removed from the premises.

PART 2 – PRODUCTS

2.01 METAL STUDS AND DRYWALL

A. All materials included herein shall be manufactured by the companies regularly engaged in producing such materials and shall be applied where indicated and as specified. Product names and numbers listed herein are used to establish the type and performance required but do not restrict experienced manufacturers from being allowed. Installation of partition materials shall be done by workmen experienced in this trade.

B. Metal Stud and Drywall Systems:
   1. Single Layer Wallboard Partitions: Shall be composed of 3-5/8" x 25 Ga. minimum with 5/8" gypsum board, screw attached to each side.
   2. Bridging: Metal studs to have cold rolled channel bridging. ¾" x 16 Ga. @ 3-5/8" studs. Use 16 Ga. Clip screwed to bridging and each steel stud. Walls up to 10'-0" to have 1 row.
   3. Design loads: 5 psf minimum as required by NC Building Code. Additional support shall be provided for wall mounted plumbing fixtures.
   4. Design framing systems to accommodate deflections of the primary building structure, construction tolerances and to withstand design loads with maximum deflections limits of NC Building Code.
   5. Contractor shall be responsible for providing final design per NC Building Code, and to construct wall system based upon final design, at no additional cost to Owner.

C. Materials:
   1. Studs: Shall be of sizes as indicated on the Drawings and be channel type, roll-formed from galvanized steel, designed for screw attachment.
   2. Floor and Ceiling Runners: Shall be 1-1/4" deep leg runners formed of galvanized steel, and in sizes to correspond with studs. Gauge of runners to correspond with studs.
   3. Gypsum Wallboard: Shall have radial edges specially designed to overcome joint deformation, shall comply with ASTM C36, and shall be: 5/8" thick x 48" or 54" wide, Sheetrock Brand Mold Tough or equal.
   4. Gypsum Sheathing, if applicable, shall be ½" thick x 48" wide with asphalt treated gypsum core and water repellant building paper surface as manufactured by U.S. Gypsum.
   5. Tile Backerboard, if applicable, shall be 5/8" thick fiber reinforced gypsum product.
   6. Cement Board, if applicable, shall be 5/8" thick cementitious fiber reinforced mat sheathing, and shall comply with ASTM 1280.

D. General Gypsum Guidelines:
   1. Joint Treatment Products: Shall conform to ASTM C474 and C475. and Fed Spec. SS-J-570a, Type I, Type II, and Type III.
      a. Pre-fill compound shall be Durabond 90 Joint Compound or equal – Multipurpose.
      b. Taping compound shall be Durabond Joint Compound or equal – Taping.
      c. Topping compound shall be Durabond Joint Compound or equal – Topping.
      d. Reinforcing Tape shall be Perf-A-Tape Reinforcing Tape or equal, spark perforated and with beveled edges.
   2. Wallboard Sealant shall be Sheetrock Brand W/R sealant or equal.
   3. Fasteners, Wallboard shall be 1" U.S.G Brand Hi=Lo Type S or equal bulge head screws.
   4. Fasteners, stud to runner shall be 3/8" U.S.G. Brand type S or equal pan head screws.
   5. Fasteners, stud to door frame shall be ½" U.S.G. Brand type S-12 or equal pan head screws.
   6. Grout, Door Frame shall be Durabond 90 or equal joint compound – multipurpose.
   7. Corner beads shall be U.S.G. corner reinforcement N0. 103 or equal.

8. Metal Trim shall be U.S.G. or equal metal trim, galvanized, of sizes corresponding with the wallboard thickness and types.
9. Control joints shall be U.S.G. or equal control No 093 or equal, roll formed of zinc.
10. Caulking shall be a resilient non-hardening, non-shrinking, non-skinning, non-staining material, U.S.G. Acoustical Sealant or equal.
11. Metal angle runners shall be U.S.G. or equal metal angle runners, 1-3/8" x 7/8" x 24 ga. galvanized steel angle sections.

2.02 LUXURY VINYL COMPOSITE TILE – LVT and BASE

A. LVT shall be 0.125" (1/8") thick uniform in size, 20 mil wear layer, with edges cut accurately and square with 20 year commercial warranty.

B. Colors and patterns shall be selected BY Owner from the manufacturer's color palette for LUXURY LVT and Base.

C. Manufactured by Armstrong "Natural Creations Diamond 10 Technology ArborArt and Earth Cuts" (main entrance) or equals.

D. Base shall be uniform thickness, supplied on rolls, premium thermoplastic, coved style for resilient flooring.

2.03 CERAMIC TILE and BASE

A. Ceramic Tile shall be 8" x 8", square for the shower, walls and floor.

B. Colors and patterns shall be selected by Owner from the manufacturer's color palette for Quarry Basics XA Tile and Base.

C. Manufactured by Quarry Basics XA Abrasive slip resistance Tile from Metropolitan Ceramics, division of Iron Rock or equal.

D. Furnish Standard Grade certificate conforming to ANSI A137.1.

E. Quarry tile trim size, color and shape to match field tile.

2.04 ACOUSTICAL CEILINGS

A. Acoustical tile and suspension system shall be the non-fire rated type: tile shall be mineral fiber in 24" sq. x 3/4" min., lay-in type, smooth design, white color, with recessed profile.

B. Suspension system for suspended acoustical tile shall be manufactured by Armstrong "Ultima" or equal and shall be the exposed grid system and shall be the non-fire rated type.

C. Edge strips:
Metal edge strips with white baked enamel finish, except as otherwise specified, shall be provided at all walls, or on vertical surfaces where acoustical tile edges would be exposed. Edge strips shall be of an approved design to prevent sagging and fastening methods and spacing shall be such that no sagging will occur in edge strips.

2.05 TOILET ROOM ACCESSORIES

A. Provide the following accessories in EACH toilet room as a minimum (items 1-6) and (items 7-8 main building only).
   1. Toilet Paper Holders: Shall be 18-8 polished stainless steel or brass chrome plated with chrome plated roller. One (1) required.
   2. Paper Towel Dispenser & Waste Receptacle: Shall be ADA surface mounted, roll towel, with min. 12 gal waste container, fabricated of 22 ga. Stainless steel and satin finish. One (1) required.
   3. Grab Bars (Type 1): Shall be wall hung bar fabricated of 18. ga. Stainless steel 1-1/2" o.d. tubing with 1-1/2" clearance to wall and shall have safety grips surface, model shall be for handicapped toilets: 42" long. (Located beside water closet). One (1) required.
   4. Grab Bar (Vertical): Same construction as (Type I) except 18" long and placed vertical. Located beside water closet. One (1) required.
   5. Grab Bar (Type 2): Same construction as (Type 1) except 36" long. (Locate behind water closet). One (1) required.
   6. Mirror: Shall be wall hung 18" x 36" min. fabricated of 20 ga. stainless steel frame, mitered corners, mirror edge protected by chafe absorbing fillers, mirror No. 1 quality, ¼" glass, silver coated and sealed. One (1) required.
   7. Grab Bars (Type 3): Shall be wall hung bar fabricated of 18. ga. Stainless steel 1-1/2" o.d. tubing with 1-1/2" clearance to wall and shall have safety grips surface, model shall be for handicapped roll in showers: 48" long. (Located on back wall of shower). One (1) required.
   8. Grab Bars (Type 4): Shall be wall hung bar fabricated of 18. ga. Stainless steel 1-1/2" o.d. tubing with 1-1/2" clearance to wall and shall have safety grips surface, model shall be for handicapped roll in showers: 24" long. (Located on side walls of shower). One (2) required.

B. Structural Strength: All components of a grab bar, supporting structure, and concealed blocking shall be strong enough to resist a 250 pound concentrated force applied either horizontally or vertically.

PART 3 – EXECUTION

3.01 INSTALLATION

Installation shall be in strict accordance with the manufacturer's instructions and recommendations.

3.02 METAL STUDS AND DRYWALL

A. Climate Control
When outdoor temperature is below 55 degrees F, heat shall be maintained in the building continuously and uniformly at not less than 55 degrees F from one week prior to beginning of installation until the gypsum wall board application and joint treatment is completed. Installation shall not be started until windows are glazed and doors are installed, unless openings are temporarily closed. Ventilation either natural or supplied by fans, circulators, or air conditioner equipment, shall be provided to remove excess moisture during joint treatment.

B. Installation
   1. Metal runners shall be aligned accurately according to partition layouts and secure to concrete slabs with stud nails or power driven anchors, spaced 24 inches on center.
   2. Caulking shall be applied in beads of 3/8" diameter where specified or detailed. Entire perimeter of face layer of wallboard shall be caulked tight, on each side of partition.

3. Metal studs shall be placed not to exceed 24" or 16" o.c., as called for on the drawings, into floor and ceiling runners and shall be secured to runners with screws of USG Metal Lock Fastener Tool or equal at door and window frames, partition intersections and corners.
4. Metal door studs shall be located within 2" of all door frame jambs and shall be anchored to the jambs and head anchor clips of each frame by bolt or screw attachment. Over frames, a cut-to-length section of runner shall be installed with flanges slip and web bent to allow flanges to overlap adjacent studs. A cut-to-length stud extending from door frame header to ceiling runners shall be positioned at vertical joints over door frames.
5. Wallboard screws shall be applied with an electric screw gun. Screws shall be driven not less than 3/8" from ends or edges of wallboard to provide uniform dimple not over 1/32" deep.
6. Gypsum sheathing shall be applied with long dimension horizontal and with vertical joints staggered ½ sheet. Stagger joints from inside gypsum board finish. Attach with 1-1/4" screws spaced 8" o.c. in the field of the board and into each stud. Screw attach at 4" o.c. staggered along vertical joints of the board. Sheathing paper shall be installed over entire surface of gypsum sheathing as specified.
7. Single layer wallboard shall be applied face out with long dimension vertical. All abutting ends and edges shall occur over stud flanges. Joints on opposite sides of a partition shall occur on different studs. Screws shall be spaced 12" o.c. in the field of the board, and 8" o.c. staggering along the vertical abutting edges, or as recommended wallboard manufacturer's literature – submit copy.
8. Joint treatment compounds shall be mixed according to manufacturer's directions.
    a. Pre-filling: All "V" grooves formed by abutting eased radial edges of wallboard shall be filled flush with the plane of the taper with pre-fill compound. Excess compound beyond the "V" groove shall be wiped clean leaving a flat joint to receive taping.
    b. Taping: After pre-fill has hardened, a thin uniform layer of taping compound shall be applied to all joints and angles to be reinforced. Reinforcing tape shall be applied immediately centered over the joint, seated into the compound. A skim coat shall follow immediately, but shall not function as a fill or second coat. Tape shall be properly folded and embedded in all angles to provide a true angle.
    c. Filling: after taping compound has hardened, topping compound shall be applied filling the board taper flush with the surface. The fill coat shall cover the tape and feather out slightly beyond the tape. On joints with no taper, the fill coat shall cover the tape and feather at least 4" on either side of the tape. No fill coat is necessary on interior angles.
    d. Finishing: After topping compound is set, a finish coat of topping compound shall be spread evenly over and extend slightly beyond the fill coat on all joints and feather to a smooth, uniform finish. Over tapered edges, the finish joint shall not protrude beyond the plane of the surface. All taped angles shall receive a finish coat to cover the tap and taping compound, and provide a true angle. Where necessary, sanding shall be done between coats and follow the final application of compound to provide a smooth surface, ready for decoration.
9. Fastener depressions: Taping compound shall be applied to all fastener depressions followed, when hardened, by at least two coats of topping, leaving all depressions level with the plane of the surface.
10. Finishing beads and trim: Taping compound shall be applied to all bead and trim and shall be feathered out from the ground to the plane of the surface. When hardened, this shall be followed by two coats of topping compound each extending slightly beyond the previous coat. The finish coat shall be feathered from the ground to the plans of the surface and sanded as necessary to provide a flat, smooth surface ready for decoration
11. Cleaning: At the completion of the installation of the partitions, all rubbish shall be removed from the building, leaving floors broom clean. Excess material, scaffolding, tools and other equipment shall be removed from the building and job site.

3.03 LUXURY VINYL TILE – LVT and BASE

A. Inspection of Surfaces
   1. Examine substrate for evidence of excessive moisture content, residues, contaminants, and unevenness that would prevent execution and quality of resilient flooring assembly as specified.
   2. Verify that new concrete substrates have been cured for at least 30 days. Verify that no chemical curing compounds have been used or are present on surface of substrates.
   3. Notify Owner of any adverse conditions encountered during examination of substrate. Do not proceed with installation of resilient flooring until defects have been corrected except where correction is indicated under PREPARATION in this Section.

B. Preparation
   1. Comply with the flooring manufacturer's written recommendations for existing and new substrate preparation as applicable.
   2. Remove dirt, oil, grease, or other foreign matter from surfaces to receive floorcovering materials.
   3. Broom clean or vacuum surfaces to be covered.
   4. Remove substrate ridges and bumps.
   5. Use finishing underlayment to fill small cracks and depressions in substrate. Provide at all locations where uneven existing floor slab conditions are not satisfactory for the application of the scheduled new floor finish. Apply finish underlayment in accordance with manufacturers written instructions.

C. Application Of Adhesives
   1. Mix and apply adhesives in accordance with manufacturer's instructions.
   2. Provide safety precautions during mixing and applications as recommended by adhesive manufacturer.
   3. Apply uniformly over surfaces.
      a. Cover only that amount of area that can be covered by flooring material within the recommended working time of the adhesive.
      b. Remove any adhesive that dries or films over.
      c. Do not soil walls, bases or adjacent areas with adhesives.
      d. Promptly remove any spillage.
   4. Apply adhesives with notched trowel or other suitable tool recommended by adhesive manufacturer.

D. Installation of LVT and Base
   1. Comply with the flooring manufacturer's written installation instructions.

3.04 CERAMIC TILE AND BASE

A. Product Handling
   1. Deliver all products to job site in manufacturer's unopened cartons.
   2. Keep tile cartons dry and protect from vandalism.

B. Environmental Conditions
   1. Maintain temperature at 50 degree F minimum during tilework and for 7 days after completion. Do not apply tile to frozen surfaces.
   2. Vent temporary heaters to outside to avoid carbon monoxide damage to new tilework.
   3. Provide adequate lighting for good grouting and clean-up.

C. Setting Materials: Follow ANSI A108 Series specifications for setting materials as set forth below. Refer to ANSI A108 Forward - Explanation and Notes and TCA Handbook for description and appropriate uses of setting materials.
   1. Portland Cement Mortar: ANSI A108.1A
   2. Dry-Set Mortar: ANSI A108.5, A118.1
   3. Latex Portland Cement Mortar: ANSI A108.5, A118.4
   4. Epoxy Mortar: ANSI A108.6, A118.3
   5. Modified Epoxy-Emulsion Mortar: ANSI A108.9, A118.8
   6. Furan Mortar: ANSI A108.8, A118.5
   7. Organic Adhesives (for interior use only): ANSI A136.1 Regardless of the setting material chosen, use of a 3/8" square notched trowel is recommended when installing Metropolitan Ceramics tile.

D. Grouting Materials: Refer to ANSI A108 Series and TCA Handbook for description and appropriate uses of grouts.
   1. Floors and Walls: furnish a commercial grout meeting the appropriate specification.
   2. Sand-Portland Cement Grout: ANSI A108.10
   3. Latex-Portland Cement Grout: ANSI A108.10
   4. Epoxy Grout: ANSI A108.6, A118.3
   5. Modified Epoxy Emulsion Grout: ANSI A108.9, A118.8
   6. Furan Grout: ANSI A108.8, A118.5

E. Protective Materials: See ANSI A108.1-A-1-5 "Environmental Conditions and Protection" for information specific to the type of setting materials and grouts used.

F. Acceptability of Surfaces: Before tiling, be sure variations of surface to be tiled fall within maximum variations shown below:

	Walls	Floors
Dry-Set Mortar	1/8" in 8'	1/8" in 10'
Epoxy Mortar	1/8" in 8'	1/8" in 10'
Organic Adhesive	1/8" in 8'	1/16" in 3'

Report all unacceptable surfaces to the engineer and do not tile such surfaces until they are leveled enough to meet above requirements.

Before tiling, be sure surfaces to be tiled are free from coating, curing membranes, oil, grease, wax and dust.

G. Layout:
   1. Determine locations of all movement joints before starting tile work.
   2. Lay out all tile work so as to minimize cuts less than one-half tile in size.
   3. Locate tile cuts so as to be least conspicuous.

H. Transitions:
   1. Transitions from tile to different finish surfaces (Carpet, Exposed Concrete) shall be per ADA rules ICC/ANSI A117.1-2003.

2. Coordination shall be made between trades by contractor.

I. Workmanship:
1. Supply first-class workmanship in all tile work.
2. Use all products in strict accordance with recommendations and directions of manufacturer.
3. Proportion all mixes in accordance with latest ANSI Standard Specifications.
4. For maximum adhesion, backbutter tile.
5. Use a beating block to embed tile and align surfaces and edges.

J. Setting Methods: Refer to applicable parts of ANSI A108 Series and TCA Handbook for information and details concerning appropriate setting methods for specific job conditions.

K. Grouting:
1. Follow grout manufacturer's recommendations as to grouting procedures and precautions.
2. Remove all grout smears and haze, observing grout manufacturers' recommendations as to use of acid or chemical cleaners. DO NOT USE ANY PRODUCT CONTAINING HYDROFLUORIC ACID SINCE IT WILL ATTACK BOTH GROUT AND TILE.

L. CURING AND PROTECTION FROM CONSTRUCTION DIRT AND TRAFFIC:
Follow directions set forth in ANSI A108. Series for curing based on type of setting material and grout used.

M. INITIAL CLEANING AND SEASONING:
1. It is the installer's responsibility to thoroughly clean and remove all grout or mortar residue from the new tile surface.
2. Because grout joints are porous and highly susceptible to staining, protect them with an application of a *penetrating sealer*, such as Aqua Mix Penetrating Sealer.

3.04 ACCOUSTAL CEILINGS

Hangers and main runners shall be spaced in accordance with the manufacturer’s specifications and recommendations governed by expected maximum load. Main runners shall be accurately leveled and spaced. Install a baked white enamel finish metal angle or channel molding, matching the ceiling system at all sides of ceiling grilles, recessed light fixtures, and other items shown in ceilings. All acoustical tile units shall be removable for access to areas above the ceiling.

Where electrical fixtures are attached to the suspension system, additional 12 ga. galvanized wire supports shall be installed from structure to the suspension system to properly support the electrical fixtures. This Contractor shall verify all locations of electrical fixtures and provide proper support for the suspension system so that the electrical fixtures can be attached to same.

END OF SECTION

SECTION 09 91 01
PAINTING

PART 1 – GENERAL

1.01 SUMMARY

This section includes preparation of surfaces to be painted on site, all field painting, and the repairs to the shop priming or finish coats of paint. In general, all equipment furnished with standard shop finishes shall be field painted, except graphic panels, electrical equipment, instruments, and similar items with baked-on enamel finishes.

1.02 REFERENCES

A. Without limiting the general aspects of other requirements of these specifications, all surface preparation, coating and painting of surfaces shall conform to the applicable requirements of the Steel Structures Painting Council, National Association of Corrosion Engineers (NACE), International Concrete Repair Institute (ICRI), and the manufacturer's printed instructions.

B. The Owner’s decision shall be final as the interpretation and/or conflict between any of the referenced specifications and standards contained herein.

1.03 SUBMITTALS

A. General – Submit listed submittals in accordance with the General Conditions.

B. Action Submittals:
Product Data: Submit manufacturer’s complete product literature for specified pipe paint, including:
1. Physical properties demonstrating compliance with the Specifications and suitability for the intended use.
2. Manufacturer’s storage, handling, and application requirements and recommendations.
3. Project-specific information
4. Any clarifications or exceptions.
5. Paint schedules shall be submitted to the Engineer for selection of colors by the Owner. Manufacturer's color charts shall be submitted to the Owner at least 30 days prior to paint application.

C. Closeout Submittals:
1. Manufacturer’s standard warranty, and any project-specific warranty, if elsewhere required. Warranties that extend beyond the Applicator’s correction period shall be project-specific documents executed by the manufacturer and shall clearly indicate beginning and ending dates of the warranty period.

1.04 APPLICATOR QUALIFICATIONS

A. The applicator shall have five years’ practical experience and successful history in the application of specified products in similar projects. Applicator shall substantiate this requirement by furnishing a list of references and job completions.

B. The Contractor shall provide a site mock up with each paint system as a representative of how the systems shall be installed and their final appearance, which is to be approved by the Owner and Engineer before any

work is started. For overcoat projects this mock up shall be used to test for adequate adhesion. This approved mock up shall be the quality standard for the rest of the project.

1.05 QUALITY ASSURANCE

A. General: Quality assurance procedures and practices shall be utilized to monitor all phases of surface preparation, application, and inspection throughout the duration of the project. Procedures or practices not specifically defined herein may be utilized provided they meet recognized and accepted professional standards and are approved by the Engineer.

B. Surface Preparation: Surface preparation will be based upon comparison with: "Pictorial Surface Preparation Standards for Painting Steel Surfaces", SSPC Vis 1 and ASTM Designation D2200; "Standard Methods of Evaluating Degree of Rusting on Painted Steel Surfaces" SSPC Vis 2 and ASTM Designation D610; "Visual Standard for Surfaces of New Steel Airblast Cleaned with Sand Abrasive" or “Guideline for Selecting and Specifying Concrete Surface Preparation for Sealers, Coating and Polymer Overlays” and ICRI CSP Surface Profile Chips.

C. Application: No coating or paint shall be applied: When the surrounding air temperature or the temperature of the surface to be coated is below the minimum required temperature for the specified product; to wet or damp surfaces or in fog or mist; when the temperature is less than 5 degrees F above the dewpoint; or when the air temperature is expected to drop below 40 degrees F within six hours after application of coating. Dewpoint shall be measured by use of an instrument such as a Sling Psychrometer in conjunction with U.S. Department of Commerce Weather Bureau Psychrometric Tables. If above conditions are prevalent, coating or painting shall be delayed or postponed until conditions are favorable. The day's coating or painting shall be completed in time to permit the film sufficient drying time prior to damage by atmospheric conditions.

D. Thickness and Holiday Checking: Thickness of coatings and paint shall be checked with a nondestructive, magnetic type thickness gauge. The integrity of coated interior surfaces shall be tested with an approved inspection device. Nondestructive holiday detectors shall not exceed the voltage recommended by the manufacturer of the coating system. For thicknesses between 10 and 20 mils (250 microns and 500 microns), a non sudsing type wetting agent, such as Kodak Photo Flo, may be added to the water prior to wetting the detector sponge. All pinholes shall be marked, repaired in accordance with the manufacturer's printed recommendations, and retested. No pinholes or other irregularities will be permitted in the final coating.

E. Inspection Devices: The Contractor shall furnish, until final acceptance of coating and painting, inspection devices in good working condition for detection of holidays and measurement of dry film thickness of coating and paint. The Contractor shall also furnish U.S. Department of Commerce; National Bureau of Standard certified thickness calibration plates to test accuracy of dry film thickness gauges and certified instrumentation to test accuracy of holiday detectors.

F. All necessary testing equipment shall be made available for the Engineer’s use at all times until final acceptance of application. Holiday detection devices shall be operated in the presence of the Owner.

G. All parties, to include the Owner, Engineer, Contractor, applicator, and the product manufacturer, shall meet prior to any work is started to review the Section and discuss project specific expectations, needs and requirements.

1.06 SAFETY AND HEALTH REQUIREMENTS

In accordance with requirements set forth by regulatory agencies applicable to the construction industry and manufacturer's printed instructions and appropriate technical bulletins and manuals, the Contractor shall provide and require use of personnel protective lifesaving equipment for persons working on or about the project site.

1.07 DELIVERY, STORAGE, AND HANDLING

All materials shall be brought to the jobsite in original, sealed containers. They shall not be used until the Owner has inspected contents and obtained data from information on containers or labels. Materials exceeding storage life recommended by the manufacturer shall be rejected.

All coatings and paints shall be stored in enclosed structures to protect them from weather and excessive heat or cold. Flammable coatings or paint must be stored to conform to City, County, State and Federal safety codes for flammable coating or paint materials. At all times, coating and paints shall be protected from freezing.

PART 2 – PRODUCTS

2.01 MANUFACTURER

Manufacturers of paint products for water process components shall only be those companies that have regularly and successfully manufactured coating systems for the municipal water and wastewater industry for at least ten (10) years consecutively prior to this contract. Approved manufacturers include Tnemec, Sherwin-Williams, Ameron, and Carboline. Other approved manufacturers for coatings for certain components are as listed in the following schedules.

2.02 COATING SYSTEMS

A. Exterior cement board and wood surfaces:
Prime Coat: Tnemec Series 10-99W, or equal.
Finish Coats: Tnemec Series 1029 Enduratone, or equal. Apply two coats over primer at 2.0 to 3.0 mils per coat. Color shall be selected by Owner.

B. Interior wood surfaces (trim): Applies to items not fully prefinished.
Prime Coat: Glidden UH-250 or Sherwin Williams or Devoe equals, or other equal.
Finish Coats: Glidden #7770 flat or low gloss latex paint, or Sherwin-Williams or Devoe Equals, Tnemec Series 1029 Enduratone,or other equal. Apply two coats over primer at 2.0 to 3.0 mils per coat. Color shall be selected by Owner.

C. Interior walls and metal surfaces (restrooms gypsum board, and all hollow metal):
Prime Coat : Hollow metal shall be shop primed with gray enamel.
Finish Coats:
1. Pittsburg Pitt Glaze and High Solids Pitt Glaze Semi-Gloss or Sherwin-Williams Tile-Clad II Epoxy, B62 Series/B60 V70 or Glidden Glid-Guard Chemical Resistant Epoxy #4508 Series or Tnemec Series 113 Tneme-Tufcoat. Application: 2 coats at 4.0 to 6.0 mils dry film thickness each. Color to be selected by Owner.

D. Interior gypsum board walls (excluding restrooms):
Prime Coat: Glidden 1000-1200 drywall primer, Sherwin-Williams equal, Devoe equal, or other equal.
Application: 1 coat.
Finish Coats: Glidden 1416 Ultrahide Semi-gloss Interior Acrylic, Sherwin-Williams equal, Devoe equal, Tnemec Series 1029 Enduratone or other equal. Application: 2 coats at 2.0 to 3.0 mils per coat. Color to be selected by Owner.

E. Traffic Paint (stall striping):
Paint shall be Sherwin-Williams "Pro-Mar" traffic marking paint, Series B29.Y.2 or Glidden traffic paint No. 63228, Devoe equal, or other equal. Apply two (2) coats of paint at manufacturer's recommended rate with total minimum of 15 mil dry film thickness. Apply with mechanical equipment to provide uniform straight edges.

F. Steel (all steel surfaces except those pre-finished such as metal roof and wall panels; includes fabricated steel such as stairway):
Shop Surface Preparation: SSPC SP-6/NACE No. 3 Commercial Blast to a 1.5 mil angular surface profile.
Shop Prime Coat: Polyamide epoxy applied at 4.0 to 6.0 dry mils (performance equivalent to Tnemec Series 161).
Field Surface Preparation: SSPC-SP3 Power Tool Cleaning to remove any corrosion or film issues. Spot prime as need with a modified aromatic polyurethane (performance equal to Tnemec Series 1 Omnithane). The surface shall be clean and dry before painting.
1st Coat: Aliphatic Acrylic Polyurethane applied at 2.0 – 3.0 dry mils
(performance equal to Tnemec Series 72 or 73 Endura-Shield)
2nd Coat: Aliphatic Acrylic Polyurethane applied at 2.0 – 3.0 dry mils
(performance equal to Tnemec Series 72 or 73 Endura-Shield)

G. Exterior Concrete Walls (Salt Storage Building and Recycle Center Attendant Building knee walls where exposed to view):
Surface preparation: New concrete must be cured 28 days; all form-release agents and other matter must be removed; patch and smooth all form tie holes and other imperfections;
Prime coat: compatible with substrate and finish coat as recommended by finish coat manufacturer (performance equal to Tnemec Series 151 at 0.7 to 1.5 dry mils).
Finish coat: sand-textured acrylic, Parex DPR Standard Acrylic, Tnemec Enviro-Crete Series 157, or equal.
Color: Beige, as selected by Owner from among manufacturer's available colors.
Application: Trowel or spray, one or two coats at 6.0 to 9.0 mils, as needed to hide concrete substrate and any form lines or other imperfections in concrete surfaces.

H. Interior Concrete Floors (new office/shop building only) where indicated on Drawings:
1. Office Area Rooms (except for break room and floors to receive tile):
Surface Preparation: NACE No. 6/ SSPC-SP13 Surface Preparation of Concrete to ICRI concrete surface profile (CSP) 4. Allow new poured-in-place concrete to cure for a minimum of 10 days at 75 degrees F.
Primer: Apply modified polyamine epoxy Tnemec Series 237 Power-Tread at 8.0-10.0 dry mils
Intermediate: Apply modified polyamine epoxy Tnemec Series 237 Power-Tread at 8.0-10.0 dry mils
Finish: Apply aliphatic moisture cured urethane Tnemec Series 248 Everthane at 2.0-3.0 dry mils
Color: clear or other color selected by Owner from among manufacturer's standard offerings.

2. Break Room Floor:
Surface Preparation: NACE No. 6/ SSPC-SP13 Surface Preparation of Concrete to ICRI concrete surface profile (CSP) 4. Allow new poured-in-place concrete to cure for a minimum of 28 days at 75 degrees F.
Primer: Apply polyurethane modified concrete Tnemec Series 242 Ultra-Tread-S at 1/8" neat. Broadcast aggregate to refusal to 3/16".
Intermediate: Apply modified polyamine epoxy Tnemec Series 280 Tneme-Glaze at 10.0-12.0 dry mils.
Finish: Apply aliphatic moisture cured urethane Tnemec Series 248 Everthane at 2.0-3.0 dry mils.
Color: clear or other color selected by Owner from among manufacturer's standard offerings.

3. Shop Floor:
Surface Preparation: NACE No. 6/ SSPC-SP13 Surface Preparation of Concrete to ICRI CSP 4. Allow new poured-in-place concrete to cure for a minimum of 10 days at 75 degrees F.
Urethane Concrete Primer: Apply Tnemec Series 241 Ultra-Tread MVT or equal at 70-80 sqft/gallon. Broadcast aggregate to refusal.
Double Broadcast: Apply Tnemec Series 237 Power-Tread or equal at 20 mils wet. Aggregate (flint shot, silica sand, quartz, flake) is then broadcast into wet resin until a uniformly dry appearance is obtained to an approximate thickness of 1/16" per broadcast. Double broadcast to 1/8".
Grout: Apply Tnemec Series 237 Power-Tread or equal at 8.0-16.0 dry mils.
Finish: Apply Tnemec Series 248 Everthane or equal at 2.0-3.0 dry mils .
Color: clear or other color selected by Owner from among manufacturer's standard offerings.

PART 3 – EXECUTION

3.01 GENERAL

A. All surface preparation, coating and painting shall conform to applicable standards of the Steel Structures Painting Council, NACE, ICRI and the manufacturer's printed instructions. Material applied prior to observation of the surface by the Engineer shall be removed and reapplied at the expense of the Contractor.

B. All work shall be performed by skilled craftsmen qualified to perform the required work in a manner comparable with the best standards of practice. Continuity of personnel shall be maintained and transfers of key personnel shall be coordinated with the Engineer.

C. Dust, dirt, oil, grease or any foreign matter that will affect the adhesion or durability of the finish must be removed by washing with clean rags dipped in an approved cleaning solvent and wiped dry with clean rags.

D. The Contractor's coating and painting equipment shall be designed for application of materials specified and shall be maintained in first class working condition. Compressors shall have suitable traps and filters to remove water and oils from the air. Contractor's equipment shall be subject to approval of the Engineer.

E. Application of the first coat shall follow immediately after surface preparation and cleaning and before rust bloom or flash rusting occurs. Any cleaned areas not receiving first coat within this period shall be recleaned prior to application of first coat.

F. Surfaces that have been shop painted and have been damaged during transit or installation, or where the shop coat or coats of paint have deteriorated, shall be cleaned and retouched before any successive painting is done on them in the field. Surfaces with enamel finishes that have been damaged in transit or during installation shall be retouched to match the original finish.

G. All surfaces to be painted as well as the atmosphere in which painting is to be done shall be kept warm and dry by heating and ventilating if necessary until each coat of paint has hardened. Any defective paint shall be scraped off and repainted in accordance with the Engineers' directions.

H. Finished surfaces shall not show brush marks or other irregularities. Undercoats shall be thoroughly and uniformly sanded with Number 00 sandpaper or equal to remove defects and provide a smooth even surface. Top and bottom edges of doors shall be painted and all exterior trim shall be backprimed before installation.

I. Painting shall be continuous and shall be accomplished in an orderly manner so as to facilitate inspection. Materials subject to weathering shall be prime coated as quickly as possible. Surfaces of exposed members that will be inaccessible after erection shall be cleaned and painted before erection.

J. In general, aluminum, stainless steel, copper, bronze, and pre-finished wall panels shall not be field painted. Care shall be taken not to paint shafts, grease fittings, nameplates, machined parts, sight glasses, etc.

3.02 SURFACE PREPARATION

A. The latest revision of the following surface preparation specifications of the Steel Structures Painting Council and NACE shall form a part of this specification:
   1. Solvent Cleaning (SSPC-SP1): Removal of oil, grease, soil and other contaminants by use of solvents, emulsions, cleaning compounds, steam cleaning or similar materials and methods which involve a solvent or cleaning action.
   2. Hand Tool Cleaning (SSPC-SP2): Removal of loose rust, loose mill scale and other detrimental foreign matter to degree specified by hand chipping, scraping, sanding and wire brushing.
   3. Power Tool Cleaning (SSPC-SP3): Removal of loose rust' loose mill scale and other detrimental foreign matter to degree specified by power wire brushing, power impact tools or power sanders.
   4. Brush-Off Blast Cleaning (SSPC-SP7/NACE 4): Brush-off blast cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, loose mill scale, loose rust, and loose coating. Tightly adherent mill scale, rust, and coating may remain on the surface. Mill scale, rust, and coating are considered tightly adherent if they cannot be removed by lifting with a dull putty knife after abrasive blast cleaning has been performed.
   5. Commercial Blast Cleaning (SSPC-SP6/NACE 3): Blast cleaning until at least 66 percent of each element of surface area is free or all visible residues.
   6. Near White Blast Cleaning (SSPC-SP10/NACE 2): Blast cleaning to nearly white metal cleanliness, until at least 95 percent of each element of surface area is free of all visible residues.
   7. Surface Preparation of Concrete (SSPC-SP13/NACE 6): This standard gives requirements for surface preparation of concrete by mechanical, chemical, or thermal methods prior to the application of bonded protective coating or lining systems.
   8. Power Tool Cleaning to Bare Metal (SSPC-SP11): This standard covers the requirements for power tool cleaning to produce a bare metal surface and to retain or produce a minimum 25 micrometer (1.0 mil) surface profile. This standard is suitable where a roughened, clean, bare metal surface is required, but where abrasive blasting is not feasible or permissible.

B. Blast cleaning for all surfaces shall be by dry method unless otherwise directed.

C. Particle size of abrasives used in blast cleaning shall be that which will produce a 1.5 – 2.0 mil (37.5 microns - 50.0- microns) surface profile or in accordance with recommendations of the manufacturer of the specified coating or paint system to be applied.

D. Abrasive used in blast cleaning operations shall be new, washed, graded and free of contaminants that would interfere with adhesion of coating or paint and shall not be reused unless specifically approved by the Owner.

E. During blast cleaning operations, caution shall be exercised to insure that surrounding existing coatings or paint are not exposed to abrasion from blast cleaning.

F. The Contractor shall keep the area of his work and the surrounding environment in a clean condition. He shall not permit blasting materials to accumulate as to constitute a nuisance or hazard to the accomplishment of the work, the operation of the existing facilities, or nuisance to the surrounding environment.

G. Blast cleaned surfaces shall be cleaned prior to application of specified coatings or paint. No coatings or paint shall be applied over damp or moist surfaces.

H. Specific Surface Preparation: Surface preparation for the specific system shall be as noted in Part 2 – Products.

3.03 APPLICATION, GENERAL

A. Coating and paint application shall conform to the requirements of the Steel Structures Painting Council Paint Application Specification SSPC-PA1, latest revision, for "Shop, Field and Maintenance Painting," and to the recommendations of the manufacturer of the coating and paint materials.

B. Thinning shall be permitted only as recommended by the manufacturer, approved by the Engineer, and utilizing the thinners stated in Part 2 – Products.

C. Each application of coating or paint shall be applied evenly, free of brush marks, sags, runs, with no evidence of poor workmanship. Care shall be exercised to avoid lapping on glass or hardware. Coatings and paints shall be sharply cut to lines. Finished surfaces shall be free from defects or blemishes.

D. Protective coverings or drop cloths shall be used to protect floors, fixtures, and equipment. Care shall be exercised to prevent coatings or paint from being spattered onto surfaces that are not to be coated or painted. Surfaces from which materials cannot be removed satisfactorily shall be recoated or repainted as required to produce a finish satisfactory to the Engineer.

E. When two coats of coating or paint are specified, where possible, the first coat shall contain sufficient approved color additive to act as an indicator of coverage or the two coats must be of contrasting color.

F. Film thickness per coat specified in Part 2 – Products are minimum required. If roller application is deemed necessary, the Contractor shall apply additional coats so as to achieve the specified thickness.

G. All welds, edges and other irregular surfaces shall receive a brush coat of the specified product prior to application of the first complete coat.

3.04 MANUFACTURER SERVICES

A NACE-certified technical representative from the paint manufacturer shall visit the Site to support the Contractor's personnel or the Owner as needed and/or requested. Visits shall be made on a weekly basis as a minimum or as needed to review hold points for the Engineer. 48 hours' notice to Engineer and paint manufacturer is required by the Contractor for each hold point inspection.

3.05 SOLVENT VAPOR REMOVAL

Where appropriate all solvent vapors shall be completely removed by suction type exhaust fans and blowers before placing in operating service.

3.06 CLEAN UP

Upon completion of the work, all staging, scaffolding, and containers shall be removed from the site or destroyed in a manner approved by the Engineer. Coating or paint spots and oil or stains upon adjacent surfaces shall be removed and the jobsite cleaned. All damage to surfaces resulting from the work of this section shall be cleaned, repaired, or refinished at no cost to the Owner.

3.07 ANNIVERSERY INSPECTION

Approximately 360 days after the date of Substantial Completion, the Contractor will return for a one-year anniversary inspection of the coatings work. The Contractor will correct any deficiencies found at no cost to the Owner.

END OF SECTION

SECTION 11 11 25
VEHICLE – LIFTING EQUIPMENT

PART 1 – GENERAL

1.01 SUMMARY

This section covers the supply and installation of two hydraulic and mechanical vehicle lift systems to be located in the shop building.

1.02 SUBMITTALS

A. General – Submit listed submittals in accordance with the General Conditions.

B. Action Submittals:
Product Data: Submit manufacturer's complete product literature for lifts and accessories, including:
1. Physical properties and dimensions demonstrating compliance with the Specifications and suitability for the intended use.
2. Manufacturer's storage, handling, and installation requirements and recommendations.
3. Project-specific information.
4. Any clarifications or exceptions.

C. Closeout Submittals:
1. Operation and maintenance data and instructions.
2. Manufacturer's standard warranty, and any project-specific warranty, if elsewhere required. Warranties that extend beyond the Contractor's correction period shall be project-specific documents executed by the manufacturer and shall clearly indicate beginning and ending dates of the warranty period.

1.03 QUALITY ASSURANCE

A. Manufacturer: Manufacturers of equipment specified in the Section shall have a minimum of ten (10) years' experience in the manufacture of the type of equipment specified. Manufacturers shall be Rotary Lift (Dover Corporation), Mohawk Lifts, Steril-Koni, or approved equal.

PART 2 – PRODUCTS

2.01 VEHICLE LIFTS

A. General – Vehicle lifts shall be of heavy-duty steel construction, four-post design with ramps and runways, dual-function lock system, power system, accessories specified herein, and all incidental items needed for a complete, functional lifting system.

B. Lift No. 1 – Lift No. 1 shall be a 14,000-pound capacity lift located in Bay #1 of the shop. It shall be Dover-Rotary Lift Model #SM014-L with RJ7000 rolling jack, FC5760-14 air line kit, and 5100151BL ramp chocks to allow drive-through use, Mohawk Lifts equals, Steril-Koni equals, or other approved equals. The lift shall meet the following specifications, allowing for minor deviations as may exist among approved manufacturers:

Rise	78 3/4”
Length Overall	21’1”
Width Overall	11’8 1/2”
Inside of Columns	116 1/4”
Between Front and Rear Columns	194 3/4”
Height of Columns	9’ 1 1/16”
Width of Runways	20”
Height of Runways	7”
Width Between Runways	43”
Lifting Capacity	14,000 lbs.
Motor	2 HP
Voltage	208v – 230v
Time of Full Rise	65 seconds

C. Lift No. 2 – Lift No. 2 shall be a 30,000-pound capacity lift located in Bay #2 of the shop. It shall be Dover-Rotary Lift Model #SM30EL3 with RJ152BK rolling jack and FC5780-3 ramp chocks to allow drive-through use; Mohawk Lifts equals, Steril-Koni equals, or other approved equals. The lift shall meet the following specifications, allowing for minor deviations as may exist among approved manufacturers:

Max Wheelbase	235”
Rise	68”
Length Overall	25’ 8 1/8”
Width Overall	12’ 4 13/16”
Inside of Columns	132”
Between Front and Rear Columns	249”
Height of Columns	7’ 3/4”
Width of Runways	24”
Height of Runways	8 3/8”
Width Between Runways (min.)	41”
Width Between Runways (max.)	48”
Lifting Capacity	30,000 lbs.
Motor	4 HP
Voltage Single Phase	208v – 230v
Time of Full Rise	105 seconds

PART 3 – EXECUTION

3.01 GENERAL

All installation shall be as recommended by the manufacturer and in accordance with applicable codes, the Drawings, and approved submittals. Furthermore, at least one day/trip of on-site services by the manufacturer’s authorized representative shall be provided, for the purpose of verifying proper installation, adjusting equipment, and training Owner’s personnel in the proper and safe use of the equipment.

END OF SECTION

SECTION 11 11 26
VEHICLE – WASHING EQUIPMENT

PART 1 – GENERAL

1.01 SUMMARY

This section covers the supply and installation, and startup services for the commercial vehicle washing system to be located in the wash bay of the shop.

1.02 SUBMITTALS

A. General – Submit listed submittals in accordance with the General Conditions.

B. Action Submittals:
Product Data: Submit manufacturer's complete product literature for vehicle-washing equipment and accessories, including:
1. Physical properties and dimensions demonstrating compliance with the Specifications and suitability for the intended use.
2. Manufacturer's storage, handling, and installation requirements and recommendations.
3. Project-specific information.
4. Any clarifications or exceptions.
5. Shop drawings showing compliance with Contract Documents and showing all other information needed for installation in wash bay (including but not limited to electrical, pneumatic, water supply, and wastewater connections).

C. Closeout Submittals:
1. Operation and maintenance data and instructions.
2. Manufacturer's standard warranty, and any project-specific warranty, if elsewhere required. Warranties that extend beyond the Contractor's correction period shall be project-specific documents executed by the manufacturer and shall clearly indicate beginning and ending dates of the warranty period.
3. Startup report by manufacturer.

1.03 QUALITY ASSURANCE

A. Manufacturer: Manufacturers of equipment specified in the Section shall have a minimum of ten (10) years' experience in the manufacture of the type of equipment specified. Manufacturer shall have experience with large vehicle washing systems. Manufacturers shall be Istobal USA Corporation of Bristol, VA, Westmatic Corporation of Buffalo, NY, N/S Corporation of Inglewood, CA, or approved equal.

PART 2 – PRODUCTS

2.01 VEHICLE WASHING EQUIPMENT

A. General – Vehicle washing equipment shall be a complete system designed, provided, and supervised during installation by a single manufacturer. The system shall use high pressure water sprays to clean vehicles up to 13'9" high and shall clean roof, sides, front, rear, and underside. The system shall be fully automatic, of the drive-through type. The system shall use potable water supply and not recycle any water. The system

shall be substantially equivalent to the Istobal HW' ROTATORS model 4HWR100 consisting of, but not limited to, the following components:

1. (1) rotator arch – 8 heads – 3 per side-and 2 on top
2. (4) 33 GPM pump stands with 3 pumps on each stand
3. (1) Foaming presoak system with arch
4. (1) Single wash activation system with stand
5. (1) Under carriage spray system with 3-way valve
6. (1) Photo eye activation system
7. (1) Touch screen control panel for programming and troubleshooting
8. (5) 4' set of guide rails
9. (1) Final rinse arch
10. (1) Two position entry light
11. (1) Water storage tank

B. Components – Components shall meet the following specifications. Product numbers listed are Istobal products and are listed to establish minimum requirements. Not all components are listed. Manufacturer shall supply all electrical, mechanical, pneumatic, hydraulic, and specialized components for a complete, functional system. Contractor shall provide all remaining materials needed for the system to be complete and functional.
   1. RC084013 Underchassis Wash 70 bar 252 l/m
      a. Set consisting of 5 mm-thick, 2,950 mm wide galvanized steel frame
      b. Double pipe with ten 15° nozzles with ceramic tip
      c. 70 bar 252 L/min high-pressure, with 15° orientation towards vehicle front and rear
      d. High-pressure solenoid valve and control selector switch with indicator light
   2. RC123024 Foamy sides chemical prewash fixed
      a. Stainless steel side pipes
      b. Pipe brackets in galvanized painted steel
      c. Dosing pump unit in plant room with premix tank and Hydrominder dilution system
      d. Impulse pump, 5.5 kW, 100 bar, 28 L/min
   3. RC065056 H.P. Electropump 16.5kW 70 bar 126 l/min
      a. Rack with three high-pressure pumps 70 bar, 5.5 kW, 42 L/min
      b. Pressure control valve
      c. 200 L plastic tank
      d. Water inlet solenoid valve to tank with level control
   4. RC077016 Pressure group 1-2 racks
      a. 2.2 kW pressure booster to supply up to two high-pressure rack tanks
      b. 60 L horizontal tank with bracket
      c. Water level detection for its supply tank
   5. RC075004 Mesh filter 100 microns
      a. Inlet filter on tank, high-pressure rack, 100 μm
      b. Wall mounted
      c. 1-1/4" connections
   6. RC079004 Centring guides length 2.3m x 120mm (5 sets required)
      a. One pair of 2.3 m-long centring guides
      b. Tubes with welded elbows on ends, 120 mm diameter
      c. 4.5 mm-thick hot-dip galvanized steel
   7. RC017002 Rinsing arch
      a. Final rinse arch consisting of 3 mm-thick galvanized steel bases and 1-1/4" aluminum pipes
      b. With 19 quick-coupling nozzles, supplied from water pump RC065013 1.5 kW 3 bar 125 L/min
      c. Control selector switch with indicator light

8. RC065013 Demineralized water pump 1,5 kW 3 bar 125 l/min
    a. Stainless steel water pump prepared to work with demineralized water
    b. Includes fittings for water hoses, non-return valve and control box
    c. Supplies rinse arch RC017002
9. RC016002 Frost prevention by pipe emptying
    a. Distributor with up to 8 solenoid valves for pipe emptying by controlled compressed-air injection
    b. Digital control thermostat
    c. 15 m connection between solenoid valve and water line
    d. Includes one solenoid valve for the first water line, extensions RC016029 necessary for the rest

PART 3 – EXECUTION

3.01 GENERAL

All installation shall be as recommended by the manufacturer and in accordance with applicable codes, the Drawings, and approved submittals. Furthermore, at least one day/trip of on-site services by the manufacturer's authorized representative shall be provided, for the purpose of verifying proper installation, adjusting equipment, and training Owner's personnel in the proper and safe use of the equipment. Additionally, manufacturer shall supervise and/or install final connections to Manufacturer's equipment, shall test and adjust complete system, and shall provide a written report certifying that the system has been properly installed.

END OF SECTION

SECTION 11 82 26
FACILITY WASTE COMPACTORS

PART 1 – GENERAL

1.01 SUMMARY

This section covers the supply and installation of two (2) waste compactors with receiving containers and appurtenances, to be located on the Recycle Center site.

1.02 REFERENCES

ANSI Z245.2 Stationary Compactors - Safety Requirements for Installation, Maintenance, and Operation

1.03 SUBMITTALS

A. General – Submit listed submittals in accordance with the General Conditions.

B. Action Submittals:
Product Data: Submit manufacturer's complete product literature for waste compactors and accessories, including:
1. Physical properties and dimensions demonstrating compliance with the Specifications and suitability for the intended use.
2. Manufacturer's storage, handling, and installation requirements and recommendations.
3. Project-specific information.
4. Any clarifications or exceptions.

C. Closeout Submittals:
1. Operation and maintenance data and instructions.
2. Manufacturer's standard warranty, and any project-specific warranty, if elsewhere required. Warranties that extend beyond the Contractor's correction period shall be project-specific documents executed by the manufacturer and shall clearly indicate beginning and ending dates of the warranty period.

1.03 QUALITY ASSURANCE

A. Manufacturer: Manufacturers of equipment specified in the Section shall have a minimum of ten (10) years' experience in the manufacture of the type of equipment specified. Manufacturers shall be Baker Waste Equipment, Lenoir, NC, Harmony Enterprises, Inc., ACE Equipment Company or approved equal.

PART 2 – PRODUCTS

2.01 WASTE COMPACTORS

A. Dimension Restrictions – Each compactor shall be limited in size so as to fit inside the shelter as shown on the Drawings. Maximum dimensions shall be 89" wide x 120" long x 96" high (including the hopper and controls).

B. Equipment Specifications – Waste compactors shall be two-cubic-yard stationary type, Baker Waste Equipment Pinnacle Model #S-200, Harmony Model #C200, ACE Equipment Model #A2 Single, or approved equal. Compactors shall be designed for stationary use and to discharge to a roll-off type 30-cubic-yard container. Each compactor shall meet the following specifications, allowing for minor deviations as may exist among approved manufacturers:

1. Hydraulic/Electrical Features:
   a. Remote Power Unit with weather cover, key lock start, reverse, and e-stop controls in panel with 8 ft. hydraulic hoses.
   b. Voltage: 208
   c. Phase: 3
   d. Warning lights 80% and 100%
   e. Hydraulic Connections/Disconnects: Left Side
   f. Load Option Description: Doghouse with 2 doors with interlocks
   g. Stationary Receiver Guide-60”-noStop
2. Dimensions: 120” L x 48” H x 66” W
3. Manufacturer Rating – 2.00 Cubic Yards
4. NSWMA Equivalent – 1.58 cubic yards
5. Clear Top Opening 60” W x 46” L
6. Loading Height – 48” standard
7. Ram Face – 29” x 60”
8. Discharge Opening – 37” x 60”
9. Performance Characteristics:
   a. Cycle Time – 60 seconds
   b. Total Normal Force – 58,400 lbs.
   c. Total Maximum Force – 71,000 lbs.
   d. Ram Penetration – 11 inches
10. Electrical Equipment
    a. Electrical Motor – 15 Horsepower
    b. Tri-voltage Starter – 208/230/460
    c. Electrical Control Voltage – 120 VAC
    d. UL Label Panel Box – NEMA 13
    e. All Circuits Fused
    f. Standard Control – Key Operated Switch
    g. Remote Pendant Option: Start, Stop and Reverse
11. Hydraulic Equipment
    a. Hydraulic Pump Capacity – 12 GPM
    b. Normal Pressure – 2050 PSI
    c. Maximum Pressure – 2550 PSI
    d. Cylinder – 6” bore x 56” stroke x 2.5” rod
12. UL Approved Panels and Power Units
13. Meets ANSI Z245.2 Regulations and OSHA Requirements

2.02 RECEIVER CONTAINERS

A. Containers – Provide one 30-cubic-yard, welded steel octagonal roll-off container for each compactor. Containers shall be compatible with the compactors. Containers shall be Baker Waste Equipment Model #CC30-710, or equal. Each container shall meet the following specifications:

1. Steel Travel Door “Side Hinged”
2. Octagonal Specifications:

a. Understructure Cross Members – 3” channel on 16” center
b. 2 Gussets per cross member
c. Main Rails – 2” x 6” tubing ¼” wall, with solid bull nose
d. Pull Hook – 1.5” integrated and welded into sub-structure crossmembers
e. Floor – 3/16” steel plate
f. Wheels – 8” diameter x 6” long with grease fitting
g. Guide Rollers – 4” dia. x 6” long with recessed grease fitting
h. Sides and Front – 3/16” steel plate
i. Sides and Top – 10 gauge
j. Rear Door – 3/16” steel w/ 3-point lever latch and safety chain with 6” formed channel frame
k. Hinges – 3 heavy duty 8” x 8” plate hinges with 1.5” pin and grease zerks
l. Paint – Oxide primer 2.0 mils; industrial enamel finish to 2.0 mils, color to be selected by Owner.

PART 3 – EXECUTION

3.01 GENERAL

A. All installation shall be as recommended by the manufacturer and in accordance with applicable codes, the Drawings, and approved submittals. Furthermore, at least one day/trip of on-site services by the manufacturer’s authorized representative shall be provided, for the purpose of verifying proper installation, adjusting equipment, and training Owner’s personnel in the proper and safe use of the equipment.

B. Install steel angle guides on concrete pavement as directed by container manufacturer to properly align container with compactor.

END OF SECTION

SECTION 11 82 36
FACILITY WASTE BALERS

PART 1 – GENERAL

1.01 SUMMARY

This section covers the supply and installation of a cardboard compactor/baler machine to be located inside the Recycle Center Attendant Office and Cardboard Recycle Shelter.

1.02 SUBMITTALS

A. General – Submit listed submittals in accordance with the General Conditions.

B. Action Submittals:
Product Data: Submit manufacturer's complete product literature for waste balers and accessories, including:
1. Physical properties and dimensions demonstrating compliance with the Specifications and suitability for the intended use.
2. Manufacturer's storage, handling, and installation requirements and recommendations.
3. Project-specific information.
4. Any clarifications or exceptions.

C. Closeout Submittals:
1. Operation and maintenance data and instructions.
2. Manufacturer's standard warranty, and any project-specific warranty, if elsewhere required. Warranties that extend beyond the Contractor's correction period shall be project-specific documents executed by the manufacturer and shall clearly indicate beginning and ending dates of the warranty period.

1.03 QUALITY ASSURANCE

A. Manufacturer: Manufacturers of equipment specified in the Section shall have a minimum of ten (10) years' experience in the manufacture of the type of equipment specified. Manufacturers shall be PTR Baler & Compactor Company, Ace Equipment Company, Harmony Enterprises, Inc., or approved equal.

PART 2 – PRODUCTS

2.01 CARDBOARD COMPACTOR/BALER

A. Dimension Restrictions – Compactor/Baler shall fit within designated space without obstructing doors or pathways. Maximum footprint shall be 83" x 42". Maximum height shall be 152 inches.

B. Equipment Specifications – Cardboard Compactor/baler shall be PTR Model 2300HD, ACE Equipment Model 6030HD, Harmony Model M60STD, or approved equal. Equipment shall be of the vertical type using hydraulic power for compaction and ejection. Capacity shall be 1,000 pounds minimum for a bale size of 30"x48"x60". Hydraulic pump shall be 10 gallons per minute minimum. Motor shall be 10 horsepower minimum and supplied by 208-volt three phase power. Unit shall have internal transformer to convert to 120-volt single phase power for controls. Platen force shall be 55,000 pounds minimum. Cycle times shall be less than one minute.

PART 3 – EXECUTION

3.01 GENERAL

All installation shall be as recommended by the manufacturer and in accordance with applicable codes, the Drawings, and approved submittals. Furthermore, at least one day/trip of on-site services by the manufacturer's authorized representative shall be provided, for the purpose of verifying proper installation, adjusting equipment, and training Owner's personnel in the proper and safe use of the equipment.

END OF SECTION

SECTION 13 34 19.11
METAL BUILDLING SYSTEMS
(SALT STORAGE)

PART 1 – GENERAL

1.01 SUMMARY

A. This section covers the pre-engineered salt storage building as shown on the Drawings and herein specified.

B. Building system general includes:
   1. Clear arch span system
   2. Enclosed rear-end wall.
   3. Enclosed front-end wall with panels precut to fit roof radius and door openings.
   4. Upward acting sectional door and personnel door.
   5. All necessary accessories to complete the building.
   6. Concrete retaining wall and foundation.

1.02 REFERENCES

ASTM A972	Standard Specification for Fusion Bonded Epoxy-Coated Pipe Piles
ASCE 7-10	Minimum Design Loads for Buildings and Other Structures
AISC	"Manual of Steel Construction," latest edition, American Institute of Steel Construction.
AISC	"Specification for Structural Steel Buildings." latest edition.
AIS1	"Cold-Formed Steel Design Manual," latest edition, American Iron and Steel Institute.
2018	NC State Building Code

1.03 SUBMITTALS

A. General – Submit listed submittals in accordance with General Conditions.

B. Action Submittals – Submit complete information for methods and materials, including:
   1. All Manufacturer drawings and design calculations, which shall bear the professional seal and signature of a licensed professional engineer registered in the state of North Carolina
   2. Anchor bolt placement plan, column reactions and calculations in advance of erection drawings.
   3. Foundation plan signed and sealed by a licensed professional engineer registered in the state of North Carolina.

C. Closeout Submittals:
   1. Maintenance data and instructions for panels, doors, walls and floors.
   2. Manufacturer’s standard warranty, and any project-specific warranty, if elsewhere required. Warranties that extend beyond the Contractor’s correction period shall be project-specific documents executed by the manufacturer and shall clearly indicate beginning and ending dates of the warranty period.

1.04 QUALITY ASSURANCE

A. General: The structure shall comply with the current versions of AISC, AISI and ASTM specifications at the time of manufacturing.

B. Manufacturer: The company manufacturing the products specified in this Section shall have a minimum of 5 years' experience in the manufacture of pre-fabricated steel building systems.

C. Structural framing and covering shall be the design of a North Carolina licensed professional engineer experienced in design of this work.

D. Erector shall have specialized experience in the erection of this type of steel building systems for a period of at least 5 years.

1.05 DESIGN REQUIREMENTS

A. Metal roof and walls:
   1. The building metal shall be designed by the Manufacturer as a complete system. Members and connections not indicated on the Drawings shall be the responsibility of the Manufacturer and/or Contractor.
   2. All loads given are minimum requirements. All applicable provisions of the 2018 NC Building Code will apply.
   3. Basic design loads include live, seismic, wind, and dead load, and shall be calculated according to ASCE 7-10.
   4. Design loads are as follows:
      a. Wind speed Vult = 170 mph LRFD/strength design as per ASCE 7-10
      b. Exposure: C, Partially Enclosed.
      c. Importance factor based upon building usage: Wind = 1.00.
      d. Roof Live load = 20 psf.
      e. Ground snow load = 30 psf.
      f. Seismic Zone: Site Class C, as per the subsurface report by S&ME, Inc.
      g. NC Building Code, 2018 edition, application and combination of loads.

B. Concrete:
   The concrete foundation and retaining walls shall be designed by a North Carolina registered professional engineer for the loads above and to store 600 tons road salt. Salt height shall be as shown on the Drawings.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Materials delivered to the site shall be immediately unloaded and stored on site in a clean dry environment, stored at least 6" above ground in a secure area, well ventilated, protected from the weather and secure from leaning and topping in accordance with storage guidelines supplied. Deliver, store and handle all items to prevent bending, corrosion and damage.

1.07 WARRANTIES

A. Building manufacturer shall provide manufacturer's standard material warranties, including but not limited to, 30-year steel mill and ArcelorMittal Galvalume warranties.

PART 2 - PRODUCTS

2.01 MATERIALS – STEEL.

A. General: Steel roof and walls shall be Steel Masters Building Systems Model Q40-11-50, or equal.

B. Arch Panels: Heavy Commercial grade 80, 20 gauge, AZM180/AZ60 minimum triple spot Galvalume Plus steel, in accordance with ASTM A972. Double bolt, 9" lap seams.

C. Front End Wall: 22-gauge Galvalume Plus steel end wall with 14' x 16' 14-gauge cannister door post and header. Panels precut to fit roof radius and door openings.

D. Rear End Wall: 22-gauge Galvalume Plus steel end wall.

E. Industrial Base Connector: Complete set for fastening structure to concrete wall. All material is 14 gauge with Galvalume Plus coating.

F. Premium Grade Hardware: 5/16" grade 8 / DT 1500 hr salt rated preassembled fasteners with polyethylene washers to secure the building components through predrilled holes.

G. Sealant Manufacturer's standard type.

H. Exterior Finish: Exterior Finish: One coat 70% polyvinylidene fluoride (PVDF) coil coating, nominal 0.7 mil (0.02 mm), over 0.2 mil (0.005 mm) primer; color as selected (by Owner) from manufacturer's standard colors.

2.02 MATERIALS – DOORS

A. Metal Personnel Doors and Frames - Shall conform to section 081113.

B. Upward Acting Sectional Doors
1. General: The upward action sectional door shall be series 421 un-insulated steel as manufactured by Overhead Door Corp. or approved equal.
2. Door Sections to be of a min. 20 ga. galvanized exterior, ribbed, un-insulated and shall form a weather tight joint and provide full-width interlocking structural rigidity. Panels shall have factory pre-coated finish, colors selected by owner from manufacturer's standard colors. Wind load Design: ANSI/DASMA 102 standards and as required by code.
3. Counterbalance shall be helical torsion springs on cross header shaft. Lift cables shall be galvanized with cable safety factor of 7:1, stressed spring wire.
4. Hardware shall be galvanized steel hinges and fixtures, full floating, hardened steel, ball bearing rollers with hardened steel races. Doors reinforced with steel struts as required for size of door.
5. Lock shall be keyed with interlock switch for automatic operator as supplied by door hardware vendor as specified in section 081113.
6. Tracks shall be galvanized steel with a wedge action to create weather tight closure when door is in the lowered position. Provide tracks as recommended by manufacturer to suit loading required and clearances available. Brackets shall be mounted on steel angles provided by others. Provide general contractor with template for all blocking locations required for the installation of this work.
7. Weather-stripping shall be flexible pvc strip on bottom section and top section and be provided and installed by this supplier. Aluminum and vinyl seal for jambs shall be provided by this supplier.

8. Operation shall be by manual (chain pull) hoist.

PART 3 - EXECUTION

3.01 EXECUTION

A. Preparation:
   1. Verify site conditions under provisions of Sections 015000 and 310200.
   2. Verify that foundation, floor slab, and electrical utilities, and placed anchors are in correct position and properly squared.
   3. Provide access to the work as scheduled for owner provided inspections, if required. The cost of any required inspections is the responsibility of the owner.
   4. Do not proceed until unsatisfactory conditions have been corrected.

B. Erection – Wall and Roof Systems
   1. Install all wall and roofing systems in accordance with manufacturer's instructions and details.
   2. Exercise care when cutting prefinished material to ensure cuttings do not remain on finish surface.

C. Erection – Flashing and Trim
   1. Install flashings and trim in strict accordance with manufacturer's instructions, using proper sheet metal procedures.

D. Installation - Accessories
   1. Install door frames, doors, overhead doors, in accordance with manufacturer's instructions.
   2. All roof and wall accessories to be installed weathertight.

E. Standards
   1. All work shall be performed by experienced workmen in a workmanlike manner to published tolerances.
   2. Install in accordance with AISC Manual of Steel Construction, approved shop drawings, building code, and Drawings.

END OF SECTION

SECTION 13 34 19.21
METAL BUILDING SYSTEMS
(SHOP AND OFFICE)

PART 1 – GENERAL

1.01 SUMMARY

A. This section covers the pre-engineered metal building system as shown on Drawings and herein specified for the new public works shop and office building.

B. Building system generally includes:
   1. Structural framing and sub-framing systems.
   2. Sheet metal & trim.
   3. Insulated standing seam metal roof.
   4. Preformed insulated and non-insulated metal wall panel.
   5. Insulation

C. Windows, doors, and other appurtenances that attach to the metal building system may be supplied by suppliers other than the metal building Manufacturer. Certain of these appurtenances are specified herein.

1.02 REFERENCES

ASCE 7-10	Minimum Design Loads for Buildings and Other Structures
MBMA	"Metal Building Systems Manual," latest edition, Metal Building Manufacturer's Association.
AISC	"Manual of Steel Construction," latest edition, American Institute of Steel Construction.
AISC	"Specification for Structural Steel Buildings." latest edition.
AISI	"Cold-Formed Steel Design Manual," latest edition, American Iron and Steel Institute.
CMAA	“Crane Manufactures Association of America Inc.” latest edition, Specification No. 70.

1.03 RELATED SECTIONS

Other sections applicable to the Pre-engineered Metal Building are (but not limited to):

01 45 33	Code Required Special Inspections and Procedures
03 33 13	Normal Weight Concrete
07 41 13.23	Insulated Metal Roof Panels, Gutters, and Snow Bars
07 42 13.13	Metal Wall Panels (Office)
07 42 13.19	Insulated Metal Wall Panels (Shop)
08 11 13	Hollow Metal Doors, Frames and Hardware
08 51 13	Aluminum Windows
09 91 01	Painting

1.04 PRE-INSTALLATION MEETINGS

Prior to erection of framing, conduct pre-installation meeting at Site attended by Owner, Engineer, Manufacturer’s technical representative, special inspections agency and any subcontractors (installers of structure).

1.05 SYSTEM DECRIPTION

A. General Building Description:
1. Clear span rigid frame.
2. 14’ eave heights - Office & 18’ eave heights - Shop.
3. Straight columns, (No tapered or soldier columns allowed).
4. Bay spacing: 28’ (Office), 25’ (Shop) as shown on the Drawings.
5. Roof: preformed insulated metal panels, slope of 4 inches per foot.
6. Wall system: preformed metal panels except where other exterior coverings are indicated on the Drawings.
7. Accessories: doors and windows.
8. Framed opening supports (Header, Jacks, Jambs, Flashings and Trims).

1.06 DESIGN REQUIREMENTS

A. Design Requirements:
1. The building shall be designed by the Manufacturer as a complete system. Members and connections not indicated on the Drawings shall be the responsibility of the Manufacturer and/or Contractor. All components of the system shall be supplied by the same manufacturer. In addition to requirements herein, the building shall be designed per the MBMA manual. The building shall be designed by a North Carolina registered professional engineer.
2. All loads given are minimum requirements. All applicable provisions of the 2018 NC Building Code will apply.
3. Basic design loads include live, seismic, wind, and dead loads. All other design loads such as mechanical equipment loads (static, dynamic, or kinetic) are classified as auxiliary loads.
4. Design loads for frames, walls and roof are as follows:
(See Appendix B – Sheet S1 for additional information)
   a. Wind speed Vult = 170 mph (ASCE 7-10, LRFD)
   b. Exposure: C, Enclosed.
   c. Importance factor based upon building usage: Snow 1.10, Seismic 1.25.
   d. Live load = 20 psf (reducible).
   e. Ground snow load = 30 psf.
   f. Collateral loads = 3 psf (Office), 5 psf (Shop) and as indicated on the Drawings.
   g. Seismic Zone: Site Class C, as per the subsurface report by S&ME, Inc.
   h. NC Building Code, 2018 edition, application and combination of loads.
   i. Auxiliary = Equipment loads (provided by plumbing, mechanical and electrical subcontractors as applicable).
5. Design each member to withstand stresses resulting from a combination of loads that produce the maximum percentage of actual to allowable stress in the member, as prescribed by AISC.

Office:

Frames:	Vertical =	L/240, based on live, snow or wind
	Horizontal =	H/200, based on wind
Purlins:	Vertical =	L/240, based on live, snow or wind
Girts:	Horizontal =	L/240, based on wind or seismic

Shop:

Frames:	Vertical =	L/180, based on live, snow or wind
	Horizontal =	H/60, based on wind

Purlins: Vertical = L/150, based on live, snow or wind
Girts: Horizontal = L/90, based on wind or seismic

6. Wind loads to manufactured stone walls shall be applied as lateral forces to girts and columns equal to the wind load across the tributary width between columns.

   * Manufactured stone support structure shall be limited to L/600 at top height of wall.

7. Seismic forces from manufactured stone wall systems shall be transferred to the structure as lateral forces at the building columns. Forces from walls shall be determined from wall cross sections shown on the Drawings, using horizontal force factors for elements of structures.
8. Subcontractors shall provide dead load weights of equipment, and all requirements for equipment supports and locations of openings in the roof and wall.

B. Concrete Foundation:
The concrete foundation, including but not limited to, floor slab and column footings, shall be designed by a North Carolina registered professional engineer. Shop floor shall be designed for a 250 psf uniform live load or a 3,000 pound concentrated load per ASCE 7-10. Office floor shall be designed for 125 psf uniform live load. Slabs and footings shall be designed to safely transfer column reactions from all load combinations to the ground, in accordance with ASCE 7-10 and the recommendations of the subsurface report.

1.07 SUBMITTALS

A. General – Submit listed submittals in accordance with General Conditions.

B. Action Submittals:
Submit complete information for methods and materials, including:
1. All Manufacturer drawings and design calculations, which shall bear the professional seal and signature of a licensed professional engineer registered in the state of North Carolina.
2. Anchor bolt placement plan, column reactions and calculations in advance of erection drawings.
3. Foundation plan signed and sealed by a licensed professional engineer registered in the state of North Carolina.

C. Closeout Submittals:
1. Maintenance data and instructions for panels, doors, walls and floors.
2. Manufacturer’s standard warranty, and any project-specific warranty, if elsewhere required. Warranties that extend beyond the Contractor’s correction period shall be project-specific documents executed by the manufacturer and shall clearly indicate beginning and ending dates of the warranty period.

1.08 QUALITY ASSURANCE

A. General: Fabricate structural steel members in accordance with MBMA Metal Building Systems Manual, and for items not covered, AISC – Specification for Structural Steel Building.

B. Manufacturer: The company manufacturing the products specified in this Section shall have a minimum of 5 years’ experience in the manufacture of steel building systems. The manufacturing company shall be certified under the American Institute of Steel Construction's Category MB Certification Program.

C. Structural framing and covering shall be the design of a licensed professional engineer experienced in design of this work.

D. Erector shall have specialized experience in the erection of steel building systems for a period of at least 5 years.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and handle all items to prevent bending, corrosion and damage.

1.10 WARRANTIES

A. Building manufacturer shall provide component manufacturer's standard material warranties (refer to related sections.)

B. Metal building installer shall provide a workmanship warranty of 2 years.

1.11 ADMINISTRATION

A. All nomenclature shall conform to the MBMA Metal Building Systems Manual.

B. Coordination and administration of the work shall be in accordance with the MBMA Metal Building Systems Manual - Common Industry Practices.

PART 2 - PRODUCTS

2.01 MATERIALS – ROOF AND WALL PANELS: refer to separate sections

2.02 MATERIALS – WALL INSULATION

A. Wall Insulation: ASTM C665, blanket, glass fiber type, faced with reinforced white vinyl, UL flame spread classification of 25 or less where exposed, with R-value of 19.0 continuous insulation.

2.03 MATERIALS - TRIM

A. Flashings, Internal and External Corners, Closure Pieces, Fascia, Infills, and Caps: Same material and finish as adjacent material, profile to suit system. Color as selected by Owner from manufacturer's standards.

2.04 MATERIALS – DOORS

A. Metal Personnel Doors and Frames - Shall conform to Section 08 11 13.

B. Upward Acting Sectional Doors
1. General: All upward acting sectional doors shall be series 525 insulated steel as manufactured by Overhead Door Corp. or approved equal.
2. Door Sections to be of a min. 24 ga. galvanized exterior, flush exterior without ribs or grooves and shall have rabbeted meeting rails to form a weather tight joint and provide full width interlocking structural rigidity. Panel shall have insulation and backer panel of 24 ga. Steel. Panels shall have

factory pre-coated finish, colors selected by owner from manufacturer's standard colors. Wind load Design: ANSI/DASMA 102 standards and as required by code.

3. Counterbalance shall be torsion springs on cross header shaft. Lift cables shall be galvanized with cable safety factor of 7:1, stressed spring wire.
4. Hardware shall be galvanized steel hinges and fixtures, full floating, hardened steel, ball bearing rollers with hardened steel races. Doors reinforced with steel struts as required for size of door.
5. Lock shall be keyed with interlock switch for automatic operator as supplied by door hardware vendor as specified in section 08 11 13.
6. Tracks shall be galvanized steel with a wedge action to create weather tight closure when door is in the lowered position. Provide tracks as recommended by manufacturer to suit loading required and high lift along roof pitch. Brackets shall be mounted on steel angles provided by others. Provide general contractor with template for all blocking locations required for the installation of this work.
7. Weather-stripping shall be flexible pvc strip on bottom section and top section and be provided and installed by this supplier. Aluminum and vinyl seal for jambs shall be provided by this supplier.
8. Operation shall be by electric operator and manual (chain pull) hoist.
   Electric Operator: Operator shall be UL listed electric operator, size and type as recommended by manufacturer Overhead Door Corp. or approved equal manufacturer. Operator designed to move door in either direction at not less than 2/3 foot or more than 1 foot per second. Means shall be provided to disconnect operator from the door for manual operation. Operator shall be equipped with drive limit switches as an integral part of the mechanism, and provide accurate settings to control the "up" and "down" positions. During manual operation limit switches shall remain "timed" to door position. Motor shall be instant reversing. Push button station shall have 3 buttons for up down and stop. Operators shall meet UL 325/2010 requirements of continuous monitoring of safety devices. Provide emergency reversing door switch mounted along bottom door edge. Operator shall be designed to work with keyed lock and interlock switch for automatic operator.

2.05 MATERIALS – WINDOWS – Refer to Section 08 51 13.

2.06 MATERIALS – TRANSLUCENT PANELS – None.

2.07 MATERIALS - ACCESSORIES

A. Ventilator/Wall Louvers: Shall conform to mechanical drawings and Specifications.

2.08 FABRICATION – PRIMARY FRAMING

A. Framing Members: Clean and prepare in accordance with SSPC-SP2 as a minimum, and coat in accordance with Section 09 91 11.

B. Hot rolled members shall be fabricated in accordance with AISC Specification for pipe, tube, and rolled structural shapes and primed.

C. Fabricate built-up members in accordance with MBMA Metal Building Systems Manual, Common Industry Practices.

2.09 FABRICATION - SECONDARY

A. Framing Members: Clean and prepare in accordance with SSPC-SP2, as a minimum, and coat in accordance with Section 09 91 11.

B. Cold Formed Members: Cold formed structural shapes shall be fabricated in accordance with MBMA Metal Building Systems Manual, Common Industry Practices.

2.10 FABRICATION - GUTTERS, DOWNSPOUTS, FLASHING AND TRIM

Refer to roof and wall panel specification sections.

2.11 THERMAL AND MOISTURE PROTECTION

A. Exterior Caulking: All joints or intersections as follows: At all masonry walls where wood, metal, or prefinished surfaces adjoin masonry or concrete work. Where metal adjoins woodwork. All miscellaneous intersections and joints as shown on drawings. Control joints in exterior brick – install butyl rod and caulk.

B. Interior Caulking: All joints or intersections as follows: All miscellaneous intersections and joints as shown on drawings. All work to be in accordance with manufacturer's recommendations.

C. Joint Sealant: All joints or intersections as follows: Saw, Isolation or Control joints in interior and exterior concrete and slab work.

All caulking and sealants shall be Sika, Sikaflex or approved equals, compatible with application and per manufacturer's recommendations.

PART 3 - EXECUTION

3.01 EXECUTION

A. Verify site conditions under provisions of Sections 01 50 00 and 31 02 00.

B. Verify that foundation, floor slab, plumbing, mechanical and electrical utilities, and placed anchors are in correct position and properly squared.

C. Provide access to the work as scheduled for Owner provided inspections. The cost of any required inspections is the responsibility of the Owner.

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

3.02 ERECTION

A. Erection - Framing
   1. Erect framing in accordance with MBMA Metal Building Systems Manual, Common Industry Practices.
   2. Use templates for accurate setting of anchor bolts. Level bearing plate area with steel wedges or shims, and grout. Check all previously placed anchorages
   3. Erect building frame true and level with vertical members plumb and bracing properly installed. Maintain structural stability of frame during erection.
   4. Ream holes requiring enlargement to admit bolts. Burned holes for bolted connections are not permitted without written approval by designer. Burned holes to be reamed.

5. Tighten bolts and nuts in accordance with "Specification for structural joints using ASTM A325 or A490 bolts".
6. The erector shall furnish temporary guys and bracing where needed for squaring, plumbing, and securing the structural framing against loads, such as wind loads acting on the exposed framing and seismic forces, as well as loads due to erection and erection operation, but not including loads resulting from the performance of work by others. Bracing furnished by the Manufacturer for the metal building system cannot be assumed to be adequate during erection and are not to be used to pull frames into plumb condition. The temporary guys, braces, falseworks and cribbing are the property of the erector, and the erector shall remove them immediately upon completion of erection.
7. Do not field cut or modify structural members without approval of the metal building Manufacturer.
8. After erection, erector to prime welds, abrasions, and surfaces not shop primed, galvanized or needing touch-up.

B. Erection – Wall and Roof Systems
1. Install all wall and roofing systems in accordance with manufacturer's instructions and details.
2. Exercise care when cutting prefinished material to ensure cuttings do not remain on finish surface.

C. Erection – Gutter, Downspout, Flashing and Trim
1. Install gutters and downspouts, flashings and trim in strict accordance with manufacturer's instructions, using proper sheet metal procedures.
2. Install downspouts to connect with underground piping.

D. Erection – Translucent Panels/Domes – None

E. Installation - Accessories
1. Install door frames, doors, overhead doors, windows and glass, in accordance with manufacturer's instructions.
2. All roof and wall accessories to be installed weathertight.

F. Tolerances
1. All work shall be performed by experienced workmen in a workmanlike manner to published tolerances.
2. Install framing in accordance with MBMA Metal Building Systems Manual, Common Industry Practices.

END OF SECTION

SECTION 21 13 13
WET-PIPE FIRE SUPPRESSION SPRINKLER SYSTEMS

PART 1 – GENERAL

1.01 SUMMARY

This section covers the design, supply, and installation of an NFPA-13 fire suppression sprinkler system for the shop and office building. Scope is limited to the system beyond (downstream) of the wet riser terminating 12-inches above the floor.

1.02 REFERENCES

NFPA-13	Standard for the Installation of Sprinkler Systems
ASSE 1013	Performance Requirements for Reduced Pressure Principle Backflow Preventers and Reduced Pressure Principle Fire Protection Backflow Preventers

1.03 SUBMITTALS

A. General – Submit listed submittals in accordance with the General Conditions.

B. Action Submittals:
1. Product Data: Submit data on all materials including manufacturers' installation instructions
2. Shop Drawings: Indicate complete layout of all system components, accessories, and system controls, sign and sealed by system designer.
3. Samples: Submit one of each style of sprinkler proposed.
4. Design Data: Submit signed and sealed design calculations.

C. Closeout Submittals:
1. Operation and Maintenance Data: Submit components of system, servicing requirements, record drawings, inspection data, replacement part numbers and availability, and location and numbers of company available for future servicing.

1.04 QUALITY ASSURANCE

A. Designer-Installer
Contractor shall provide a complete fire suppression system designed and installed by a North Carolina licensed fire sprinkler contractor. The Designer-Installer shall have a minimum of five (5) years' experience providing systems of the same type and scope as for this Project.

1.05 DESIGN PARAMETERS

A. Design system to comply with NFPA 13.

B. System shall protect all floors, lower and upper, and concealed spaces as may be required by NFPA 13 and applicable codes. Design shall be for the building hazard classification, type of construction, dimensions, and other data as shown on the Drawings. Note in particular the data on Appendix B, Sheet S-1.

C. Available water supply: The nearest existing fire hydrant (#A-58) is approximately 2,500 linear feet from the proposed riser. The hydrant was flow tested by Town of Beech Mountain personnel on May 22, 2019. The measurements observed were:

Static pressure:	90 psi
Residual pressure:	71 psi
Flow:	1,500 gal./min.

The approximate elevation of this fire hydrant is 5220 (mean sea level). The ground storage water tank supplying this fire hydrant (Emerald Mountain Tank) is stated to be 35-feet diameter x 16 feet tall with a ground elevation of 5460.

The pipe line from this tank to the fire hydrant and to the point of connection in Water Tank Road is assumed to be 10-inch cast iron. The proposed pipe line from here to the riser is 6-inch ductile iron, approximately 515 linear feet. The estimated, calculated conditions at the riser are:

Elevation:	5110.0 (12” above floor)
Static Pressure:	155 psi (based on tank water level at 5468)
Residual Pressure:	140 psi (at 500 gpm)

PART 2 – PRODUCTS

2.1 GENERAL

System products shall be selected by the system designer according to designer’s experience and qualifications and according to applicable codes and NFPA 13. Products specified herein are intended to establish a general level of quality only. Not all products listed herein may be needed for this Project.

2.2 SPRINKLERS

A. Acceptable Manufacturers: Viking, Reliable, Tyco Simplex Grinnel, or equal.

B. Suspended Ceiling Types (acoustical tile):
1. Type: Standard or Extended Coverage, Recessed or Concealed pendant type with matching adjustable escutcheon plate.
2. Construction: All brass frame with metal spring seal, Teflon coated, brass or chrome finish.
3. Escutcheon Plate Finish: Chrome plated.
4. Fusible Link: Glass bulb type, temperature rated for specific area hazard.

C. Exposed Area Type:
1. Type: Standard or Extended Coverage upright type, with guard.
2. Factory applied corrosion-resistant coating.
3. Fusible Link: Glass bulb type, temperature rated for specific area hazard.

D. Side Wall Type:
1. Type: Standard or Extended Coverage, Semi-recessed or Recessed horizontal side wall type with matching adjustable escutcheon plate and guard.
2. Construction: All brass frame with metal spring seal, Teflon coated, brass or chrome finish.

3. Escutcheon Plate Finish: Brass. Chrome plated. Enamel, color as selected.
4. Fusible Link: Glass bulb type temperature rated for specific area hazard.

E. Guards: Finish to match sprinkler finish.

2.2 ABOVE GROUND PIPING

A. Pipe shall be Standard Weight, Schedule 40 Black-Steel Pipe: ASTM A53/A53M, Type E, Grade B, ERW pipe or ASTM A106, Grade B, seamless steel pipe. Pipe ends may be factory or field formed to match joining method.
   1. Thread Fittings:
      a. Malleable-Iron Fittings: ASME B16.3, Class 300
      b. Flanges and Flanged Fittings: ASME B16.5, Class 300, unless Class 600 is indicated.
   2. Grooved-End Fittings: ASTM A47 malleable Iron or ASTM A536 Ductile Iron, with dimensions matching steel pipe and ends factory grooved according to AWWA C606.

2.3 BURIED PIPING (if applicable)

A. Ductile Iron Pipe, Class 350, AWWA C151, grooved ends.
   1. Steel Fittings: ASME B16.5, steel flanges and fittings.
   2. Ductile Iron Joints: ANSI/AWWA C-606.
   3. Ductile Iron Coupling Housings: ASTM A536, Grade 65-5-12.
   4. Install piping with double-layer half over-lap 10 mil polyethylene tape.

2.4 PIPING SPECIALTIES (where applicable)

A. WetPipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber faced clapper to automatically actuate water motor alarm or electric alarm, with pressure retard chamber and variable pressure trim; test and drain valve; strainer and gages. Valve shall be double check type with reduced pressure zone (RPZ) conforming to ASSE 1013 and having isolation valves and test cocks.

B. Water Motor Alarm: Hydraulically operated impeller type alarm with aluminum alloy red enameled gong and motor housing, nylon bearings, and inlet strainer.

C. Electric Alarm: Electrically operated red enameled gong with pressure alarm switch.

D. Water Flow Switch: Vane or paddle type switch with u-bolt mounting, horizontal or vertical, with adjustable alarm delay 0-120 second range.

E. Fire department Connections
   1. Type: Flush mounted wall type with chrome plated finish or free standing type with ductile iron pedestal with red enamel finish.
   2. Outlets: Two-way with fire department thread size. Threaded dust-cap and chain of matching material and finish.
   3. Drain: 3/4" inch min. automatic drip.
   4. Label: “Sprinkler – Fire Department Connection”.

2.5 ELECTRICAL CHARACTERISTICS AND COMPONENTS (if applicable)

A. Controls: Supervisory switches, Water Level Supervisory Switches, Tank Temperature Supervisory Switches, Room Temperature Supervisory Switches.

B. Disconnect Switch: Factory mount in control panel and/or on equipment.

PART 3 - EXECUTION

3.1 INSTALLATION (as applicable)

A. Install buried shut-off valves in valve box, furnish post indicator as required.

B. Install and/or indicate location of approved double check valve assembly at sprinkler system water source connection and Fire Department Connection. (Utility contractor will install FDC and pipe to 12” above floor).

C. Install outside alarm-gong on building wall.

D. Place pipe runs to minimize obstruction to other work.

E. Install piping in concealed spaces above finished ceiling.

F. Locate sprinklers in coordination with ceiling plan. Sprinkler heads to be near the center of ceiling tiles.

G. Install guards on sprinklers as required.

H. Hydrostatically test entire system.

3.2 INTERFACE WITH OTHER PRODUCTS

A. Verify signal devices are installed and connected to fire alarm system.

3.3 LABELLING AND SIGNS

A. Provide as required per NFPA.

3.4 PROTECTION OF INSTALLED CONSTRUCTION

A. Apply masking or paper cover to protect concealed sprinklers, cover plates, and sprinkler escutcheons not receiving field paint finish. Remove after painting. Replace painted sprinklers with new.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Prepare test and inspection reports.

C. Wet Sprinkler System will e considered defective if it does not pass tests and inspections.

3.5 CLEANING

A. Flush entire piping system of foreign matter.

B. Remove and replace sprinklers with pain other than factory finish.

END OF SECTION

SECTION 220000 – Plumbing System

22-0100 GENERAL CONDITIONS:

1.1 SUMMARY:

A. The General Conditions of the Contract, Supplementary General Conditions, Special Conditions and applicable portions of all General Requirements, included with these specifications or ahead of the detailed specifications for general construction apply to all contracts and are hereby made a part of the Plumbing Contract.

1.2 PROJECT SPECIFICATIONS AND DRAWINGS:

A. The Plumbing Contractor is cautioned to read the entire project specifications and the entire set of project working drawings to assure that no reference to work by the Plumbing Contractor is overlooked and to assure an understanding of the division of work between the various trades and/or contracts. Failure of the Plumbing Contractor to do this will not relieve him of any responsibility or remove any work from the Plumbing Contract.

1.3 REFERENCE STANDARDS:

ASHRAE – Guide and Data Books
National Bureau of Standards (NBS)
Cast Iron Soil Pipe Institute (CISPI)
American Society of Testing & Materials (ASTM)
American Water Works Association (AWWA)
National Fire Protection Association (NFPA)
Factory Mutual Engineering Corporation (FM)
American Society of Mechanical Engineers (ASME)
North Carolina State Building Code – Current Edition of All Volumes

1.4 FEES, PERMITS AND TAXES:

A. This Contractor shall make arrangements for and pay for all inspection fees, connection fees and permits required by local authorities. The Contractor shall also pay all taxes levied for labor and materials associated with work under this Division.

1.5 SUBMITTALS:

The symbol "<S>" indicates a requirement for submittals.

Refer to General Conditions, Instruction to Bidders and Shop Drawings.
In addition to the requirements of the above referenced portions of this specification, all Subcontractors proposing to perform work under this Division shall comply with the following additional requirements:

A. These specifications and drawings are intended to indicate a standard of quality for materials and equipment which is established by the listing of manufacturers' names and catalog numbers and/or by referenced standards. Materials and equipment that do not comply with these standards of quality will not be considered for substitution.

B. As soon as practicable and within thirty (30) days after the award of the contract and before beginning the fabrication of any material or the installation of any equipment, data shall be submitted for approval on equipment and materials where noted.

Materials (pipe, fittings, etc.) may be listed with the name of the manufacturer and identifying catalogue numbers. Data for equipment shall include manufacturer's name, catalogue data, diagrams, drawings and other descriptive data as required or requested by the Owner/Engineer for evaluation.

C. Notwithstanding, any reference in the specifications to any article, device, product, material, fixture, form or type of construction by name, make or catalogue number, such reference shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition; the Contractor, in such cases, may at his option, use any article, device, product, material, fixture, form or type of construction which in the judgement of the Engineer, expressed in writing, is equal to that specified.

D. All data shall carefully be examined and shall be forwarded for approval with a signed certification to the effect that the data has been carefully checked and found to be correct with respect to dimensions and available space and that the equipment complies with all requirements of the specifications.

E. Indicate in writing all deviations between the plans and specifications and the materials submitted.

F. It is understood that proof of equality is the responsibility of the Contractor and/or supplier and that is not the responsibility of the Engineer to prove the inequality of the proposed substitutions. Furthermore, the decisions of the Engineer are final.

G. While it is not the intention of the Engineer to discriminate against any manufacturer of equipment that is equal to specified equipment, a strict interpretation of such equality will be exercised by the Engineer in considering any equipment offered as a substitute for equipment named in the specification.

H. It shall be the responsibility of the Contractor to submit with each request for approval of substitute material or equipment, sufficient data to show conclusively that it is equal to the material or equipment specified. This Contractor is responsible for any additional costs that may arise from any substitution for any item.

I. Each Contractor shall submit shop drawings and/or diagrams for approval and for job coordination in all cases where significant deviations from the contract drawings are contemplated because of job conditions, interference's, substitutions of equipment or when requested by the Engineer for purposes of clarification of the Contractor's intent. He shall also submit detailed shop drawings, rough-in sheets, etc., for all custom build or custom items of equipment.

J. Submittal of shop drawings shall be made in sufficient copies to provide the following: One (1) copy of all data to be retained by the Engineer, two (2) copies of all data to be accumulated for the Owner, one (1) copy of all data to be retained by the Contractor, one (1) copy of all data to be retained by the Lead Design Professional. The Contractor shall increase the number of copies if he requires more to be returned to him. Should any substitute items be submitted and disapproved, those items must then be furnished exactly as described herein.

K. The Engineer's review of shop drawings and/or submittal data shall not relieve the Contractor of responsibility for deviations from the contract drawings or specifications. The size of equipment shown on the drawings is based on the dimensions of a

particular manufacturer. While other manufacturers may be acceptable, it is the responsibility of the Contractor to determine if the equipment he proposes will fit in the space. Shop drawings shall be prepared when required by the Engineer or Owner to indicate a suitable arrangement.

1.6 OPERATING AND MAINTENANCE MANUALS AND INSTRUCTIONS:

The symbol "<OM>" indicates a requirement for operation and maintenance manuals to be furnished.

Provide four (4) copies of operating and maintenance manuals. Manuals shall be bound in large ring, loose-leaf binders and shall contain the following:

A. Manufacturer's instructions and/or installation manual.

B. Manufacturer's service manual.

C. Manufacturer's lubrication charts listing types of lubricant to be used on each item of equipment and recommended frequency of lubrication.

D. Electrical diagrams of equipment such as water heaters, etc.

E. Parts lists and identifying part numbers with prices of each part. The name and address of the nearest distributor from which parts can be obtained.

1.7 WARRANTY:

A. The Contractor shall warranty all workmanship, material, equipment systems, etc., provided by him for a period of One (1) Year after substantial completion of the project. This warranty means that this contractor shall make good to the Owner, at no cost, any defects that become apparent during the year following substantial completion. This warranty is in addition to other guarantees or warranties and is not intended to limit such other guarantees or warranties. This Contractor shall give a letter of guarantee stating the date the guarantee period begins and ends. The Owner/Engineer shall be furnished with three (3) copies of the letter of guarantee.

1.8 DEFINITIONS:

The following words and phrases as used herein are hereby defined:

A. "Provide": Furnish and install all material and labor required for a complete installation, ready for operation, in accordance with the intent of the Contract Documents.

B. "As Required": Indicates that the Contractor shall perform the work or provide the material as indicated in accordance with manufacturer's installation instructions, and in accordance with applicable codes or regulations, in a workmanlike manner as defined by good local practice.

C. "Or Equal": Indicates that the Contractor may substitute equipment by another manufacturer if the salient features of the equipment indicated by the manufacturers' name and/or description are, in the judgment of the Owner/Engineer adequate. Submittals for approval are required where indicated.

D. "Contractor": Where the word (s) "Contractor" or "this Contractor" is/are used, refer to the Contractor engaged to execute the work under the division of the specifications only, even though he may be technically described as a sub-contractor.

E. "Intent of the Contract Documents": The specific intent of these documents is to provide the Owner, in a thoroughly functional condition, all of the various systems, equipment, etc., indicated herein. Final authority over interpretation of the "intent" shall rest with the Owner/Engineer.

F. "Shall": Indicates a mandatory requirement.

1.9 INSPECTION OF THE SITE:

A. The drawings and specifications are prepared from the best information available and reflect all conditions commensurate with this information. However, this information is not guaranteed and the contractor should visit the site prior to submitting a proposal and shall verify the locations, sizes, depths, pressures, etc., of all existing utilities and familiarize himself with working conditions, hazards, existing grades, soil conditions, obstructions, etc. If it becomes evident that existing site conditions will impair operation of the utilities, the Engineer should be notified in writing at least 10 days before the Bid Date.
B. All proposals shall take these existing conditions and any revisions required into consideration. The submission of a bona fide bid will be considered as evidence that the Contractor has inspected the job site and understands that the conditions under this contract work must be fulfilled.
C. Contract cost changes will be negotiated for conditions found during construction that were not visible at a thorough on-site inspection and which were unknown to the Owner/Engineer or Contractor prior to receipt of bids.

1.10 INTENT:

A. The intent of this specification and the naming herein of specific equipment manufacturer's name and catalog number are to establish the minimum quality, function and physical features required. There is no intent to restrict competitive bidding or the use of other manufacturer's equipment provided it is in fact equal or superior to that specified.
B. The Owner/Engineer will decide the question of quality and/or acceptability of any alternate equipment and materials offered based on the requirements of this contract and performance capacities and other pertinent information supplied to him by the contractor.
C. The Contractor's proposal shall be based on the supply and installation of equipment and materials equivalent to or better than that specified. Requests for approval of alternate equipment or materials of lower quality, function or different function will not be considered unless each is accompanied by a written statement of credit to the contract dollar amount or other benefit to the Owner if the proposed substitute is accepted.

1.11 MATERIALS AND WORKMANSHIP:

A. Unless otherwise specifically stipulated in the specifications, all workmanship shall be of the best quality and all equipment, materials and articles incorporated in the work

under this contract shall be new and equal to or better than the grade specified. The contractor, if required, shall furnish evidence as to the kind and quality of materials.

B. This Contractor shall submit to the Owner/Engineer a list of equipment and material manufacturers, suppliers and subcontractors for approval within fifteen (15) days after award of contract. See equipment listed at the end of this division for which identification of source shall be submitted for approval.

1.12 CONSTRUCTION SCHEDULE AND COORDINATION:

A. Refer to the General Conditions of the Contract for this Contractor's responsibility regarding project completion schedules, delays and extensions of time and applicable liquidated damages.

B. The Plumbing Contractor shall cooperate with all other contractors on the project and with the Owner/Engineer so that all portions of the construction work will proceed with all possible speed. Specifically, the Plumbing Contractor shall coordinate with the General Contractor, plumbing work penetrating foundation, wall, ceiling or roof construction or to be concealed by a finished wall, floor, ceiling or a paved surface as the general construction progresses.

C. Attention is called to the fact that the General Contractor is responsible for coordinating and programming the work of all prime contractors. This does not excuse the other prime contractors from the responsibility of having their men and materials available at the proper time so as not to delay the project construction progress.

D. The Plumbing Contractor shall meet, within seven (7) days or as soon as scheduled by the General Contractor after the award of the contract, with the General Contractor to prepare project construction schedules. The Plumbing Contractor shall give written notice to the General Contractor and the Owner/Engineer as soon as it is known, for any reason, that the schedule cannot be met.

1.13 SUPERVISION:

A. All work under this contract shall be under the direct supervision of a competent foreman thoroughly experienced in the type work being performed. If, in the opinion of the Owner/Engineer, the foreman is not "running" the job satisfactorily, shall be replaced by a foreman acceptable to the Owner/Engineer. The job foreman shall *not* be removed from the project without written notice from the contractor to the Owner/Engineer.

1.14 FIELD ADJUSTMENTS AND COORDINATION:

A. Working drawings and specifications are not complete without consulting with the Owner/Engineer. Certain field adjustments and corrections of conflicts are to be expected. The Owner/Engineer recognizes this fact and shall make their services available to the contractor on this project at all times to answer questions of interpretation or intent and to make any and all decisions wherever a question of any nature arises during the course of construction.

B. Any such question or adjustment shall be referred to the Owner/Engineer for final decision before work proceeds. The contractor's failure to obtain the Owner's/Engineer's interpretation and/or agreement to the resolution of such question

or adjustment shall make the contractor responsible for the cost of proper rectification of resultant incorrect or unacceptable work.

C. Each set of plans and specifications issued to each prime contractor contain all original drawings and all original specifications covering general construction, plumbing, heating and electrical work. Each prime contractor and/or his respective subcontractors shall be responsible to each other prime contractor and/or his respective subcontractors for any conflicts in the total work caused by his failure to examine the complete project drawings and specifications.

22-0500 PLUMBING COMMON WORK:

1.0 PROJECT SCOPE AND DESCRIPTION OF WORK:

A. GENERAL: Unless otherwise specified, furnish all labor, transportation, materials, apparatus, fuel, energy, light, scaffolding and tools necessary to furnish and install in a skilled, workmanlike manner, complete potable water, waste and vent piping systems and everything properly incidental thereto as shown on plans, stated in specifications or reasonably implied therein, all in accordance with the contract documents.

B. All new plumbing fixtures shall be type as noted on the plans, in these specifications or approved equal. All fixtures shall be supplied and installed complete with all accessories required and/or recommended by the manufacturer for completely operational and code compliant plumbing systems as intended.

C. Maintain all tools and equipment during construction. Remove all surplus materials and construction equipment from the site as soon as it is no longer required in progressing the contract work.

2.0 DRAWINGS AND SPECIFICATONS:

A. The Contractor shall furnish and install all materials called for in these specifications and on drawings. All hardware and miscellaneous items of material, labor or equipment not specifically mentioned by the drawings or specifications, but necessary to complete the work which is obviously intended under this contract shall be furnished as if specified.

B. Drawings are diagrammatic in nature and it may occur that actual dimensions or locations of equipment or materials will be other than exactly as shown on the drawings or stated in the specifications. In the event that such changes are necessary, they shall be made by the Contractor without expense to the Owner, provided that such changes do not require furnishing more materials or performing more labor than the obvious intent of the drawings and specifications.

C. Simple scaling of the plans for equipment locations is not accurate enough for the intent of these specifications. It is the Contractor's responsibility to comply with the evident intent for centering or symmetric arrangements relative to ceiling, wall and cabinet arrangement. The Contractor's attention is specifically directed to the general construction and structural engineering plans for detailed plans and elevations of toilet and service areas for the exact location of fixtures.

D. The Plumbing Contractor shall engage the cooperation of the General Contractor's Superintendent in locating equipment relative to room wall, cabinetwork and similar general construction features. Should there be any doubt of centering or symmetry, the Contractor shall consult the Owner/Engineer before proceeding with the installation.

3.0 CODES AND INSPECTIONS:

A. The Plumbing Codes of the State of North Carolina and Local Ordinances are hereby made a part of these specifications. This Contractor shall pay for and make arrangements for the Plumbing Inspector having jurisdiction make inspections of all roughing before piping is covered or concealed and of the finished plumbing installation. This Contractor shall provide the Owner/Engineer with three (3) copies each of the plumbing inspector's certificates of approval of the roughing and final inspection.

B. Code and regulation requirements govern where drawing and/or specifications are in conflict with any code or regulation. However, where drawings and specifications exceed the requirements of any code or regulation, drawings and specifications shall govern. In the event that there is a conflict between the Specifications and Drawings, Drawings shall take precedence. If the Contractor observes that the drawings and specifications are at variance with applicable codes, he shall promptly notify the Owner/Engineer in writing and any necessary change shall be negotiated as provided in the contract for changes in the work. If the contractor performs any work knowing it to be contrary to such laws, ordinances, rules and regulations and without prior notice to the Owner/Engineer, he shall bear all costs of labor and material necessary to rectify unacceptable work or installation.

4.0 INCIDENTAL CONSTRUCTION WORK:

A. The Plumbing Contractor shall supply and shall set sleeves for piping and inserts for hangers as building construction progresses. Install equipment noted "to be concealed in walls" before walls are constructed in order for walls to be constructed around piping, etc.

B. The General Contractor will provide openings and lintels for the Plumbing Contractor's work as building construction progresses. The Plumbing Contractor shall fully designate these requirements prior to building construction at those particular locations. Failure of the Plumbing Contractor to furnish his requirements prior to building construction and failure to coordinate his work with other contractors shall make the Plumbing Contractor responsible for cost of proper removal (chasing) and repair of general construction work to provide for installation of the plumbing work.

C. Written approval shall be obtained from the Owner/Engineer before cutting any structural member or finished work. The cost of cutting and reinforcing of any structural member to accommodate plumbing work shall be the responsibility of the Plumbing Contractor and shall be done by craftsmen experienced in the craft involved and in a manner acceptable to the Structural Engineer.

4.1 CLEANING AND PAINTING:

A. The Plumbing Contractor shall at all times keep the Owner's premises, the adjoining premises, driveways and streets clean of rubbish caused by the Plumbing Contractor's operations and, at the completion of the work, shall remove all rubbish from and around the premises, all of his tools, equipment, temporary work and surplus materials and shall leave the work area clean and ready for use.

B. The Plumbing Contractor shall "touch up" paint to restore it to the original "new" appearance, all equipment installed under this contract on which the factory applied finish was damaged or scratched during construction or which does not have a finished paint or other outer coating and which is not otherwise to be painted by the General Contractor.

C. Exposed copper pipe and bronze body and copper body valves and fittings shall be thoroughly cleaned with a rubbing of fine steel wool.

D. All structural steel, rods, etc., installed by this Contractor, whether concealed or exposed, shall be wire brushed to remove dirt and scale and painted with one (1) full cover coat of rust preventive primer, Rust-O-Leum #X-60, or approved equal. Surfaces inaccessible after placement shall be painted prior to placement.

5.0 SLEEVE, PLATES AND ESCUTCHEONS:

A. The Plumbing Contractor shall furnish and shall install schedule 40 steel sleeves where piping passes through building walls, floors, ceilings and partitions.

B. Where pipe is to be insulated, sleeve shall be large enough to enclose both pipe and its thermal insulation. Sleeves through the floor in finished areas shall project 3/4 inch above the finished floor. All sleeves shall be firmly and neatly set in place, concentric with pipe. Sleeves through interior walls shall have lugs or straps cast into or attached within the wall to fix the sleeve and keep it from sliding due to movement of the pipe.

C. The Plumbing Contractor shall be held fully responsible for the cost of repairing all damage to footings, floors, walls, ceilings and partitions resulting from installation of plumbing work.

D. Escutcheons manufactured by Grinnell and Michigan Hangar Company, Inc. will be accepted subject to confirmation by submittal data.

E. Furnish and install solid cast iron unplated escutcheons at each point where new pipe passes through or into a wall, floor ceiling or partition. Escutcheon on piping at wall, ceiling, floor or partitions shall be Grinnell #395, or equal. All escutcheons shall have screws, which finish flush with outside plate surface. Anchor escutcheons to building construction, sleeve and/or pipe according to manufacturer's recommendations.

F. The space between pipe and sleeve in all sleeves penetrating exterior walls, fire walls, smoke walls and walls adjacent to toilet rooms including any located above the finished ceiling shall be packed with fiberglass insulation and covered with white oakum rope or non-hardening caulking sealant finished flush with end of sleeve and covered with tight fitting escutcheon ring or plate.

G. Each escutcheon shall be secured so that it will not "creep" away from the wall due to vibration or movement of the pipe.

6.0 PROTECTION OF EQUIPMENT AND WORK:

A. All equipment, fixtures and materials received at the job site shall be properly stored and protected to prevent damage from vandalism or construction activities. Piping shall be thoroughly blown out as it is erected to remove any dirt or debris. Open ends or branches of piping systems shall be kept capped during construction except when connections are being made to prevent the entry of dirt or debris.

B. Acceptance by the Owner of piping systems in no way relieves the contractor of the responsibility of correcting systems malfunctioning or replacing valves damaged as a result of dirt or debris left inside the equipment or piping during construction.

7.0 PIPE SUPPORTS:

A. Hanger numbers of Grinnell are used herein to establish quality. Equivalent hangers by Crawford or Modern will be acceptable subject to confirmation by submittal data.

B. Support piping neatly and securely by hangers with maximum spacing as follows – up to size 1" pipe, 6'-10" centers, size 1-1/4 inch and larger, 8'-0" centers unless otherwise noted. Use two (2) hangers at each turn in direction. Support piping from overhead construction. Use adjustable type pipe hangers, Grinnell Fig. #269. Sheet metal covering protection saddle specifically designed for the application shall be used between insulated pipe and hanger. Pipe hangers shall fit around saddles and insulation. Bolt, clamp, power drive or weld rods to building construction. Support pipe risers along wall from wall with Grinnell Company.

C. Any portion of hanger in contact with copper pipe shall be copper, copper clad or separated from the copper pipe by a dielectric insulating material.

D. Provide steel supports between joints, anchors, frames, bracing, plates, bolt, nuts washers, etc., incidental to installation of work. Provide bracing for all vertical risers. Arrangement subject to approval. Deliver steel to job site with prime coat of paint.

E. The maximum spacing between soil pipe supports, both horizontal and vertical, shall be five feet (5') or at each end.

8.0 IDENTIFICATION:

A. UNDERGROUND WARNING TAPE: Detectable underground warning tape, 5.0 mil overall thickness, minimum 2" width or as noted on plans, .0035" thick aluminum foil core with polyethylene jacket bonded to both sides. Color code tape and print caution along with name of buried service in bold letters on face of tape. Thor Enterprises Magnatec or equal by Carlton, MSI Marking Services, Seton.

B. UNDERGROUND TRACER WIRE: All underground non-metallic sewer piping shall be provided with tracer wire installations. Tracer wire installations shall conform with NC Plumbing Code requirement 306.2.4. Tracer wire shall be an approved continuous copper conductor not less than 14 AWG with direct burial listed insulation. Installation, Access and Termination requirements per the plans.

22-0700 PIPE INSULATION:

1.0 GENERAL

A. Unless otherwise specified or called for on drawings, the Plumbing Contractor shall furnish and install insulation on all exposed and concealed water piping. This includes all piping in wall chases, exposed in service areas, attic spaces and piping exposed in toilet rooms (except the chrome plated brass pipe and fixtures).

B. Follow approved standards for quality, neatness and finished appearance. Exposed torn edges of fabric or vapor barrier will not be accepted. Thermal insulation shall be applied only after the piping has been cleaned, hydrostatically tested and inspected.

2.0 MATERIALS

A. All hot and cold-water piping above ground shall be insulated with one inch (1") thick pre-molded foam rubber type insulating tubing – Armstrong "Armaflex", CSG "Ultra-Foam" or approved equal. The contractor may, at his discretion, use two layers of ½ inch thick foam rubber type insulation or one inch (1") thick pre-molded fiberglass insulation with foil-scrim-craft vapor barrier jacket with all joint sealed. Thermal insulation shall be applied with minimum of joints with particular attention to longitudinal joints. All joints shall be tightly butted and carefully adhered with Armstrong #620 adhesive, or as recommended by the insulation manufacturer. Adhesive shall be applied to the entire joint surface so that the resultant finished joint, both butt and longitudinal, is free of voids.

3.0 EXECUTION

A. Hot water piping under floor-on-grade shall be insulated with pre-molded foam rubber type insulating tubing the same as specified for above grade.

B. Cold water piping under floor-on-grade and within three feet (3') of an exterior wall shall be insulated the same as hot water piping under floor-on-grade.

C. All other cold-water piping below a building floor-on-grade and all water piping underground outside the building need not be insulated but shall be surrounded (top, bottom and sides) by three inches (3") of clean sand.

D. Fittings shall be covered with precut-insulation-wrap pieces wrapped around, ells, valves and tees covered with molded snap form covers.

22-1000 WATER PIPING:

1.0 GENERAL

A. Plumbing Contractor shall furnish and install all new hot and cold-water piping, valves and fittings shown on the plans and as described in these specifications and as required to distribute potable water to each and every fixture requiring hot and/or cold water.

2.0 MATERIALS

A. All water piping below grade shall below grade water piping shall be pex or schedule 80 pvc with minimum joints and where piping is required to run below building slab it shall be installed without joints below slab, or approved equal. All piping shall bear the name of the manufacturer or trade name and the weight at intervals of not more than 12 inches on centers. Foreign made piping is prohibited.

B. All fittings in pipe shall be the same as the pipe used. Joints shall be made in strict accordance with the fitting manufacturer's instructions. No copper pipe or solder with lead will be permitted.

C. All water lines, stops, traps and waste pipe exposed, including that in under-counter cabinets, toilet rooms and similar finished occupied areas shall be polished chrome plated brass, which for the most part will be furnished with the fixtures. Polished chrome plated cast brass escutcheon ring with sets-crew shall be used at each point of entrance of chrome piping into wall or ceiling.

D. Domestic water piping control valves shall be provided by this Contractor where required to adequately control and isolate the various domestic water piping systems. Valves shall match the piping used and equal to valves manufactured by Nibco, Crane, Stockham, Milwaukee, Walworth or Grinnell. Typical Milwaukee numbers as stated below:

1. Gate Valves throughout the domestic water piping shall be equal to Milwaukee Gate 149, 125 lb., rising stem solid wedge disc.

2. Globe valves shall be equal to Milwaukee Globe 1502, 125 lb. globe valve.

3. Check valves shall be equal to Milwaukee Check 1509-S, 125 lb., check valve with "Buna-N" disc.

4. Temperature and pressure relief valves shall be ASME rated Watts valve or approved equal.

3.0 EXECUTION

A. Exposed work shall be plumb, level and uniform in height for each type of fixture. Threaded joints shall be made up with sealing material applied only to male threads. All pipe shall be reamed and cleaned thoroughly before installation and all threading shall be sharp and true to American Standard Taper.

B. All piping shall be protected in an approved manner from mechanical damage and/or freezing during construction. The top of water piping underground outside of the building shall be a minimum of (30") thirty inches below the finished grade surface.

22-1300 WASTE, DRAIN AND VENT PIPING:

1.0 GENERAL

A. Plumbing Contractor shall furnish and install all new waste and vent piping and fittings required for system shown on the plans and as described in these specifications and as required by the application.

2.0 MATERIALS

A. All waste and vent piping (two inch minimum) below floor-on-grade, outside the building, inside the building and above grade, unless otherwise specifically noted, shall be schedule 40 PVC.

3.0 EXECUTION

A. The use of double hubs, sleeves, inverted caulk joints, sanitary crosses, drilling and tapping of drains, soil, waste or vent pipes and use of saddles is prohibited. Use only double 90° long tee wye or 45° double wye and 45° ells where practical.

B. Use sanitary long sweep bends for connecting branch lines to fixtures and on vertical runs of pipe. Use double wyes or double combination wye and 1/8 bends where practical.

C. Grade any new waste and vent piping 1/4 inch per foot where possible but not less than 1/8 inch per foot unless specifically directed.

D. Connect two or more vent pipes and extend as one pipe where practical and/or noted on plans. Make vent connections at least 4 feet above floor on which fixture vented is located to prevent accidental use of vent line as waste. Vents rising in outside walls shall be offset a minimum of two feet (2´) in ceiling space before penetrating roof. Extend vent pipe 18 inches above the highest rooftop surface at point of penetration. Vent pipe penetrating and extending above the roof shall be 4 inches (4") in diameter minimum. Vent stacks smaller than four inches (4") shall be increased before penetrating the roof. Locate vents in roof at least 10 feet from nearest operable window or door.

E. The Plumbing Contractor will supply the vent stack flashing cones and the Roofing Contractor will make all roof cuts and install flashing cones.

22-3000 PLUMBING EQUIPMENT: <S> <OM>

1.0 GENERAL

A. Plumbing Contractor shall furnish and install all new plumbing equipment and components required for systems shown on the plans and as described in these specifications and as required by the application.

2.0 MATERIALS

A. Solar Water Heater and its installation shall comply with the latest issue and all addenda thereto of the NC State Plumbing Code and the N.C State Boiler Inspection Laws and Regulations as applicable. All wiring and controls associated with the heater shall be third party approved and in accordance with the latest edition of the National Electrical Code.

B. Solar water heater shall be fitted with an ASME and North Carolina approved rated pressure relief valve with a minimum relieving capacity equal to the maximum heat input to the heater.

3.0 EXECUTION

A. Discharge relief valve from each water heater shall be piped full size over or near a floor drain, drip pan or other safe location. Do not pipe discharge to floor only. Discharge pipe shall be supported and anchored so that it will not cause undue strain on the relief valve body or mounting coupling.

22-4000 PLUMBING FIXTURES: <S>

1.0 GENERAL

A. The Plumbing Contractor shall furnish and install all plumbing fixtures indicated on the project drawings and/or described in these specifications unless otherwise specifically noted.

B. Fixtures shall be set and piped in a neat, finished and uniform manner, making connections with supplies, waste, soil and vent piping previously specified or as may be directed.

C. All fixtures shall be of quality of workmanship and materials specified, complete with all fittings and trim.

D. Provide A.D.A. compliant molded insulation on exposed water and drain piping beneath handicap accessible lavatories and sinks. Insulation shall be designed to allow removal and re-installation for pipe servicing.

E. Solar Water Heater AO Smith model number SUNX-80 (or approved equal) with two (2) roof mounted collectors shall be used as follows: The plumbing contractor shall install or employee a trained solar installation sub-contractor to install an 80 gallon solar tank with a 208 volt 4500 watt electric element with a 21 gallon/hour recovery at 90◦ F rise to heat water when there is not enough solar energy available. The tank shall include an internal coil which will be used with two roof mounted collectors to circulate a closed mixture of non-potable liquid between the collectors and the tank. A control shall be furnished to circulate the non-potable liquid between the tank, coil and collectors when solar conditions allow and include any chemicals, thermal expansion tanks or devices to prevent the non-potable liquid from contaminating the storage tank potable water. All potable water piping above building slab shall be insulated with 1" thick fiberglass piping insulation having a one piece fire retardant jacket and self-sealing cap. Jacket shall be all service type, white and cleanable with a damp cloth. The solar storage tank shall have a metal drain pan that is a minimum of 3" greater than the diameter of the tank and piped to the floor drain near the solar tank location shown on the drawing. The piping of the non-potable liquid from the storage tank coil to the roof mounted collectors shall be protected and of a material to not allow leakage of the liquid and/or any damage to the roof, building or equipment involved. The system installer shall be responsible for any damage involved for a minimum of one year after acceptance of the system by the owner. The potable hot water supply temperature shall not exceed 110◦ F.

2.0 MATERIALS

A. Fixtures and accessories are listed by manufacturer's name to establish quality, physical arrangement and function desired. Equivalent fixtures manufactured by American Standard, Zurn, Crane or Kohler of quality and features specified herein will be acceptable subject to confirmation by submittal data.

B. Faucets manufactured by Chicago, Kohler, McGuire or Delta equivalent to that specified will be acceptable subject to confirmation by submittal data.

C. Fixture carriers manufactured by Josam, Smith or Zurn equivalent to that specified will be acceptable subject to confirmation by submittal data.

D. Shower mixing valves shall be ASME A112.18.1M, CSA B125, ASSE 1016 and ADA compliant, having combination thermostatic/pressure balancing replaceable cartridge, integral check valves, integral stops and high temperature limit set at 110° F.

E. The contractor shall submit booklets – see "Submittals" – showing cuts and data covering fixtures and fabricated equipment proposed for use and obtain the Owner/Engineer's approval before ordering.

3.0 EXECUTION

A. Fixture installations shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction. All installation shall be in accordance with manufacturer's published recommendations.

B. Coordinate mounting heights of plumbing fixtures with architectural details/elevations.

C. Each fixture supply, including any within cabinetwork shall be rigid polished chrome plated brass with chrome plated cast brass wall flange secured in place with setscrew. Each supply shall be fitted with wheel operated angel stops unless otherwise specifically stated.

D. Exposed "P" traps, including traps within cabinet, shall be rigid polished chromium plated cast brass with PCP cast brass collar nut, integral threaded cleanout plug, inside threaded outlet and PCP IPS brass nipple to wall with PCP cast brass escutcheon secured in place with a set screw. The "P" trap outlet shall be one pipe size larger than its inlet.

E. Install and secure all wall mounted fixtures in place with commercial carriers and bolts in accordance with manufacturer's instructions. Fixture weight shall not be transmitted to walls, partitions or service piping. Installation shall prevent any movement of fixture during use

F. The Plumbing Contractor shall clean all exposed parts of the plumbing system and all fixtures furnished and set under this contract.

G. All plaster, mortar, stickers, stains and other foreign matter shall be removed in the cleaning process.

H. The Plumbing Contractor shall neatly caulk with a white silicone base caulking material the joint between wall flange and wall and between floor flange and floor on all fixtures. Drinking fountains shall be caulked only across the top and sides of the basin rim.

I. Fixtures and fixture "brass" and exposed piping shall be cleaned prior to the semi-final inspection and again immediately prior to the occupancy/acceptance inspection. All labels and marking shall be removed prior to the occupancy/acceptance inspection.

22-7000 TESTING:

1.0 GENERAL

A. The Upon completion of the installation of various parts of the plumbing system, all equipment, apparatus and appurtenances shall be properly adjusted and tested by the contractor and placed in proper operating condition. The contractor shall furnish all labor and equipment necessary to properly perform tests. No portion of the work shall be covered or concealed until tests are completed.

B. All new domestic water piping shall be tested at the static water pressure of 150 lbs. per square inch for a minimum of four (4) hours without loss of pressure. All new waste and vent piping inside the building shall be tested at a static water pressure of fifteen feet (15') water head or five (5) pounds per square inch hydrostatic pressure. Pressure shall remain constant for at least thirty (30 minutes without any addition of water or "pump up" of pressure.

C. The Owner/Engineer shall be notified by the Contractor during normal working hours at least forty-eight (48) hours before any anticipated test. Inspection shall be requested after the Contractor has assured himself that the work will stand the prescribed tests.

D. Materials or equipment, which prove to be defective as a result of the inspection or test, shall be replaced within three (3) working days and the inspection or test repeated. The Plumbing Contractor shall be responsible for protecting the plumbing system against freezing throughout the process of the installation until acceptance of the completed building.

22-8000 DISINFECTION OF WATER SYSTEM PIPING:

1.0 GENERAL

A. Upon completion of all tests, repairs and/or replacements of piping, fittings and fixtures in connection with the potable water distribution system, the system shall be disinfected as follows and shall include all piping installed under this contract.

B. The system shall be thoroughly flushed with water to remove any construction slag, grease or sediment from the piping and equipment.

C. The system shall be filled completely with chlorinated water having a chlorine residual of not less than fifty (50) PPM after the system has been filled for twenty-four (24) hours.

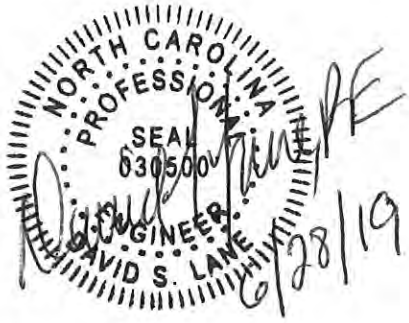
D. During the period that the chlorinating solution is in the system, all valves in the system shall be operated from fully closed to fully opened or vice versa and returned to

their normal position. Should it be impossible to allow the chlorinating solution to remain in the piping system for twenty-four (24) hours, the concentration may be increased to 200 PPM with the solution remaining in the system for no less than two (2) hours.

E. Following chlorination, all chlorinated water shall be thoroughly flushed from the system at all extremities until the replacement water throughout its length shall, upon test be proved comparable in quality to water serving the public from the local utility system and as approved by the local public health office. It shall be proven to the satisfaction of the local health officer that an acceptable quality of water is flowing from the system for a period of not less than three (3) full days after the sterilization operation. (Do *not* take samples from unsterilized hoses or other water handling facilities).

F. All costs and arrangements for inspection, testing of samples and certification by local health authorities shall be paid by the Plumbing Contractor.

END OF SECTION 220000 — PLUMBING SYSTEM



SECTION 230000 – HVAC System

23-0100 GENERAL CONDITIONS:

1.1 SUMMARY:

A. The General Conditions of the Contract, Supplementary General Conditions, Special Conditions and applicable portions of all General Requirements, included with these specifications or ahead of the detailed specifications for general construction apply to all contracts and are hereby made a part of the Mechanical Contract.

1.2 PROJECT SPECIFICATIONS AND DRAWINGS:

A. The Mechanical Contractor is cautioned to read the entire project specifications and the entire set of project working drawings to assure that no reference to work by the Mechanical Contractor is overlooked and to assure an understanding of the division of work between the various trades and/or contracts. Failure of the Mechanical Contractor to do this will not relieve him of any responsibility or remove any work from the Mechanical Contract.

1.3 REFERENCE STANDARDS:

Standard for Mechanical Refrigeration Systems – ANSI B9.1

National Fuel Gas Code – NFPA 54

ASHRAE – Guide and Data Books

SMACNA – HVAC Duct System Design, Second Edition 1981

NFPA – 90A, 90B, 91, 96, 204, 101, 54

SMACNA – HVAC Duct Construction Standards, First Edition, 1985

National Bureau of Standard (NBS)

Cast Iron Soil Pipe Institute (CISPI)

American Society of Testing & Materials (ASTM)

American Water Works Association (AWWA)

National Fire Protection Association (NFPA)

Factory Mutual Engineering Corporation (FM)

American Society of Mechanical Engineers (ASME)

North Carolina State Building Code – Current Edition of all Volumes

1.4 FEES, PERMITS AND TAXES:

A. This Contractor shall make arrangements for and pay for all inspection fees, connection fees and permits required by local authorities. The Contractor shall also pay all taxes levied for labor and materials associated with work under this Division.

1.5 SUBMITTALS:

The symbol "<S>" indicates a requirement for submittals.

Refer to General Conditions, Instruction to Bidders and Shop Drawings.

In addition to the requirements of the above referenced portions of this specification, all Subcontractors proposing to perform work under this Division shall comply with the following additional requirements:

A. These specifications and drawings are intended to indicate a standard of quality for materials and equipment which is established by the listing of manufacturers' names and catalog numbers and/or by referenced standards. Materials and equipment that do not comply with these standards of quality will not be considered for substitution.

B. As soon as practicable and within thirty (30) days after the award of the contract and before beginning the fabrication of any material or the installation of any equipment, data shall be submitted for approval on equipment and materials where noted. Materials (pipe, fittings, etc.) may be listed with the name of the manufacturer and identifying catalogue numbers. Data for equipment shall include manufacturer's name, catalogue data, diagrams, drawings and other descriptive data as required or requested by the Owner/Engineer for evaluation.

C. Notwithstanding, any reference in the specifications to any article, device, product, material, fixture, form or type of construction by name, make or catalogue number, such reference shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition; the Contractor, in such cases, may at his option, use any article, device, product, material, fixture, form or type of construction which in the judgement of the Engineer, expressed in writing, is equal to that specified.

D. All data shall carefully be examined and shall be forwarded for approval with a signed certification to the effect that the data has been carefully checked and found to be correct with respect to dimensions and available space and that the equipment complies with all requirements of the specifications.

E. Indicate in writing all deviations between the plans and specifications and the materials submitted.

F. It is understood that proof of equality is the responsibility of the Contractor and/or supplier and that is not the responsibility of the Engineer to prove the inequality of the proposed substitutions. Furthermore, the decisions of the Engineer are final.

G. While it is not the intention of the Engineer to discriminate against any manufacturer of equipment that is equal to specified equipment, a strict interpretation of such equality will be exercised by the Engineer in considering any equipment offered as a substitute for equipment named in the specification.

H. It shall be the responsibility of the Contractor to submit with each request for approval of substitute material or equipment, sufficient data to show conclusively that it is equal to the material or equipment specified. This Contractor is responsible for any additional costs that may arise from any substitution for any item.

I. Each Contractor shall submit shop drawings and/or diagrams for approval and for job coordination in all cases where significant deviations from the contract drawings are contemplated because of job conditions, interference's, substitutions of equipment or when requested by the Engineer for purposes of clarification of the Contractor's intent. He shall also submit detailed shop drawings, rough-in sheets, etc., for all custom build or custom items of equipment.

J. Submittal of shop drawings shall be made in sufficient copies to provide the following: One (1) copy of all data to be retained by the Engineer, two (2) copies of all data to be accumulated for the Owner, one (1) copy of all data to be retained by the Contractor, one (1) copy of all data to be retained by the Lead Design Professional. The Contractor shall increase the number of copies if he requires more to be returned to him. Should any substitute items be submitted and disapproved, those items must then be furnished exactly as described herein.

K. The Engineer's review of shop drawings and/or submittal data shall not relieve the Contractor of responsibility for deviations from the contract drawings or specifications. The size of equipment shown on the drawings is based on the dimensions of a particular manufacturer. While other manufacturers may be acceptable, it is the responsibility of the Contractor to determine if the equipment he proposes will fit in the space. Shop drawings shall be prepared when required by the Engineer or Owner to indicate a suitable arrangement.

1.6 OPERATING AND MAINTENANCE MANUALS AND INSTRUCTIONS:

The symbol "<OM>" indicates a requirement for operation and maintenance manuals to be furnished.

A. The Owner's operation Personnel shall be instructed by the Contractor on how to start and operate each item of Equipment. Safety features shall be pointed out, particularly the possible trouble which might cause the Safety Controls to operate and what might be done to remedy the trouble.
B. The Owner's operation Personnel shall be thoroughly instructed in the operation of the Control System. Instructions should include an explanation of the Control System or System Sequence of Operation, the proper set points of each Thermostat, etc., and how to change the setting to accommodate overheating, overcooling or incorrect humidity. Instructions shall include an explanation of components that should not be changed except by authorized personnel of the Control Manufacturer. Thermostat keys shall be turned over to the Owner.
C. Relative to the Air Conditioning System, instruct the Owner's operating personnel in the following:

   a. Removal of Service Access Panels from Equipment. If special tools are required, turn over at least (1) one set to the Owner.

   b. Method of removing Air Filters.

   c. Method of cleaning Permanent Type Air Filters.

   d. Location of Concealed Valves, Traps, Air Splitters, Automatic Valves and Dampers, etc., requiring periodic maintenance and location of access to them.

D. Provide four (4) copies of operating and maintenance manuals. Manuals shall be bound in large ring, loose-leaf binders and shall contain the following:
   a. Manufacturer's instructions and/or installation manual.

   b. Manufacturer's service manual.

c. Manufacturer's lubrication charts listing types of lubricant to be used on each item of equipment and recommended frequency of lubrication.

d. Electrical diagrams of equipment and control system, etc. Diagrams of Automatic Temperature Control Systems, identifying each by name, location and number showing sequence of operation. Each component of a Control System shall be identified. All diagrams shall be up-to-date and reflect any on-the-job changes.

e. Parts lists and identifying part numbers with prices of each part. The name and address of the nearest distributor from which parts can be obtained.

1.7 WARRANTY:

A. The Contractor shall warranty all workmanship, material, equipment systems, etc., provided by him for a period of One (1) Year after substantial completion of the project. This warranty means that this contractor shall make good to the Owner, at no cost, any defects that become apparent during the year following substantial completion. This warranty is in addition to other guarantees or warranties and is not intended to limit such other guarantees or warranties. This Contractor shall give a letter of guarantee stating the dates the dates the guarantee period begins and ends. The Owner/Engineer shall be furnished with three (3) copies of the letter of guarantee.

1.8 DEFINITIONS:

The following words and phrases as used herein are hereby defined:

A. "Provide": Furnish and install all material and labor required for a complete installation, ready for operation, in accordance with the intent of the Contract Documents.

B. "As Required": Indicates that the Contractor shall perform the work or provide the material as indicated in accordance with manufacturer's installation instructions, and in accordance with applicable codes or regulations, in a workmanlike manner as defined by good local practice.

C. "Or Equal": Indicates that the Contractor may substitute equipment by another manufacturer if the salient features of the equipment indicated by the manufacturers' name and/or description are, in the judgment of the Owner/Engineer adequate. Submittals for approval are required where indicated.

D. "Contractor": Where the word (s) "Contractor" or "this Contractor" is/are used, refer to the Contractor engaged to execute the work under the division of the specifications only, even though he may be technically described as a sub-contractor.

E. "Intent of the Contract Documents": The specific intent of these documents is to provide the Owner, in a thoroughly functional condition, all of the various systems, equipment, etc., indicated herein. Final authority over interpretation of the "intent" shall rest with the Owner/Engineer.

F. "Shall": Indicates a mandatory requirement.

1.9 INSPECTION OF THE SITE:

A. The drawings and specifications are prepared from the best information available and reflect all conditions commensurate with this information. However, this information is not guaranteed and the contractor should visit the site prior to submitting a proposal and shall verify the locations, sizes, depths, pressures, etc., of all existing utilities and familiarize himself with working conditions, hazards, existing grades, soil conditions, obstructions, etc. If it becomes evident that existing site conditions will impair operation of the utilities, the Engineer should be notified in writing at least 10 days before the Bid Date.
B. All proposals shall take these existing conditions and any revisions required into consideration. The submission of a bona fide bid will be considered as evidence that the Contractor has inspected the job site and understands that the conditions under this contract work must be fulfilled.
C. Contract cost changes will be negotiated for conditions found during construction that were not visible at a thorough on-site inspection and which were unknown to the Owner/Engineer or Contractor prior to receipt of bids.

1.10 INTENT:

A. The intent of this specification and the naming herein of specific equipment manufacturer's name and catalog number are to establish the minimum quality, function and physical features required. There is no intent to restrict competitive bidding or the use of other manufacturer's equipment provided it is in fact equal or superior to that specified.
B. The Owner/Engineer will decide the question of quality and/or acceptability of any alternate equipment and materials offered based on the requirements of this contract and performance capacities and other pertinent information supplied to him by the contractor.
C. The Contractor's proposal shall be based on the supply and installation of equipment and materials equivalent to or better than that specified. Requests for approval of alternate equipment or materials of lower quality, function or different function will not be considered unless each is accompanied by a written statement of credit to the contract dollar amount or other benefit to the Owner if the proposed substitute is accepted.

1.11 MATERIALS AND WORKMANSHIP:

A. Unless otherwise specifically stipulated in the specifications, all workmanship shall be of the best quality and all equipment, materials and articles incorporated in the work under this contract shall be new and equal to or better than the grade specified. The contractor, if required, shall furnish evidence as to the kind and quality of materials.

B. This Contractor shall submit to the Owner/Engineer a list of equipment and material manufacturers, suppliers and subcontractors for approval within fifteen (15) days after award of contract. See equipment listed at the end of this division for which identification of source shall be submitted for approval.

1.12 CONSTRUCTION SCHEDULE AND COORDINATION:

A. Refer to the General Conditions of the Contract for this Contractor's responsibility regarding project completion schedules, delays and extensions of time and applicable liquidated damages.

B. The Mechanical Contractor shall cooperate with all other contractors on the project and with the Owner/Engineer so that all portions of the construction work will proceed with all possible speed. Specifically, the Mechanical Contractor shall coordinate all work with the General Contractor.

C. Attention is called to the fact that the General Contractor is responsible for coordinating and programming the work of all prime contractors. This does not excuse the other prime contractors from the responsibility of having their men and materials available at the proper time so as not to delay the project construction progress.

D. The Mechanical Contractor shall meet, within seven (7) days or as soon as scheduled by the General Contractor after the award of the contract, with the General Contractor to prepare project construction schedules. The Mechanical Contractor shall give written notice to the General Contractor and the Owner/Engineer as soon as it is known, for any reason, that the schedule cannot be met.

1.13 SUPERVISION:

A. All work under this contract shall be under the direct supervision of a competent foreman thoroughly experienced in the type work being performed. If, in the opinion of the Owner/Engineer, the foreman is not "running" the job satisfactorily, shall be replaced by a foreman acceptable to the Owner/Engineer. The job foreman shall *not* be removed from the project without written notice from the contractor to the Owner/Engineer.

1.14 FIELD ADJUSTMENTS AND COORDINATION:

A. Working drawings and specifications are not complete without consulting with the Owner/Engineer. Certain field adjustments and corrections of conflicts are to be expected. The Owner/Engineer recognizes this fact and shall make their services available to the contractor on this project at all times to answer questions of interpretation or intent and to make any and all decisions wherever a question of any nature arises during the course of construction.

B. Any such question or adjustment shall be referred to the Owner/Engineer for final decision before work proceeds. The contractor's failure to obtain the Owner's/Engineer's interpretation and/or agreement to the resolution of such question or adjustment shall make the contractor responsible for the cost of proper rectification of resultant incorrect or unacceptable work.

C. Each set of plans and specifications issued to each prime contractor contain all original drawings and all original specifications covering general construction, plumbing, heating and electrical work. Each prime contractor and/or his respective subcontractors shall be responsible to each other prime contractor and/or his respective subcontractors for any conflicts in the total work caused by his failure to examine the complete project drawings and specifications.

23-0500 HVAC COMMON WORK:

1.0 PROJECT SCOPE AND DESCRIPTION OF WORK:

A. GENERAL: Unless otherwise specified, furnish all labor, transportation, materials, apparatus, fuel, energy, light, scaffolding and tools necessary to furnish and install in a skilled, workmanlike manner, complete mechanical HVAC systems and everything properly incidental thereto as shown on plans, stated in specifications or reasonably implied therein, all in accordance with the contract documents.

B. All new mechanical equipment shall be type as noted on the plans, in these specifications or approved equal. All equipment, duct, controls, etc. shall be supplied and installed complete with all accessories required and/or recommended by the manufacturer for completely operational and code compliant systems as intended.

C. The Contractor shall be responsible for fitting his Material and Apparatus into the building and shall carefully lay out his work at the site to conform to the structural conditions, provide proper grading of lines, avoid all obstructions and conform to the details of installation supplied by the Manufacturer of the Equipment to be installed. Furnish all necessary pilot lines and control lines whether indicated on the Drawings or not. The Drawings do not give exact details of elevations of ductwork nor do they show exact locations of duct to scale. Devices necessary for installation and support of ducts, and Equipment such as sleeves, inserts, etc., shall be located and installed as the construction progresses in order to allow completion of each phase of the work in the proper sequence.

D. Drawings showing the extent and arrangement of the work of a particular trade shall be used together with drawings showing the extent and arrangement of the work of other trades to insure that the Contractor, in laying out and installing his work, shall do so in a manner that the work of the various trades may progress in the most efficient, workmanlike and harmonious manner.

E. The Contractor shall be responsible for the proper location and size of slots, holes or openings in the building structure pertaining to his work, and for the correct location of sleeves. The Drawings indicate the extent and general arrangement of the various systems. But, if any departures from these Drawings are deemed necessary by the Contractor, detailed Drawings and descriptions of these departures shall be submitted to the Owner/Engineer as soon as practicable along with a statement of reasons for departure. No departures from the arrangements shown on the Drawings shall be made without prior written approval of the Owner/Engineer.

F. In general, piping and ductwork in finished areas of the building shall be run concealed unless noted and directed otherwise. Should any condition arise that would cause any piping or ductwork to be exposed in finished areas, it shall be immediately called to the attention of the Owner/Engineer. In unfinished spaces such as equipment rooms, all pipe and duct shall be run as high as possible, shall be run to a continuous grade and shall be grouped wherever it is feasible.

G. Equipment shall be installed in such a manner to make oiling devices and parts requiring service and maintenance readily accessible.

H. All Pipe, Duct, etc., shall be cut accurately to measurements established at the building and shall be worked into place without springing or forcing. All Ducts and

Pipe runs exposed in machinery and equipment rooms shall be installed parallel to the building planes except that the lines shall be sloped to obtain the proper pitch. Piping and ducts that run above furred ceilings, etc., shall be similarly installed, except as otherwise shown. All pipe openings shall be kept closed during construction until the systems are closed with final connections.

I. The construction details of the building are illustrated on the General Construction Engineering and Structural Drawings. The trades shall thoroughly acquaint themselves with the details before submitting Bids as no allowance shall be made due to unfamiliarity of these details. For new construction, place all inserts to accommodate the ultimate installation of pipe hangers in the forms before the concrete is poured and set sleeves in forms before construction. For existing construction, all required inserts shall be "drilled-in". All openings required through concrete or masonry shall be "saw-cut" or "core drilled" with tools specifically designed for this purpose. Explosive compression driven inserts shall *only* be allowed for use as approved by SMACNA *and* the Manufacturer of these devices. All concealed lines shall be installed as required at the pace of the job to precede the general construction.

J. Maintain all tools and equipment during construction. Remove all surplus materials and construction equipment from the site as soon as it is no longer required in progressing the contract work.

2.0 DRAWINGS AND SPECIFICATONS:

A. The Contractor shall furnish and install all materials called for in these specifications and on drawings. All hardware and miscellaneous items of material, labor or equipment not specifically mentioned by the drawings or specifications, but necessary to complete the work which is obviously intended under this contract shall be furnished as if specified.

B. Drawings are diagrammatic in nature and it may occur that actual dimensions or locations of equipment or materials will be other than exactly as shown on the drawings or stated in the specifications. In the event that such changes are necessary, they shall be made by the Contractor without expense to the Owner, provided that such changes do not require furnishing more materials or performing more labor than the obvious intent of the drawings and specifications.

C. Simple scaling of the plans for equipment locations is not accurate enough for the intent of these specifications. It is the Contractor's responsibility to comply with the evident intent for centering or symmetric arrangements relative to ceiling, wall and cabinet arrangement. The Contractor's attention is specifically directed to the general construction and structural engineering plans for detailed plans and elevations of toilet and service areas for the exact location of fixtures.

D. The Mechanical Contractor shall engage the cooperation of the General Contractor's Superintendent in locating equipment relative to room wall, cabinetwork and similar general construction features. Should there be any doubt of centering or symmetry, the Contractor shall consult the Owner/Engineer before proceeding with the installation.

3.0 CODES AND INSPECTIONS:

A. The Mechanical Codes of the State of North Carolina and Local Ordinances are hereby made a part of these specifications. This Contractor shall pay for and make arrangements for the Inspector having jurisdiction to make inspections of all roughing before material is covered or concealed and of the finished mechanical installation. This Contractor shall provide the Owner/Engineer with three (3) copies each of the inspector's certificates of approval of the roughing and final inspection.

B. Code and regulation requirements govern where drawing and/or specifications are in conflict with any code or regulation. However, where drawings and specifications exceed the requirements of any code or regulation, drawings and specifications shall govern. In the event that there is a conflict between the Specifications and Drawings, Drawings shall take precedence. If the Contractor observes that the drawings and specifications are at variance with applicable codes, he shall promptly notify the Owner/Engineer in writing and any necessary change shall be negotiated as provided in the contract for changes in the work. If the contractor performs any work knowing it to be contrary to such laws, ordinances, rules and regulations and without prior notice to the Owner/Engineer, he shall bear all costs of labor and material necessary to rectify unacceptable work or installation.

4.0 INCIDENTAL CONSTRUCTION WORK:

A. All oiling devices and all parts of Equipment requiring adjustment shall be easily accessible. Equipment shall be located and installed to permit convenient and safe maintenance and future replacement. The trade ordering and furnishing the Equipment shall be responsible, prior to ordering same, in the event that the specified Equipment and/or approved is incompatible with this requirement.

B. This Contractor shall provide all lubricants for the operation of all equipment until acceptance. This Contractor shall be required to protect all bearings during the installation and shall thoroughly grease steel shafts to prevent corrosion. All motors and other equipment shall be provided with covers as required for proper protection during construction. All equipment bearings requiring periodic lubrication shall be provided with proper fittings for this purpose. Copper tubing extensions shall be provided in addition to lubrication fittings when equipment requiring such lubrication is not readily accessible due to location.

C. Pipe and Duct, regardless of material, that passes through a concrete slab, (except slab on grade), masonry wall, roof or other portion of the building structure, shall be free from the structure and shall pass through a sleeve furnished and installed by the Sub-contractor responsible for the work involved. Above grade and dry location sleeves shall be constructed from (20) twenty to (22) twenty-two gauge galvanized steel and shall be flush on both sides of wall surface penetrated.

D. The General Contractor will provide openings and lintels for the Mechanical Contractor's work as building construction progresses. The Mechanical Contractor shall fully designate these requirements prior to building construction at those particular locations. Failure of the Mechanical Contractor to furnish his requirements prior to building construction and failure to coordinate his work with other contractors shall make the Mechanical Contractor responsible for cost of proper removal (chasing)

and repair of general construction work to provide for installation of the mechanical work.

E. Written approval shall be obtained from the Owner/Engineer before cutting any structural member or finished work. The cost of cutting and reinforcing of any structural member to accommodate mechanical work shall be the responsibility of the Mechanical Contractor and shall be done by craftsmen experienced in the craft involved and in a manner acceptable to the Structural Engineer.

4.1 CLEANING AND PAINTING:

A. The Mechanical Contractor shall at all times keep the Owner's premises, the adjoining premises, driveways and streets clean of rubbish caused by the Mechanical Contractor's operations and, at the completion of the work, shall remove all rubbish from and around the premises, all of his tools, equipment, temporary work and surplus materials and shall leave the work area clean and ready for use.

B. The Mechancial Contractor shall "touch up" paint to restore it to the original "new" appearance, all equipment installed under this contract on which the factory applied finish was damaged or scratched during construction or which does not have a finished paint or other outer coating and which is not otherwise to be painted by the General Contractor.

C. All structural steel, rods, etc., installed by this Contractor, whether concealed or exposed, shall be wire brushed to remove dirt and scale and painted with one (1) full cover coat of rust preventive primer, Rust-O-Leum #X-60, or approved equal. Surfaces inaccessible after placement shall be painted prior to placement.

4.2 ISOLATION:

A. The Transmission of Perceptible Vibration, Structure-borne Noise or Objectionable Airborne Noise to occupied areas by Equipment installed under this Contract shall not
B. be permitted.

C. The Isolation Supplier shall be a firm or individual capable of dealing effectively with vibration and noise characteristics, effects and criteria and have facilities and the capability of measuring and evaluating such disturbances and be qualified in the preparation of Drawings and Installation Instructions.

4.3 FOUNDATIONS:

A. Concrete foundations required for Mechanical Equipment shall be constructed by this Contractor. Equipment shall be set in place on their bases, leveled and properly aligned by means of shims, piped and grouted, in this order. After grouting, the forms shall be removed and the foundation surfaces shall be hand-rubbed with carborundum. Concrete work shall conform to the requirements of General Specifications.

4.4 CONFLICTS, INTERFERENCES AND COORDINATION BETWEEN TRADES:

A. The Drawings are *not* to be construed as Shop Drawings, but only to indicate the extent, general location, arrangement, etc., of Piping Systems and Equipment. This Contractor shall refer to other sections of the specifications and other Drawings such

as electrical, structural, architectural, etc., in order to eliminate conflicts and undue delays in the progress of the work. Where other Contractors furnish items requiring piping connections by the Contractor, the other Contractors shall be held responsible for providing Rough-in Drawings and assistance upon request.

B. Each trade shall synchronize its work with that of the other trades in such a way that the work may be done in the most direct and workmanlike manner without hindering other trades. Piping interference shall be handled by giving precedence to pipe lines that require a stated grade for proper operation. When there is a conflict in space requirements the following order of precedence shall be observed:

a. Building Lines

b. Structural Members

c. Soil and Drain Piping

d. Vent Piping

e. Supply Ductwork

f. Exhaust Ductwork

g. Domestic Water

h. Electrical Conduit

C. In the event that there is a conflict between the Specifications and Drawings, Drawings shall take precedence. In matters pertaining to quality, application and coordination between Trades, Specifications shall govern.

D. In the event that there is a conflict between Codes, as interpreted by the authority having jurisdiction and the Contract Documents, the Codes shall govern.

E. In the event that there is a conflict between the Manufacturer's Installation Instructions and the Drawings, the Manufacturer's Installation Instructions shall govern.

5.0 CONSTRUCTION SAFETY AND DAMAGE:

A. The Contractor assumes all responsibility for the safety of his personnel on the project during construction. The Contract Documents do not include Material, Procedures, Components, etc., required to insure construction safety. Refer to General Conditions and Supplementary General Conditions for additional information.

B. This Contractor shall be responsible for damage to project caused by this Contractor's failure to recognize hazards associated with issues such as leaks, scheduling of work, inexperienced workmen, excessive cutting, etc.

C. This Contractor shall repair any such damage at no expense to the Owner.

D. This Contractor shall familiarize himself with working conditions to the extent that he shall be responsible for damage to concealed piping, wiring and other equipment to remain, and shall repair any damage caused by his negligence at no cost to the Owner.

6.0 PROTECTION OF STRUCTURE, EQUIPMENT AND WORK:

A. Each Contractor shall provide space for storage of Equipment, Materials and Tools at ground level. Any storage contemplated within the building will be allowed only upon specific approval of the Architect/Engineer.

B. The Contractor shall continuously maintain adequate protection of Stored Materials and Installed Equipment. Fixtures and Equipment, located inside or outside, shall be protected against dirt, dust, rust, moisture and abuse from other trades. Materials and Equipment shall *not* be stored directly on the ground. Ductwork, Piping and Equipment shall *not* be used by other trades as supports for scaffolds or for personnel. At the completion of the work, Equipment, Fixtures, Exposed Supports and Piping shall be vacuumed free of loose dirt and cleaned to the satisfaction of the Engineer. Repairs that become necessary because of damage shall be paid by the Contractor.

C. Each Contractor shall take particular care *not* to damage the structure while performing his work. All finished floors and step treads shall be covered to prevent any damage by workman or their Tools and Equipment during the construction of the building. In addition, each Contractor shall protect any material on the job site whether a part of this Contract or the property of another Contractor

D. The Manufacturers' published directions shall be followed in the delivery, storage, protection, installation, piping and wiring of all Equipment and Material.

7.0 IDENTIFICTION:

A. Each piece of equipment, shall be permanently and clearly identified; every zone duct, and outside air duct and return air duct whose duty is not immediately apparent shall be permanently identified.

B. Equipment and Duct shall be provided with laminated phenolic nameplates appropriately engraved with proper identification correlated to the designation shown on the drawings. Punched plastic tape will not be acceptable. Insulated Equipment may have identification taped on to identify a piping system.

23-0529 HANGERS AND SUPPORTS:

A. All Vertical and Horizontal Ducts shall be supported as noted on the drawings and in accordance with SMACNA HVAC Duct Construction Standards, Latest Edition.

B. Flexible Ducts shall be free of sags and kinks and supported on a minimum of (36") thirty-six inch centers with (3/4") three quarter inch wide banding material. Perforated strap will *not* be acceptable.

23-0593 TESTING ADJUSTING AND BALANCING: <S>

1.0 GENERAL:

A. Mechanical Contractor shall at his own expense, during the progress of the work or upon its completion, make any Test of his work as specified herein in accordance with all Laws and Governing Authorities, as required by the Engineer or by State or Municipal Bureaus having jurisdiction under their supervision. The Contractor shall provide all Apparatus, Temporary Piping Connections or anything necessary to conduct such Test. He shall take all due precautions to prevent damage to the Building or its contents during these Test and shall be required to repair and make good any such damage incurred by any tests at his own expense. Any leaks, defects or deficiencies discovered as a result of the Test shall immediately be repaired or made good and the Test shall be repeated until the Test Requirements are fully met.

B. None of the work shall be concealed, covered or otherwise enclosed until it is properly inspected, tested and approved. Any leaks that develop during any Testing shall be corrected with New Material and made good as required. These Tests shall be repeated until every aspect of the work is satisfactory to the Engineer and the Mechanical Inspectors.

C. Each individual System and all of its components shall be operated by this Contractor for a reasonable length of time to demonstrate the performance of all Equipment and Piping in accordance with the true intent and purpose of the Plans and Specifications. All necessary adjustments shall be made to the satisfaction of the Owner/Engineer.

D. All motor driven Equipment shall be proven to be generally operable in accordance with the intent of these Specifications.

E. The General Contractor shall provide all Power and Water for Electrical Testing of the Air Conditioning and/or Heating Equipment and Systems.

F. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

a. AABC - National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems.
b. NEBB - National Environmental Balancing Bureau, Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems.
c. ASHRAE HVAC Applications Chapter 37: Testing, Adjusting and Balancing.

2.0 TESTING OF HEATING, AIR CONDITIONING, VENTILATION SYSTEMS:

A. All phases of the Air Conditioning, Heating and Ventilation Systems shall be operated separately or in conjunction with the others for a period of time to demonstrate to the Engineer's satisfaction the ability of the Equipment to meet capacity and performance requirements while maintaining design conditions in accordance with the true intent and purpose of these Specifications.

B. Heating and cooling capacities and performance for every System shall be checked in the winter and summer respectively. Any adjustment and/or startup required shall be done at no additional cost to the Owner. Any adjustments done during one season shall not affect capacities and performance during the other seasons.

C. The Volume of air at each Outlet and Inlet, Air Conditioning Equipment Performance Data, etc., shall be tabulated and required balancing performed by Engineering personnel skilled, trained and experienced in the performance of these functions. Prior to such Performance Tests, this Contractor shall have set all Valves, Dampers, Motors, Controllers, Thermostats, etc., and shall have the System operating and maintaining Design Temperatures, Humidity and Air Circulation throughout every area of the Building. This Contractor shall also any additional adjustments that may be required to obtain consistent temperatures throughout the Project.

3.0 SYSTEM TESTING ADJUSTING AND BALANCING FOR HVAC: <S>

A. This Section covers Test, Balance and Adjustment of Environmental Systems including but not limited to the Air Distribution System and the Equipment and Apparatus connected thereto.

B. Environmental Systems including all Equipment, Apparatus and Distribution Systems shall be Tested and Balanced in accordance with the latest edition of NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems published by NEBB or approved equal by AABC.

C. Instruments used for measurement shall be accurate and Calibration Histories shall be available for examination for each Instrument.

D. Before receiving Final Approval, the Mechanical Contractor shall clean out all lines, adjust all valves, control items and other equipment, clean all pipe and equipment, and leave his Installation complete and in good working order.

E. The Contractor shall be responsible for Inspection, Adjustment, Balancing and Logging the Data on the Performance of Equipment, Fans, all Dampers in the Duct Systems and all Air Distribution Devices.

F. Because of variance in usage of area, the number of occupants and other factors, any air quantities shown on Plans at Air Terminals shall be considered for preliminary use in initial Balancing of the System. Final Balancing adjustments as needed shall be done immediately after occupancy so that all areas of the Building are at the same approximate temperature at the time of Balancing. Any additional Testing and/or Adjustments required shall be done at *no* additional cost to the Owner. Any Adjustments done during one season shall *not* affect capacities and performance during the other season.

G. Any Re-balancing shall be done during the Warranty period as required by the Engineer.

H. Final Adjustments shall be within $\pm$ 5% of Design Values. If this cannot be attained the Engineer shall be notified in writing with an explanation.

I. The Final Report shall be submitted for review on Approved Reporting Forms. The Final Reporting Form submitted must bear the signature of the person that recorded the data and the signature of the Contractor Project Manager.

J. Identification of all types of the Instruments used and the last date of calibration of each Instrument shall be submitted with the Final Report.

K. Prior to Final Acceptance of the System, the Contractor shall furnish (five copies) of the minimum NEBB or AABC required data to the Engineer for approval.

23-0700 HVAC INSULATION: <S>

Section 23 07 13 – Ductwork Insulation

SUMMARY:

1. Perform all Work required to provide and install ductwork insulation and jackets indicated by the Contract Documents with supplementary items necessary for proper installation.

REFERENCE STANDARDS

1. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

2. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

    a. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.

    b. ASTM C168 - Terminology Relating to Thermal Insulation Materials.

    c. ASTM C518 - Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

    d. ASTM C553 - Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

    e. ASTM C612 - Mineral Fiber Block and Board Thermal Insulation.

    f. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material).

    g. ASTM C1104 - Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation.

    h. ASTM C1290 - Standard Specification for Flexible Fibrous Glass Blanket Insulation Used to Externally Insulate HVAC Ducts.

    i. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.

    j. ASTM C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings.

    k. ASTM E84 - Surface Burning Characteristics of Building Materials.

    l. ASTM E96 - Water Vapor Transmission of Materials.

m. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

n. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

o. NFPA 255 - Surface Burning Characteristics of Building Materials.

p. SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

q. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors.

r. UL 723 - Surface Burning Characteristics of Building Materials.

s. ASTM E2336 - Standard for Grease Ducts.

t. ASTM D5590 - - Standard Test Method for Determining the Resistance of Paint Films and Related Coatings to Fungal Defacement by Accelerated Four-Week Agar Plate Assay

QUALITY ASSURANCE

1. All ductwork requiring insulation shall be insulated as specified herein and as required for a complete system. In each case, the insulation shall be equivalent to that specified and materials applied and finished as described in these Specifications.

2. All insulation, jacket, adhesives, mastics, sealers, etc., utilized in the fabrication of these systems shall meet NFPA for fire resistant ratings (maximum of 25 flame spread and 50 smoke developed ratings) and shall be approved by the insulation manufacturer for guaranteed performances when incorporated into their insulation system, unless a specific product is specified for a specific application and is stated as an exception to this requirement. Certificates to this effect shall be submitted along with Contractor's submittal data for this Section of the Specifications. No material may be used that, when tested by the ASTM E84-89 test method, is found to melt, drip or delaminate to such a degree that the continuity of the flame front is destroyed, thereby resulting in an artificially low flame spread rating.

3. Application Company Qualifications: Company performing the Work of this Section must have minimum three (3) years experience specializing in the trade.

4. All insulation shall be applied by mechanics skilled in this particular Work and regularly engaged in such occupation.

5. All insulation shall be applied in strict accordance with these Specifications and with factory printed recommendations on items not herein mentioned. Unsightly, inadequate, or sloppy Work will not be acceptable.

PRODUCTS

GENERAL

All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

MANUFACTURERS

CertainTeed Corporation.

Johns Manville Corporation.

Knauf Corporation.

Owens-Corning.

Armacell North America.

Unifrax 1 LLC. (FyreWrap)

3M Fire Protection Products (Fire Barrier Duct Wrap 615+)

INSULATION MATERIALS

Type D1: Flexible glass fiber; ASTM C553 and ASTM C1290; commercial grade; 'k' value of 0.25 at 75 degrees F; 1.5 lb/cu ft minimum density; 0.002 inch foil scrim kraft facing for air ducts.

Type D2: Rigid glass fiber; ASTM C612, Class 1; 'k' value of 0.23 at 75 degrees F; 3.0 lb/cu ft minimum density; 0.002 inch foil scrim kraft facing for air ducts.

Type D3: Ductliner (to be used in return air sound boots only), flexible glass fiber; ASTM C1071; Type II, 'k' value of 0.23 at 75 degrees F; 3.0 lb/cu ft minimum density; coating air side for maximum 4,000 feet per minute air velocity. The airstream surface must be protected with a durable acrylic surface coating specifically formulated to:

Be no more corrosive than sterile cotton when tested in accordance with the test method for corrosiveness in ASTM C665.

Absorb no more than 3 percent by weight when tested in accordance with the test method for moisture vapor sorption in ASTM C1104.

Not support the growth of fungus or bacteria, when tested in accordance with the test method for fungi resistance in ASTM C1071, ASTM C1338, ASTM G21, and ASTM G22.

Show no signs of warpage, cracking, delaminating, flaming, smoking, glowing, or any other visibly negative changes when tested in accordance with the test method for temperature resistance in ASTM C411.

Have a flame spread rating of 25 or less and a smoke developed rating of 50 or less when tested in accordance with the test method for surface burning in ASTM E 84.

Meet the sound absorption requirements when tested in accordance with the test method for sound absorption in ASTM C423.

Show no evidence of continued erosion, cracking, flaking, peeling, or delamination when tested in accordance with the test method for erosion resistance in UL181.

Type D4: Fire Rated Grease Duct Insulation (High Temperature Flexible Blanket); 1-1/2-inch thick refractory grade fibrous fire barrier material with minimum service temperature design of 2,000 degrees F; aluminum foil laminated on both sides; with a minimum 'k' value of 0.25 and a minimum density of 6 lbs/cu ft; containing no asbestos. Listed by a nationally recognized testing laboratory (NRTL) UL to meet ASTM E 2336, ASTM E119, and with flame spread/smoke minimum rating of 25 / 50 when tested as per ASTM E84/UL 723.

Type D5: Outdoor Duct Insulation (Closed Cell Flexible Elastomeric Insulation); 1 inch thick material that has a service temperature range from –60 degrees F to 180 degrees F. This outdoor duct insulation meets ASTM C 177 or C 518 and shall have minimum 'k' value of 0.27 Btu-in. / hr-ft2- degrees F at minimum density measurement of 3 lb/cu ft. The insulation and outside surface must be protected with a white Thermo Plastic Rubber Membrane formulated to:

Be resistant to UV, and ozone, acid rain, and physical elements produced from outdoor weather per ASTM E 96 Procedure A.

Have aflame spread rating of 25 or less and a smoke developed rating of 50 or less when tested in accordance with the test method for surface burning in ASTM E 84.

Show no evidence of continued erosion, delaminating, cracking, flaking, or peeling when tested in accordance with the test method for erosion resistance in UL181. Be resistant to mold growth resistance, ASTM G 21/C 1338 resistant to fungi, and resistant to bacteria growth per ASTM G 22.

Type D6: Ductliner (to be used in return air sound boots only), flexible glass fiber; ASTM C1071; Type II, 'k' value of 0.23 at 75 degrees F; 3.0 lb/cu ft minimum density; coating air side for maximum 4,000 feet per minute air velocity. The airstream surface must be protected with a durable polyacrylate copolymer emulsion specifically formulated to:

Not support the growth of fungus or bacteria, when tested in accordance with the test method for fungi resistance in ASTM D 5590 with "0" growth rating.

Act as a fungicidal protective coating: water based, VOC < 50 g/l. Fungicidal coating must be EPA registered for use in HVAC duct systems. Manufacturer: H.B. Fuller Construction Products Inc., Foster 40-20 (white) or 40-30 (black) Fungicidal Protective Coating or approved equal. Coatings may also be used to repair damage to duct liner insulation.

EXECUTION:

Verify that ductwork has been tested before applying insulation materials.

Verify that surfaces are clean, foreign material removed, and dry.

Maintain required ambient temperature during and after installation for a minimum period of 24 hours.

INSTALLATION:

Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

All installation shall be in accordance with manufacturer's published recommendations.

Extend duct insulation without interruption through walls, floors, and similar penetrations, except where otherwise indicated.

Provide external insulation on all round ductwork connectors to ceiling diffusers and on top of diffusers as indicated in the Ductwork Insulation Application and Thickness Schedule and the Drawings. Secure insulation to the top of ceiling diffusers with UL181B-FX listed polypropylene duct tape Do not insulate top of ceiling diffuser if it is used in ceiling return air plenum or in an open space with no ceiling.

Flexible and Rigid fiberglass insulation (Types D1 and D2) application for exterior of duct:

Secure flexible insulation jacket joints with vapor barrier adhesive, tape. Tape shall be UL181B-FX listed polypropylene duct tape.

Install without sag on underside of ductwork. Use 4-inch wide strips of adhesive on 8-inch centers and mechanical fasteners where necessary to prevent sagging. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

Insulate standing seams and stiffeners that protrude through the insulation with 1-1/2 inch thick, unfaced, flexible blanket insulation. Cover with reinforcing mesh and coat with vapor barrier finish coating.

On circumferential joints, the 2-inch flange on the facing shall be secured with 9/16 inch outward clinch steel staples on 2-inch centers, and taped with minimum 3-inch wide strip of glass fabric and finish coating.

Vapor seal all seams, joints, pin penetrations and other breaks with vapor barrier coating reinforced with reinforcing mesh.

Duct Liner (Type D3 or D6) application for interior of return air sound boots:

Secure insulation with 100 percent coverage of duct liner adhesive, pins and clips not more than 18 inches on center.

Secure bottom of duct insulation using alternate single and double clips. The first pin will secure the insulation and the second clip will be used to secure the cladding. Isolate the exterior clip from the cladding by using two 1/8 inch closed cell neoprene (Armaflex) washers on either side of the cladding. Predrill holes in cladding and avoid contact with pin during installation.

For round duct, secure insulation with 100 percent coverage of duct liner adhesive. Secure cladding with 3/4 inch, 0.020 inch stainless steel bands on 12-inch centers.

For joints and overlaps, fold cladding to form a double thickness hem 2 inches minimum. Seal with a non-shrink, non-hardening sealing compound.

Type D6: Provide fungicidal coating in air handlers ten feet on either side, first ten feet downstream of cooling coils, ten feet downstream of mix boxes, in mechanical rooms or as otherwise specified in potentially high humidity areas in the duct system shall be coated with an fungicidal coating; EPA registered for use in HVAC duct systems at a coverage rate of 80 ft2/gallon.

All ductwork, accessories, and all plenums including metal and masonry construction, etc., shall be insulated as indicated on the Drawings, as specified herein and as required for a complete system. In each case, the insulation shall be equal to that specified and materials applied and finished as described in these Specifications.

Flexible ductwork connections to equipment shall not be insulated.

Where vapor barriers are required, the vapor barrier shall be on the outside. Extreme care shall be taken that the vapor barrier is unbroken. Joints, etc., shall all be sealed. Where insulation with a vapor barrier terminates, it shall be sealed off with the vapor barrier being continuous to the surface being insulated. Ends shall not be left raw.

Extreme care shall be taken in insulating high and medium pressure ductwork including all ductwork between the fan discharge and all mixing boxes to ensure the duct is not pierced with sheet metal screws or other fasteners. All high and medium pressure ducts in these Specifications are classified as high velocity ductwork.

Where canvas finish is specified use lagging adhesive/coating to prevent mildew in securing canvas. Do not use wheat paste.Use only anti fungal lagging adhesive that adheres to ASTM D 5590 with 0 growth rating. (Foster 30-36AF, Childers CP-137AF). In addition, cover all exterior canvas-covered insulation with a fire retardant weather barrier mastic.

All supply ductwork in the Project shall be insulated; all exhaust and fume hood exhaust ductwork shall not be insulated, unless used for energy recovery purposes or noted on drawings.

Flexible round ducts shall be factory insulated.

INSPECTION:

Visually inspect the completed insulation installation per manufacturers recommended materials, procedures and repair or replace any improperly sealed joints.

Where there is evidence of vapor barrier failure or “wet” insulation after installation, the damaged insulation shall be removed, duct surface shall be cleaned and dried and new insulation shall be installed.

23-3000 HVAC AIR DISTRIBUTION:

Section 23 3100 – HVAC Ductwork

SUMMARY:

1. Provide materials and installation for complete first class HVAC systems; install ductwork, flexible duct, hangers, supports, sleeves, flashings, vent flues, and all necessary accessories as indicated in the Contract Documents. Provide any supplementary items necessary for proper installation that make the systems operable, code compliant and acceptable to the authorities having jurisdiction.

REFERENCE STANDARDS

1. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

2. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

   ASHRAE - Handbook of Fundamentals; Duct Design.

   ASHRAE - Handbook of HVAC Systems and Equipment; Duct Construction.

   ASTM A 90 - Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles.

   ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials.

   ASTM A 167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

   ASTM A 525 - General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.

   ASTM A 527 - Steel Sheet, Zinc-Coated (Galvanized) by Hot-Dip Process, Lock Forming Quality.

   ASTM B209 - Aluminum and Aluminum Alloy Sheet and Plate.

   NFPA 90A - Installation of Air Conditioning and Ventilating Systems.

   NFPA 90B - Installation of Warm Air Heating and Air Conditioning Systems.

   SMACNA – HVAC Duct Construction Standards.

   SMACNA – Rectangular Industrial Duct Construction Standards.

   SMACNA – Round Industrial Duct Construction Standards.

   SMACNA – HVAC Air Duct Leakage Test Manual.

   UL 181 - Factory-Made Air Ducts and Connectors.

   Engineering Design Manual for Air Handling Systems, United McGill Corporation (UMC).

   Engineering Report No. 132 (Spacing of Duct Hangers), UMC.

1.0 MATERIALS:

A. All ductwork indicated on the Drawings, specified or required for the air conditioning and ventilating systems shall be of materials as hereinafter specified unless indicated otherwise on Drawings. All air distribution ductwork shall be fabricated, erected, supported, etc., in accordance with all applicable standards of SMACNA where such standards do not conflict with NFPA 90A and where class of construction equals or exceeds that noted herein.

B. Ductwork shall be constructed of G-90 coated galvanized steel of ASTM A653 and A924 Standards.

C. Minimum gage of round, oval or rectangular ductwork shall be 26 gage per SMACNA Standards.

D. All duct sizes shown on the Drawings are clear inside dimensions. Allowance shall be made for internal lining, where specified, to provide the required free area.

E. All holes in ducts for damper rods and other necessary devices shall be either drilled or machine punched (not pin punched), and shall not be any larger than necessary. All duct openings shall be provided with sheet metal caps if the openings are to be left unconnected for future connections/phases, otherwise plastic covers are acceptable.

F. Except for specific duct applications specified herein, all sheet metal shall be constructed from prime galvanized steel sheets and/or coils up to 60 inches in width. Each sheet shall be stenciled with manufacturer's name and gage.

G. Sheet metal must conform to SMACNA sheet metal tolerances as outlined in SMACNA's "HVAC Duct Construction Standards."

H. Where ducts are exposed to view (including equipment rooms) and where ducts pass through walls, floors or ceilings; furnish and install sheet metal collars around the duct.

I. Spin-in fittings shall be as specified under Section 23 33 00 – Ductwork Accessories.

J. Duct Sealing: All ductwork, regardless of system pressure classification, shall be sealed in accordance with Seal Class A, as referenced in SMACNA Standards. All transverse joints, longitudinal seams, and duct wall penetrations shall be sealed.

K. All seams and joints in shop and field fabricated ductwork shall be sealed by applying one layer of sealant, then immediately spanning the joint with a single layer of 3 inches wide open weave fiberglass scrim tape. Sufficient additional sealant shall then be applied to completely embed the cloth.

L. Sealant shall be water based latex UL 181A-M sealant with flame spread of 0 and smoke developed of 0. Sealants shall be Hard Cast Iron Grip 601, Ductmate Pro Seal, Foster 32-19, Childers CP-146 or Design Polymerics DP 1010.

M. Scrim tape shall be fiberglass open weave tape, 3 inches wide, with maximum 20/10 thread count, similar to Hardcast FS-150.

N. Sealer shall be rated by the manufacturer and shall be suitable for use at the system pressure classification of applicable ductwork. Except as noted, oil or solvent-based sealants are specifically prohibited.

RECTANGULAR AND ROUND DUCTWORK

A. Metal gages listed in SMACNA HVAC Duct Construction Standards, Metal and Flexible Duct, are the minimum gages which shall be used. Select metal gage heavy enough to withstand the physical abuse of the installation. In no case shall ductwork be less than 26 gage per SMACNA Standards.

B. All longitudinal seams for rectangular duct shall be selected for the specified material and pressure classification. Seams shall be as referenced in SMACNA Standards.

C. Longitudinal seams in laboratory hood exhaust ducts shall be welded.

D. All transverse joints and intermediate reinforcement on rectangular duct shall be as shown in SMACNA Standards. Transverse joints shall be selected consistent with the specified pressure classification, material, and other provisions for proper assembly of ductwork.

E. Spiral round duct and fittings shall be as manufactured by United McGill Sheet Metal Company or approved equivalent. All fittings shall be factory fabricated, machine formed and welded from galvanized sheet metal.

F. Joints in spiral duct and fittings shall be assembled, suspended, sealed, and taped per manufacturer's published assembly and installation instructions.

G. Contractor may use DUCTMATE or Ward Industries coupling system, as an option, on rectangular ductwork. The DUCTMATE or Ward Industries system shall be installed in strict accordance with manufacturer's recommendations.

H. Rectangular ductwork field fabricated offsets shall not exceed 30 degrees.

CASINGS AND PLENUMS - 2 inch W.G. PRESSURE CLASS

A. All 2 inch w.g. pressure class casings and plenums for mixed air plenums shall be constructed in accordance with SMACNA Standards.

B. All casings shall enclose the filter and automatic dampers as shown on the Drawings. Casings shall be fabricated of galvanized sheet metal erected with three-foot center maximum standing seams reinforced with ¼-inch bars. The casing shall be stiffened on three-foot centers maximum with angle irons tack welded in place.

C. All openings to the casing shall be properly sealed to prevent any air leakage. Access doors shall be installed as indicated on the Drawings and shall be air tight, double skin insulated construction with frames welded in place. Doors shall be rubber gasketed with #390 Ventlok gasketing and equipped with fasteners equal to Ventlok #310 latches and #370 hinges that can be operated from both the inside and the outside.

D. Casings shall be anchored by the use of angle irons sealed and bolted to the curb and floor of the apparatus casing. Casings shall be tested and provided tight at a pressure of three inches water column.

E. Insulate per Section 23 07 13.

ELBOWS RECTANGULAR DUCTS

A.

Construct elbows as follows in order of preference: Long radius, unvaned elbows. Short radius, single thickness vaned elbows. Rectangular, double thickness vaned elbows.

B. Long radius elbows shall have a centerline radius of not less than one and one-half (1-1/2) times the duct width. Short radius elbows shall have a centerline radius of not less than one times the duct width.

C. Contractor shall have the option to substitute short radius vaned elbows, but shall request the substitution at the time of submittal of Product Data.

D. Provide turning vanes in all rectangular elbows and offsets.

E. Job fabricated turning vanes, if used, shall be fabricated of the same gage and type of material as the duct in which they are installed. Vanes must be fabricated for same angle as duct offset. Submit Shop Drawings on factory fabricated and job fabricated turning vanes.

F. All turning vanes shall be anchored to the cheeks of the elbow in such a way that the cheeks will not breathe at the surfaces where the vanes touch the cheeks. In most cases, this will necessitate the installation of an angle iron support on the outside of the cheek parallel to the line of the turning vanes.

G. In 90-degree turns that are over 12 inches wide in the plane of the turn, provide and install double thickness vanes on integral side rails. For ducts under 12 inches in width, use single thickness vanes. The installation of the turning vanes shall be as described for single thickness vanes. On other types of turns or elbows, single thickness trailing edge vanes shall be used.

FLEXIBLE DUCT

A. Flexible duct shall be used where flexible duct connections are shown on the Drawings to air distribution devices and terminal units and as scheduled under “Ductwork System Applications.

B. Acoustical Flexible Duct to Diffusers, Grilles, and Terminal Units:

C. Maximum flex duct length 10’-0” (ten feet), installed with no more than 90 degrees of bend to diffusers and grilles. Where longer duct runs or more bends are necessary, provide rigid round ductwork.

D. Maximum flex duct length 2’-0” (two feet), installed as a straight run to the inlet of the terminal units.

E. Acoustical flexible duct shall be manufactured with an acoustically rated CPE inner film as the core fabric, mechanically locked by a corrosion-resistant galvanized steel helix.

F. Core shall be factory pre-insulated with a total thermal performance of R-3.5 or greater. Outer jacket shall be a fire retardant polyethylene vapor barrier jacket with a perm rating not greater than 0.10 per ASTM E 96, Procedure A.

G. Duct shall be rated for a minimum positive working pressure of 6 inches w.g. and a negative working pressure of 4 inches w.g. minimum.

H. Temperature range shall be –20 degrees F to 250 degrees F.

I. Duct must comply with the latest NFPA Bulletin 90A and be listed and labeled by Underwriter's Laboratories, Inc., as Class I Air Duct, Standard 181, and meet GSA, FHA and other U. S. Government standards; flame spread less than 25; smoke developed less than 50.

J. Acoustical flexible duct shall be similar to Flexmaster Type 8M for construction and acoustical performance standards.

2.0 EXECUTION

1.0 INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. All installation shall be in accordance with manufacturer's published recommendations.

C. Provide openings in ductwork where required to accommodate thermometers, controllers and other devices. Provide pitot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring. Sleeve of pitot tube opening shall be no more than one inch long. Opening shall be one inch wide to accept pitot tube.

D. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

E. Set plenum doors 6 to 12 inches above floor. Arrange door swings so that fan static pressure holds door in closed position.

Flexible Duct:

A. The terminal ends of the duct core shall be secured by compression coupling or stainless steel worm gear type clamp.

B. Fittings on terminal units and on sheet metal duct shall have flexible duct core slipped over duct and coupling or clamp tightened, then connection sealed with sealant. Insulation of flexible duct shall be slipped over connection to point where insulation abuts terminal unit or insulation on duct.

C. These insulation connections shall be sealed by embedding fiberglass tape in the sealant and coating with more sealant to provide a vapor barrier.

D. Support flexible ducts as per SMACNA standards to prevent sags, kinks and to have 90 degree turns.

Hangers and Supports:

A. All ductwork supports shall be in accordance with Table 4-1 (rectangular duct) and Table 4-2 (round duct) of the SMACNA Standards, with all supports directly anchored to the building structure.

B. Rectangular duct shall have at least one pair of supports on minimum 8'-0" (eight feet) centers. All horizontal round and flat oval ducts shall have ducts hangers spaced 10'-0" (ten feet) maximum.

C. Lower attachment of hanger to duct shall be in accordance with Table 4-4 of the SMACNA Standards.

D. Vertical ducts shall be supported where they pass through the floor lines with 1-1/2 inch x 1-1/2 inch x 1/4 inch angles for duct widths up to 60 inches. Above 60 inches in width, the angles must be increased in strength and sized on an individual basis considering space requirements.

E. Hanger straps on duct widths 60 inches and under shall lap under the duct a minimum of 1 inch and have minimum of one fastening screw on the bottom and two on the sides.

F. Hanger straps on duct widths over 60 inches shall be bolted to duct reinforcing with 3/8 inch bolts minimum.

3.0 DUCTWORK SYSTEM CLEANING

A. If the system has been operated without scheduled filters or if the integrity of temporary closures has been compromised, Contractor shall have ductwork cleaned according to National Air Duct Cleaners Association (NADCA) Standards by a Certified Regular Member of the NADCA.

B. Before turning the installation over to the Owner, Contractor shall certify that the air handling systems have only been operated with scheduled filters in place. Otherwise, Contractor shall present evidence that the ductwork was cleaned as required above.

23-3300 AIR DUCT ACCESSORIES:

1.0 GENERAL

A. Perform all work required to provide and install the following ductwork accessories indicated by the Contract Documents with supplementary items necessary for proper installation as required by the application.
   1. Airflow control dampers and spin-in fittings.
   2. Flexible duct connections

2.0 MATERIALS

A. Furnish and install dampers where shown on the Drawings and wherever necessary for complete control of airflow, including all supply, return, outside air, and exhaust branches, "division" in main supply, return and exhaust ducts, and each individual air supply outlet.

B. Volume dampers blades shall not exceed 48 inches (48") in length or twelve inches (12") in width and shall be of the opposed interlocking type. The blades shall be of not less than No. 16 gage galvanized steel supported on one-half inch (1/2") diameter rust-proofed axles. Axle bearings shall be the self-lubricating ferrule type

C. Spin-in fittings may be used for duct taps to air devices and shall include dampers on all duct to air devices (diffusers and grilles) even though a volume damper is specified for the air device. Spin-in fittings shall be similar to Flexmaster FLD with BO3 including a 2 inch buildout, nylon bushings, locking quadrant similar to Duro Dyne KR-3, and a 3/8 inch square rod connected to the damper with U-bolts. Spin-in fittings shall be sealed at the duct tap with sealant as specified herein. Determine location of spin-in fittings after terminal units are hung or after location of light fixtures are confirmed to minimize flexible duct lengths and sharp bends .

3.0 EXECUTION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. All installation shall be in accordance with manufacturer's published recommendations.

C. Provide balancing dampers at points on low pressure supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing.

D. Provide backdraft dampers on exhaust fans or exhausts ducts where required. Install dampers so that they will open freely.

23-3400 IN-LINE FANS: <S> <OM>

1.0 GENERAL

A. Perform all work required to provide and install the following Fans indicated by the Contract Documents with supplementary items necessary for proper installation as required by the application.

2.0 MATERIALS

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

B. Fans shall be either belt or direct drive as scheduled on the drawings. Provide fans capable of accommodating static pressure variations of plus or minus 10 percent.

C. Fan Housings shall be constructed of heavy gauge galvanized steel, acoustically lined with (1/2") one-half inch thick insulation. The Motor shall be mounted on resilient elastic grommets. The Fan shall have a centrifugal wheel.

D. All Fans shall bear the AMCA Seal for Air and Sound Performance.

E. Acceptable Manufacturers: Greenheck, Twin City, Cook, Penn

3.0 EXECUTION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. All installation shall be in accordance with manufacturer's instructions. Do not operate fans for any purpose until ductwork is clean, filters in place, bearings lubricated and fan has been test run under observation.

C. Install fans with resilient mountings and flexible electrical leads. Install flexible connections between fan inlet and discharge ductwork.

D. Provide backdraft dampers on exhaust fans where required. Install dampers so that they will open freely.

23-3700 AIR OUTLETS AND INLETS: <S>

1.0 GENERAL

A. Perform all work required to provide and install all diffusers, diffuser boots, registers/grilles and louvers indicated by the Contract Documents with all supplementary items necessary for proper installation as required by the application.

2.0 MATERIALS

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

B. Grilles, Registers and Ceiling Outlets shall be as scheduled in the Plans and shall be provided with sponge rubber or soft felt gaskets. If a Manufacturer other than the one scheduled is used, the sizes shown on the Drawings shall be checked for performance, noise level, face velocity, throw, pressure drop, etc., before the submittal is made. Selections shall meet the Manufacturer's own published data for the above performance criteria. The throw shall be such that the velocity at the end of the throw in the (5') five foot occupancy zone will not be more than (50) fifty FPM or less than (25) twenty-five FPM. Should grilles other than those scheduled by name be furnished, Manufacturer shall be prepared to demonstrate compliance with noise criteria upon request to Owner/Engineer satisfaction. All devices shall be tested per Air Diffuser Council and labeled as such. Each Air Distribution Device located below an unconditioned space such as an attic, shall be provided with a (3") three inches thick, (3/4) three-quarter pound density insulation blanket for condensation control.

C. Locations of Outlets on Drawings are approximate and shall be coordinated with other trades to make symmetrical patterns and shall be governed by the established pattern of the lighting fixtures or GC reflected ceiling plan. Grilles, registers and ceiling outlets shall be provided with deflecting devices and manual dampers where indicated on schedules. These shall be the standard product of the Manufacturer, subject to review by the Engineer, and equal to the brand scheduled. All ceiling devices shall be furnished compatible with the type of ceiling in which they are to be installed.

D. Provide a frame compatible with the type of ceiling or wall in which the devices are installed. Refer to Architectural Drawings for exact type of ceiling specified.

E. Coordinate color and finish of devices with the Architect.

F. Acceptable Manufacturers: Titus, Price, Nailor, Metalaire or approved equal

3.0 EXECUTION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. All installation shall be in accordance with manufacturer's instructions.

C. Check location of air outlets and inlets and make necessary adjustments in position to conform to architectural features, reflected ceiling plans, symmetry, and lighting arrangement.

D. Install air outlets and inlets to ductwork with airtight.

E. Provide balancing dampers on duct take-off to diffusers, grilles and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly. The use of extractors or scoops at duct take-off to diffusers, grilles and registers is not allowed.

F. Provide all specialties and frames for air distribution devices as required for proper installation in ceiling type as indicated on Architectural Drawings. Provide all cutting and patching of T-bars, gypsum board, and other ceiling systems as required for installation of air devices.

23-8000 DECENTRALIZED HVAC EQUIPMENT: <S> <OM>

Section 23-8143 Split System Cooling / Gas Furnace

1.0 GENERAL

A. Furnish and install a Direct Expansion Split System air conditioner/gas furnace comprised of Indoor horizontal gas furnace, cased evaporator coil, and Outdoor Air-Cooled Condensing Unit of the size and capacity shown on the Equipment Schedule.

B. All Indoor-Outdoor Components shall be Factory matched for compatibility and shall be rated in accordance with ARI Standards.

C. Each Unit shall be a complete Factory Package, consisting of Compressor(s), Condenser Coil, Condenser Fans and Motors, Casing, Refrigeration and Temperature Controls.

D. Units shall be designed for vertical or horizontal discharge as shown and shall contain a holding charge of Refrigerant.

E. Casing shall be a fully weatherproof type designed for outdoor installation. Casing shall be of galvanized steel, zinc phosphatized with an electrostatically applied high solids polyvinyl paint with a baked enamel finish. This paint shall withstand the (500) five hundred-hour salt spray test.

F. Removable Panels shall provide complete access for servicing Compressor(s) and Electrical Controls.

2.0 MATERIALS

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

B. Compressor shall be a serviceable hermetic type and be completely field rebuildable. Compressor shall contain a crankcase heater, vibration isolators and shall be located in a separate section from the condenser fans and coil.

C. Unit Compressor shall be capable of operation down to (20˚) twenty degrees Fahrenheit outdoor temperature when Indoor Unit is not supplied with an economizer cycle.

D. All Compressors shall be provided with the following minimum protection: Over-current, Over temperature, Short Cycle (minimum five minutes before restart), High Pressure, Low Pressure.

E. Condenser Coil shall have aluminum plate fins mechanically bonded to copper tubes. Condenser Coil shall be cleaned, dehydrated, leak tested at (150) one hundred fifty psig and pressure tested at (450) four hundred fifty psig. Condenser coil shall contain integral sub-cooling circuit.

F. Condenser fans shall be of the direct driven propeller type with steel wire safety guards and shall be balanced statically and dynamically. Condenser Fan Motors shall have inherent over-current and over-temperature protection.

G. Furnish and Install Gas Furnace of the type, size and capacity shown on the Plans and Schedule. Furnish and install cased evaporator coil on the gas furnace.

H. Unit shall consist of direct expansion Evaporator Coil, Condensate Pan, Refrigerant, Accessories, Forward Curved Fans, Motor and Insulated Casing and Filter Frame.

I. Unit Casing shall be made of galvanized steel bonderized and coated with a baked enamel finish. Casing shall be internally factory insulated.

J. Evaporator Coil shall be aluminum plate fins mechanically bonded to copper tubes and shall be cleaned, dehydrated, leak tested and sealed at the factory.

K. Manufacturer shall supply Evaporator Coil with distributors for field installation of Factory supplied thermal expansion valves, nozzles, side outlet connector (if hot gas bypass is specified), solenoid valves, sight-glass and filter drier.

L. Indoor Blowers shall be a forward curved, multiple wheel centrifugal type, capable of delivering the required cfm at the external static pressure specified in the Equipment Schedule.

M. Gas Furnaces shall be provided with stainless steel burners and field installed LP conversion kits. Gas Furnaces are to be selected for operation at 5,505 feet elevation above sea level.

N. Provide an Evaporator Coil Freeze-up Thermostat for field installation which shall shut Compressor(s) down if Evaporator Coil temperature reaches (28˚) twenty-eight degrees Fahrenheit.

O. Acceptable Manufacturers: Trane, Carrier, JCI.

P. All refrigeration Piping from the Air-Cooled Condensers to the Refrigerant Coil shall be Type "L" hard drawn copper per ASTM B-88. All fittings and joints shall be made with silver-fos solder. Provide strainer-dryer combination and liquid solenoid valves at Refrigerant Coil. Thermostatic Expansion Valves and all accessories shall be equal to Alco, Inc., or approved equal. Provide and install Distributors equal to Alco, Inc., suitable for modulating flow rates. Size piping and accessories as recommended by Equipment Manufacturer.

Q. Provide specialties such as solenoid valves, sight glasses and filter/dryers as indicated and required for proper system operation. Components shall be specifically designed for Refrigeration Service. The Mechanical Contractor shall contact the HVAC equipment manufacturer to determine refrigerant line sizing and components required for specific installation.

R. Condensate Condensate drain piping shall be schedule 40 PVC pipe or type "L" hard drawn copper piping with cast and/or wrought copper fittings per ASTM B-88, 95/5 solder.

S. Test filters - To protect the equipment during construction and for the purpose of testing and balancing, this Contractor shall furnish and install a complete set of temporary filters. These temporary filters shall be glass fiber in a heavy cardboard frame with suitable retainers to hold the media in place.

3.0 EXECUTION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. All installation shall be in accordance with manufacturer's instructions.

C. Install electrical and control devices furnished by the manufacturer but not specified to be factory mounted. All electrical work shall comply with Division 26 Sections.

D. Perform startup checks according to manufacturer's written instructions. Test controls and demonstrate compliance with project requirements.

4.0 EQUIPMENT CONNECTIONS

A. With the exception of items that are to be completely wired at the point of manufacture and so delivered, or unless specifically noted to the contrary herein, the Electrical Contractor shall power wire every character of these Specifications.

B. Wiring for all automatic controls, temperature controls, temperature indicators and interlock wiring shall be done by the Mechanical Contractor. Disconnect switches required for proper operation shown on the Drawings and required by

Code shall be furnished under Electrical Work except where specifically designated on the Plans.

C. The Electrical Design and Drawings are based on the Equipment Schedule and shown on the Drawing. Should any Mechanical Equipment that require changes to the Electrical Design be approved, the required electrical changes shall be made at the expense of the trade furnishing the equipment change and at no cost to the Owner.

5.0 FINAL INSPECTIONS

A. The Contractor shall conduct a careful inspection of the entire project to assure himself that the work on the project is complete and ready for final acceptance before notifying the Engineer.

B. The Contractor shall have all necessary bonds, guarantees, receipts, affidavits, etc., prepared and signed in advance, along with a letter of transmittal listing each document included, and shall deliver to the Owner/Engineer on or before the Final Inspection. The Contractor is cautioned to check each bond, receipt, etc., before preparing these documents for submission to insure that the items match the requirements of the Specification.

END OF SECTION 230000 — HVAC SYSTEM

SECTION 260000 — ELECTRICAL SYSTEM

26-0100 GENERAL CONDITIONS:

1.1 SUMMARY:

A. The General Conditions of the Contract, Supplementary General Conditions, Special Conditions and applicable portions of all General Requirements, bound with these specifications ahead of the detailed specifications for general construction apply to all contracts and are a part of the Electrical Contract.

1.2 PROJECT SPECIFICATIONS AND DRAWINGS:

A. The Electrical Contractor is cautioned to read the entire project specifications and the entire set of project working drawings to assure that no reference to work by the Electrical Contractor is overlooked and to assure an understanding of the division of work between the various trades and/or contracts. Failure of the Electrical Contractor to do so will ***not*** relieve him of any responsibility or remove any work from the Electrical Contract.

1.3 FEES, PERMITS AND TAXES:

A. This Contractor shall make arrangements for and pay for all inspection fees and permits required by State and local authorities. The Contractor shall also pay all taxes levied for labor and materials associated with work under this Division.

1.4 INSPECTION OF THE SITE:

A. The drawings are prepared from the best information available and reflect all conditions commensurate with this information. However, the Contractor is encouraged to visit the site prior to submitting a proposal and shall verify the locations, sizes, depth, pressures, etc., of all existing utilities and familiarize himself with working conditions, hazards, existing grades, soil conditions, obstructions, etc. If it becomes evident that existing site conditions will impair the proper operation of the utilities, the Engineer shall be notified in writing at least 10 days before the Bid Date.

B. During the site visit, the Contractor shall inspect all areas of work and note any existing conditions or installations that are not compliant with the NC Building Code. The Contractor shall include within the scope of the project bid adequate funds to correct the noted non code compliant conditions.

C. All proposals shall take the existing conditions and any revisions required into consideration. The lack of specific site information on the drawings shall not relieve the Contractor of any responsibility.

1.4 INTENT:

A. The intent of this specification and the naming therein, of specific equipment manufacturer's name and catalog number, is to establish the minimum quality, function and physical features required. There is no intent to restrict competitive bidding or the use of other manufacturers' equipment and materials provided they are in fact equal or superior to that specified.

B. The Engineer will decide the question of quality and/or acceptability of alternate equipment and/or materials offered, based upon the requirements of this contract, performance capacities and other pertinent information supplied to him by the Contractor.

C. The Contractor's Bid proposal shall be based on the supply and installation of equipment and materials as specified or as the listed equals. Requests for approval of alternate equipment or materials of lower quality or function or different function will not be considered unless each is accompanied by a written deduct amount from the Bid proposal. All alternate equipment must be approved prior to Bid Date, and the Electrical Contractor shall submit full specifications on all alternate equipment a minimum of 10 days prior to Bid Date for pre-approval. Any alternate equipment not pre-approved shall not be accepted.

1.5 SUBMITTALS:

A. The symbol "<S>" indicates a requirement for submittals. Shop drawings, manufacturer's data materials list, etc., are required for all equipment and material where submittals are required. Refer to "General Conditions" and/or "Instructions to Bidders" for additional information on submittals.

B. Submittals shall be presented from published manufacturer's data and in such a form that the Engineer can readily verify compliance with codes, standards and the Contract Documents including construction features, rough-in requirements, etc. Each submittal shall contain data relevant to the particular equipment (including options).

C. The data shall be identified by highlighting, arrows, underlining, etc. Do not submit pages with non-relevant information. Broad general data is not acceptable. If equipment submitted is not as specified in the Contract Documents, the submittal shall contain pre-approval documents from the Engineer. This Contractor is responsible for any additional costs arising from any substitution of any item.

1.6 SHOP DRAWINGS AND SUBMITTAL:

A. The Contractor's attention is directed to "Shop Drawings" of "Instructions to Bidders" and "General Conditions of the Contract". Shop drawings and other submittal information on items offered as substitutes or equals to that specified shall be submitted for approval within (15) fifteen days after the award of the contract.

B. The Contractor shall, within (15) fifteen days of receipt of properly signed contract and written notice to begin work, submit to the Engineer for approval, (6) six copies of a list of supplies and manufacturer's material and equipment to be used for this project. See list below of equipment and materials for which specification data shall be submitted for approval.

C. Substitution of materials and/or equipment for that specified or listed as equal will not be accepted without prior written approval by the Engineer. The Engineer shall be the sole judge as to whether material and equipment is "equal" to that specified and acceptable for this particular job and application. Incomplete submittals will be held by the Engineer until all required data is received.

D. The Contractor shall submit for comparison, actual samples of any light fixtures offered as substitutes for the light fixtures specified if requested by the Engineer. If requested by the

Engineer, a sample of the specified fixtures shall also be submitted at the time the approval of substitutions is requested.

E. Material and equipment on which descriptive information and/or specifications are *not* submitted for approval within the time stated above shall be supplied and installed exactly as specified.

F. Material and equipment manufacturer's lists and specification data shall be submitted to the Engineer for approval and verification whether materials and equipment to be used are as specified or a proposed substitute.

G. The Contractor shall check thoroughly all manufacturer data to satisfy himself that it is correct and complete prior to submittal to the Engineer. The Contractor's letter of transmittal shall so state. The manufacturer's material and equipment list shall be complete. Manufacturer's descriptive literature and specification data shall be accumulated by the Contractor and submitted in booklet form. All data required for the project shall be submitted to the Engineer at the same time to expedite approval and facilitate overall project coordination.

H. Approval by the Engineer of specific equipment data shall not relieve the Contractor of the responsibility of supplying the proper quantity, accessory hardware or miscellaneous material required for a complete operating installation as specified or as intended.

I. Two (2) copies of all list and data submitted will be retained by the Engineer. The Contractor shall increase the number of copies submitted by the number he requires to be returned to him.

1. Submit list of manufacturers and source of supply of the following materials:

Cast Outlet Boxes	EMT and Rigid Metal Conduit
Condulets	Flexible Conduit
PVC Conduit	Strut
Conduit Connectors	Junction and Pull Boxes
Wire	Lamps
Wiring Connectors	Other items as requested by the Engineer

2. Submit full manufacturer's descriptive literature and specifications on the following equipment:

Disconnect Switches	Wiring Devices
Lighting Fixtures	Panelboards / Switchboards
Motor Disconnects	Weatherproof In-Use covers
Wet Location Boxes and Covers	Other items as requested by the Engineer

1.7 OPERATING AND MAINTENANCE MANUALS AND INSTRUCTIONS:

A. The symbol "<OM>" indicates that operating and maintenance manuals are to be furnished. Each operating and maintenance manual shall apply specifically to the equipment installed. In those cases where one manual covers a general class of equipment, the Contractor shall be required to identify (highlighting, underlining, etc.) those portions that apply to the installed equipment. All operating and maintenance manuals shall be available for inspection by the Engineer at the final review.

1.8 MATERIALS AND WORKMANSHIP:

A. Unless otherwise specifically stipulated in the specifications, all workmanship shall be of the best quality and all equipment, materials and articles incorporated into the work under this contract shall be new and equal to or better than the grade specified. The Contractor, if required, shall furnish evidence as to the kind and quality of materials.

B. This Contractor shall submit to the Engineer a list of equipment and material, manufacturers, suppliers and subcontractors for approval within (15) fifteen days after award of contract and written notice to begin work. See equipment list for detailed manufacturer's data to be submitted for approval.

C. All materials and components of field fabricated assemblies of electrically operated equipment under this contract shall be third party listed or approved by an agency accredited by the NCBCC in every case where such approval has been established for the particular type of materials or devices in question.

D. All manufactured items of electrically operated equipment shall be third party listed or approved by an agency accredited by the NCBCC in every case where such approval has been established for the particular type of devices in question.

1.9 CONSTRUCTION SCHEDULE AND COORDNATION:

A. GENERAL:

1. The Electrical Contractor shall cooperate with all other Contractors on the project and with the Engineer/Owner so that all portions of the construction work can proceed with all possible speed. Specifically, the Electrical Contractor shall coordinate with the General Contractor, electrical work penetrating foundation, wall, ceiling or roof construction or to be concealed by a finished floor, wall, ceiling or paved surface as the general construction progresses.

B. SUPERVISION:

1. All work under this contract shall be under the direct supervision of a competent foreman thoroughly experienced in the type work being performed. If, in the opinion of the Owner/Engineer, the foreman is not "running" the job satisfactorily, he shall be replaced by a foreman acceptable to the Engineer. The job foreman shall not be removed from the project without written notice from the Contractor to the Owner/Engineer.

2. The Contractor shall keep the job properly manned at all times. His foreman shall see to it that concealed work is properly built into other construction – not leaving it to the other trades. Exposed work shall be square and plumb with adjacent surfaces and lines and shall be neat and uniform in appearance. In failing to do these things, the Electrical Contractor may be required to correct the installation and pay for other construction damaged in making correction – all without extra compensation.

3. The Contractor or one of his key permanent personnel shall continuously keep familiar with details of the work on the job site. This shall be in addition to the installing electrician or other job site personnel. Any workman who is unsatisfactory to the Engineer or the Owner shall be removed from the job.

4. The Contractor shall properly protect his work against acoustical spraying, mortar filling, painting or other damage by other trades. All exposed raceways, panels, boxes (both inside and outside surfaces) and all equipment installed under this contract shall be thoroughly cleaned. Damaged finishes shall be touched up to the satisfaction of the Owner and the Engineer.

5. This Contractor shall place his own sleeves and notify other trades of chases and openings far enough ahead so that they can be properly built-in.

C. FIELD ADJUSTMENTS AND COORDINATION:

1. Working drawings and specifications are not complete without consulting with the Engineer. Certain field adjustments and corrections of conflicts are to be expected. The Engineer recognizes this fact and makes his services available to the Contractor on this project at all times to answer questions of interpretation or intent and to make any and all decisions wherever problems of any nature arise during the course of construction.

2. All such questions or adjustments shall be referred to the Engineer for his final decision before work proceeds. The Contractor's failure to obtain the Engineer interpretation and/or agreement to the resolution of such questions or adjustments shall make the Contractor responsible for proper rectification of incorrect or unacceptable work. Each set of plans and specifications issued to each Contractor contains all original drawings and all original specifications covering general construction, plumbing, heating and electrical work. Each Contractor and/or his respective subcontractors shall be responsible to every other Prime Contractor and/or his respective subcontractors for any and all conflicts in the total work caused by his failure to examine the complete project drawings and specifications.

2.0 DESCRIPTION OF WORK:

A. Unless otherwise specified, furnish all equipment, materials, labor, supervision, tools, apparatus, scaffolding, fuel, energy and light necessary to install a complete electrical system including but not limited to lighting fixtures, lamps, breakers and/or fuses, electrical devices, control and computer systems, telephone and all raceway systems and miscellaneous hardware as outlined or intended in these specifications and on the contract drawings.

2.1 DRAWINGS AND SPECIFICATIONS:

A. The Contractor shall furnish and install all materials called for in these specifications and on the drawings. All items of material, labor or equipment not specifically mentioned by the drawings or specifications, but necessary to complete the work that is obviously intended under this contract, shall be furnished as if specified.

B. The plans are diagrammatic in nature, and it may occur that actual dimensions or locations of equipment or materials will be other than exactly as shown on the drawings or stated in the specifications. In the event that changes are necessary, such changes shall be made by the Contractor without expense to the Owner, provided that such changes do not require furnishing more material or performing more labor than the intent of the drawings and specifications.

C. During the pre bid site visit, the Contractor shall inspect all areas of work and note any existing conditions or installations that are not compliant with the NC Building Code. The Contractor shall include within the scope of the project bid adequate funds to correct the noted non code compliant conditions.

D. Simple scaling of the plans for equipment locations is not necessarily accurate enough for the intent of these specifications. It is the Contractor's responsibility to comply with the evident intent for centering or symmetric arrangements on ceiling or wall spaces. The Contractor's attention is specifically directed to the General Construction and Structural plans for detailed plans and elevations of casework, toilet and service areas, etc., for exact locations of fixtures, devices, etc. Should there be a lack of symmetry, the Contractor shall consult the Engineer/Owner before proceeding with the installation.

3.0 CODES AND INSPECTIONS:

A. The Electrical Contractor shall notify the proper State Electrical Inspector with Department of Administration to schedule all required inspections, obtain and pay for all permits and all inspections required by governing authorities for work done under this contract.

B. The requirements of all laws, rules and regulations of the State Department governing building construction and equipment shall be followed and all work shall be carried out in strict accordance with such requirements even though each item involved may not be mentioned herein, particularly mentioned or shown on the drawings. In particular, the work must be done in accordance with the standards established in the latest edition of the North Carolina State Building Code, which includes the latest edition of the National Electrical Code and interim amendments thereto. All work shall comply with the State Construction Office Electrical Guidelines. All work shall meet all ADA requirements.

C. Code and regulation requirements govern where drawings and/or specifications are in conflict with any code or regulation. However, where drawings and specifications exceed requirements of any code or regulation, the drawings and specifications shall govern. In the event that there is a conflict between the Specifications and Drawings, Drawings shall take precedence. If the Contractor observes that the drawings and specifications are at variance with applicable codes, he shall promptly notify the Engineer in writing and any necessary changes shall be negotiated as provided in the contract for changes in work. If the Contractor performs any work knowing it to be contrary to such laws, ordinances, rules and regulations, and without prior notice to the Engineer, the Contractor shall bear all costs arising from or necessary to rectify unacceptable work or installation.

D. A final inspection of the electrical work must be made by the Electrical Inspector upon notification by the Electrical Contractor that the job is ready for a final inspection. Three (3) copies of the certificate of approval issued by the Electrical Inspector must be presented to the Engineer and the Owner before final payment can be authorized.

4.0 INCIDENTAL CONSTRUCTION WORK:

A. All supports for outlets, boxes, lights and conduit on ceilings, concrete floors, walls or wooden partitions shall be provided by the Electrical Contractor. The Electrical Contractor shall do all cutting and fitting of his work and of other work that may be required to make the several parts come together properly and to fit his work to receive and be received by the work of other Contractors as shown on, or reasonably implied by the drawings and specifications. He shall properly complete and finish his work after other Contractors have finished as the Engineer may direct.

B. The General Contractor will provide chases for the Electrical Contractor's work in masonry walls, which are to be plastered or paneled. However, the Electrical Contractor shall fully designate these requirements to the General Contractor prior to application of finish to these walls.

C. Unless otherwise noted, the General Contractor will provide openings, chases and lintels for the Electrical Contractor's work as building construction progresses. The Electrical Contractor shall fully designate these requirements prior to building construction at those particular locations.

D. Failure of the Electrical Contractor to furnish his requirements prior to building construction and failure to coordinate his work with the other Contractors shall make the Electrical Contractor responsible for reinstallation of his work and the cost of proper repair of general construction.

E. Chases are prohibited in masonry walls that are not to be plastered or paneled. Piping, ducts and conduit indicated to be concealed in unplastered and unpaneled masonry walls shall be set before walls are constructed in order for walls to be constructed around pipes, ducts or conduits.

F. Written approval shall be obtained from the Structural Engineer before cutting any structural member or finished work. Cutting and reinforcing of any structural member to accommodate electrical work shall be the responsibility of the Electrical Contractor and shall be done in a manner satisfactory to the Engineer.

G. All excavating for and backfill over underground work required by the Electrical Contract shall be the responsibility of the Electrical Contractor. No backfilling shall be done until work to be covered is approved by the Engineer. Place backfill in (12") twelve-inch layers and tamp thoroughly. Backfill within (12") twelve inches of conduits shall be clean dirt or sand free of clods, brick or masonry.

H. Finish surfaces over excavations outside the building shall match new grades and/or existing surfaces. The Electrical Contractor shall be responsible for any of his subcontractors and the power company backfilling and matching new grades and/or existing surface. This shall include reseeding of any existing grassed areas. Distribute surplus earth on premises as directed by the General Contractor.

I. The Electrical Contractor shall be specific in his layout of raceways, wall recesses, penetrations and openings in the building structure. Cutting of tile, brick, concrete, etc., shall be directly supervised by the Electrical Contractor to prevent oversized holes and misalignment of electrical devices.

4.1 CLEANING AND PAINTING:

A. The Electrical Contractor shall, at all times, keep the Owner's premises and the adjoining premises, driveways and streets clean of rubbish caused by the Electrical Contractor's operations and at the completion of the work shall remove from and around the premises, all rubbish, tools, equipment, temporary work and surplus materials and shall have the work clean and ready for use.

B. The Electrical Contractor shall "touch-up" paint to restore to original "new" appearance all equipment installed under this contract on which the factory applied finish was damaged or scratched during construction and which is not otherwise to be painted by the General Contractor.

C. All structural steel, rods, etc., installed by this Contractor shall be wire brushed to remove dirt and scale and painted with (1) one full cover of rust preventative primer, Rust-O-leum #X-60, or approved equal. Surfaces inaccessible after placement shall be painted prior to placement.

D. Surfaces or conduits which are exposed or outside the building shall be finish painted aluminum or to match adjacent walls or equipment or as directed by the Architect.

5.0 WARRANTY:

A. This Contractor shall guarantee fully all workmanship, material, equipment, systems, etc., provided by him for a period of (1) one-year after the date of final acceptance of the work. This guarantee means that this Contractor shall make good, at no cost to the Owner, any defects that become apparent during the year following the date of final acceptance of the work. This guarantee is in addition to any other guarantees or warranties and is not intended to limit any other warranties or guarantees.

26-05-00 DEMOLITION AND SALVAGE:

1.1 GENERAL:

A. The Electrical Contractor shall be responsible for all demolition and removal of electrical work as required on the project. The Electrical Contractor shall coordinate with the general contractor to ensure that all electrical work is removed where required. Abandoned conduit/boxes shall have all electrical wiring removed completely and not just made "safe".

26-0583 EQUIPMENT CONNECTIONS:

1.1 GENERAL:

A. This Contractor shall bring all required electrical service to all equipment furnished under all divisions of the specifications and as required by the Owner or Engineer. This Contractor shall provide power wiring up to a termination point consisting of a junction box, disconnect switch, etc. and the line side terminations shall be provided. Additionally, wiring from the termination point to all equipment, including all final connections, shall be provided by this Contractor regardless of the contractor providing the equipment. This Contractor shall be

responsible for making all final connections including to equipment installed as part of any project alternates. This Contractor shall coordinate with any affected trade to ensure proper operation of the equipment item, i.e., phase rotation, type of switching, control location and accessibility.

B. When the Contractor is uncertain about the method of installation, proper location, etc., he shall ask the Engineer for further instructions or details. Failure to request such information will not excuse non-compliance.

1.2 CONTROL AND INTERLOCK WIRING:

A. Except as otherwise indicated on the drawings, all control and interlock wiring shall be performed by respective Contractors.

B. The Electrical Subcontractors shall install all starters, pilot switches, control devices and miscellaneous items of electrical equipment furnished under Division 26 of these specifications.

C. The Mechanical Contractor shall furnish and install all starters, pilot switches, control devices and miscellaneous items for mechanical equipment specified in Division 23.

26-0519 CONDUCTORS AND CABLES: (600 Volts and Less)

1.1 GENERAL

A. Provide all wiring as indicated and/or required to each piece of equipment, wiring device, lighting fixture, etc. All wire and cable shall be run in an approved raceway. Prior to energizing feeders, conductor cables shall be tested for electrical continuity and short circuits. A copy of these test results shall be sent to the State Construction Office, the Engineer of record and the Owner.

2.1 MATERIALS

A. All wire sizes specified shall be in accordance with and designated by AWG (American Wire Gauge). All wire and cable shall be listed by an approved third-party agency such as UL. Power and lighting circuits #10 AWG and smaller shall have solid copper conductors. Conductor sizes #8 AWG and larger shall have Class B stranded copper conductors. The minimum conductor size shall be #12 AWG for power and lighting circuits. The maximum conductor size allowed shall be 500 Kcmil. Full size neutral conductor shall be provided for each service and sub-panel.

B. Copper conductors equal to Encore Wire Corporation, Southwire, Cerro Wire or General Cable shall be used throughout unless specifically noted otherwise. The electrical design is based on copper conductors, and aluminum (AL) conductors are not permitted.

C. Insulation for interior power conductors shall be type THHN/THWN-2 or XHHW-2, rated 600 volts.

3.1 EXECUTION

A. Insulation shall be color coded as required by the N.E.C. and as specified below. Color coding of conductor insulation shall be uniform throughout the project in accordance with the following tables or shall match existing as applicable:

120/240 Volts	120/208 Volts	480/277 Volts
Phase A Black	Phase A Black	Phase A Brown
Phase B Red	Phase B Red	Phase B Orange
	Phase C Blue	Phase C Yellow
Neutral White	Neutral White	Neutral Natural Gray
Ground Green	Ground Green	Ground Green

B. Main feeders may be taped or painted at panelboard terminations. For 3 phase services, from left to right, the first bus in each panel shall be phase "A", middle "B", and right bus "C".

C. All home runs shall be #12 or larger as indicated. Provide #10 where home runs exceed (50') fifty feet in length on a 120 volt circuit. Provide #10 where home runs exceed 125 feet on a 277 volt circuit. No wire smaller than #12 shall be permitted to serve lighting or outlets.

D. Joints in solid conductors shall be spliced using Ideal "wirenuts", 3M Company "Scotchlock" or T&B connectors in junction boxes, outlet boxes and lighting fixtures. "Sta-kon" or other permanent type crimp connectors shall not be used for branch circuit connections.

E. Joints in stranded conductors shall be spliced by approved mechanical connectors and gum rubber tape or friction tape. Solderless mechanical connectors for splices and taps, provided with third party approved insulating covers, may be used instead of mechanical connectors plus tape.

F. All splices, taps, connections, terminations, etc., shall be made with appropriate connectors in a workmanlike manner and in compliance with the N.E.C. Conductors in all cases shall be run continuous from outlet to outlet and no splicing shall be made except within outlet or junction boxes, troughs and gutters. Provide suitable split-wedge cable supporting devices in each conduit riser as required to properly support vertical cables.

26-0526 GROUNDING AND BONDING:

1.1 GENERAL

A. Grounding conductors where insulated shall be colored solid green. Conductors intended as neutral shall be colored solid white on 120/208 volt circuits and natural gray on 277/480 volt circuits.

B. The raceway system shall not be relied on for ground continuity. A green grounding conductor, properly sized per NEC Table 250-122, shall be run in ALL raceways except for telecommunications, data and audio systems raceways.

C. Grounding electrode conductor #4 AWG and larger shall be installed in raceway system.

D. Boxes with concentric, eccentric or over-sized knockouts shall be provided with bonding bushings and jumpers. The jumper shall be sized per NEC Table 250-122 and lugged to the box.

2.1 EXECUTION

A. The electrical service shall be grounded by three (3) means:
   1. To the metallic cold water pipe (if pipe present), as per NEC Article 250-20
   2. To the steel frame of the building, provided the building frame is effectively grounded.
   3. Minimum (2) two ground rods. Ground rods shall be 10 feet long and ¾ inch in diameter, and shall be of copper-clad steel construction. All ground connections shall be accessible.

B. Identify each grounding electrode connected to a common ground bus. The height and the thickness of the common ground bus shall not be less than 2-1/4 inches.

C. Where one building is feeding another building and a grounding conductor is run with the ungrounded conductors, a metallic conduit shall be provided between the buildings to establish improved grounding system.

D. Any gas piping system shall be bonded to the equipment ground as required per the Gas Code Section 309.1

26-0529 FASTENINGS AND SUPPORTS:

1.1 GENERAL

A. This Contractor shall provide all miscellaneous structural steel necessary to mount electrical equipment to walls, beams and joists. All structural steel furnished under the electrical contract shall be protected from corrosion by factory applied coatings, paint and galvanizing. All structural steel shall be standard shapes and sizes and shall be free from rust and/or scale. All interior steel shall be firmly and rigidly welded or bolted in place.

2.1 MATERIALS

A. All structural steel shall be structural quality conforming to ASTM A47-49T. All steel and shapes shall be stainless steel type or shall be galvanized after all cutting, drilling and/or welding is done. See project drawings for more requirements. All shop connections shall be welded or riveted and all field connections shall be bolted on all outdoor structures. Where field cutting or drilling of galvanized steel is necessary, the Contractor shall apply one coat of primer paint and one finish coat of aluminum and oil paint or equivalent zinc rich protective coating for galvanized steel surfaces.

B. Round head screws and round or hex head bolts only shall be used to attach boxes, cabinets, etc. Nails are *not* acceptable.

C. Inserts in masonry shall be lead, fiber or plastic types installed in drilled holes. Wooden plugs shall *not* be used. Lead only shall be used on all exterior masonry or interior masonry subject to permanent moisture. Cast-in-place inserts shall be used wherever possible.

3.1 EXECUTION

A. Hung raceways, wireways and bus ducts shall be supported from the structure with rod supports at least 5/16" in diameter. Non-corrosive “Unistrut”, “Kindorf” or approved equal support systems shall be used unless a standard support unit is furnished with the material by its manufacturer.

B. Equipment and raceways attached to outside walls or to interior walls shall be spaced off the wall surface a minimum of ¼ inch using "clamp-backs" or strut. Non-corrosive material shall be used at all locations.

C. All materials, whether exposed or concealed, shall be firmly and adequately held in place. All fixtures, raceways and equipment shall be supported from the structure. Nothing may be supported on suspended ceilings.

26-0533 RACEWAYS:

1.1 GENERAL

A. All wiring indicated, including power wiring, emergency systems wiring (NEC Article 700), temperature control wiring, communication wiring where indicated, etc., shall be in separate raceways. All wiring shall be in a raceway. The minimum trade size conduit is ½ inch for interior installation and ¾ inch for below grade installation.

B. The raceway system shall not be relied upon for grounding continuity.

C. The use of "LB's" shall be limited where possible.

D. Where conduits of any type pass over a building expansion joint, a standard expansion joint fitting compatible with the type raceway being used shall be provided.

2.1 ABOVE GROUND RACEWAYS:

A. Conduit shall be sized in accordance with the latest edition of the NEC unless shown otherwise. Minimum conduit size is ½ inch. Flexible metal and watertight ("sealtight") conduit, size ½ inch and larger, are acceptable for motor, appliance and fixture connections provided green ground wire is installed and NEC is followed.

B. Conduit, exposed and concealed (except "in-slab"), shall be neatly installed parallel to, or at right angles to beams, walls and floors.

C. Conduits, JB's, troughs and any enclosure when mounted outside on walls shall be off the walls by 1 inch.

2.2 MATERIALS

A. EMT may be used for the project as noted on the drawings and in these specifications. EMT conduit, couplings, elbows and fittings shall not be installed:
   a. At any location outdoors, in direct contact with earth or underground.
   b. Indoors in wet or damp locations or in concrete, cinderblocks or bricks.
   c. Where exposed to severe corrosive influence and/or severe physical damage.
   d. Encased in concrete.
   e. For transition between EMT and rigid conduits. JB's should be used.

B. EMT conduit provided below roof deck shall be installed 1-1/2 inches away from the deck to allow for screws not to penetrate the EMT conduit during roofing.

C. Electrical metallic tubing (EMT) shall be galvanized steel. Connectors and couplings shall be steel-plated hexagonal compression type. No pot metal, set screw or indented type fittings shall be allowed.

D. Rigid metal conduit or intermediate metal conduit shall be galvanized steel and shall be used for applications underground, under slab, under floor or “cast-in” concrete, or exposed on the exterior. Connectors and couplings shall be threaded type only. Connectors shall have insulated throats. IMC and GRC shall terminate with either a double locknut/bushing set or in a threaded hub.

E. Flexible metal conduit may be used for final connections to recessed lighting fixtures and shall be used for final connections to motors and transformers. Maximum length permitted is (72") seventy-two inches. Use “liquid-tight” type for all wet locations on this project.

F. Rigid nonmetallic conduit (Schedule 40 or 80 PVC) may be used for conduit runs underground, under floor slab or where specifically indicated on the plans. PVC conduit shall not be installed exposed or concealed in gypsum walls, but it may be used in CMU walls. Plastic conduit shall conform to Article 352 of the N.E.C. Grounding conductors sized in accordance with N.E.C. table 250-122 shall be provided. Provide long sweep rigid or IMC galvanized metal bends for all changes in direction greater than (15°) fifteen degrees in (10') ten feet of conduit.

G. <u>OUTLET AND JUNCTION BOXES:</u>

a. Provide cast device boxes or non-corrosive metallic galvanized boxes as directed on the drawings and per the N.E.C. Article 314 at each outlet location indicated on the drawings or as required.
b. Boxes at all wet locations and shall be non-corrosive cast for rigid metal conduit with threaded hubs and gasketed covers.
c. The owner reserves the right to make minor adjustments to the locations of outlet boxes prior to rough-in.
d. Sizes and configuration of boxes shall be as required for the intended service and shall conform to and be applied in accordance with Tables 314.16(A) and (B) of the N.E.C. Provide extension rings, expandable bar sets, supports, and gaskets for weatherproof type etc., where required.
e. Boxes shall be equal to O-Z Gedney, Killark, Steel City or an approved equal.
f. G-W type boxes shall be used where multiple wiring devices are located adjacent to each another, including cast-in floor boxes.
g. Outlet and Junction Boxes shall be installed in a workmanlike manner, rigidly supported and properly aligned. Do not rough-in boxes back-to-back.
h. Locate boxes for receptacles serving water coolers in accordance with cooler rough-in data so that cord is concealed.

H. <u>TAP AND PULL BOXES:</u>

a. Boxes shall be wet location rated non-corrosive cast for use with rigid metal conduit. Where it is necessary for boxes to be supported away from the ceiling or beams, galvanized steel fittings, straps, etc. shall be used for supports. Boxes shall have covers fastened with stainless steel screws. Box sizes shall be determined by National Electrical Code requirements.
b. Handhole enclosures shall be designed and installed to withstand all loads likely to be imposed on them. They shall be identified for use in underground systems and shall be sized and installed per NEC Article 314. Covers shall have logo that identifies function, such as “electric.”

3.1 EXECUTION

A. Raceways shall be installed neatly racked, routed parallel or perpendicular to building lines, securely attached and supported. Installation shall conform to applicable sections of N.E.C. Article 342 through 392.

B. Concealed raceways shall be supported with galvanized stamped steel clamps secured to the structure. Conduit shall not be used to support other conduit. Exposed raceways shall be secured to the structure with non corrosive galvanized stamped steel clamps or suspended from the structure with non corrosive beam clamps and conduit hangers.

C. Grouped raceways shall be supported with galvanized steel channel assemblies equal to Kindorf B-909 and single-bolt straps equal to Kindorf C-105. Acceptable manufacturers: Unistrut, Power Strut, Globe Strut.

D. Raceway supports shall be spaced as follows:

   a. rigid metal, IMC or EMT – within 3' of termination or connection and 10' o.c.

   b. rigid nonmetallic – per N.E.C. paragraph 352.30

   c. flexible nonmetallic – within 12" of termination or connection, 4.5' o.c.

E. Unless otherwise noted, raceways shall be concealed where possible in finished areas, and may be exposed in mechanical/electrical equipment rooms.

F. Stub up raceways for telephone and data outlets shall extend to a minimum of 8” and a maximum of 12” above the ceiling. Electrical Contractor shall leave a 200 lb pull line in each conduit stub up for use by others.

G. Provide expansion fittings in all conduit crossings and expansion joints. Fittings shall be equal to O.Z. type “EX” for rigid metal conduit, IMC or Schedule 40 PVC and equal to O.Z. type “TX” for EMT. Acceptable manufacturers: Burndy, ITT Blackburn, Thomas & Betts.

H. Pull boxes shall be provided as required for long runs and where excessive turns are encountered.

I. Grade all raceways away from the service entrance equipment to prevent water damage.

J. All conduit penetrations through fire rated ceilings, walls or floors shall be fire stopped using approved materials to maintain the fire rating of the ceiling, wall or floor structure.

3.2 UNDERGROUND RACEWAYS:

A. Raceways run external to building foundation walls, with the exception of branch circuit raceways, shall be encased with a minimum of three (3) inches of concrete on all sides. Encased raceways must have a minimum cover of eighteen (18) inches. Encased raceways shall be of a type approved by the NEC as “suitable for concrete encasement.”

B. Branch circuit raceways run underground external to building foundation walls shall be installed in accordance with the NEC, and shall be of a type approved by the NEC as “suitable for direct burial.” Minimum raceway size shall be 3/4”.

C. All underground raceways shall be identified by underground line marking tape located directly above the raceway at 6 to 8 inches below finished grade. Tape shall be permanent, bright colored, continuous printed, plastic tape compounded for direct burial not less than 6 inches wide and 4 mils thick. Printed legend shall be indicative of general type of underground line below.

D. Raceways run underground internal to building foundation walls shall be of a type and installed by a method approved by the NEC.

E. Where underground raceways are required to turn up into cabinets, equipment, etc., the elbow required and the stub-up out of the earth or slab shall be of rigid steel.

F. Where passing through a "below grade" wall from a conditioned interior building space, raceways shall be sealed utilizing fittings similar and equal to OZ/Gedney type FSK thru-wall fitting with FSKA membrane clamp adapter if required.

26-0543 UNDERGROUND DUCT BANKS:

1.1 GENERAL REQUIREMENTS

A. System shall consist of single, round bore conduit encased in concrete. Concrete shall be 3000 psi class. The minimum number and size of ducts shall be indicated on the drawings. Excavation and backfill shall conform to "division 2" of project specifications except that hydraulic-operated compaction equipment shall not be used. Trenches shall be cut neatly and uniformly, sloping uniformly to required pitch.

B. Ducts should be pitched to drain toward manholes and away from buildings and equipment. Minimum slope shall be 4 inches in 100 feet. Where necessary to achieve this between manholes, ducts should be sloped from a high point in the run to drain in both directions.

C. Concrete encased nonmetallic duct shall be supported on plastic separators coordinated with the duct size and spacing. Separators shall be spaced close enough to prevent sagging and deforming of ducts. Separators to the earth and to the ducts should be secured to prevent floating during placement of concrete. Steel tie wires should not be used in such a way as to form conductive or magnetic loops around ducts or duct groups.

D. Installation of single conduit shall be completely encased in concrete. The thickness of concrete shall be not less than 3 inches on the sides, bottom and top of conduit.

E. Installation of duct banks comprising multiple single conduits – each single conduit shall be completely encased in concrete with a minimum of 3 inches between conduits and a minimum thickness of concrete encasement of 3 inches which may be increased to fit the actual size of the trench.

F. Waterproof 130 pound tensile test marking cord (marked at least every foot) shall be installed in all ducts, including spares, after thoroughly rodding, clearing and swabbing all lines free of any and all obstructions.

G. All ducts should be sealed at terminations, using sealing compound and plugs, as required to withstand 15 psi minimum hydrostatic pressure.

H. The installation of Manholes should be in accordance with OSHA requirements.

I. After installation of the raceway system and before pulling the cables, the raceway system shall be air tested to 15 psi hydrostatic pressure.

26-0553 IDENTIFICATION & LABELS:

1.1 GENERAL

A. Identification and Labels - This Contractor shall identify and label all new transformers, contactors, disconnect switches, panelboards, magnetic starters, wire-gutters, major pull or junction boxes (8" x 8" x 4" or larger), and branch breakers within electrical panels that are affected by the scope of project electrical work.

2.1 MATERIALS

A. Labels shall be engraved (approx. 1" high x 3" long) rigid laminated phenolic plastic plates with letters 1/2" high minimum. Plates shall be fixed to equipment housing with (2) self-tapping stainless steel screws placed 3/16" from each end. Rivets shall be used instead if the screw sharp end is not protected. Pressure sensitive adhesive materials and “tape-writer” labels will *not* be accepted.

3.1 EXECUTION

A. Labels shall indicate what the equipment is (panel EP1, Panel #1, etc.), voltage and phases (120/208 volt, 3 phase, 4-wire, etc.) and its source and/or destination (fed from panel EP1 or serves outside, etc.).

B. Nameplate material colors shall be as follows:

- Blue surface with white core for 120/208 volt equipment
- Black surface with white core for 277/480 volt equipment
- Bright red surface with white core for all equipment related to fire alarm system
- Dark red surface with white core for all equipment related to security
- Green surface with white core for all equipment related to “emergency” systems
- Orange surface with white core for all equipment related to telephone systems
- Brown surface with white core for all equipment related to data systems
- White surface with black core for all equipment related to paging system
- Purple surface with white core for all equipment related to TV systems

C. All outlet boxes, junction boxes and pull boxes shall have their covers and exterior visible surfaces painted with colors to match the surface color scheme outlined above. This includes covers on boxes above accessible ceilings.

D. All empty conduit runs shall be identified for use and shall indicate where they terminate. Identification shall be by tags with string or wire attached to conduit.

E. Before having any labels made the Electrical Contractor shall submit a typewritten list of all labels and what they indicate to the Engineer for approval.

26-0620 WIRING DEVICES: <S>

1.1 GENERAL

A. Provide wiring devices as indicated on drawings. Device color shall be selected by Owner. Each type of device on the project shall be of same manufacturer and catalog number

throughout. All devices shall be listed by an approved third-party agency and approved for the voltage and amperage indicated.

2.1 MATERIALS

A. Toggle Switches: Gounding type with hex-head grounding screw, Specification grade, AC only, 20A, 120-277V rating, full size handle (framed toggle *not* acceptable), side wired screw terminal only (pressure terminal *not* acceptable). The switch type shall be indicated on the drawings as follows:

Single Pole	- Equal to Hubbell 1101
Double Pole	- Equal to Hubbell 1102
3-way	- Equal to Hubbell 1103
4-way	- Equal to Hubbell 1104
Pilot light	- Equal to Hubbell 1101-PL

Acceptable manufacturers: Arrow Hart, Leviton, P & S, Hubbell

B. Duplex Receptacle: Grounding type, arranged for back and side wiring with separate single or double grounding terminals. Industrial Specification heavy duty grade, AC, 20A 125V rating, face configuration shall conform to the NEMA Standard No. WD-1, NEMA WD-6, DSCC W-C-596G & UL-498. Receptacles shall be mounted vertically. Receptacles mounted over counters, back splashes, etc., shall be mounted horizontally. Receptacles shall not be mounted back to back. GFCI receptacles shall be rated minimum 20A (NEMA 5-20R configuration).
Receptacles shall be equal to:

Standard	- Equal to Hubbell 5362
Safety	- Equal to Hubbell SG-62H
Corrosion Resistant	- Equal to Hubbell CR-5362
Isolated Ground	- Equal to Hubbell IG-5362
Ground Fault	- Equal to Hubbell GF-5362

Acceptable manufacturers: Arrow Hart, Leviton, P & S, Hubbell

C. Device Plates

a. Provide a standard size device plate with matching screws for each flush mounted wiring device, blank box, telephone outlet, etc., as required. Plates shall completely cover rough wall openings and shall have rounded edges. Plates used for flush mounted devices and telephone/data outlets shall be Type “302” stainless steel or nylon type with matching slotted head oval mounting screws as indicated on the drawings. Quantity of 2% spare cover plates of each type shall be provided to the Owner.

b. Plates on surface mounted boxes not used in conjunction with surface metal raceway system shall be galvanized steel with ½" raised face and rounded edges or as directed on the drawings. Unless otherwise directed on the drawings, switch and receptacle cover plates on exposed work shall be galvanized cast ferrous metal, standard size, and shall be single or ganged as indicated or required.

c. Single multi-gang device plates shall be used where multiple devices occur. Sectionalized plates will *not* be acceptable.

d. Exterior mounted switch and receptacle plates, and all those noted to be weatherproof, shall be weatherproof cover plates, standard size, single or ganged as indicated, and shall be approved third party listed as “rain-tight while in use.”

Acceptable manufacturers: Bell, Hubbell, P & S, Perfectline, Arrow Hart, Leviton

3.1 EXECUTION

A. MOUNTING HEIGHTS:

Wiring devices and other equipment shall, unless otherwise noted or required by code, be mounted as follows:

Receptacles:	18" above floor or 6" above working surface unless otherwise noted on plans
Thermostats:	4'-0" above floor
Switches:	4'-0" above floor
Telephone outlets:	Same as receptacles
Computer outlets:	Same as receptacles
Television outlets:	As noted on plans
Panelboards:	6'-6" to top above finished floor

26-0800 TESTS AND DEVICES:

1.1 GENERAL

A. All current carrying phase conductors and neutrals shall be tested as installed, and before connections are made, for insulation resistance and accidental grounds. The Contractor shall do this with a 500 volt megger to prove insulation resistance is of acceptable value.

B. Minimum readings shall be one million (1,000,000) or more ohms for #6 AWG wire and smaller, 250,000 ohms or more for #4 AWG wire or larger, between conductors and between conductors and the grounding conductor.

C. After all fixtures, devices and equipment are installed and all connections completed to each panel, the contractor shall disconnect the neutral feeder conductor from the neutral bar and take megger readings between the neutral bar and the grounded enclosure. If this reading is less than 250,000 ohms, the contractor shall disconnect the branch circuit neutral wires from this neutral bar. He shall then test each one separately to the panel and until the low readings are found. The contractor shall correct troubles, reconnect and retest until at least 250,000 ohms from the neutral bar to the grounded panel can be achieved with only the neutral feeder disconnected.

D. At final inspection, the contractor shall furnish a megger and show the engineers and the Local AHJ/Inspection representatives that the panels comply with the above requirements.

He shall also furnish a hook-on type ammeter and voltmeter to take current and voltage readings as directed by the representatives.

E. Upon completion of installation of the electrical grounding and bonding systems, the ground resistance shall be tested with a ground resistance tester. Where tests show resistance-to-ground is over 25 ohms, appropriate action should be taken to reduce the resistance to 25 ohms or less by driving additional ground rods. Compliance shall be demonstrated by retesting.

F. All tests specified shall be completely documented indicating time of day, date, temperature and all pertinent test information. All required documentation of readings indicated above shall be submitted to the engineer prior to, and as one of the prerequisites for, final acceptance of the project.

G. The Contractor shall complete all panelboard directories, etc., using a typewriter and indicate area and/or devices served.

H. The Contractor shall assemble and turn over to the Owner, in logically arranged folios, all instruction bulletins, lubrication schedules, operating instructions, pamphlets, parts lists, prints, etc., accompanying or attached to apparatus and equipment.

I. The Contractor shall pull in and leave in place No. 16 gauge galvanized iron or steel wire in all empty raceways to facilitate the pulling in of conductors by others.

J. In all feeder tap and pull boxes and at all feeder termination points, all feeders shall be individually identified with suitable permanent type tags to indicate the feeder number and/or the feeder source and destination, corresponding to a similar labeling of switch-gear, breakers and/or other protective devices at each feeder's source.

26-2100 ELECTRICAL SERVICE:

1.1 GENERAL

A. The electrical service is new and shall be installed as shown in the contract documents and in accordance with the local utility having jurisdiction.

B. The electrical contractor shall pay all fees and/or make all installations for utility relocations, installations and for a new utility transformer, metering, transformer concrete pad, etc.

C. The Electrical Contractor shall establish a temporary electrical service for use during construction. The temporary service shall be located as directed by the local utility.

D. The Electrical Contractor shall coordinate all work with the Owner and the Engineer to minimize any inconvenience to the Owner. See the electrical requirements and notes and power riser diagrams on the contract drawings for additional specific requirements.

E. All Panelboards, Switchboards, etc. shall be sized and rated as indicated on the drawing schedules or as required by the NEC.

26-2416 PANELBOARDS: <S>

1.1 GENERAL

A. Provide and install all new panelboards rated and sized as indicated in the schedule and shown on the plans.

B. Panelboards shall be properly identified and labeled (see section 26-0553 of this specification). Panelboards identified for use as service equipment shall be so labeled. A typed directory card shall be supplied and mounted on the inside door of each panel.

2.1 MATERIALS

A. A 100% ground and neutral bus shall be included in all panels. All bus bars shall be copper.

B. Panelboards shall be equal to Square D Company, Model NQOD, for services up to 240 volts, Model NEH for services up to 480 volts and "I-Line" for power distribution panels. "Load Centers" are not acceptable. GE Type "A" panels shall be provided with screw covers. Equipment shall be built to NEMA Standard PB-1, third party standards equivalent to UL50 and UL67 and all NEC requirements.

C. Construction features shall include minimum (5") five inch gutters, dead front construction, electroplated current carrying parts, third party listed terminals suitable for conductors specified, flush front hinged door with cylinder tumbler type locks (all keys alike), circuit directory and frame, code gauge steel, galvanized and baked enamel finished. Feed through panels are not permitted.

D. Circuit breakers shall be bolt-on type equal to QOB (NQOD panelboards), equal to type EH (NEH panelboard), and equal to type FY and FA (I-line panelboards). Breakers shall be toggle action with quick-make, quick-break mechanism. Trip indication shall be by breaker handle taking a position between ON and OFF. All multiple breakers shall be common trip with a single handle. Minimum interrupting rating of breakers shall be 42,000 AIC at the main panel and 14,000 AIC at sub panels or as noted on the drawings. Refer to the drawings regarding higher ratings for circuit breakers. Provide Class A ground fault detection type breakers where indicated on the drawings.

Acceptable manufacturers: Square D, Siemens, GE or Eaton/Cutler-Hammer

26-2813 FUSES: <S>

1.1 GENERAL

A. All fuses shall be of the same manufacturer, shall have characteristics to insure retention of positive selective coordination as designed, shall be of the same size shown on schedules, and where *not* indicated on the drawings, shall be of the required size for proper operation of the equipment protected.

2.1 MATERIALS

A. Fuses rated 600 amperes or less for all general power circuits shall be equal to Bussman Low Peak LPN-RK or LPS-RK, as required by the system, dual element, Class R time-delay type. The design shall provide time-delay of not less than ten seconds at 500% of ampere rating. The interrupting rating shall be 200,000 amperes RMS symmetrical. Peak let-thru valves shall be as established by an approved third-party agency standard for Class RK1 fuses.

B. Fuses installed in individual motor circuits shall be sized at 125% of motor nameplate current or nameplate current rating for the next standard fuse size, unless otherwise indicated on the drawings or indicated in the manufacturer's instructions for the equipment in which the motor is used. The interrupting rating shall be 200,000 amperes RMS symmetrical. Peak let-thru valves shall be as established by an approved third-party agency standard for Class RK5 fuses.

C. Fuses, 601 amperes to 6000 amperes, shall be equal to Bussman KRP-C. The design shall provide time-delay of not less than (4) four seconds at 500% of ampere rating and (45) forty-five seconds at 300% of ampere rating. The interrupting rating shall be 200,000 amperes RMS symmetrical. Peak let-thru currents (lp) and energy let-thru valves (12T) shall not exceed the values established by an approved third-party agency standard for Class L fuses.

3.1 EXECUTION

A. Upon completion of the building, the Electrical Subcontractor shall provide the Owner with spare fuses as shown below:
   a. 5% of each type of rating installed 110 to 600 amperes
   b. One standard carton of each type and rating installed 0 to 100 amperes
   c. Three fuses each rating installed 601 to 2000 amperes

26-2816 MOTOR AND CIRCUIT DISCONNECTS: <S>

1.1 GENERAL

A. Provide safety switches at each location indicated on the drawings or where required by code when not specifically shown. All switches shall be properly labeled and identified. See section 26-0553 of this specification for labeling requirements.

2.1 MATERIALS

A. Safety switches shall be the "heavy duty" type and shall be third party listed. General Duty switches are not acceptable.

B. Switches shall have defeatable door interlocks that prevent the door from opening when the operating handle is in the "On" position. Switches shall be rigidly supported and properly aligned.

C. Switches shall be equal to Square D type HD with the following minimum requirements:
   a. Switching mechanism shall be quick-make, quick-break mechanism with handle as integral part of the box. All current carrying parts shall be electroplated.
   b. Unless noted otherwise on the drawings, enclosures shall be NEMA 1 for interior locations NEMA 3R for exterior locations, and shall be of code gauge steel (galvanized for NEMA 3R) with baked enamel finish and shall have locking hasp.
   c. Ratings, fusing provisions, poles, etc., shall be as indicated on the plans.

D. General-use snap switches suitable for AC use only, shall be provided to disconnect 120 volt motors, 1 horsepower or less where indicated. Switch ampere rating shall be 125% of motor full-load current.

E. Manual Motor Switches shall be provided as indicated or required. Unit shall have NEMA 1 surface mounted enclosures unless otherwise indicated. Switches *not* located adjacent to equipment served shall have pilot lights. Devices shall be equal to Square D type KG-1 and KG-2.

26-5000 LIGHTING FIXTURES: <S>

1.1 GENERAL SCOPE:

A. The Contractor shall provide and completely install lighting fixtures and all required accessories including interior and exterior fixtures and emergency battery pack type fixtures as indicated on the plans, as described in the lighting fixture schedule and as herein specified. All fixtures shall be equipped with LED's, lamps, etc. as applicable. A lighting fixture shall be provided for each lighting outlet indicated. Outlets lacking fixture designations shall be brought to the attention of the Engineer before submitting proposal; otherwise units selected by the Engineer shall be furnished and installed complete by the Contractor at no additional charge.

B. The Contractor shall supply to the Owner two (2) cases of spare lamps of all types used on the project.

1.2. SUBMITTALS:

A. Submit for approval complete manufacturer's data sheets for all fixtures. Indicate all components, characteristics and options. Submit for approval manufacturer's data sheets for all lamps to be furnished.

2.1 MATERIALS

A. A disconnecting means is required for the double-ended lamps per NEC 410.130, and the disconnect shall be labeled and located next to the room's local switch, and shall be within site of the lighting fixture, unless it is third party approved as part of the fixture package.

B. All fixtures shall be labeled by an approved third-party agency and shall be regularly cataloged and commonly manufactured products.

C. Fixture designations are on the drawings. Fixture types are identified in the light fixture symbol legend and schedule. However, the schedule does not list all accessories and hardware necessary for the complete installation, nor does it detail the construction to be encountered at the fixture locations. It is the Contractor's responsibility to properly determine and provide correct components, accessories and hardware required for the complete installation.

D. Recessed fixtures in plaster and gypsum board ceilings shall be equipped with plaster frames. In other ceilings they shall be equipped with plaster frames and/or other devices as approved by the Engineer/Owner to facilitate removal of the fixture and access to the concealed junction box.

E. Pendant fixtures shall be equipped with swivel hangers; twin stem for individual fluorescent fixtures and single stem for continuous row fluorescent fixtures, spaced according to the manufacturer's recommendations but not less than one per fixture unit plus one per row.

F. Materials indicated to be "acrylic" shall be of 100% virgin methyl methacrylate produced by Rohm and Haas, DuPont or Cyanimid.

G. LED light fixtures shall be in accordance with IES, NFPA, UL, as shown on the drawings, and as specified.

H. LED fixtures shall be modular and allow for separate replacement of LED boards/lamps and drivers. User serviceable LED's and drivers shall be replaceable from the room side.

I. LED Troffer housing, LED driver, and LED module shall be products of the same manufacturer.

J. Fluorescent fixtures containing three or more lamps shall be ballasted and connected to permit separate switching of center lamp in three-lamp units and two center lamps in four-lamp units unless otherwise noted.

K. Recessed LED and fluorescent fixtures (Troffers) shall conform to the following minimum requirements unless modified by notes and schedules on the drawings:

   a. Housings shall be of 4-3/8" minimum, 5" maximum depth and of 22 gauge minimum steel with deeply formed transverse ribs for rigidity, primed and finished in baked white enamel. Pre-painted steel is acceptable.
   b. Lenses shall be flat clear K-12 type acrylic of 0.125" nominal thickness in rigid steel or extruded aluminum door frames. Joints between the door frames and the housings shall be totally free of light leaks.
   c. Fluorescent ballasts shall be as hereinafter specified. Fluorescent lampholders shall be rigidly mounted and replaceable without removing the fixture from the ceiling.
   d. Troffers for inverted tee exposed grid ceilings shall be designed to be raised through the ceiling opening and be supported and framed by the ceiling. They shall be secured to the ceiling grid with four "earthquake clips" furnished by the fixture manufacturer.
   e. Troffers for ceilings with concealed suspension systems including plaster, gypsum board and acoustical tile shall be equipped with suitable adjustable hardware designed to hook onto the plaster frame or ceiling channels to prevent the channels from spreading and to support the fixture.

2.2 LAMPS (FLUORESCENT):

A. All lamps shall be T8, T5 OR Compact Fluorescent as manufactured by Osram Sylvania, General Electric or Philips. Lamps shall be provided as indicated in the light fixture schedule.

B. All lamps shall be compatible with the design and photometric characteristics of the light fixture and the ballast supplied and shall conform to all of the manufacturer's recommendations.

2.3 BALLASTS:

A. Ballasts for fluorescent lamps shall be manufactured by Advance, Motorola, Valmont, Magnetek or approved equal. All fixtures of the same type shall be supplied with ballasts of the same manufacturer. A minimum of five (5) years warranty is required for each electronic ballast.

B. Fluorescent ballasts shall be High Power Factor (minimum of 90%), listed and labeled by an approved third-party agency and designed for operation at 120 or 277 volts as applicable.

C. Fluorescent ballasts shall be electronic Class P sound rating A, non PCB with ballast efficacy factors in compliance with NAECA requirements. Electronic ballasts shall provide high frequency operation with lamp current crest factors of 1.7 or less and total harmonic distortion of less than 10%. Flicker shall be 15% or less with any lamp suitable for the ballast.

D. Ballast enclosures shall be smaller than the magnetic type. Light regulation shall be +/- 10% input voltage variation. Ballast shall have high power factor (90% min.) Input current third harmonics shall not exceed ANSI recommendations (32% total harmonic distortion, 27.5% of the third triplets). Ballast design shall withstand line transients per IEEE 587, Category A. Ballast case temperature shall not exceed 25 degrees C rise over 40 degrees C ambient. Ballast shall meet FCC rules and regulations, Part 18. Parallel wiring between the ballast and the fixture is recommended.

E. Fluorescent ballasts shall be two-lamp wherever possible and one-lamp where necessary. Fixtures having 3 or more lamps shall have two ballasts when possible unless noted otherwise.

2.4 EMERGENCY EXIT LIGHTS:

A. Fixtures shall be LED type with a maximum LED failure rate of 25% within a seven (7) year period. Fixtures shall be completely self-contained, provided with maintenance free battery, automatic charger and other features. Fixtures must be third-party listed as emergency lighting equipment and meet or exceed the following standards: NEC, NC Building Code, NC Energy Code, NFPA-101 and NEMA Standards.

B. The battery shall be sealed, maintenance free type with minimum of 90 minutes operating endurance. It must have a normal life expectancy of 10 years. Batteries shall be a high temperature type with an operating range of 0 degree C to 60 degrees C and contain a re-sealable pressure vent a sintered + positive terminal and – negative terminal.

C. The charger shall be fully automatic solid state type, full wave rectifying with current limiting. Charger shall restore the battery to its full charge within 24 hours after a discharge of 90 minutes under full rated load. The unit shall be activated when the voltage drops below 80 percent. A low voltage disconnect switch shall be included if lead battery is used to disconnect the battery from the load and to prevent damage from a deep discharge during extended power outage.

D. A pilot light shall indicate the unit is connected to AC power. The battery shall have high rate charge pilot light unless self-diagnostic type. A test switch shall simulate the operation of the unit upon loss of AC power by energizing the lamps from the battery. This simulation shall also exercise the transfer relay.

E. The entire unit shall be warranted for three years. The battery must have an additional two more years pro-rated warranty. Warranty shall start from the date of project final acceptance. Warranty shall be included in the contract document.

F. Contractor shall perform a test on each unit after it is permanently installed and charged for a minimum of 24 hours. Battery shall be tested for 90 minutes. The battery test shall be done 10 days prior to final inspection by the State Construction Office, the Engineer and

local AHJ. Any unit which fails the test must be repaired or replaced and tested again. A copy of the test report shall be sent to the State Construction Office.

2.5 EMERGENCY EGRESS LIGHTS:

A. Fixtures shall be completely self-contained, provided with maintenance free 12 volt battery, automatic charger, two lamps and other features. Fixtures must be third-party listed as emergency lighting equipment and meet or exceed the following standards: NEC, NC Building Code, NC Energy Code, NFPA-101 and NEMA Standards.

B. The battery shall be sealed, maintenance free type with minimum of 90 minutes operating endurance. It must have a normal life expectancy of 10 years. Batteries shall be a high temperature type with an operating range of 0 degree C to 60 degrees C and contain a re-sealable pressure vent a sintered + positive terminal and – negative terminal.

C. The charger shall be fully automatic solid state type, full wave rectifying with current limiting. Charger shall restore the battery to its full charge within 24 hours after a discharge of 90 minutes under full rated load. The unit shall be activated when the voltage drops below 80 percent. A low voltage disconnect switch shall be included if lead battery is used to disconnect the battery from the load and to prevent damage from a deep discharge during extended power outage.

D. A pilot light shall indicate the unit is connected to AC power. The battery shall have high rate charge pilot light unless self-diagnostic type. A test switch shall simulate the operation of the unit upon loss of AC power by energizing the lamps from the battery. This simulation shall also exercise the transfer relay. If fluorescent emergency unit is used, an LED charging indicator light must be easily visible after installation and a remote test switch shall be installed adjacent to the fixture.

E. The entire unit shall be warranted for three years. The battery must have an additional two more years pro-rated warranty. Warranty shall start from the date of project final acceptance. Warranty shall be included in the contract document.

F. Contractor shall perform a test on each unit after it is permanently installed and charged for a minimum of 24 hours. Battery shall be tested for 90 minutes. The battery test shall be done 10 days prior to final inspection by the State Construction Office, the Engineer and local AHJ. Any unit which fails the test must be repaired or replaced and tested again. A copy of the test report shall be sent to the State Construction Office.

3.1 EXECUTION

A. Contractor shall verify ceiling or wall type in or on which each fixture is to be mounted and shall furnish unit with appropriate trim type, mounting hardware and accessories to fit the construction; and feed through junction boxes as required to maintain proper access to system wiring.

B. Installation methods for each fixture shall be as indicated or detailed and as recommended by the fixture manufacturer for the application. All lighting fixtures shall be supported from the building structure using corrosion resistant steel hardware. Supports such as mounting brackets, hangers, clamps, etc. shall be provided in the best practical manner consistent with good workmanship and appearance. 10 gauge minimum steel wire may be used for support from the structure where concealed above suspended ceilings.

C. In addition to the supports from the structure, fixtures shall also be screwed to suspended ceilings on which they are mounted or in which they are recessed on all four corners. Where fixtures are secured to suspended ceilings, the primary supports from the building structure shall be slack.

D. A minimum of two supports from the structure shall be provided for each lighting fixture unless otherwise indicated. The supports shall be located at diagonal corners of the rectangular fixtures. Where installed recessed in grid type ceilings, attach each fluorescent fixture to the grid with a minimum of four sheet metal screws.

E. Conductors in fixture taps shall be in ½" flexible metal conduit of 72" maximum length. A green insulated equipment grounding conductor shall be included.

F. Mount fixtures plumb and square and keep rows in perfect line.

G. Any fixture damaged during construction prior to final acceptance of the project shall be replaced or repaired to the satisfaction of the Owner and Engineer. Fixtures and lamps shall be clean and fully operational at the time of project/phase completion.

H. Fixtures exposed to outdoor temperature shall be rated for (0˚) zero degrees Fahrenheit operation.

I. LED fixtures that fail during the 12 month guarantee period will be considered to have been defective and shall be replaced by the Contractor at no cost to the Owner.

26-3213 STANDBY DIESEL GENERATOR SETS: <S>

PART 1 -

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. It is the intent of this specification to secure emergency standby generator set equipment with digital electronic controls, digital governor and digital voltage regulator that has been prototype tested, factory built, production tested, site tested by a technician authorized by the manufacturer, and is of the latest commercial design, together with all accessories necessary for complete and fully operational installations as detailed on the plans and in the specifications herein.

1.3 DEFINITIONS

A. Emergency Standby Power (ESP): Per ISO 8528: The maximum power available during a variable electrical power sequence, under the stated operating conditions, for which a generating set is capable of delivering in the event of a utility power outage or under test conditions for up to 200 hours of operation per year with the maintenance intervals and procedures being carried out as prescribed by the manufacturers. The permissible average power output (Ppp) over 24 hours of operation shall not exceed 70 percent of the ESP unless otherwise agreed by the RIC engine manufacturer.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of packaged engine generator indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. In addition, include the following:

1. Thermal damage curve for generator.

2. Time-current characteristic curves for generator protective device.

3. Sound test data, based on a free field requirement.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, and location and size of each field connection.

1. Dimensioned outline plan and elevation drawings of engine-generator set and other components specified.

2. Wiring Diagrams: Control interconnection, Customer connections.

C. Certifications:

1. Submit statement of compliance which states the proposed product(s) is certified to the emissions standards required by the location for EPA, stationary emergency application.

1.5 INFORMATIONAL SUBMITTALS

A. Source quality-control test reports.

1. Certified summary of prototype-unit test report. See requirements in Part 2 "Source Quality Control" Article Part A. Include statement indicating torsional compatibility of components.

2. Certified Test Report: Provide certified test report documenting factory test per the requirements of this specification, as well as certified factory test of generator set sensors per NFPA110 level 1.

3. List of factory tests to be performed on units to be shipped for this Project.

4. Report of exhaust emissions and compliance statement certifying compliance with applicable regulations.

B. Warranty:

1. Submit manufacturer's warranty statement to be provided for this Project.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Manufacturer Qualifications: A qualified manufacturer. Maintain, within 100 miles of Project site, a service center capable of providing training, parts, and emergency maintenance repairs.

C. Source Limitations: Obtain packaged generator sets and auxiliary components through one source from a single manufacturer.

D. Comply with NFPA 37 (Standard For the Installation and Use of Stationary Combustion Engines and Gas Turbines).

E. Comply with NFPA 70 (National Electrical Code. Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702).

F. Comply with NFPA 110 (Emergency and Standby Power Systems) requirements for Level 1 emergency power supply system.

G. Comply with UL 2200.

1.7 PROJECT CONDITIONS

A. Environmental Conditions: Engine-generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:

1. Ambient Temperature: -10.0 deg F to 90.0 deg F.

2. Relative Humidity: 0 to 95 percent.

3. Altitude: Sea level to 5000.0 feet.

1.8 WARRANTY

A. Base Warranty: Manufacturer shall provide base warranty coverage on the material and workmanship of the generator set for a minimum of twenty-four (24) months for Standby product and twelve (12) months for Prime/Continuous product from registered commissioning and start-up.

B. Extended Warranty: Manufacturer shall offer extend coverage of 4 years from date of registered commissioning and start-up.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Equipment and services required in this specification shall be provided by Cummins Power Generation, Caterpillar Power Systems, Kohler Power Systems or MTU Onsite Energy.

2.2 ENGINE-GENERATOR SET

A. Factory-assembled and tested, engine-generator set.

B. Mounting Frame: Maintain alignment of mounted components without depending on concrete foundation; and have lifting attachments.

1. Rigging Information: Indicate location of each lifting attachment, generator-set center of gravity, and total package weight in submittal drawings.

C. Capacities and Characteristics:

1. Power Output Ratings: Electrical output power rating for Standby operation of not less than 275kW/344kVA, at 80 percent lagging power factor, 277/480, Series Wye, Three phase, 4 -wire, 60 hertz.

2. Alternator shall be capable of accepting maximum 1210.0 kVA in a single step and be capable of recovering to a minimum of 90% of rated no load voltage. Following the application of the specified kVA load at near zero power factor applied to the generator set.

3. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of component. The engine-generator nameplate shall include information of the power output rating of the equipment.

D. Generator-Set Performance:

1. Steady-State Voltage Operational Bandwidth: 0.5 percent of rated output voltage from no load to full load.

2. Transient Voltage Performance: Not more than 10 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within 1 seconds. On application of a 100% load step the generator set shall recover to stable voltage within 10 seconds.

3. Steady-State Frequency Operational Bandwidth: 0.25 percent of rated frequency from no load to full load.

4. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.

5. Transient Frequency Performance: Not more than 5 percent variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within 3 seconds. On application of a 100% load step the generator set shall recover to stable frequency within 10 seconds.

6. Output Waveform: At full load, harmonic content measured line to line or line to neutral shall not exceed 5 percent total and 3 percent for any single harmonic. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50.

7. Sustained Short-Circuit Current: For a 3-phase, bolted short circuit at system output terminals, system shall supply a minimum of 300 percent of rated full-load current for not less than 8 seconds without damage to generator system components. For a 1-phase, bolted short circuit at system output terminals, system shall regulate both voltage and current to prevent over-voltage conditions on the non-faulted phases.

8. Start Time: Comply with NFPA 110, Level 1, Type 10, system requirements.

9. Ambient Condition Performance: Engine generator shall be designed to allow operation at full rated load in an ambient temperature under site conditions, based on highest ambient condition. Ambient temperature shall be as measured at the air inlet to the engine generator for enclosed units, and at the control of the engine generator for machines installed in equipment rooms.

2.3 ENGINE

A. Fuel: ASTM D975 #2 Diesel Fuel

B. Rated Engine Speed: 1800RPM.

C. Lubrication System: The following items are mounted on engine or skid:

1. Lube oil pump: shall be positive displacement, mechanical, full pressure pump.

2. Filter and Strainer: Provided by the engine manufacturer of record to provide adequate filtration for the prime mover to be used.

3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.

D. Engine Fuel System: The engine fuel system shall be installed in strict compliance to the engine manufacturer's instructions

E. Main Fuel Pump: Mounted on engine. Pump ensures adequate primary fuel flow under starting and load conditions.

F. Governor: Adjustable isochronous, with speed sensing. The governing system dynamic capabilities shall be controlled as a function of engine coolant temperature to provide fast, stable operation at varying engine operating temperature conditions. The control system shall actively control the fuel rate as appropriate to the state of the engine generator. Fuel rate shall be regulated as a function of starting, accelerating to start disconnect speed, accelerating to rated speed, and operating in various isochronous states.

G. Cooling System: Closed loop, liquid cooled

1. The generator set manufacturer shall provide prototype test data for the specific hardware proposed demonstrating that the machine will operate at rated standby load in an outdoor ambient condition of 40 deg C.

2. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.

3. Size of Radiator overflow tank: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.

4. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.

5. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.

6. Duct Flange: Generator sets installed indoors shall be provided with a flexible radiator duct adapter flange.

H. Muffler/Silencer: Selected with performance as required to meet sound requirements of the application, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements. For generator sets with outdoor enclosures the silencer shall be inside the enclosure.

I. Air-Intake Filter: Engine-mounted air cleaner with replaceable dry-filter element and restriction indicator.

J. Starting System: 12 or 24V, as recommended by the engine manufacturer; electric, with negative ground.

1. Components: Sized so they will not be damaged during a full engine-cranking cycle with ambient temperature at maximum specified in Part 1 "Project Conditions" Article.

2. Cranking Cycle: As required by NFPA 110 for level 1 systems.

3. Battery Cable: Size as recommended by engine manufacturer for cable length as required. Include required interconnecting conductors and connection accessories.

4. Battery Compartment: Factory fabricated of metal with acid-resistant finish.

5. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation. The battery charging alternator shall have sufficient capacity to recharge the batteries with all parasitic loads connected within 4 hours after a normal engine starting sequence.

6. Battery Chargers: Unit shall comply with UL 1236, provide fully regulated, constant voltage, current limited, battery charger for each battery bank. It will include the following features:

a. Operation: Equalizing-charging rate based on generator set manufacturer’s recommendations shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.

b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 20 deg C to plus 40 deg C to

prevent overcharging at high temperatures and undercharging at low temperatures.

c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.

d. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.

e. Provide LED indication of general charger condition, including charging, faults, and modes. Provide a LCD display to indicate charge rate and battery voltage. Charger shall provide relay contacts for fault conditions as required by NFPA110.

f. Enclosure and Mounting: NEMA, Type 1, wall-mounted cabinet.

2.4 FUEL OIL STORAGE

A. Comply with NFPA 30.

B. Sub Base-Mounted Fuel Oil Tank: Provide a double wall secondary containment type sub base fuel storage tank. The tank shall be constructed of corrosion resistant steel and shall be UL 142 listed and labeled. The fuel tank shall include the following features:

1. Capacity: Fuel for 36 Hour(s) continuous operation at 100 percent rated power output.

2. Tank rails and lifting eyes shall be rated for the full dry weight of the tank, genset, and enclosure.

3. Electrical stub up(s)

4. Normal & emergency vents

5. Lockable fuel fill

6. Mechanical fuel level gauge

7. High and low level switches to indicate fuel level

8. Leak detector switch

9. Sub base tank shall include a welded steel containment basin, sized at a minimum of 110% of the tank capacity to prevent escape of fuel into the environment in the event of a tank rupture.

10. Fill port with overfill prevention valve (OFPV)

11. 5 gallon fill/spill dam or bucket

12. Tank design shall meet the regional requirements for the Project location

2.5 CONTROL AND MONITORING

A. Engine generator control shall be microprocessor based and provide automatic starting, monitoring, protection and control functions for the unit.

B. Automatic Starting System Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of generator set. When mode-selector switch is switched to the on position, generator set starts. The off position of same switch initiates generator-set shutdown. (Switches with different configurations but equal functions are acceptable.) When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms. Operation of the local (generator set-mounted) and/or remote emergency-stop switch also shuts down generator set.

C. Manual Starting System Sequence of Operation: Switching on-off switch on the generator control panel to the on position starts generator set. The off position of same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms. Operation of the local (generator set-mounted) and/or remote emergency-stop switch also shuts down generator set.

D. Configuration: Operating and safety indications, protective devices, system controls, engine gages and associated equipment shall be grouped in a common control and monitoring panel. Mounting method shall isolate the control panel from generator-set vibration. AC output power circuit breakers and other output power equipment shall not be mounted in the control enclosure.

E. Indicating and Protective Devices and Controls: As required by NFPA 110 for Level 1 system, and the following:

1. AC voltmeter (3-phase, line to line and line to neutral values).

2. AC ammeter (3-phases).

3. AC frequency meter.

4. AC kW output (total and for each phase). Display shall indicate power flow direction.

5. AC kVA output (total and for each phase). Display shall indicate power flow direction.

6. AC Power factor (total and for each phase). Display shall indicate leading or lagging condition.

7. Ammeter-voltmeter displays shall simultaneously display conditions for all three phases.

8. Emergency Stop Switch: Switch shall be a red "mushroom head" pushbutton device complete with lock-out/tag-out provisions. Depressing switch shall cause the generator set to immediately stop the generator set and prevent it from operating.

9. Fault Reset Switch: Supply a dedicated control switch to reset/clear fault conditions.

10. DC voltmeter (alternator battery charging).

11. Engine-coolant temperature gauge.

12. Engine lubricating-oil pressure gauge.

13. Running-time meter.

14. Generator-voltage and frequency digital raise/lower switches. Rheostats for these functions are not acceptable. The control shall adjustment of these parameters in a range of plus or minus 5% of the voltage and frequency operating set point (not nominal voltage and frequency values.) The voltage and frequency adjustment functions shall be disabled when the paralleling breaker is closed.

15. Fuel tank derangement alarm.

16. Fuel tank high-level shutdown of fuel supply alarm.

17. AC Protective Equipment: The control system shall include over/under voltage, reverse kVAR over current, loss of voltage reference, and over excitation shut down protection. There shall be a overload warning, and overcurrent warning alarm.

18. Status LED indicating lamps to indicate remote start signal present at the control, existing shutdown condition, existing alarm condition, not in auto, and generator set running.

19. A graphical display panel with appropriate navigation devices shall be provided to view all information noted above, as well as all engine status and alarm/shutdown conditions (including those from an integrated engine emission control system). The display shall also include integrated provisions for adjustment of the gain and stability settings for the governing and voltage regulation systems.

20. Panel lighting system to allow viewing and operation of the control when the generator room or enclosure is not lighted.

21. Data Logging: The control system shall log the latest 20 different alarm and shut down conditions, the total number of times each alarm or shutdown has occurred, and the date and time the latest of these shutdown and fault conditions occurred.

22. DC control Power Monitoring: The control system shall continuously monitor DC power supply to the control, and annunciate low or high voltage conditions. It shall also provide an alarm indicating imminent failure of the battery bank based on degraded voltage recover on loading (engine cranking).

F. Control Heater: Generator sets that are installed in outdoor enclosures, or are in tropical or coastal environments shall be provided with control heaters for anti-condensation protection.

G. Remote Alarm Annunciator: Comply with NFPA 110. An LED labeled with proper alarm conditions shall identify each alarm event and a common audible signal shall sound for each alarm condition.

H. Remote Emergency-Stop Switch: Flush; wall mounted (location per Owner), unless otherwise indicated; and labeled. Push button shall be protected from accidental operation.

2.6 GENERATOR OVERCURRENT AND FAULT PROTECTION

A. Generator Overcurrent Protection: The generator set shall be provided with a UL Listed/CSA Certified protective device that is coordinated with the alternator provided to prevent damage to the generator set on any possible overload or overcurrent condition external to the machine. The protective device shall be listed as a utility grade protective device under UL category NRGU. The control system shall be subject to UL follow-up service at the manufacturing location to verify that the protective system is fully operational as manufactured. Protector shall perform the following functions:

1. Initiates a generator kW overload alarm when generator has operated at an overload equivalent to 110 percent of full-rated load for 60 seconds. Indication for this alarm is integrated with other generator-set malfunction alarms.

2. Under single phase or multiple phase fault conditions, or on overload conditions, indicates an alarm conditions when the current flow is in excess of 110% of rated current for more than 10 seconds.

3. Under single phase or multiple phase fault conditions, operates to switch off alternator excitation at the appropriate time to prevent damage to the alternator.

4. The operator panel shall indicate the nature of the fault condition as either a short circuit or an overload.

5. Senses clearing of a fault by other overcurrent devices and controls recovery of rated voltage to avoid overshoot greater than 120% of nominal voltage.

6. The protective system provided shall not include an instantaneous trip function.

2.7 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

A. Comply with NEMA MG 1.

B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.

C. Electrical Insulation: Class H

D. Temperature Rise: 105 / Class H environment.

E. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, over speed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.

F. Permanent Magnet Generator (PMG) shall provide excitation power for optimum motor starting and short circuit performance.

G. Enclosure: Drip-proof.

H. Voltage Regulator: Solid-state type, separate from exciter, providing performance as specified. The voltage regulation system shall be microprocessor-controlled, 3-phase true RMS sensing, full wave rectified, and provide a pulse-width modulated signal to the exciter. No exceptions or deviations to these requirements will be permitted.

I. The alternator shall be provided with anti-condensation heater(s) in all applications where the generator set is provided in an outdoor enclosure, or when the generator set is installed in a coastal or tropical environment.

J. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.

K. Subtransient Reactance: 15 percent maximum, based on the rating of the engine generator set.

2.8 OUTDOOR GENERATOR-SET ENCLOSURE

A. Description: Level 2, Sound Attenuated Aluminum housing. Multiple panels shall be lockable and provide adequate access to components requiring maintenance. Instruments, control, and battery system shall be mounted within enclosure.

B. Construction:

1. Hinged Doors: With padlocking provisions. Restraint/Hold back hardware to prevent door to keep door open at 180 degrees during maintenance. Rain lips over all doors.

2. Exhaust System:

a. Muffler Location: Within enclosure.

3. Hardware: All hardware and hinges shall be stainless steel.

4. Mounting Base: Suitable for mounting on sub-base fuel tank or housekeeping pad.

5. A weather protective enclosure shall be provided which allows the generator set to operate at full rated load with a static pressure drop equal to or less than 0.5 inches of water.

6. Inlet ducts shall include rain hoods and snow protective cowlings.

C. Engine Cooling Airflow through Enclosure: Housing shall provide ample airflow for engine generator operation at rated load in an ambient temperature of 40 deg C.

1. Louvers: Fixed-engine, cooling-air inlet and discharge.

D. Sound Performance: Reduce the sound level of the engine generator while operating at full rated load to a maximum of 75 dBA measured at any location 7 m from the engine generator in a free field environment.

E. Site Provisions:

1. Lifting: Complete assembly of engine generator, enclosure, and sub base fuel tank (when used) shall be designed to be lifted into place as a single unit, using spreader bars.

2.9 VIBRATION ISOLATION DEVICES

A. Vibration Isolation: Generators installed on grade shall be provided with elastomeric isolator pads integral to the generator, unless the engine manufacturer requires use of spring isolation.

2.10 FINISHES

A. Indoor and Outdoor Enclosures and Components: Powder-coated and baked over corrosion-resistant pretreatment and compatible primer. Manufacturer's standard color or as directed on the drawings.

2.11 SOURCE QUALITY CONTROL

A. Prototype Testing: Factory test engine-generator set using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.

1. Tests: Comply with NFPA 110, Level 1 Energy Converters. In addition, the equipment engine, skid, cooling system, and alternator shall have been subjected to actual prototype tests to validate the capability of the design under the abnormal

conditions noted in NFPA110. Calculations and testing on similar equipment which are allowed under NFPA110 are not sufficient to meet this requirement.

B. Project-Specific Equipment Tests: Before shipment, factory test engine-generator set manufactured specifically for this Project. Perform tests at rated load and power factor. Include the following tests:

1. Test engine generator set manufactured for this Project to demonstrate compatibility and functionality.
2. Full load run.
3. Maximum power.
4. Voltage regulation.
5. Steady-state governing.
6. Single-step load pickup.
7. Simulated safety shutdowns.
8. Provide 14 days' advance notice of tests and opportunity for observation of tests by Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with packaged engine-generator manufacturers' written installation, application, and alignment instructions and with NFPA 110.

B. Equipment shall be installed by the contractor in accordance with final submittals and contract documents. Installation shall comply with applicable state and local codes as required by the authority having jurisdiction. Install equipment in accordance with manufacturer's instructions and instructions included in the listing or labeling of UL listed products.

C. Installation of equipment shall include furnishing and installing all interconnecting wiring between all major equipment provided for the on-site power system. The contractor shall also perform interconnecting wiring between equipment sections (when required), under the supervision of the equipment supplier.

D. Equipment shall be installed on concrete housekeeping pads. Equipment shall be permanently fastened to the pad in accordance with manufacturer’s instructions and seismic requirements of the site.

E. Equipment shall be initially started and operated by representatives of the manufacturer. All protective settings shall be adjusted as needed.

F. All equipment shall be physically inspected for damage. Scratches and other installation damage shall be repaired prior to final system testing. Equipment shall be thoroughly cleaned to remove all dirt and construction debris prior to initial operation and final testing of the system.

G. On completion of the installation by the electrical contractor, the generator set supplier shall conduct a site evaluation to verify that the equipment is installed per manufacturer's recommended practice.

3.2 ON-SITE ACCEPTANCE TEST

A. The complete installation shall be tested to verify compliance with the performance requirements of this specification following completion of all site work. Testing shall be conducted by representatives of the manufacturer, with required fuel supplied by Contractor. The Engineer shall be notified in advance and shall have the option to witness the tests. The generator set manufacturer shall provide a site test specification covering the entire system. Tests shall include:

B. Prior to start of active testing, all field connections for wiring, power conductors, and bus bar connections shall be checked for proper tightening torque.

C. Installation acceptance tests to be conducted on site shall include a "cold start" test, a two hour full load (resistive) test, and a one-step rated load pickup test in accordance with NFPA 110. Provide a resistive load bank and make temporary connections for full load test, if necessary.

D. Perform a power failure test on the entire installed system. This test shall be conducted by opening the power supply from the utility service, and observing proper operation of the system for at least 2 hours. Coordinate timing and obtain approval for start of test with site personnel.

3.3 TRAINING

A. The equipment supplier shall provide training for the facility operating personnel covering operation and maintenance of the equipment provided. The training program shall be not less than 4 hours in duration and the class size shall be limited to 5 persons. Training date shall be coordinated with the facility owner.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

3.5 SERVICE AND SUPPORT

A. The generator set supplier shall maintain service parts inventory for the entire power system at a central location which is accessible to the service location 24 hours per day,

365 days per year. The manufacturer of the generator set shall maintain a central parts inventory to support the supplier, covering all the major components of the power system, including engines, alternators, control systems, paralleling electronics, and power transfer equipment.

B. The generator set shall be serviced by a local service organization that is trained and factory certified in generator set service. The supplier shall maintain an inventory of critical power system replacement parts in the local service location. Service vehicles shall be stocked with critical replacement parts. The service organization shall be on call 24 hours per day, 365 days per year. The service organization shall be physically located within 100 miles of the site.

C. The manufacturer shall maintain model and serial number records of each generator set provided for at least 20 years.

3.6 SERVICE AGREEMENT:

A. The supplier shall include in the base price, a one-year service agreement. The maintenance shall be performed by factory authorized service technicians capable of servicing both the engine generator set and the transfer switch (es). This agreement shall include the following:

1. Generator supplier must have an in-house rental fleet with equipment sized to back up this project site.

2. All engine maintenance as recommended by the service manual.

3. All electrical controls maintenance and calibrations as recommended by the manufacturer.

4. All auxiliary equipment as a part of the emergency systems.

5. The supplier shall guarantee emergency service.

6. All expendable maintenance items are to be included in this agreement.

7. A copy of this agreement and a schedule shall be given to the Owner at the time of his acceptance, showing what work is to be accomplished and when.

26-3623 AUTOMATIC TRANSFER SWITCHES: <S>

PART 4 - GENERAL

4.1 RELATED DOCUMENTS

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

4.2 SUMMARY

A. This Section includes transfer switches rated 600 V and less, including the following:

1. Automatic transfer switches

2. Remote annunciation systems

B. Related Sections include the following:

4.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, weights, operating characteristics, furnished specialties, and accessories.

1. Technical data on all major components of all transfer switches and other products described in this section. Data is required for the transfer switch mechanism, control system, cabinet, and protective devices specifically listed for use with each transfer switch. Include steady state and fault current ratings, weights, operating characteristics, and furnished specialties and accessories.

2. Single Line Diagram: Show connections between transfer switch, power sources and load

B. Shop Drawings: Dimensioned plans, elevations, sections, and details showing minimum clearances, conductor entry provisions, gutter space, installed features and devices, and material lists for each switch specified.

1. Dimensioned outline drawings of assembly, including elevations, sections, and details including minimal clearances, conductor entry provisions, gutter space, installed features and devices and material lists for each switch specified.

2. Internal electrical wiring and control drawings.

3. Interconnection wiring diagrams, showing recommended conduit runs and point-to-point terminal connections to generator set.

4. Installation and mounting instructions, including information for proper installation of equipment to meet seismic requirements.

C. Manufacturer Seismic Qualification Certification: Submit certification that transfer switches accessories, and components will withstand seismic forces for the location. Include the following:

1. Seismic certification, as required for site conditions. Seismic certifications shall be third-party certified, and based on testing. Certification based on calculations does not meet this requirement.

a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational both during and after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements. Coordinate paragraph below with qualification requirements in Division 01 Section "Quality Requirements" and as supplemented in "Quality Assurance" Article.

D. Manufacturer and Supplier Qualification Data

1. The transfer switch manufacturer shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development, production, installation, and service, in accordance with ISO 9001.

2. The manufacturer of this equipment shall have produced similar equipment for a minimum period of 10 years. When requested, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.

E. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Features and operating sequences, both automatic and manual.

2. List of all factory settings of relays, timers and protective devices; provide setting and calibration instructions where applicable.

F. Warranty documents demonstrating compliance with the project’s contract requirements.

4.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: The equipment supplier shall maintain a service center capable of providing training, parts, maintenance and emergency repairs to equipment, including transfer switch generator sets and remote monitoring equipment (if applicable) at the site within a response period of less than eight hours from time of notification.

1. The transfer switch shall be serviced by technicians employed by, and specially trained and certified by, the generator set supplier and the supplier shall have a service organization that is factory-certified in both generator set and transfer switch service. The supplier shall maintain an inventory of critical replacement parts at the local service organization, and in service vehicles. The service organization shall be on call 24 hours per day, 365 days per year.

2. Submit names, experience level, training certifications, and locations for technicians that will be responsible for servicing equipment at this site.

3. The manufacturer shall maintain model and serial number records of each transfer switch provided for at least 20 years.

B. Source Limitations: All transfer switches are to be obtained through one source from a single manufacturer. The generator set manufacturer shall warrant transfer switches to provide a single source of responsibility for products provided.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked as suitable for use in emergency, legally required or optional standby use as appropriate for the connected load.

D. The automatic transfer switch installation and application shall conform to the requirements of the following codes and standards:

1. Transfer switches and enclosures shall be UL 1008 listed and labeled as suitable for use in emergency, legally required, and optional standby applications.

2. CSA 282, Emergency Electrical Power Supply for Buildings, and CSA C22.2, No. 14-M91 Industrial Control Equipment

3. NFPA 70, National Electrical Code. Equipment shall be suitable for use in systems in compliance with Articles 700, 701 and 702.

4. Comply with NEMA ICS 10-1993 AC Automatic Transfer Switches

5. IBC 2012 – The transfer switch(es) shall be prototype-tested and third-party certified to comply with the requirements of IBC group III or IV, Category D/F. The equipment shall be shipped with the installation instructions necessary to attain installation compliance.

6. IEEE 446 – Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
7. EN55011, Class B Radiated Emissions and Class B Conducted Emissions
8. IEC 1000-4-5 (EN 61000-4-5); AC Surge Immunity
9. IEC 1000-4-4 (EN 61000-4-4) Fast Transients Immunity
10. IEC 1000-4-2 (EN 61000-4-2) Electrostatic Discharge Immunity
11. IEC 1000-4-3 (EN 61000-4-3) Radiated Field Immunity
12. IEC 1000-4-6 Conducted Field Immunity
13. IEC 1000-4-11 Voltage Dip Immunity
14. IEEE 62.41, AC Voltage Surge Immunity
15. IEEE 62.45, AC Voltage Surge Testing

E. Comply with NFPA 110 – Emergency and Standby Power Systems. The transfer switch shall meet all requirements for Level 1 systems, regardless of the actual circuit level.

F. The manufacturer shall warrant the material and workmanship of the transfer switch equipment for a minimum of two (2) year from the warranty start date. The warranty start date is the date of registered commissioning and start up or eighteen (18) months from date of shipment, whichever is sooner.

G. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, and etc. during the minimum noted warranty period described above.

4.5 PROJECT CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service:

1. Notify Construction Manager/Owner no fewer than 5 days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Owner's written permission.
3. Do not energize any new service or distribution equipment without notification and permission of the Construction Manager/Owner.

4.6 COORDINATION

A. Size and location of concrete bases and anchor bolt inserts shall be coordinated. Concrete, reinforcement and formwork must meet the requirements specified in Division 03. See section "INSTALLATION" for additional information on installation

PART 5 - PRODUCTS

5.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cummins Power Generation
2. Caterpillar Power Systems
3. Kohler Power Systems
4. MTU Onsite Energy
5. ASCO Power Technologies

B. Transfer switches utilizing only molded case circuit breakers do not meet the requirements of this specification and will not be accepted.

5.2 GENERAL TRANSFER-SWITCH PRODUCT REQUIREMENTS

A. Provide transfer switches in the number and ratings that are shown on the drawings.

B. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer.

C. Fault-Current Closing and Withstand Ratings: UL 1008 WCR ratings must be specifically listed as meeting the requirements for use with protective devices at installation locations, under specified fault conditions. Withstand and closing ratings shall be based on use of the same set of contacts for the withstand test and the closing test.

D. Solid-State Controls: All settings should be accurate to +/- 2% or better over an operating temperature range of - 40 to + 60 degrees C (- 40 to + 140 degrees F).

E. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.41. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.

F. Electrical Operation: Accomplished by a non-fused, momentarily energized solenoid or electric motor operator mechanism, mechanically and electrically interlocked in both directions (except that mechanical interlock is not required for closed transition switches).

G. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.

1. Switches using only molded-case switches or circuit breakers, or insulated case circuit breaker components are not acceptable.

2. Transfer switches shall be double-throw, electrically and mechanically interlocked, and mechanically held in the Source 1 and Source 2 positions.

3. Main switch contacts shall be high pressure silver alloy. Contact assemblies shall have arc chutes for positive arc extinguishing. Arc chutes shall have insulating covers to prevent inter-phase flashover.

4. Contacts shall be operated by a high-speed electrical mechanism that causes contacts to open or close within three electrical cycles from signal.

5. Transfer switch shall be provided with flame retardant transparent covers to allow viewing of switch contact operation but prevent direct contact with components that could be operating at line voltage levels.

6. The transfer switch shall include the mechanical and control provisions necessary to allow the device to be field-configured for operating speed. Transfer switch operation with motor loads shall be as is recommended in NEMA MG1.

   a. Phase angle monitoring/timing equipment is not an acceptable substitute for this functionality

7. Transfer switches designated on the drawings as “3-pole” shall have a full current-rated neutral bar with lugs.

8. Transfer switches designated on the drawings as "service entrance" switches shall meet the requirements of section "SERVICE ENTRANCE TRANSFER SWITCHES" of this specification.

H. Control: Transfer switch control shall be capable of communicating with the genset control, other switches and remote programming devices over a high-speed network interface.

I. Factory wiring: Transfer switch internal wiring shall be composed of pre-manufactured harnesses that are permanently marked for source and destination. Harnesses shall be connected to the control system by means of locking disconnect plug(s), to allow the control system to be easily disconnected and serviced without disconnecting power from the transfer switch mechanism

J. Terminals: Terminals shall be pressure type and appropriate for all field wiring. Control wiring shall be equipped with suitable lugs, for connection to terminal strips.

K. Enclosures: All enclosures shall be third-party certified for compliance to NEMA ICS 6 and UL 508, unless otherwise indicated:

1. The enclosure shall provide wire bend space in compliance to the latest version of NFPA70, regardless of the direction from which the conduit enters the enclosure.

2. Exterior cabinet doors shall provide complete protection for the system's internal components. Doors must have permanently mounted key-type latches. Bolted covers or doors are not acceptable.

3. Transfer switches shall be provided in enclosures that are third party certified for their intended environment per NEMA requirements.

5.3 AUTOMATIC TRANSFER SWITCHES

A. Comply with requirements for Level 1 equipment according to NFPA 110.

B. Indicated current ratings:

1. Refer to the Project drawings for specifications on the sizes and types of transfer switch equipment, withstand and closing ratings, number of poles, voltage and ampere ratings, enclosure type, and accessories.

2. Main contacts shall be rated for 600 VAC minimum.

3. Transfer switches shall be rated to carry 100% of rated current continuously in the enclosure supplied, in ambient temperatures of -40 to +60 degrees C (-40 to +140 degrees F), relative humidity up to 95% (non-condensing), and altitudes up to 10,000 feet (3000 meters).

C. Relay Signal: Control shall include provisions for addition of a pre-transfer relay signal, adjustable from 0 to 60 seconds, to be provided if necessary for elevator operation, based on equipment provided for the project.

D. Control: Transfer switch control shall be provided with necessary equipment and software to communicate with the genset control, other transfer switches, remote annunciation equipment, and other devices over a high speed control network.

E. Transfer switches that are designated on the drawings as 3-pole shall be provided with a neutral bus and lugs. The neutral bus shall be sized to carry 100% of the current designated on the switch rating.

F. Automatic Transfer Switch Control Features

1. The transfer switch control system shall be configurable in the field for any operating voltage level up to 600 VAC. Voltage sensing shall be monitored based on the normal voltage at the site. Systems that utilize voltage monitoring based on standard voltage conditions that are not field configurable are not acceptable.

2. All transfer switch sensing shall be configurable from an operator panel or from a Windows XP or later PC-based service tool. Designs utilizing DIP switches or other electromechanical devices are not acceptable.

3. The transfer switch shall be configurable to accept a relay contact signal and a network signal from an external device to prevent transfer to the generator service.

4. The transfer switch shall provide a relay contact signal prior to transfer or re-transfer. The time period before and after transfer shall be adjustable in a range of 0 to 60 seconds.

5. The control system shall be designed and prototype tested for operation in ambient temperatures from - 40 degrees C to + 60 degrees C (- 40 to +140 degrees F). It shall be designed and tested to comply with the requirements of the noted voltage and RFI/EMI standards.

6. The control shall have optically isolated logic inputs, high isolation transformers for AC inputs and relays on all outputs, to provide optimum protection from line voltage surges, RFI and EMI.

7. The transfer switch network monitoring equipment, when supplied, shall be provided with a battery-based auxiliary power supply to allow monitoring of the transfer switch when both AC power sources are non-operational.

8. The indicator panel LEDs shall display:

    a. Which source the load is connected to (Source 1 or Source 2)

    b. Which source or sources are available

    c. When switch is not set for automatic operation, the control is disabled

    d. When the switch is in test/exercise mode

9. The indicator shall have pushbuttons that allow the operator to activate the following functions:

    a. Activate pre-programmed test sequence

    b. Override programmed delays, and immediately go to the next operation

    c. Reset the control by clearing any faults

    d. Test all of the LEDs by lighting them simultaneously

10. The alphanumeric digital display shall be vacuum fluorescent-type, clearly visible in both bright sunlight and no-light conditions over an angle of 120 degrees, and shall display the following:

    a. AC voltage for all phases, normal and emergency

b. Source status: connected or not connected.

11. The display panel shall be password-protected, and allow the operator to view and make adjustments:

a. Set nominal voltage and frequency for the transfer switch

b. Adjust voltage and frequency sensor operation set points

c. Set up time clock functions

d. Set up load sequence functions

e. Enable or disable control functions including program transition

f. View real-time clock data, operation log (hours connected, times transferred, failures) and service history

G. Transfer Switch Control Panel: The transfer switch shall have a microprocessor-based control with a sealed membrane panel incorporating pushbuttons for operator-controlled functions, and LED lamps for system status indicators. Panel display and indicating lamps shall include permanent labels.

H. Control Functions: Functions managed by the control shall include:

1. Software adjustable time delays:

a. Engine start (prevents nuisance genset starts in the event of momentary power fluctuation): 0 to 120 seconds (default 3 sec)

b. Transfer normal to emergency (allows genset to stabilize before load is transferred): 0 to 120 seconds (default 3 sec)

c. Re-transfer emergency to normal (allows utility to stabilize before load is transferred from genset): 0 to 30 minutes (default 3 sec)

d. Engine cooldown: 0 to 30 minutes (default 10 min)

e. Programmed transition: 0 to 60 seconds (default 3 sec)

2. Voltage imbalance sensing:

a. Dropout: 2 to 10% (default 4%)

b. Pickup: 90% of dropout

c. Time delay: 2.0 to 20 seconds (default 5 sec)

3. Phase rotation sensing:

a. Time delay: 100 msec

4. Loss of single-phase detection:

    a. Time delay: 100 msec

I. Control features shall include:

1. Programmable genset exerciser: A field-programmable control shall periodically start and run the generator with or without transferring the load for a preset time period, then re-transfer and shut down the generator after a preset cool-down period.

2. In event of a loss of power to the control, all control settings, real-time clock setting and the engine start-time delay setting will be retained.

3. The system continuously logs information including the number of hours each source has been connected to the load, the number of times transferred, and the total number of times each source has failed. An event recorder stores information, including time and date-stamp, for up to 50 events.

4. Re-Transfer Inhibit Switch: Inhibits automatic re-transfer control so automatic transfer switch will remain connected to emergency power source as long as it is available regardless of condition of normal source.

5. Transfer Inhibit Switch: Inhibits automatic transfer control so automatic transfer switch will remain connected to normal power source regardless of condition of emergency source.

J. Control Interface

1. Provide one set Form C auxiliary contacts on both sides, operated by transfer switch position, rated 10 amps 250 VAC.

2. The transfer switch shall be provided with a network communication card, and configured to allow network-based communication with the transfer switch and other network system components, including the generator set(s) provided for the Project.

K. Engine Starting Contacts

1. One isolated and normally closed pair of contacts rated 10A at 32 VDC minimum.

5.4 SERVICE ENTRANCE TRANSFER SWITCHES

A. Transfer switches must be specifically intended for service entrance applications, and labeled “Suitable for service entrance use only”

B. Transfer switch shall meet NEC requirements for emergency, legally required and standby applications as specified in UL 1008.

C. Entire transfer switch including enclosure must be listed and labeled to UL 1008; switches with only the mechanism listed are not acceptable.

D. Molded case circuit breaker must be UL 489 listed.

5.5 REMOTE ANNUNCIATOR SYSTEM

A. Functional Description: Remote annunciator panel shall annunciate conditions for indicated transfer switches. Annunciation shall include the following:

1. Sources available, as defined by actual pickup and dropout settings of transfer-switch controls.

2. Switch position.

3. Switch in test mode.

4. Failure of communication link.

B. Annunciator Panel: LED-lamp type with audible signal and silencing switch.

1. Indicating Lights: Grouped for each transfer switch monitored.

2. Label each group, indicating transfer switch it monitors, location of switch, and identity of load it serves.

3. Switch in test mode.

4. Lamp Test: Push-to-test or lamp-test switch on front panel.

C. Malfunction of annunciator or communication link shall not affect functions of automatic transfer switch. In the event of failure of communication link, automatic transfer switch automatically reverts to stand-alone, self-contained operation.

D. Automatic transfer-switch sensing, controlling, or operating function shall not depend on remote panel for proper operation. The remote annunciation system shall not prevent transfer to the alternate source when the primary power source fails, nor prevent return to the primary source if the alternate source fails

PART 6 - EXECUTION

6.1 INSTALLATION

A. Floor-Mounting Switch: Anchor to floor by bolting.

1. Floor-mounted transfer shall be mounted on concrete bases complying with the following requirements:

a. Concrete Bases: 4 inches high, reinforced, with chamfered edges. Extend base no more than 4 inches in all directions beyond the maximum dimensions of switch, unless otherwise indicated or unless required for seismic support.

B. Annunciator Panel Mounting: Flush in wall (where directed by Owner), unless otherwise indicated.

C. Identify components according to Division 26 Section "Identification for Electrical Systems."

D. Set field-adjustable intervals and delays, relays, and engine exerciser clock.

E. Provide certification of IBC Seismic compliance

6.2 CONNECTIONS

A. Wiring to Remote Components: Match type and number of cables and conductors to control and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner if necessary to accommodate required wiring.

B. Field control connections shall be made on a common terminal block that is clearly and permanently labeled.

C. Transfer switch shall be provided with AL/CU mechanical lugs sized to accept the full output rating of the switch. Lugs shall be suitable for the number and size of conductors shown on the drawings.

D. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

6.3 SOURCE QUALITY CONTROL

A. Prior to shipping, factory shall test and inspect components, assembled switches, and associated equipment to ensure proper operation.

B. Factory shall check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements.

C. Factory shall perform dielectric strength test complying with NEMA ICS 1.

6.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: The supplier of the transfer switch(es) and associated equipment shall inspect, test, and adjust components, assemblies, and equipment installations, including connections, and report results in writing.

B. Manufacturer’s representative shall perform tests and inspections and prepare test reports.

C. After installing equipment and after electrical circuitry has been energized, installer shall test for compliance with requirements.

1. Perform recommended installation tests as recommended in manufacturer's installation and service manuals.

2. After energizing circuits, demonstrate interlocking sequence and operational function for each switch.

a. Simulate power failures of normal source to automatic transfer switches and of emergency source with normal source available.

b. Verify time-delay settings.

c. Verify that the transfer switch is accurately metering AC voltage.

d. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.

D. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each switch. Remove all access panels so joints and connections are accessible to portable scanner.

1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switch 11 months after date of Substantial Completion.

2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

3. Record of Infrared Scanning: Prepare a certified report that identifies switches checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

6.5 DEMONSTRATION

A. After generator set installation, the generator and transfer switch supplier shall conduct a complete operation, basic maintenance, and emergency service seminar covering generator set and transfer switch equipment, for up to 10 people employed by the Owner.

1. The seminar shall include instruction on operation of the transfer equipment, normal testing and exercise, adjustments to the control system, use of the PC based service and maintenance tools provided under this contract, and emergency operation procedures.

2. The class duration shall be at least 8 hours in length, and include practical operation with the installed equipment.

6.6 SERVICE AND SUPPORT

A. The manufacturer shall supply the Service Provider with a complete set of the service and maintenance software required to support the product. The software shall be provided at a training class attended by the user, to qualify the user in proper use of the software. The software shall have the following features and capabilities:

1. The software shall allow adjustment of all functions described herein, adjustment of operating levels of all protective functions, and programming of all optional functions in the controller. Adjustments shall be possible over modem from a facility that is remote from the generator set.

2. The software shall be capable of storing and displaying data for any function monitored by the generator set control. This data shall be available in common file formats, and on graphical "strip chart" displays.

3. The software shall automatically record all control operations and adjustments performed by any operator or software user, for tracking of changes to the control.

4. The software shall display all warning, shutdown, and status changes programmed into transfer switch controller. For each event, the control shall provide information on the nature of the event, when it last occurred, and how many times it has occurred.

END OF SECTION 260000 — ELECTRICAL SYSTEM

SECTION 31 02 00
EARTHWORK

PART 1 – GENERAL

1.01 SUMMARY

This section covers the rough and fine grading of the site, including excavating and filling operations of earth.

1.02 REFERENCES

ASTM D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft3 (600 kN-m/m3))
NCDOT	North Carolina Department of Transportation Standard Specifications for Roads and Structures, January, 2012
Geotechnical Report	Report of Subsurface Exploration by S & ME, February 11, 2019 (S&ME Project #1243-18-051)

1.03 SUBMITTALS

Obtain and submit sources and descriptions for any off-site material to be incorporated into earthwork. Submit blasting permit from Beach Mountain Fire Department prior to any rock excavation by blasting. In addition, submit damage prevention and mitigation plan.

1.04 QUALITY ASSURANCE

Owner will employ, at its expense, an independent testing agency (geotechnical engineering firm) to assist with the assurance of quality of site preparation, fill placement, footing bottoms, and compaction. All such special inspections shall be coordinated by the Contractor to avoid delays.

Compacted earth shall be tested by the geotechnical engineering firm. Tests shall be made for each 12-inch depth of fill at a minimum rate of one per 1,000 square feet in traffic and building areas and a rate of one per 2,500 square feet in all other area. A minimum of one test per 12-inch layer per separate fill area shall be performed, i.e., non-contiguous areas of fill may not be combined to compute an average of one test per 1,000 or 2,500 square feet. Tests shall be for density and moisture content.

All fill areas shall be compacted to at least 98% of maximum dry density at optimum moisture content as determined by the Standard Proctor Test, ASTM D698, except that landscaped areas greater than 10 feet from pavements or structures may be as low as 90%. In addition, the top 24-inches of fill areas below any pavements, curbs, walks, foundations, or slabs shall be compacted to at least 100% of maximum dry density at optimum moisture content. Inadequately compacted areas shall be corrected by Contractor and retested at Contractor's expense until results are compliant with this specification. Excavated areas under structures shall also be tested for density at a rate of one test per 2,500 square feet per lift. Backfilled trenches shall also be tested at a rate of one test per 50 linear feet per trench. In addition to laboratory testing, all areas shall be proofrolled in the presence of the Engineer or his representative and any areas that have visible "pumping" action or excessive deflection shall be corrected. Proofrolling shall be performed on both cut and fill areas at final grade and on original ground just prior to filling. The Contractor shall provide a fully loaded tandem axle dump truck for proofrolling.

PART 2 – PRODUCTS

2.01 EARTH FILL

Earth used as fill material shall be obtained on site or off site as may be required to bring the site to final grade. If insufficient quantities of suitable earth are available on site, the Contractor shall obtain elsewhere at his expense. (If excess material is excavated that cannot be properly placed on the site, then the Contractor shall remove from the site at his expense.) All such material, regardless of where obtained, must be suitable for structural fill unless otherwise authorized by the Engineer. To be suitable as structural fill, the earth must be free of organic matter (stumps, roots, sod, topsoil, and the like), frozen material, rocks larger than 4-inch, and any trash or debris. Dark gray, or black, unweathered shale shall not be used. The top 12-inches of fill shall be free of any material that will not pass a 3-inch sieve. The fill material shall have a maximum dry density of at least 90 lbs. per cubic foot. Also, the earth must be near the optimum moisture content (within +/- 2%), as determined by the independent testing agency, to achieve satisfactory compaction. The Contractor shall add water if material is too dry. Material that is too wet shall not be used until it dries to acceptable moisture content.

Pipe bedding or embedment material: native material suitable as fill, but where stone bedding is indicated or required it shall be crushed stone conforming to NCDOT, size no.67 (Standard Specifications, Table 1005-1), unless otherwise indicated on the Drawings.

2.02 EXCAVATION CLASSIFICATION

Earth excavation shall be classified into the following three categories unless otherwise specified elsewhere in the Contract Documents.

A. Normal Excavation: All excavation not classified as “rock excavation” or “undercutting” shall be classified as “normal excavation”.

B. Rock Excavation: Material which requires unusual means to be excavated shall be classified as “rock excavation”.

Rock excavation shall be defined as the removal of a formation that cannot be excavated with normal earth moving equipment. In contrast, normal or earth excavation is a formation that, when plowed or ripped, breaks down into small enough pieces to be easily removed, can be loaded into hauling units, and can be readily incorporated in to an embankment or foundation in relatively thin layers. Boulders larger than ½ cubic yards shall be classified as rock.

In order to prove that the material should be classified as rock excavation, the Contractor is to provide a demonstration that the material cannot be removed with a backhoe equipped with a minimum ½ cubic yard heavy-duty trenching bucket placed on a machine capable of a lifting capacity of 7,500 pounds at a trench depth of 10 feet. The Contractor may be required to provide equipment specification data verifying that the above minimum-rated equipment will be used for demonstration purposes. The equipment is to be in good repair and in proper working condition.

The Engineer is to be the final judge as to what is to be classified as rock excavation. The quantity measured as provided in this Section will be paid for at the Contract unit price per cubic yard of rock excavation. Such price and payment will be compensation for all work covered by this section including, but not limited to,

use or rental of special equipment, removal and disposal of rock, and acquisition and placement of suitable backfill material.

C. Undercutting: Material that must be removed in order to reach suitable material shall be classified as "undercutting". This generally will be excessively wet soil, organic soil, or expansive clay. Any other material deemed unsuitable by the Engineer or by the independent testing agency shall also be undercut and removed. Only material that must be removed in order to support foundations, pavements, embankments, and the like shall be classified as "undercutting". Material which is to be removed as part of the grading plan and which happens to also be "unsuitable" shall not be classified as "undercutting". All material the Contractor desires to be paid for as "undercutting" (if excavation has been bid as "classified") must be reviewed by the Engineer prior to excavation in order to qualify for payment. It is the Contractor's responsibility to notify the Engineer for this purpose. If payment is made based on unit bid prices, such pricing is understood to be the total compensation for all work associated with "undercutting", including the acquisition and placement of suitable fill material.

D. Undocumented Fill Material, as defined in the geotechnical report, shall be removed and reworked or replaced wherever it exists within areas to be built upon with structures or pavements. Undocumented fill shall be classified the same as "undercutting".

Unless earthwork has been bid under classifications, then no separate payment will be made for "rock excavation" or "undercutting".

PART 3 – EXECUTION

3.01 GEOTECHNICAL REPORT

Although not part of the Contract Documents, the geotechnical report shall be read and its recommendations implemented as applicable. Any discrepancies observed between the report and the Contract Documents shall be brought to the attention of the Engineer and a resolution sought prior to commencing with work affected by the discrepancy. Note the Geotechnical report is based on the site plan dated October 19, 2018. Bore locations are also shown on the final site plan in the Drawings to correlate the data with the final site elevations and locations.

3.02 CLEARING AND GRUBBING

Prior to grading the site, all areas to be graded shall be cleared of all trees, shrubs, brush, and all other vegetation including stumps, roots, and sod, except that any trees designated on the Drawings to be saved shall be protected. Areas which are not to be cut or filled but will have pavements or structures located on them shall also be cleared and grubbed. Grubbing shall be complete leaving no part of the stumps or roots left in place. All topsoil shall be stripped from the original ground surface and stockpiled separately for use in landscaped areas after final grading. Cut trees, brush, and stumps shall be removed from the site, or burned on site if permitted by local codes. No such matter shall be buried or left on site unless specifically indicated on Drawings or otherwise authorized by Engineer.

The Contractor shall layout the limits of clearing based on the Drawings and shall use all means necessary to protect adjacent properties. No equipment or personnel shall enter adjacent properties unless temporary easements or equivalent permission have been obtained.

3.03 SURVEYING

The Contractor shall provide all construction surveying necessary to establish the final grades indicated on the Drawings. Sufficient benchmarks and horizontal line (typically property line) markers will be provided by the Owner from which the Contractor can layout the project dimensions and elevations.

3.04 GRADING, GENERAL

All areas shall be graded as indicated on the Drawings with uniform slopes between indicated elevations (whether contours or spot elevations), except that significant changes in slope shall be rounded at the point of change. In the absence of direction on the Drawings or by the Engineer, always grade earth to slope away form structures and to collect surface water at logical points such as storm drain inlets, curbs, swales, and the like.

3.05 EXCAVATION

Earth shall be excavated as required to establish the grades and dimensions indicated on the Drawings and as required to allow the later construction of foundations, slabs, pavements, walks, or other improvements. The bottom of all excavations shall be firm and relatively dry. Any excessively wet, organic, or otherwise unsuitable soil revealed at the bottom of an excavation shall be undercut to suitable material unless otherwise directed by the Engineer. Undercut areas shall be brought back up to design elevation with compacted earth per these specifications, compacted washed stone, or concrete.

Cut and fill slopes shall generally not be steeper than 2 horizontal to 1 vertical, unless otherwise indicated on the Drawings.

Foundation cut areas shall be protected from water and freezing during the time between excavation and pouring of concrete. The time between excavating a foundation area and pouring the concrete shall be minimized as much as possible. All foundation and slab area excavations must be inspected by the Engineer and by the local building official prior to pouring any concrete.

When rock is encountered within the limits of construction the Contractor shall notify the Engineer. The Contractor is to expose and clean the rock material for inspection. When rock is encountered, all lines and grades will be held in accordance with the Drawings or adjusted only after approval of the Engineer.

Where rock is encountered in foundation areas, it shall be cut clean at sides. Bottom of footings and slabs shall be removed to a minimum depth of 12 inches below planned bearing elevation and replaced with properly compacted fill. No loose or fractured rock shall be left in place. When thus properly prepared, the remaining rock may serve as forms for the concrete. Likewise, excavated earth faces (vertical) may be used in lieu of constructed forms if the earth is sufficiently firm and uniform. Step-downs in footing trenches shall be no steeper than 2 horizontal to 1 vertical, unless excavated in rock.

Where rock is encountered in paving areas, it shall be removed to a minimum depth of 11 inches below planned pavement surface elevation and replaced with properly compacted aggregate base course and asphalt pavement. No loose or fractured rock shall be left in place.

Where water is encountered in excavated areas it must be kept pumped out, whether groundwater or stormwater. Where groundwater is encountered the Engineer shall be notified to review the situation.

The Contractor will not receive any additional or separate payment for unauthorized or excessive excavations, nor for excavations required to accommodate forms, pumps, temporary structures, or other items that may be necessary as part of the total project. All such "additional" excavations shall be filled back in with compacted earth or stone, or with concrete, in accordance with this section.

Protect all existing underground utilities or other structures to remain during excavation operations.

3.06 FILL

Except as otherwise specified, earth foundation surfaces shall be graded to remove surface irregularities and shall be scarified parallel to the axis of the fill or otherwise acceptably scored and loosened material to a minimum depth of 2 inches. The moisture content of the loosened material shall be controlled as specified for the earth fill, and the surface materials of the foundation shall be compacted and bonded with the first layer of earth fill.

Where embankments are to be placed and compacted on hillsides, or when new embankment is to be compacted against existing embankments, or when embankment is built in part widths, and the slopes are steeper than 4:1, then benches shall be cut in the existing ground. For slopes of 4:1 or flatter, the original ground shall be loosened and scarified to a depth of 6-inches.

The material shall be deposited and spread in successive, uniform, approximately horizontal layers of not more than 8-inches in depth, loose measurement, for the full width of the cross section, and shall be kept approximately level by the use of effective spreading equipment. Each layer of the fill shall be thoroughly compacted as herein specified. The full width of the fill shall be properly drained at all times.

Fill shall not be placed upon a frozen surface, nor shall snow, ice, or frozen material be incorporated in the fill.

All fill material shall be compacted as specified herein unless otherwise provided in the Contract or directed by the Engineer. Compaction equipment used by the Contractor shall be adequate to produce the required compaction and produce a uniformly constructed fill with all layers uniformly bound to all preceding layers.

Fill materials shall be compacted at a moisture content satisfactory to the Engineer, which shall be approximately that required to produce the maximum density (+/- 3% tolerance allowed). The Contractor shall dry or add moisture to the fill material when required to produce a uniformly compacted and stable fill.

Water may be applied by sprinkling the materials after placement on fill, if necessary. Uniform moisture distribution shall be obtained by discing, blading, or other approved methods prior to compaction of the layer.

Fill placed at densities lower than the minimum acceptable density or at moisture contents outside the acceptable range of moisture content or otherwise not conforming to the requirements of the specifications shall be reworked to meet the requirements or removed and replaced by acceptable fill. The replacement fill and the foundation abutment and fill surfaces upon which it is placed shall conform to all requirements of this specification for foundation preparation, approval, placement, moisture control and compaction.

3.07 FINAL GRADING

When pavements, walks, structures, and other improvements are complete, prepare remaining areas for grassing or other landscaping by loosening the top 6-inches of soil and grading to remove any depressions and irregularities. Remove all stones greater than 2", wood, rubbish, or other undesirable material in the top 6-inches. Incorporate any available topsoil at this time. After this preparation, no equipment shall be allowed on these areas, other than what is necessary for grassing and/or landscaping, for the remainder of the project.

3.08 EROSION CONTROL

The Contractor shall control erosion and shall prevent off-site sedimentation throughout the life of the project, in accordance with the instructions on the Drawings. All disturbed areas not being actively worked on for more than two weeks shall be temporarily or permanently revegetated.

3.09 TRENCH WORK

A. Protection: Worker and property protection: References to sheeting and trench shields below are within regard to their relation to the pipe installation. The Contractor is responsible at all times for providing protection in compliance with all laws and regulations, whether by moveable trench, shields or other means. The Engineer will not direct the Contractor in the use of any protection. However the Owner reserves the right to stop work due to Contractor disregarding laws and regulations. The Contractor shall use all necessary means to protect personal, public and private property structures, utilities etc.

B. Horizontal and Vertical Control: The Contractor shall establish all locations, lines, grades and elevations as required to install the pipeline as indicated on the drawings, based on whatever horizontal and vertical control is given however limited. A land surveyor shall be employed if necessary. Do not begin excavation when the ground is frozen.

C. Trench Excavation:

1. Dimensions: Trenches shall be excavated to the width and depth indicated on the drawings and typical sections. Trench bottoms shall have a uniform slope when indicated and shall conform to the horizontal alignment shown. The sides of the trenches shall be as nearly vertical as possible. Minimum depth of the trench shall be as required to achieve 36 inches cover over the top of the pipe, unless otherwise noted.

2. Sheeting and Bracing: If trench sides are not stable due to the soil type then they may be sloped back at an angle necessary for stability or sheeting and or bracing shall be used. The width of a trench shall be as narrow as possible as measured at the bottom just above the pipe crown (maximum of 12 inches between outside diameter and side walls), unless wider width is required due to trench shields, sheeting, or to accommodate compaction equipment. Above the crown of the pipe the trench width may be wider. The trench must be wide enough to accommodate compaction material on each side of the pipe.

3. Movable Trench Shields: Where movable trench shields are used, a narrow sub ditch shall be excavated below the bottom of the shield such that the 12 inches limit each side of the pipe is achieved. The sub ditch shall have a depth equal to the pipe outside diameter plus any bedding material. The use of a sub ditch when using a moveable trench shield may be omitted if permitted by the Engineer. In that case, the soil on each side of the pipe must be compacted in accordance with these specifications after the shield is removed. Pipe bedding, pipe location and pipe joints must not be disturbed when moving the trench shields.

4. Sheeting: Whenever necessary to protect adjacent property, structures, pavement or any existing facilities, sheeting and bracing shall be installed to support trench walls and to prevent lateral soil movement. The method and design of sheeting and bracing is the contractor's responsibility and the contractor is responsible for the protection of all such adjacent improvements from the excavation process. If in place sheeting and bracing is used for any reason, it must be used in a manner that protects the integrity of the pipe installation. Such sheeting shall be left in place from 2 feet above the

top of the pipe to the bottom of the sheeting. Sheeting above 2 feet above the pipe may be cut and removed. Sheeting must be removed to a depth of a least 3 feet below finished ground surface, as long as there remains 2 feet above the pipe. The bedding and initial backfill for the pipe shall not be disturbed during removal of sheeting.

5. Over Excavation: Where the bottom of the trench is excavated deeper then necessary, whether due to poor foundation conditions requiring undercutting or due to contractor error, suitable material shall be placed in 6 inch layers up to the specified grade for the pipe. Each layer shall be compacted to achieve 95% Standard Proctor maximum density.

6. Rock: Where rock is encountered during excavation, it must be removed using any effect, safe, and legal means available, such as the use of explosives. It shall be removed to achieve the minimum trench dimensions required plus an additional 6 inches below the pipe (or below any bedding specified). Approved material shall be used to bring the trench bottom back up to designed grade. The trench width may be reduced, if approved by Engineer, to a minimum clearance of 6 inches on each side of the pipe. In this case, crushed stone, or hand compaction of other approved materials will be required for bedding and haunching. The specified 6 inches additional depth and 6 inches minimum shall be maintained from the outside edge of all pipe bells, fittings and appurtenances.

   Excavated rock may not be used as backfill material, unless it is crushed to meet the requirements for backfill as given in this Section. The Contractor shall dispose of all rock that is not suitable for backfill.

   The use of explosives and any other means of removal shall comply with all applicable laws and ordinances. The Engineer will not direct Contractor in this regard.

   Unless otherwise specified, there will be no compensation to the Contractor for rock excavation in addition to the lump sum or unit price bid for pipe laying. If a bid price for rock excavation has been included in the contract, then the payment for rock excavation shall be made for the number of cubic yards removed, based on the definition of rock and of the quantity given in this Section. In order for rock to qualify for additional payment, it must be demonstrated to the Engineer that the material can not be removed by backhoe, power shovel, or any means normally used in the excavation of trenches and that the material can only be removed by the use of explosives or jack hammers. The Contractor shall clean all rock for inspection by Engineer and shall submit measurements and wait for the Engineer's approval prior to excavating. Otherwise additional payment will not be made. The measurement for rock payment shall be limited to the minimum clearances and under cutting required, as described above, regardless of actual quantity removed. The Contractor is responsible for all damage that may result from the use of explosives. Proper warning devices, flagmen and protective coverings shall be used whenever blasting. The Contractor shall employ or subcontract experienced qualified personnel for all blasting.

7. Water: Whenever ground water is encountered in the trench, it shall be removed by pumping to maintain a suitable pipe foundation and safe working conditions. The contractor shall provide all necessary pumps and appurtenances for this purpose. All visible standing or running water must be removed from the trench prior to the placement of bedding and pipe. If the trench bottom is, in the opinion of the Engineer, unsuitable due to wetness, it shall be undercut and backfilled in accordance with these specifications.

   The discharge of ground water shall be in accordance with all applicable laws and ordinances. Turbid water shall be filtered or shall be discharged to a temporary sediment trap. There will be no separate payment to the contractor for dewatering.

D. Unsuitable Foundation: Where unsuitable foundation conditions are encountered in the trench (such as highly organic material very soft earth or excessive wetness), then the material encountered shall be undercut and back filled. Under cutting depth below the design grade shall be as directed by the Engineer but shall generally be 12 inches. Backfill material shall be crushed stone. Other select material may be used only if approved by the Engineer prior to placement. The backfill material shall be compacted up to the design grade for the trench bottom. There will be no separate payment for under cutting and back filling unless otherwise specified. If payment is specified, it shall be for the number of cubic yards of crushed stone placed. The unit price if any shall include all cost involved including under cutting, backfill and disposal of unsuitable material.

END OF SECTION

SECTION 31 31 16.13
CHEMICAL TERMITE CONTROL

PART 1 – GENERAL

1.01 SUMMARY

This section covers treatment of soil and foundations of all structures for the protection of damage from subterranean termites.

1.02 QUALITY ASSURANCE

A. Qualifications:
For the application of pesticides, use the services of an applicator whose principal business is pest control. The applicator must be commercially certified in North Carolina. Termiticide applicators must also be certified in the U.S. Environmental Protection Agency (EPA) pesticide applicator category which includes structural pest control. Submit a copy of the pest control business license and pesticide applicator certificates.

B. Safety Requirements:
Formulate, treat, and dispose of termiticides and their containers in accordance with label directions.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Delivery:
Deliver termiticide material to the site in the original unopened containers bearing legible labels indicating the EPA registration number, manufacturer's registered uses and in new or otherwise good condition as supplied by the manufacturer or formulator.

B. Handling:
Handle and mix termiticides in accordance with the manufacturer's label and SDS, preventing contamination by dirt, water, and organic material. Protect termiticides from weather elements as recommended by the manufacturer's label and SDS. Spill kits must e maintained on pest control vehicles and must be available at the mixing site. Conduct termiticide mixing in an area with adequate spill containment.

1.04 SITE CONDITIONS

The following site conditions determine the acceptable time of application.

A. Soil Moisture:
Test soils to be treated immediately before application. Test soil moisture content to a minimum depth of 75 mm (3"). The soil moisture must be as recommended by the termiticide manufacturer. Application of termiticide is not permitted when soil moisture content exceeds manufacturer's recommendations.

B. Runoff and Wind Drift:
Application of termiticide will not be permitted during or immediately following heavy rains, when conditions may allow runoff, or create an environmental hazard or when average wind speed exceeds 16 km 10 miles per hour. Termiticide is not permitted to enter water systems, aquifers, or endanger humans or animals.

1.04 WARRANTY

Provide a 5-year written warranty against infestations or reinfestations by subterranean termites of the buildings or building additions constructed under this contract. Include in the warranty annual inspections of the buildings or building additions during the warranty period. If live subterranean termite infestation or subterranean termite damage is discovered during the warranty period, and the soil and building conditions have not been altered in the interim:

Retreat the site and perform treatment as may be necessary for elimination of subterranean termite infestation;
Repair damage caused by termite infestation; and
Reinspect the building approximately 180 days after the re-treatment.

PART 2 – PRODUCTS

2.01 SYSTEM DESCRIPTION

Chemical termite control uses liquid termiticide treatments applied to the soil to form a continuous chemical barrier in the soil around both sides of the foundation. The application shall be surface applied at ideal depths prior to foundation and floor completion. This barrier prevents foraging termites from reaching the foundation and piers. Only the soil adjacent to these foundation elements is treated. For slab construction (including foundations, patios and garages), the entire soil (or gravel) surface is treated before the vapor barrier is installed and the slab is poured over it. Soil treatment is coordinated with all building activities from foundation construction through final grading of the soil around the building's exterior. In order for the treatment to be effective, the final phase of the application must be done after final grading and sometimes after landscaping is completed so that the treated soil is not disturbed.

2.02 MATERIALS

A. Termiticides:
Provide termiticides currently registered by the EPA. Select non-repellant termiticides for maximum effectiveness and duration after application. Select a termiticide that is suitable for the soil and climatic conditions at the project site and apply at the highest labeled rate. Submit manufacturer's label and Safety Data Sheet (SDS) for termiticides proposed for use.

PART 3 - EXECUTION

3.01 PREPARATION

Eliminate food sources by removing debris from clearing and grubbing and post construction wood scraps such as ground stakes, form boards, and scrap lumber from the site, before termination application begins.

A. Verification:
Before work starts, verify that final grades are as indicated and smooth grading has been completed. Finely graded soil and remove particles larger than 25 mm 1 inch.
Compact soil particles to eliminate soil movement.

B. Foundation Exterior:
If the exterior perimeter treatment is applied when the horizontal barrier is applied, it will be damaged or removed before construction is completed. The exterior foundation perimeter treatment will have to occur in phases when any pads, porches, aprons, sidewalks, final grading or landscape planting are simultaneously involved adjacent to the building foundation. This treatment area should be coordinated after all major construction but before any pads, porches, or other items requiring special consideration are poured adjacent to the foundation walls. Submit written verification that final grading, landscape planting and other items adjacent to the foundation will not disturb treatment of the soil on the exterior sides of foundation walls, grade beams, and similar structures.

C. Utilities and Vents:
Turn off and block HVAC ducts and vents located in treatment area prior to application, to protect people and animals from termiticide. Submit written verification that the HVAC ducts and vents, water and sewer lines, and plumbing have been turned off or blocked prior to applying termiticide.

D. Crawl and Plenum Air Spaces:
Submit written verification that crawl and plenum air spaces have been located and identified prior to applying termiticide.

E. Application Plan:
Prior to commencing application of termiticide, submit a Termiticide Application Plan addressing the following items:
1. Proposed sequence of treatment work including dates and times of application.
2. Termiticide trade name.
3. EPA registration number.
4. Chemical composition.
5. Concentration of original and diluted material.
6. Formulation.
7. Manufacturer’s recommended application rates.
8. Regional requirements.
9. Application rate of active ingredients.
10. Method of application
11. Area or volume to be treated.
12. Amount to be applied.
13. Coy of the pest control business license.
14. Copy of the pesticide applicator certificates.

3.2 APPLICATION

For areas to be treated, establish complete and unbroken vertical and horizontal soil poison barriers between the soil and all portions of the intended structure which may allow termite access to wood and wood related products. Make applications to crawl spaces in accordance with label directions. Applications to crawl space areas that are used as plenum air spaces will not be permitted.

A. Equipment Calibration and Tank Measurement:
Conduct calibration test on the application equipment to be used immediately prior to commence of termiticide application. Measure the volume and contents of the application tank. Testing must confirm that the application equipment is operating within the manufacturer's specifications and meets the specified requirements. Submit written certification of the equipment calibration test results within 1 week of testing. Where results from the equipment calibration and tank requirements tests are unsatisfactory, re-treatment will be required.

B. Mixing and Application:
1. Mixing:
Perform all work related to formulating, mixing, and application in the presence of the certified applicator. Submit mixing formulation:
   a. Quantity of pesticide used.
   b. Rate of dispersion.
   c. Percent of use.
   d. Total amount used.

A closed system is recommended as it prevents the termiticide from coming into contact with the applicator or other persons. Only use water from designated locations. Fit filling hoses with a backflow preventer meeting local plumbing codes or standards. Prevent overflow during the filing operation. Spill kits must be maintained on pest control vehicles and must be available at the mixing site. Termiticide mixing must be conducted in an area that has been designated by the Government representative and that has adequate spill containment. Inspect the application equipment for applying termiticides prior to each day of use for leaks, clogging, wear, or damage. Immediately perform repairs on the application equipment to prevent or eliminate leaks and clogging.

2. Application Method:
   a. Surface Application – Use surface application for establishing horizontal barriers. Apply surface applicants as a coarse spray and provide uniform distribution over the soil surface. Termiticide must penetrate a minimum 25 mm 1 inch into the soil, or as recommended by the manufacturer. If soils are treated to a depth less than specified or approved, repeat work performed to the depth specified at no additional cost to the Owner.
   b. Rodding and Trenching – not applicable for new construction.

C. Vapor Barriers and Waterproof Membranes:
Apply termiticide prior to placement of a vapor barrier or waterproof membrane.

D. Placement of Concrete:
Place concrete covering treated soils as soon as the termiticide has reached maximum penetration into the soil as recommended by the manufacturer.

E. Clean Up, Disposal, and Protection:
Once application has been completed, proceed with clean up and protection of the site without delay.
1. Clean up – Clean the site of all material associated with the treatment measures, according to the label instructions, or as indicated. Remove and dispose of excess and waste material off site.
2. Disposal of Termiticide – Dispose of residual termiticide and containers off site and in accordance with label instructions and EPA criteria.

3.3 FIELD QUALITY CONTROL

A. Verification of Measurement:
Once termiticide application has been completed, measure tank contents to determine the remaining volume. The total volume measurement of used contents for the application must equal the application rate established in the application plan. Submit written verification that the volume of termiticide used meets the application rate established in the application plan.

3.4 PROTECTION

A. Protection of Treated Area:
Immediately after the application, protect the area from other use by erecting barricades as required or directed. Place signage inside the entrances to crawl spaces and identify the space as treated with termiticide and not safe for children or animals. Cover treated areas with plastic if slab is not to be poured immediately following termiticide application.

B. Disturbance of Treated Soils:
Re-treat soil and fill material disturbed after treatment before placement of slabs of other covering structures.

END OF SECTION

SECTION 32 11 23
AGGREGATE BASE COURSES

PART 1 – GENERAL

1.01 SUMMARY

The work covered by this section consists of the construction of a base composed of an approved aggregate material hauled to and placed on the vehicular areas, compacted, and shaped to conform to the lines, grades, depths, and typical sections shown on the Drawings or established by the Engineer.

1.02 REFERENCES

NCDOT	Standard Specifications for Roads And Structures
AASHTO T27	Sieve Analysis of Fine and Coarse Aggregates
AASHTO T180	Standard Method of Test for Moisture-Density Relations of Soils

1.03 SUBMITTALS

A. General – Submit listed submittals in accordance with the General Conditions.

B. Action Submittals:
Product Data: Submit producer's complete information for specified material including:
1. Physical properties demonstrating compliance with the Specifications and suitability for the intended use.
2. Producer's storage, handling, and installation requirements and recommendations.
3. Qualifications of the source in accordance with Article 1.04.

C. Closeout Submittals:
1. Manufacturer's standard warranty, and any project-specific warranty, if elsewhere required. Warranties that extends beyond the Contractor's correction period shall be project-specific documents executed by the valve manufacturer and shall clearly indicate beginning and ending dates of the warranty period.

1.04 QUALITY ASSURANCE

A. Source of Material:
All aggregate base course material shall be obtained from an aggregate producer that is in current compliance with the NCDOT Aggregate QC/QA Program.

B. Owner will at its expense, employ an independent materials testing firm for on-site verification of base course material conformance to this section. Contractor shall cooperate with the testing agent to accommodate testing. Such testing does not relieve the Contractor from performing Contractor's own tests as needed to ensure compliance with this section.

PART 2 – PRODUCTS

2.01 GENERAL

Aggregate base course materials: shall consist of crushed stone or uncrushed gravel, or other similar material having hard, strong, durable particles free of adherent coatings.

The Contractor shall furnish aggregate base course material produced in accordance with the requirements indicated herein.

All aggregates shall be from approved sources as described in the NCDOT Standard Specifications for Roads and Structures. Sources will not be approved unless the material has satisfactory soundness and satisfactory resistance to abrasion.

2.02 GRADATION

All standard sizes of aggregates shall meet the gradation requirements when tested in accordance with AASHTO T27.

Percentage of Total by Weight Passing

1 ½" = 100%
1" = 75% - 97%
½" = 55% - 79%
#4 = 35% - 55%
#10 = 25% - 45%
#40 = 14% - 30%
#200 = 4% - 12%

PART 3 – EXECUTION

3.01 STOCKPILING

Aggregates shall be handled in such a manner as to minimize segregation.

Sites for aggregate stockpiles shall be grubbed and cleaned prior to storing aggregates, and the ground surface shall be firm, smooth, and well drained. A cover of at least three (3) inches of aggregate shall be maintained over the ground surface in order to avoid the inclusion of soil or foreign material. Stockpiles shall be built in such a manner as to minimize segregation. When it is necessary to operate trucks or other equipment on a stockpile in the process of building the stockpile, it shall be done in a manner approved by the Engineer.

Stockpiles of different types or sizes of aggregates shall be spaced far enough apart, or else separated by suitable walls or partitions, to prevent the mixing of the aggregates.

Any method of stockpiling aggregates which allows the stockpile to become contaminated with foreign matter or causes excessive degradation of the aggregate will not be permitted. Excessive degradation will be determined by sieve tests of samples taken from any portion of the stockpile over which equipment has been operated, and failure of such samples to meet all grading requirements for the aggregate will be considered cause for discontinuance of such stockpiling procedure.

3.02 HAULING AND PLACING AGGREGATE BASE MATERIALS

The aggregate material shall be spread on the subgrade with a mechanical spreader capable of placing the material to a uniform loose depth and without segregation.

Where the required compacted thickness of base is 8 inches or less the base material may be spread and compacted in one layer. Where the required compacted thickness of base is more than 8 inches, the base material

shall be spread and compacted in 2 or more approximately equal layers. The minimum compacted thickness of any one layer shall be approximately 4 inches.

Each layer of material shall have been sampled, tested, compacted and approved prior to placing succeeding layers of base material or pavement.

No base material shall be placed on frozen subgrade or base. Hauling equipment shall not be operated on subgrade or a previously completed layer of base material soft enough to rut or weave beneath the equipment.

The maximum speed of trucks hauling or traveling over any part of the subgrade or base is 5 miles per hour.

Final compaction shall be 100% of the maximum density in accordance with AASHTO T180, as modified by the NCDOT. Alternative density determination by nuclear methods is permitted if in accordance with Section 520-9 of the NCDOT Standard Specifications.

3.03 CONTAMINATION

The Contractor shall utilize methods of handling, hauling, and placing which will minimize segregation and contamination. If segregation occurs, the Engineer may require that changes be made in the Contractor's methods to minimize segregation, and may also require mixing on the road which may be necessary to correct any segregated material. No additional compensation will be allowed for the work of road mixing as may be required under this provision. Aggregate which is contaminated with foreign materials to the extent the base course will not adequately serve its intended use shall be removed and replaced by the Contractor at no additional cost to the Owner. The above requirements will be applicable regardless of the type of aggregate placed and regardless of prior acceptance.

3.04 TOLERANCES

After final shaping and compacting the base, the Engineer will check the surface of the base for conformance to grade and typical section and the Owner’s testing agent will determine the base thickness.

The thickness of the base shall be within a tolerance of plus or minus ½ inch of the base thickness required by the Drawings.

3.05 MAINTENANCE

Where the base material is placed in a trench section, the Contractor shall provide adequate drainage through the shoulders to protect the subgrade and base until such time as shoulders are completed.

The Contractor shall maintain the surface of the base by watering, machining, and rolling or dragging when necessary to prevent damage to the base by weather or traffic.

Where the base or subgrade is damaged, the Contractor shall repair the damaged area; reshape the base to the required lines, grade, and typical sections; and recompact the base to the required density at no cost to the Owner.

END OF SECTION

SECTION 32 12 16.13
PLANT-MIX ASPHALT PAVING

PART 1 – GENERAL

1.01 SUMMARY

This section includes of the production, delivery, and placement of all types of bituminous plant mixed bases and surface courses to the lines, grades, thickness, and typical section shown on the Drawings. In general, pavement and paving operation shall conform to the NCDOT Standard Specifications for Roads and Structures.

1.02 REFERENCES

NCDOT	Standard Specifications for Roads and Structures
AASHTO T11	Percentage of Material Finer than #200 in Aggregate by Washing

1.03 SUBMITTALS

A. General – Submit listed submittals in accordance with the General Conditions.

B. Action Submittals:
Product Data: Submit producer's complete information for materials, including:
1. Physical properties demonstrating compliance with the Specifications and suitability for the intended use.
2. Job mix formula.

1.04 QUALITY ASSURANCE

A. Source of Material:
All material shall be obtained from an asphalt producer that is in current compliance with the NCDOT Performance Graded Asphalt Binder and Asphalt Emulsion QC/QA Programs.

B. Owner will at its expense, employ an independent materials testing firm for on-site verification of plant-mix material conformance to this section. Contractor shall cooperate with the testing agent to accommodate testing. Such testing does not relieve the Contractor from performing Contractor's own tests as needed to ensure compliance with this section.

PART 2 – PRODUCTS

2.01 COMPOSITION OF MIXTURES

The bituminous plant mix shall be composed of a mixture of aggregate, asphalt cement, and mineral filler when required. The several aggregate fractions shall be sized, uniformly graded, and combined in such proportions that the resulting mixture meets the grading requirements of a job mix formula prepared by the Engineer. Materials which will not produce a job mix within the full allowable tolerances required by these specifications will be rejected.

The job mix formula with the allowable tolerances shall be within the design limits specified for the particular type of bituminous mixture. The job mix formula for each mixture will establish a single percentage of asphalt

cement to be added to the aggregate, and a single temperature at which the mixture is to be discharged from the plant.

The Contractor shall make a written request for the job mix formula at least 10 days prior to beginning work. When the request made by the Contractor is not for a previously approved job mix formula, the Contractor shall also submit samples of all aggregates proposed for use in the mix. The aggregate samples shall be taken by the Contractor in the presence of a representative of the Engineer.

The job mix formula for each mixture shall be in effect until modified in writing by the Engineer.

All mixtures furnished for the work shall conform to the job mix formula within the tolerance ranges specified for the particular mix involved as specified herein.

2.02 GENERAL REQUIREMENTS

A combination of graded coarse and fine aggregates will be required which will produce an acceptable mix. The use of crusher run material will not be permitted. The coarse that other standard sizes may be used when approved by the Engineer.

At least ½ of the fraction passing the No. 200 sieve shall be mineral filler or stone screenings.

The total natural sand or sands in the mixture will be tested in accordance with ASSHTO T11 to determine the amount of material which can be washed through the No. 200 sieve. The total amount of such washed material shall not exceed 8 percent by weight of the total natural sand in the mixture. The above test will be performed prior to establishing the design mix and, when required by the job mix formula, prior to the entry of the sand into the drier.

2.03 JOB MIX FORMULA

The job mix formula will be established within the design limits listed in the table below:

TABLE DESIGN LIMITS

Sieve Designation	**Total Percent Passing S 9.5B**
½"	100
3/8"	90-100
No. 4	90
No. 8	32-67
No. 200	4-8
Asphalt Cement Content Range	4.5% - 7.5%
Temperature Range	250 deg. F. 300 deg. F.

In addition to the requirements of the Table, the amount of material between any adjacent sieves shall not be less than 4 percent.

The completed mix shall conform to the job mix formula within the tolerances shown in the Table below:

TABLE
Tolerances for Job Mix Formula

Sieve Designation	Tolerance for Percent Passing
½"	+0
3/8"	+5
No. 4	+5
No. 8	+5
No. 200	+2

When a mix has been tested and has been found to be outside of the design limits, the Engineer may require the removal from the site of any of this mix which has been placed and which is represented by the test results. All such mix which has been removed shall be replaced with plant mix which is within the job mix formula and allowable tolerances at no cost to the Owner.

2.04 REQUIREMENTS FOR COMPLETED PLANT MIX

The completed mix shall meet the requirements shown in the Table below when tested in accordance with the Marshall method of test:

TABLE
Requirements for Marshall Method Of Test

Requirement	Value S 9.5B
Stability, Minimum	1,200 Lbs.
Flow	7-14
Void Content	3-8

PART 3 – EXECUTION

3.01 DELIVERY AND ACCEPTANCE OF MATERIALS

Materials shall comply with Section 1020-1 of the NCDOT Standard Specifications as to tickets showing compliance data.

3.02 WEATHER AND TEMPERATURE LIMITATIONS FOR PRODUCING AND PLACING BITUMINOUS MIXTURES

Bituminous mixtures shall not be produced or placed during rainy weather, when the subgrade or base course is frozen, or when the moisture on the surface to be paved would prevent proper bond. Bituminous material shall not be placed when the air temperature, measured in the shade away from artificial heat at the location of the paving operations, is less than the following temperatures:

Material	Thickness of Layer Being Placed	Air Temperatures
Bituminous Concrete Base Course, Type B; Bituminous Concrete Binder Course; or Sand Asphalt Base Course	1 ½" or greater	35 deg.
Bituminous Concrete Binder Course, or Sand Asphalt Base course	Less than 1 ½"	40 deg.
Surface Course Materials	1" or greater	40 deg. Except Final Layer
Surface Course Materials	1" or greater	40 deg. For Final Layer Except 50 Deg. Between Nov. 1 & April 1
Surface Course Materials	Less than 1"	50 deg. Except 60 deg. Between Nov. 1 & April 1

In addition, open-graded asphalt friction courses shall not be placed between November 1 and April 1.

As an exception to the above, when in any day's operations the placement of a layer of bituminous base course material or binder material 1 ½" or greater in thickness has started, it may continue until the temperature drops to 32 deg. Fahrenheit.

3.03 TRANSPORTATION OF BITUMINOUS MIXTURE

The mixture shall be transported from the mixing plant to the point of use in the vehicles which have tight, clean, smooth metal beds that have been sprayed with a lime solution, a soap and oil solution, or other approved material, to prevent the mixture from adhering to the beds. Each vehicle shall be covered with a canvas or other suitable material. All covers shall be so constructed and secured as to prevent the entrance of moisture and the rapid loss of temperature. A 3/8" diameter hole shall be provided on each side of the vehicle body near the center of the body and 6 inches above the bed of the vehicle for the purpose of inserting a thermometer.

The temperature of the mixture immediately prior to discharge from the hauling vehicle shall be within a tolerance of plus 15 deg. Fahrenheit to minus 25 deg. Fahrenheit of the specified job mix temperature.

3.04 SPREADING AND FINISHING

The bituminous mixture shall be spread and struck off to the required grades, cross sections, and thicknesses by self-contained, power propelled pavers. The pavers shall be equipped with an activated screed or strike off assembly which is designed to be preheated, and shall have a sliding shoe attachment which will form a slope on the edge of the mixture which shall prevent edge raveling when the mixture is compacted.

A string line shall be placed by the Contractor for the first land of each layer of mixture placed to provide alignment control for the paper, except that a string line will not be required when the first layer is placed adjacent to a curb section.

Roller used to compact the mixture shall be in good condition, capable of reversing with backlash. The rollers shall be operated with the drive wheels nearest the paver and it speeds slow enough to avoid displacement of the mixture. Steel wheel rollers shall be equipped with wetting devices to prevent the mixture from sticking to the roller wheels.

The number and weight of rollers shall be sufficient to compact the mixture to the required density while it is still in a workable condition.

Rolling for open-graded asphalt friction course shall consist of one coverage with a tandem steel wheel roller weighing a maximum of 10 tons, with additional rolling limited to one coverage with the roller where necessary to improve riding surface.

The use of rolling equipment with results in excessive crushing of the aggregate or excessive displacement of the mixture will not be permitted.

In areas inaccessible to equipment shall be thoroughly compacted by the use of hand tampers or hand operated mechanical tampers.

The tolerance of the final compacted pavement shall be ¼ inch from the typical cross-sections shown on the plans.

3.05 JOINTS

A. Transverse Joints:

When the laying of the mixture is to be suspended long enough to permit the mixture to become chilled, transverse joints shall be constructed. At the end of the day's operation the Contractor shall construct a sloped wedge ahead of the end of the full depth pavement to provide for proper compaction and protection of the full depth pavement. When directed by the Engineer, the Contractor shall place a paper parting strip beneath this wedge to facilitate joint construction.

Before paving operations are resumed, the Contractor shall remove the sloped wedge and cut back into the previously constructed pavement shall then lightly coated with tack coat.

When laying of the mixture is resumed at the joint, the construction of the joint shall be completed while the mixture is still in a workable condition.

B. Longitudinal Joints

Longitudinal joints shall be formed by allowing the paver to deposit the mixture adjacent to the joint to such depth that maximum compaction can be obtained along the joint. The joint shall be pinched by rolling immediately behind the paver.

When the multi-lane, multi-layer construction is required, the longitudinal joint is each lay shall offset that in the layer immediately below by approximately 6-inches. The joint in the top layer shall be constructed, where possible, between design travel lanes.

3.06 OTHER CONSTRUCTION REQUIREMENTS

Where the surface course is to be placed on Type B 25.0 B or C binder course, the surface course shall be placed as soon as possible after the binder course has been placed and in all cases during the same paving season.

The bituminous plant mix shall be compacted to a density of at least 95% of the laboratory density as determined by the Marshall Method test.

3.07 SURFACE REQUIREMENTS

The surface of the plant mix base or pavement after compaction shall be smooth and true to the required cross section and grade. Any defective areas shall be corrected with satisfactory material which shall be immediately compacted to conform to the surrounding area. Any area showing an excess of asphalt cement shall be removed and replaced.

The surface will be tested by the Engineer at all joints and at other selected locations using a 10 foot straightedge. The variation of the surface from the testing edge of the straightedge, when applied parallel to the centerline of the surface, shall not exceed 1/8 inch between any two contact points. Areas found to exceed this tolerance shall be corrected by the Contractor by removal of the defective work and replacement with new material unless other corrective measures are permitted by the Engineer. The work and materials required in the correction of defective work shall be provided by the Contractor at no cost.

3.08 UTILITY ADJUSTMENTS

A. Description

The work covered by this section consists of raising or lowering of existing meter boxes, and valve boxes encountered within the limits of the project to match the adjacent finished work.

B. Materials

All materials such as brick, mortar, and iron castings shall meet the requirements of Division 10 of the NCDOT Standard Specifications for Roads and Structures.

C. Construction Requirements

Adjustment of meter boxes and valve boxes shall be made by utilizing cast iron or steel fittings. Where fittings are used, the fittings shall be securely attached or installed in a manner which will eliminate movement of the fitting.

END OF SECTION

SECTION 32 31 13
CHAIN LINK FENCES AND GATES

PART 1 – GENERAL

1.01 SUMMARY

This section shall include the chain link fence complete with all posts, gates, fabric, fabric ties, padlocks, and appurtenances. The fence shall be four feet high unless otherwise noted, or in the case of replacement fencing it shall match the height of the original fencing. Fence shall have top and bottom reinforcing wire. Additional horizontal rails and diagonal rods shall be provided at gates, corners, pull posts, and ends.

1.02 REFERENCES

ASTM A-121	Specification for Metallic-Coated Carbon Steel Barbed Wire
ASTM A-153	Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A-392	Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric
ASTM F-1043	Standard Specification for Strength and Protective Coatings on Steel Industrial Fence Framework
ASTM F668	Standard Specification for Polyvinyl Chloride (PVC), Polyolefin and Other Polymer-Coated Steel Chain Link Fence Fabric
ASTM F626	Standard Specification for Fence Fittings

1.03 SUBMITTALS

A. General – Submit listed submittals in accordance with the General Conditions.

B. Action Submittals:
Product Data: Submit manufacturer's complete product literature for specified materials, and accessories, including:
1. Physical properties and dimensions demonstrating compliance with the Specifications and suitability for the intended use.
2. Manufacturer's storage, handling, and installation requirements and recommendations.
3. Project-specific information.
4. Any clarifications or exceptions.

C. Closeout Submittals:
1. Manufacturer's standard warranty, and any project-specific warranty, if elsewhere required. Warranties that extend beyond the Contractor's correction period shall be project-specific documents executed by the manufacturer and shall clearly indicate beginning and ending dates of the warranty period.

PART 2 – PRODUCTS

2.01 POSTS

All posts shall be of high carbon steel pipe having the weight and diameter as follows:

Top Rail ……1-1/2" O.D. -2.27 LBS/FT
Line Posts .....2-1/2" O.D. -3.65 LBS/FT
End and Corner Posts up to 6' wide .....3" O.D. -5.79 LBS/FT
Gate Posts for Gate Frames over 6' wide and up to and including 13'0" wide .....4" O.D. -9.11 LBS/FT
Gate Posts for Gate Frames over 13'0" wide and up to and including 18'0"……6-5/8" O.D. -18.97 LBS/FT
Gate Posts for Gate Frames over 18'0" .....8-5/8" O.D. -14.70 LBS/FT

All piping for fence and gates shall be Schedule 40, hot-dipped galvanized steel, or approved equal, for size, finish, material composition, strength, appearance, performance and ease of maintainability. All piping shall be green vinyl coated in accordance with ASTM F 1043.

All posts shall be set in concrete footings which shall be not less than three feet deep. Footings shall be of Class B concrete. Footing for line posts shall be not less than 8-inches in diameter and footings for all other posts (including the footings for gate center stops) shall be not less than 12-inches in diameter.

Line posts shall be spaced uniformly, not more than ten feet apart.

2.02 FABRIC AND TIES

Fabric shall be composed of Number 9-gauge steel wire woven in a two-inch mesh. Top and bottom edges shall have a twisted and barbed finish. Fabric ties shall be Number 6 gauge round aluminum and shall be spaced not more than 24 inches apart on the top rail, 14 inches apart on posts, and 24 inches on bottom wire. Fabric shall conform to ASTM Designation A-392. Additionally, all chain link fabric shall be fused bonded vinyl-coated, unless otherwise noted. Coating shall be fused to wire prior to weaving. Coating shall conform to ASTM F668, Class 2b. Color shall be green.

2.03 GATE FRAMES

Gate frames shall be 2-inch standard steel pipe with internal bracing of 1-5/8-inch standard steel pipe and shall be welded at all points. Gate hinges and latches shall be of heavy malleable iron center stop and integral padlock eye. Provide a keeper for all vehicle gates which automatically engages the gate leaf and holds it in the open position until manually released. All frames shall be green vinyl coated in accordance with ASTM F 1043.

2.04 FITTINGS

Fittings shall be hot-dipped galvanized pressed steel in accordance with ASTM F 626. All fittings shall be industrial quality. All fittings shall be green vinyl coated in accordance with ASTM F 1043, unless otherwise noted.

2.05 GALVANIZING

All ferrous parts shall be galvanized after fabrication in accordance with ASTM A-153 to protect against corrosion

2.06 PADLOCKS

Each gate shall be provided with a cylinder, five pin type padlock.

Padlocks for all gates will be keyed alike.

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PART 3 – EXECUTION

3.01 INSTALLATION

Barbed wire shall be installed where specified and shall be composed of two strands of 12 gauge steel wire with four -point barbs spaced three inches apart. Barbed wire shall conform to ASTM Designation A-121. Tension bars shall be used for attaching fabric to all posts, except line posts, and shall consist of 1/4-inch x 3/4-inch steel, fastened to posts by beveled-edge bands.

Bottom wire shall be stretched along the fence approximately six inches above finished grade and shall be 7 gauge coil spring wire. Fabric shall be attached to the bottom wire with fabric ties.

Bracing shall be installed at all ends, gate and pull posts and in both tangents at corner posts. All posts shall be true to line and the fence shall be adequately stretched to secure proper rigidity and alignment, shall be plumb and shall present a neat appearance.

END OF SECTION

SECTION 32 97 00
PLANTING

PART 1 – GENERAL

1.01 SUMMARY

This section covers the furnishing of all labor, equipment and the materials necessary for the landscaping of all areas of the site disturbed by construction operations and all earth surfaces of embankments including rough and fine grading, topsoil if required, fertilizer, lime, seeding and mulching. The Contractor shall adapt his operations for variations in weather or soil conditions as necessary for the successful establishment and growth of the grasses and legumes.

Related Sections: 31 02 00 Earthwork

1.02 REFERENCES

None

1.03 SUBMITTALS

A. General – Submit listed submittals in accordance with the General Conditions.

B. Action Submittals:
Product Data: Submit manufacturer's complete product literature for specified fertilizer, seed, lime, and mulch, including:
1. Physical properties demonstrating compliance with the Specifications and suitability for the intended use.
2. Manufacturer's storage, handling, and installation requirements and recommendations.
3. Any clarifications or exceptions.

PART 2 – PRODUCTS

2.01 FERTILIZER

The quality of fertilizer and all operations in connection with the furnishing of this materials shall comply with the requirements and regulations adopted by the North Carolina Board of Agriculture.

Fertilizer shall be 10-10-10 grade. Upon written approval of the Engineer, a different grade of fertilizer may be used, provided the rate of application is adjusted to provide the same amounts of plant food.

During handling and storing, the fertilizer shall be cared for in such a manner that will be protected against hardening, caking, loss of plant food values.

Any hardened or caked fertilizer shall be pulverized to its original conditions before being used.

2.02 LIME

The quality of lime and all operations in connection with the furnishing of this material shall comply with the requirements of the North Carolina Lime Law and regulations adopted by the North Carolina Board of Agriculture.

During the handling and storing, the lime shall be cared for in such a manner that it will be protected against hardening and caking. Any hardened or caked lime shall be pulverized to its original condition before being used.

Lime shall be agriculture grade ground dolomitic limestone. It shall contain not less than 85% of the calcium and magnesium carbonates and shall be of such fineness that at least 90% will pass a No. 10 sieve and at least 50% will pass a No. 100 sieve.

2.03 SEED

The quality of seed and all operations in connection with the furnishing of this material shall comply with the requirements of the North Carolina Seed Law and regulations adopted by the North Carolina Board of Agriculture.

Seed shall have been approved by the North Carolina Department of Agriculture or any agency approved by the Engineer before being sown, and no seed will be accepted with a date of test more than 9 months prior to the date of sowing. Such testing, however, will not relieve the Contractor from responsibility for furnishing and sowing seed that meets these specifications at the time of sowing. When a low percentage of germination causes the quality of the seed to fall below the minimum pure live seed specified, the Contractor may elect, subject to the approval of the Engineer, to increase the rate of seeding sufficiently to obtain the minimum pure live seed contents specified, provided that such an increase in seeding does not cause the quantity of noxious weed seed per square yard to exceed the quantity that would be allowable at the regular rate of seed.

During handling and storing, the seed shall be cared for in such a manner that it will be protected from damage by heat, moisture, rodents or other causes.

Seed shall be entirely free from bublets or seed of Johnson Grass, Nutgrass, Sandbur, Wild Onion, Wild Garlic, and Bermuda Grass. The specifications for restricted noxious weed seed refers to the number per pound, singly or collectively, of Blessed Thistle, Wild Radish, Canada Thistle, Corncockle, Field Bindweed, Quackgrass, Dodders, Dock, Horsenettle, Bracted Plantain, Buckthorn or Wild Mustard; but in no case shall the number of Blessed Thistle or Wild Radish exceed 27 seeds of each per pound. No tolerance on weed seed will be allowed.

2.04 MULCH

Straw Mulch shall be threshed straw oats, rye or wheat free from matured seed of obnoxious weeds or other species which would grow and be detrimental to the specified grass.

PART 3 – EXECUTION

3.01 FINE GRADING

Fine grading shall consist of shaping the final contours for drainage and removing all rock greater than 2" in any dimension, clumps of earth, roots greater than 1" in diameter, and waste construction material. It shall also include thorough loosening of the soil to a depth of 6-inches by plowing, discing, harrowing, or other approved

methods until the area is acceptable as suitable for subsequent landscaping operations. The work of landscaping shall be performed on a section by section basis immediately upon completion of earthwork.

3.02 SEEDBED PREPARATION

The Contractor shall cut and satisfactorily dispose of weeds or other unacceptable growth on the areas to be seeded. Uneven and rough areas outside the graded section, such as crop rows, farm contours, ditches and ditch spoil banks, fence line and hedge row soil accumulations, and other minor irregularities which cannot be obliterated by normal seedbed preparation operations, shall be shaped and smoothed as directed by the Engineer to provide for more effective seeding and for ease of subsequent mowing operations.

The soil shall then be scarified or otherwise loosened to a depth of not less than 6-inches except as otherwise provided below or otherwise directed by the Engineer. Clods shall be broken and the top 2 to 3-inches of soil shall be worked into an acceptable seedbed by the use of soil pulverizers, drags, or harrows; or by other methods approved by the Engineer.

On 2:1 slopes a seedbed preparation will be required that is the same depth as that required on flatter areas, although the degree of smoothness may be reduced from that required on the flatter areas if so permitted by the Engineer.

On cut slopes that are steeper than 2:1, both the depth of preparation and the degree of smoothness of the seedbed may be reduced as permitted by the Engineer, but in all cases the slope surface shall be scarified grooved, trenched, or punctured so as to provide pockets, ridges, or trenches in which the seeding materials can lodge.

On cut slopes that are either 2:1 or steeper, the Engineer may permit the preparation of a partial or complete seedbed during the grading of the slope. If at the time of seeding and mulching operations such preparation is still in a condition acceptable to the Engineer, additional seedbed preparation may be reduced or eliminated.

The preparation of seedbeds shall not be done when the soil is frozen, extremely wet, or when the Engineer determines that it is in an otherwise unfavorable working condition.

3.03 APPLICATION

Seed shall be applied by means of a hydro-seeder or by other approved methods. The rates of application of seed, fertilizer and limestone shall be as stated on the Drawings.

Equipment to be used for the application, covering or compaction of limestone, fertilizer, and seed shall have been approved by the Engineer before being used on the project. Approval may be revoked at any time if equipment is not maintained in satisfactory working condition, or if the equipment operation damages the seed.

Limestone, fertilizer, and seed shall be applied within 24 hours after completion of seedbed preparation unless otherwise permitted by the Engineer, but no limestone or fertilizer shall be distributed and no seed shall be sown when the Engineer determines that weather and soil conditions are unfavorable for such operations.

Limestone may be applied as a part of the seedbed preparation, provided it is immediately worked into the soil. If not so applied, limestone and fertilizer shall be distributed uniformly over the prepared seedbed at the specified rate of application and then harrowed, raked, or otherwise thoroughly worked into the seedbed.

Seeds shall be distributed uniformly over the seedbed at the required rate of application, and immediately harrowed, dragged, raked or otherwise worked so as to cover the seed with a layer of soil. The depth of covering

shall be as directed by the Engineer. If two kinds of seed are to be used which require different depths of covering, they shall be sown separately.

When a combination seed and fertilizer drill is used, fertilizer may be drilled in with the seed after limestone has been applied and worked into the soil. If two kinds of seed are being used which require different depths of covering, the seed requiring the lighter covering may be sown broadcast or with a special attachment to the drill, or drilled lightly following the initial drilling operation.

When the hydraulic seeder is used for application of seed and fertilizer the seed shall not remain in water containing fertilizer for more than 30 minutes prior to application unless otherwise permitted by the Engineer.

Immediately after seed has been properly covered, the seedbed shall be compacted in the manner and degree approved by the Engineer.

When adverse seeding conditions are encountered due to steepness of slope, height of slope, or soil conditions, the Engineer may direct or permit that modifications be made in the above requirements which pertain to incorporating limestone into the seedbed; covering limestone, seed, and fertilizer; and compaction of the seedbed.

3.04 MULCHING

All seeded areas shall be mulched unless otherwise indicated in the special provisions or directed by the Engineer.

It shall be spread uniformly at a rate of two tons per acre in a continuous blanket over the areas specified.

Before mulch is applied on cut or fill slopes which are 3:1 or flatter, and ditch slopes, the Contractor shall remove and dispose of all exposed stones in excess of 3-inches in diameter and all roots or other debris which will prevent proper contact of the mulch with the soil.

Mulch shall be applied within 24 hours after the completion of seeding unless otherwise permitted by the Engineer. Care shall be exercised to prevent displacement of soil or seed or other damage to the seeded area during the mulching operation.

Mulch shall be uniformly spread by hand or by approved mechanical spreaders or blowers which will provide an acceptable application. An acceptable application will be that which will allow some sunlight to penetrate and air to circulate but also partially shade the ground, reduce erosion, and conserve soil moisture.

Mulch shall be held in place by applying a sufficient amount of asphalt or other approved binding material to assure that the mulch is properly held in place. The rate and method of application of binding material shall meet the approval of the Engineer. Where the binding material is not applied directly with the mulch it shall be applied immediately following the mulch application.

The Contractor shall take sufficient precautions to prevent mulch from entering drainage structures through displacement by wind, water, or other causes and shall promptly remove any blockage to drainage facilities which may occur.

3.05 MAINTENANCE

The Contractor shall keep all seeded areas in good condition, reseeding if and when necessary, until a good lawn is established over the entire area seeded and shall maintain these areas in an approved condition until final acceptance of the Contract.

Grassed areas will be accepted when a 95 percent cover by permanent grasses is obtained and weeds are not dominant. On slopes, the Contractor shall provide against washouts by an approved method. Any washouts which occur shall be regraded and reseeded until a good sod is established.

Areas of damage or failure due to any cause shall be corrected by being repaired or by being completely redone as may be directed by the Engineer. Areas of damage or failure resulting either from negligence on the part of the Contractor in performing subsequent construction operations or from not taking adequate precautions to control erosion and siltation as required throughout the various sections of the specifications, shall be repaired by the Contractor as directed by the Engineer at no cost to the Owner.

END OF SECTION

SECTION 33 11 00
WATER UTILITY DISTRIBUTION PIPING

PART 1 – GENERAL

1.01 SUMMARY

These specifications shall apply to the materials to be furnished and installed to complete the waterline installations in accordance with the Contract Drawings, including fire protection lines. All pipe and appurtenances shall be of the class and type as indicated on the Contract Drawings, or as designated herein. Unless otherwise noted, pipe shall be ductile iron.

1.02 RELATED DOCUMENTS

Contract Drawings and general provisions of the Contract and Supplementary Conditions and Division 1 Specification Sections apply to work of this section.

1.03 SUBMITTALS

A. General – Submit listed submittals in accordance with the General Conditions.

B. Action Submittals:
Product Data: Submit manufacturer's complete product literature for specified pipe, fittings, and accessories, including:
1. Physical properties and dimensions demonstrating compliance with the Specifications and suitability for the intended use.
2. Manufacturer's storage, handling, and installation requirements and recommendations.
3. Project-specific information.
4. Any clarifications or exceptions.

C. Closeout Submittals:
1. Manufacturer's standard warranty, and any project-specific warranty, if elsewhere required. Warranties that extend beyond the Contractor's correction period shall be project-specific documents executed by the manufacturer and shall clearly indicate beginning and ending dates of the warranty period.

1.04 DELIVERY STORAGE, HANDLING

The Contractor shall unload pipe so as to avoid deformation or other injury thereto. Pipe shall not be rolled or dragged over gravel or rock during handling. When any joint or section of pipe is damaged during transporting, unloading, handling, or storing, the undamaged portions of the joint or section may be used where partial lengths are needed, or, if damaged sufficiently, the Engineer will reject the joint or section as being unfit for installation.

If any defective pipe is discovered after installation, it shall be removed and replaced with sound pipe or shall be repaired by the Contractor in an approved manner and at his own expense.

The Contractor shall store all pipe in an approved manner. The pipe interior, sealing surfaces, fittings, and other accessories shall be kept clean. Pipe bundles shall be stored on flat surfaces with uniform support. Stored pipe shall be protected from prolonged exposure to sunlight with a canvas or other opaque covering. Air circulation shall be provided under any covering. Gaskets shall not be exposed to oil, grease, ozone, excessive heat, or direct

sunlight. The pipe manufacturer for each type of pipe shall be consulted for specific storage and handling

PART 2 – PRODUCTS

2.1 GENERAL

A. All materials shall be first quality with smooth interior and exterior surfaces, free from cracks, blisters, honeycombs, and other imperfections, and true to theoretical shapes and forms throughout. All materials shall be subject to the inspection of the Engineer at the plant, trench, or other point of delivery, for the purpose of culling and rejecting material which does not conform to the requirements of these specifications. Such material shall be marked by the Engineer, and the Contractor shall remove it from the project site upon notice being received of its rejection.

B. As specific specifications are cited, the designation shall be construed to refer to the latest revisions under the same specification number, or to superseding specifications under a new number, except provisions in revised specifications which are clearly inapplicable.

2.2 PIPE

A. Ductile Iron Pipe

1. Unless otherwise specified, all ductile iron pipe shall be manufactured in accordance with ANSI/AWWA Specification C151/A21.51. All ductile iron pipe shall be Class 350 unless otherwise specified and shall be lined with cement mortar not less than 1/16-inch thick conforming to ANSI/AWWA Specification C104/A21.4.

a. Flanged Joints

i. Flanged pipe shall have flanges with long hubs, shop fitted on the threaded end of the pipe. Pipe and flanges shall conform to ANSI/AWWA Specification C115/A21.15.

ii. Where required, flanges shall be tapped for stud bolts. Flanges shall be accurately faced at right angles to the pipe axis and shall be drilled smooth and true, and covered with coal tar pitch varnish or otherwise protected against corrosion of flange faces. Flange faces shall be cleaned to bare metal with wire brushes before installation of pipe.

iii. Ductile iron flanged joint pipe shall be thickness Class 53 minimum and shall have ductile iron flanges conforming to ANSI B 16.1, 125-pound template. Pipe shall be ordered in lengths needed as no pipe shall be cut, threaded or flanged in the field.

iv. Gaskets for flanged joints shall be the ring type of cloth inserted rubber or rubber with a minimum thickness of 1/8-inch. Dimensions shall conform to those in Table A.1 of AWWA C115, Appendix A.

v. All piping, fittings, and appurtenances installed above ground and/or in structures shall have flanged joints.

vi. In general, flanged joints shall be made up with through bolts of the required type and size in accordance with Section A.1 of Appendix A of AWWA C115.

vii. Connecting flanges shall be in proper alignment and no external force shall be used to bring them together. Bolts and gaskets shall be furnished by the installer of piping for joints connecting the piping with equipment, as well as for those between pipe and fittings, whether such equipment and piping is furnished by the installer or not.

b. Mechanical Joints
   i. All mechanical joints shall be manufactured in accordance with ANSI/AWWA Specification C111/A21.11.
   ii. All bolts shall be tightened by means of torque wrenches in such a manner that the follower shall be brought up toward the pipe evenly. If effective sealing is not obtained by tightening the bolts to the specified torques, the joint shall be disassembled and reassembled after thorough cleaning.

c. Slip Joints
   i. Slip or "push-on" joints shall be manufactured in accordance with ANSI/AWWA Specification C111/A21.11.
   ii. Bells of "slip" joint pipe shall be contoured to receive a bulbshaped, circular rubber gasket, and plain ends shall have a slight taper to facilitate installation. The lubricant used in making up the joints shall be furnished by the pipe manufacturer. The jointing shall be done by guiding the plain end into the bell until contact is made with the gasket and by exerting a sufficient compressive force to drive the joint home until plain end makes full contact with the base of the bell.

d. Ball Joints: Use ball joint pipe where specified on the Contract Drawings. All ball joint pipe shall be American Flex-Lock Boltless Ball Joint Pipe, US Pipe equal, Griffin Pipe equal, or other approved “equal”. Joints shall consist of spherical ball and socket, rubber gasket, locking retainer gland, and locking wedge. Joints shall be capable of deflecting up to 15 degrees without harm to pipe or joint components and without leakage. Ball joint pipe shall have a working pressure rating of at least 250 psi and a thickness class of 55.

e. Restrained Joints: Where restrained joint pipe is indicated on the Contract Drawings, except for pipe to be suspended from bridge deck, it shall consist of mechanical joint pipe as specified above with the addition of retainer glands at each joint. The retainer glands shall be cast from ductile iron no less than grade 70-50-0 and shall comply with all applicable provisions of AWWA/ANSI C110/A21.10 and C111/A21.11. All screws shall be 5/8” with torque-set head. For pipe to be suspended from bridge deck, specialized restrained joint pipe and fittings shall be used and shall be equal to U.S. Pipe TR Flex, American Flex Ring, Griffin Snap-Lok, or equal. All restrained joint pipe and fittings shall have a minimum working pressure rating of 250 psi.

B. Polyvinyl Chloride Pipe

1. Polyvinyl Chloride (PVC) pipe 4" and larger shall meet the requirements of AWWA Specification C-900, latest edition, and have a dimension ratio of 18 (DR 18) or 14 (DR-14) unless otherwise specified. All PVC pipe smaller than 4" diameter shall meet the requirements of ASTM D 2241 (SDR-PR), SDR 13.5 (250). All PVC pipe shall be tested to four times the rated working pressure of the pipe and be approved by the National Sanitation Foundation. The pipe shall be furnished in standard laying lengths of 20 feet +1”.
2. All PVC pipe joints shall be of an integral bell and spigot of the same material as the pipe with a factory applied solid cross-section rubber "O" ring.

2.3 FITTINGS

A. All cast iron and ductile iron pipe fittings shall be in accordance with ANSI/AWWA Specification C110/A21.10.

B. Alternatively, fittings for underground piping only may conform to ANSI/AWWA Specification C153/A21.53 (compact fittings). All fittings, unless otherwise specified, shall have mechanical joints in accordance with ANSI/AWWA C111/A21.11. All fittings shall be lined with cement mortar not less than 1/16-inch thick in conformance with ANSI/AWWA Specification C104/A21.4 and have a minimum of 350 PSI working pressure unless otherwise specified. **All fittings shall use a restrainer gland capable of restraint around the outside diameter of the pipe.**

2.4 GATE VALVES

A. All gate valves shall be designed for a working pressure of **350 PSI** unless otherwise specified and shall have a clear waterway equal to the full nominal diameter of the pipe and shall be opened by turning counterclockwise. Each valve shall have the initials of the maker, pressure rating and year of manufacture cast on the body. Prior to shipment from the factory, each valve shall be tested by hydraulic pressure equal to twice the specified working pressure. Valves shall be operated by handwheel or operating nut as herein specified and shall have an arrow cast in the metal indicating the direction of opening. Valves to be installed underground shall be non-rising stem type with 2-inch square operating nut. Valves installed above ground or in buildings and structures shall have outside stem and yoke (OS&Y). **All gate valves shall be approved by the Owner.**

B. Gate valves 4" and larger shall be of the iron body, resilient seated type, meeting the requirements set forth in AWWA Specification C515. Where possible, all valves shall be from one manufacturer and parts interchangeable. All gate valves to be installed underground shall have mechanical joint ends while valves above ground shall have flanged ends, unless otherwise specified.

C. All gate valves 3" and smaller shall be of the iron body, resilient seat type with a minimum water pressure rating of 350 psig and shall meet the requirements set forth in AWWA Specification 509. Threaded valves shall have a union on one side.

2.5 VALVE BOXES

A. All valve boxes shall be cast iron and shall conform to ASTM Specification A 48. Valve boxes shall be of the adjustable screw type with a range of 24-inches to 36-inches and with a removable cover with the word "water" cast thereon. Precast concrete collar is to be placed around top of valve box.

2.6 TAPPING SLEEVE AND VALVE

A. Tapping Sleeves shall consist of a two-piece, ductile iron, wrap around design as provided by Mueller, Romac, Kennedy, or other approved. **Tapping sleeves shall be approved by the Owner.**

B. The sleeves shall have flanged outlets which will accommodate the tapping valves. Valves will be identical to gate valves elsewhere specified with the inlet and outlet ends adaptable to the tapping machine and to provide mechanical joint connections to discharge pipes.

2.7 FIRE HYDRANTS

A. Fire hydrants shall comply with all of the applicable requirements of the American Water Works Association Specification C-502 350 psi rated, latest revision, and with these specifications. Hydrants shall be of the traffic model type incorporating a break-away flange arrangement which will permit the upper section of the hydrant barrel to separate from the lower section upon impact. Each hydrant shall include an automatic system designed to lubricate the entire length of the threaded part of the valve stem each time the hydrant is operated. It shall be further equipped with "O" ring seals to insure that the threads on the valve stem do not come into contact with water at any time.

B. **Hydrants shall open counter-clockwise (left)** with compression base valves opening against pressure and be capable of withstanding **350 PSI working pressures and 700 PSI hydrostatic test pressures**, unless otherwise specified. The pentagonal operating nut shall be 1-1/2 inches from the point to the flat. Hydrants shall be equipped with one 4-1/2-inch pumper nozzle and two 2-1/2-inch hose nozzles, all with standard threads and chained nozzle caps. Unless otherwise indicated on the Contract Drawings, all hydrants shall have 6-inch mechanical joint bottom connections, 4-1/2-inch valve openings and a bury to the bottom of the ditch of 3 feet 6 inches. All hydrants shall be the manufacturer's standard red color. Fire hydrants shall be Mueller Super Centurion, AVK equal, Clow equal, or other approved equal. **Fire hydrants shall be similar to those currently used in the Owner's water system and shall be approved by the owner.**

2.8 WATER METERS

A. **Any new meters required shall be provided by the Owner, but installed by the Contractor. The Owner uses Kamstrup Model flow IQ 3101**

B. Water Meter Box

The boxes shall be white, corrugated HDPE pipe of one-piece molded construction, size as required based on meter size (18" minimum). The meter box shall have a minimum depth of 36 to 40 inches and shall have adequate space and depth for housing the meter-radio read assembly. The bottom of the meter box is to be flush with base of meter. Meter boxes shall be placed on brick supports and installed flush with the existing grade. The material of the meter box- lid combination shall allow automatic radio reading. **New meter boxes shall be similar to those in the Owner's water system and shall be approved by the Owner.**

C. Water Service Pipe and Fittings

Water service fittings and appurtenances shall be for **SDR 9 PEXa copper tubing size tubing**. The water service tubing shall be compatible with AWWA C800 fittings and shall meet or exceed the requirements of ASTM F876, ASTM F2023 for chlorine resistance, and AWWA C904 for service tubing. The water service tubing shall be crosslinked polyethylene pipe (PEXa). The water service fittings shall include ¾-inch couplings and fittings as necessary to provide service connections to the locations indicated on the plans. Appurtenances shall be by Mueller, A.Y. McDonald, Jones Corporation, or equal. For service connections smaller than 2-inch size, use a meter setter. Each meter setter shall have a stop valve on the supply side, dual check valves on the customer side, female iron pipe connections at each end, and a pack joint coupling on the supply end, and be of all copper and brass construction with a minimum height of 7 inches. The corporation stop shall be Mueller H-15013, A.Y. McDonald 4701 BT, Jones Corporation equal, or equal. The service saddle shall be double strap-type for use on ductile iron, capable of 200 PSI working pressure, and shall be Mueller BRB, A.Y. McDonald equal, or Jones Corporation equal. All components except meter shall be adequate for minimum 200 psi working pressure. **All water service fittings shall be approved by the Owner.**

D. Pressure Reducing Valves

Pressure reducing valves shall be capable of receiving inlet pressures of up to 300 psi and shall reduce the outlet pressure to 45 – 50 psi. Outlet pressure shall be adjustable. Valves shall be placed in boxes to allow access unless located inside buildings. **Valves shall be Watts Series 25 AUB, Wilkins Equal, Bermad equal, or other approved equal and shall be approved by the Owner.**

PART 3 - EXECUTION

3.1 HANDLING AND STORING MATERIALS

A. The Contractor shall unload pipe so as to avoid deformation of other injury thereto. Pipe shall not be rolled or dragged over gravel or rock during handling. When any joint or section of pipe is damaged during transporting, unloading, handling, or storing, the undamaged portions of the joint or section may be used where partial lengths are needed, or, if damaged sufficiently, the Engineer will reject the joint or section as being unfit for installation.

B. If any defective pipe is discovered after installation, it shall be removed and replaced with sound pipe or shall be repaired by the Contractor in an approved manner and at his own expense.

3.2 PREPARATION OF PIPE FOUNDATION

A. The pipe foundation shall be prepared to be uniformly firm and shall be true to the lines and grades as shown on the Contract Drawings. Any deviation or field adjustment will require the approval of the Engineer. The Contractor shall be responsible for the finished work conforming to proper line and grade.

A. The foundation shall be prepared to the depth at which the top of the pipe is 36-inches below natural ground or below the frost line, whichever is greater.

C. Whenever the nature of the ground will permit, the excavations at the bottom of the trench shall have the shape and dimensions of the outside lower third of the circumference of the pipe, care being taken to secure a firm bearing support uniformly throughout the length of the pipe. A space shall be excavated under and around each bell to sufficient depth to relieve it of any load and to allow ample space for filling and finishing the joint. The pipe, when thus bedded firmly, shall be on the exact grade. In case the bed shape in the bottom of the trench is too low, the pipe shall be completely removed from position, and earth of suitable quality shall be placed and thoroughly tamped to prepare a new foundation for the pipe. In no case shall the pipe be brought to grade by blocking up under the barrel or bell of the same, but a new and uniform support must be provided for the full length of the pipe. Where rock or boulders are encountered in the bottom of the trench, the same shall be removed to such depth that no part of the pipe, when laid to grade, will be closer to the rock or boulders than 6 inches. A suitable tamped and shaped foundation of approved material shall be placed to bring the bottom of the trench to proper subgrade over rock or boulders.

D. Where the foundation material is found to be of poor supporting value, the Engineer may make minor adjustment in the location of the pipe to provide a more suitable foundation. Where this is not practical, the foundation shall be conditioned by removing the existing foundation material by undercutting to the depth as directed by the Engineer and backfilling with foundation conditioning material consisting of crushed stone or gravel or a combination of sand and crushed stone or gravel approved by the Engineer as being suitable for

the purpose intended. The selection of the type of backfill material to be used for the foundation conditioning will be made by the Engineer.

E. The Contractor shall remove all water which may be encountered or which may accumulate in the trenches by pumping or bailing and no pipes shall be laid until the water has been removed from the trench. Water so removed from the trench must be disposed of in such a manner as not to cause injury to work completed or in progress.

3.3 LAYING PIPE

A. All piping is to be installed in strict accordance with the manufacturer's recommendations and the contract material specifications.

B. Proper tools, implements, and facilities satisfactory to the Engineer shall be provided and used for the safe and convenient prosecution of pipe laying. All pipe and other materials used in the laying of pipe will be lowered into the trench piece by piece by means of suitable equipment in such a manner to prevent damage to the pipe, materials, to the protective coating on the pipe materials, and to provide a safe working condition to all personnel in the trench. Each piece of pipe being lowered into the trench shall be clean, sound and free from defects. It shall be laid on the prepared foundation, as specified elsewhere to produce a straight line on a uniform grade, each pipe being laid so as to form a smooth and straight inside flow line. Pipe shall be removed at any time if broken, injured or displaced in the process of laying same, or of backfilling the trench.

C. When cutting short lengths of pipe, a pipe cutter as approved by the Engineer will be used and care will be taken to make the cut at right angles to the centerline of the pipe or on the exact skew as shown on the Contract Drawings. In the case of push-on pipe, the cut ends shall be tapered with a portable grinder or coarse file to match the manufactured taper.

D. All pipe shall be laid with the groove or bell end upgrade, and the spigot or tongue fully inserted. All pipe joints will be constructed in strict accordance with the pipe manufacturers specifications and materials and any deviation must have prior approval of the Engineer. In addition to the manufacturer's specifications, the following joint assembly procedures will be followed:

1. "Push-On"
    a. "Push-on" type joints, such as "Bell Tight", "Tite-One", or approved equal, shall be prepared by removing all dirt or foreign material from the bell end of the pipe and inserting the gasket. The spigot end of the pipe shall be prepared by cleaning and applying a thin coat of approved lubricant after which the spigot end is centered in the bell and pushed on. The procedure in making up this joint shall be performed in accordance with the recommendations of the manufacturer.

2. Mechanical Joint
    a. When "making up" mechanical joints, the spigot end of each pipe shall be entered into the adjoining shall be properly centered and have uniform space all around for reception of the packing material.
    b. The packing material, bolts, nuts, and other accessories used in making mechanical or sleeve type joints shall be obtained from the manufacturer of the pipe and joint.
    c. The surface of the spigot and bell are to be thoroughly cleaned just prior to assembling. The spigot end is to be cleaned just prior to slipping the gasket on the entering into the bell.
    d. When tightening bolts, it is essential that the glands be brought up toward the pipe flange evenly, maintaining approximately the same distance between the gland and the face of the flange at all

points around the socket. This is to be done by partially tightening the bottom bolt first, then the top bolt, next two bolts at either side, and last, the remaining bolts. Repeat this cycle until all bolts are within the range of the torques listed below:

Bolt Size (Inches)	Range of Torque (Ft./Lbs.)
5/8	40-60
3/4	60-90
1	70-100
1¼	90-120

e. If effect of sealing is not obtained at the maximum torques indicated above, the joint must be disassembled and reassembled.

E. Whenever shown on the Contract Drawings, the Contractor shall furnish and install all piping appurtenances, such as gate valves, special valves, valve boxes, Y's, tees, crosses, bends, sweeps, etc.

F. All plugs, caps, tees, bends, and other fittings shall be provided with adequate thrust blocks. Thrust blocks shall be constructed to the minimum dimensions shown on the Contract Drawings or as directed. Thrust Blocks shall be made of concrete having a compressive strength of 28 days of 3000 psi and shall bear directly against the undisturbed trench wall. Where possible, the backing shall be so placed that the fitting joints will be accessible for repair. All bolts and pipe joints shall be protected against contact with thrust block concrete by the installation of a polyethylene film placed between the fittings and the poured concrete. Where any section of a main is provided with concrete thrust blocks, the hydrostatic pressure test shall not be made until three days after installation of the concrete thrust blocks unless otherwise approved by the Engineer.

G. Concrete for thrust blocks shall consist of a mix of Portland Cement, Fine and Coarse aggregate and water to produce concrete with a minimum compressive strength at 28 days of not less than 3000 psi when tested in accordance with ASTM Specification C 39 or C 42. Sakrete or any similar material will not be permitted under any circumstances.

H. Where trench conditions are, in the opinion of the Engineer, unsuitable for thrust blocks, the Contractor shall provide steel tie rods to adequately anchor the piping. In addition, all fittings, hydrants, valves, etc., located within ten feet of another fitting, hydrant, valve, etc., shall be joined using steel tie rods and eye bolts. All tie rods shall be given a bituminous protective coating or shall be galvanized.

I. Concrete for thrust blocks, polyethylene, tie rods, etc., are considered incidental to pipe line construction and are to be included in the linear foot unit cost of the pipe. No additional payment will be made.

3.4 MAXIMUM PERMISSIBLE DEFLECTIONS

A. Maximum permissible deflections per joint per 18-feet length of mechanical joint pipe is as follows:

2”	31 inches
3”	31 inches
4"	31 inches
6"	27 inches
8"	20 inches
10"	20 inches
12"	20 inches
14"	13.5 inches

16"	13.5 inches
18"	11 inches
20"	11 inches
24"	9 inches

B. Deflection for lengths lesser or greater then the above are proportionate.

C. The maximum deflection permitted for "push-on" type joints are as follows, based upon 18-feet length:

4" through 12"	19 inches
14" through 16"	15 inches
18" through 24"	11 inches

C. The maximum deflection per joint of flexible joint pipe shall be that deflection recommended by the manufacturer.

3.5 BACKFILLING

A. The initial backfill shall be carefully placed to a level 12 inches over the top of the pipe. This backfill shall be excavated soil free from debris, organic material and large rock and stones.

B. Initial backfill is to be deposited uniformly on both sides of the pipe so as to insure adequate stability of the installed pipe. Initial backfill shall be compacted so that the material fills and supports the haunch area and encases the pipe to the limits shown on the trench cross sections on the Contract Drawings.

C. The initial backfill shall be placed in layers not to exceed 6 inches loose and compacted to 95% of the maximum dry density as determined by the Standard Proctor test. From the bottom of the trench to the centerline of the pipe the backfill material shall be compacted by approved hand tamps. From the centerline of the pipe to the top of the initial backfill, other mechanical tamps as approved by the Engineer may be used.

D. Final backfill for pipelines shall be defined as that portion of the trench from an imaginary line drawn 12 inches above the top of the pipe to the original ground surface. Final backfill will be done with suitable excavated material. Debris, material not given to adequate compaction, and stone over one cubic foot will not be allowed within the trench limits. If material excavated is not suitable for backfilling, the Contractor shall, at no increased cost to the Owner, remove and dispose of such unsatisfactory material and shall backfill the trench with suitable material obtained elsewhere.

E. Where pipelines installed within the ditch to ditch limits of any roadway, driveway or parking area etc., final backfill shall be compacted to a minimum dry density of 95 percent of the maximum dry density in pounds per cubic foot as determined by the Standard Proctor Compaction Test.

F. Backfill material shall be placed in 6 inch layers and thoroughly tamped or rolled to the required degree of compaction by sheepsfoot or pneumatic rollers, mechanical tampers, vibrators, etc. Successive layers shall not be placed until the layer under construction has been thoroughly compacted.

G. In areas outside the ditch to ditch limits of a roadway, driveway, parking areas, etc., backfill shall be compacted in a satisfactory method. Any settlement shall be immediately corrected.

H. Heavy equipment shall not be operated over any pipe until it has been properly backfilled and has a minimum cover of 24 inches. Where any part of the required cover is above the proposed finish grade, the

Contractor shall place, maintain, and finally remove such material at no cost to the Owner. Pipe which becomes misaligned, shows excessive settlement, or has been otherwise damaged by the Contractor's operations shall be removed and replaced by the Contractor at no cost to the Owner.

I. The Contractor shall maintain all pipes installed in a condition that they will function continuously from the time the pipe is installed until the project is accepted.

3.6 GATE VALVE INSTALLATION

Before setting each valve, the Contractor shall make sure the interior is clean and test opening and closing. Valves shall be set with stems plumb, unless horizontal installation is called for on the plans, and at the exact locations shown. Trench backfill shall be tamped thoroughly for a distance of three feet on each side of valve boxes.

3.7 GATE VALVE BOX INSTALLATION

A valve box shall be installed over each underground valve. All boxes shall be set plumb with their top flush with finished grade.

3.8 FIRE HYDRANT INSTALLATION

Fire hydrants shall be located as shown. Each hydrant shall be connected to the main with a 6-inch branch line having at least as much cover as the distribution main. Hydrants shall be set plumb with the pumper nozzle facing the roadway and with the center of the lowest outlet not less than 18-inches above the finished grade. Hydrants shall be thoroughly blocked with concrete and shall be rodded to the 6-inch branch tee. Unless otherwise specified, the backfill around hydrants shall be thoroughly compacted to the final grade immediately after installation in order to put the hydrant into service as soon as practicable. Not less than seven cubic feet of clean crushed stone shall be placed around the base of the hydrant to insure drainage of the hydrant barrel. A cap block shall be set under the fire hydrant foot for a solid bottom. **The gate valve for the fire hydrant shall be installed outside of the road travel surface and shall be rodded back to the fire hydrant tee. The valve shall not be installed in the ditchline.**

3.9 AIR RELEASE VALVE

Each air release valve shall be installed at the exact location shown in a precast concrete manhole as shown in detail on the plans. Manhole sections shall be set plumb and on a firm foundation. Each joint between sections and all wall be set plumb and on a firm foundation. Each joint between sections and all wall openings shall be sealed inside and out with a 2:1 sand-cement mortar and made watertight. When so directed, the Contractor shall install a flat slab top, precast with a standard frame and cover. Flat slab tops shall be traffic bearing.

3.10 WARNING TAPE AND TRACER WIRE INSTALLATION

The Contractor shall install a metallic warning tape a minimum of 12” directly above all pipe installed under this Contract. Tape shall be at least 3” wide and shall be conspicuously marked with the words “Caution Buried Waterline” or similar wording.

In addition, all PVC pipe shall have 14-gauge copper wire connected to the outside and extended continually from one gate valve box to the next (including fire hydrant valves). Wire shall be inserted between the lower and upper pieces of valve boxes such that the wire is kept away from the valve operating nut and is easily reached from the surface.

3.11 SERVICE CONNECTION INSTALLATION

A. All service lines, fittings, and connections shall be installed as described on the Contract Drawings and herein. All service lines shall be installed at a minimum depth of 36" and trenching and backfilling shall be in accordance with this section.

3.12 TESTING

A. After the pipeline has been satisfactorily constructed complete with the required fire hydrants, services, and all other appurtenances, and the trench sufficiently backfilled, the newly constructed pipeline and valve sections shall be subjected to a hydrostatic pressure leakage test, in accordance with AWWA C-600 for ductile iron pipe and in accordance with AWWA C-605 for PVC pipe.

B. Each completed section of the pipeline shall be plugged at both ends and slowly filled with water. As the main is being filled with water in preparation for the test, all air shall be expelled from the pipe. The main shall be subjected to hydrostatic pressure not less than 1.25 times the maximum sustained working pressure of the pipeline measured at the highest elevation along the test section and not less than 1.5 times the working pressure at the lowest elevation of the test section for a period of two hours unless otherwise specified. Pressure shall be applied to the main by means of a hand pump for small lines or by use of a gasoline pump or fire engine for larger lines. In no case shall the test pressure exceed the rated working pressure for any component used in the waterline.

C. The rate of leakage shall be determined at 15-minute intervals by means of volumetric measurement of the water added during the test until the rate has stabilized at the constant value for three consecutive 15 minute periods.

D. Leakage is defined as the quantity of water to be supplied into the newly laid pipe, or any valved section thereof, necessary to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled. No piping installation will be accepted until the leakage is less than 10 gallons per inch of pipe diameter per mile of pipe per 24 hours.

E. Cracked or defective pipe, joints, fittings, valves, or hydrants discovered in consequence of this test shall be removed and replaced with sound materials, and the test shall be removed and replaced with sound materials, and the test shall be repeated until the test results are satisfactory. Precautions shall be taken to remove or otherwise protect equipment in, or attached to, pipe to prevent damage or injury thereto.

F. Tests of insulated and concealed piping shall be made before the piping is covered or concealed. No leakage will be allowed under the above tests for piping in buildings.

G. The Contractor shall notify the Engineer when the work is ready for testing with all testing done in the presence of the Engineer. All labor, equipment, water and materials, including meters and gauges shall be furnished by the Contractor at his own expense.

3.13 STERILIZATION

A. After the pressure-leakage test is completed and before the use of water is permitted from any portion of newly constructed waterline which will hold or carry potable water, it shall be chlorinated and flushed clean in the presence of and directed by the Engineer. The Contractor shall chlorinate the new water mains by the use of liquid chlorine gas-water mixture or hypochlorite solution. The choice of chlorinating agent shall be

at the Contractor's discretion provided the method of sanitizing the new water lines is in accordance with AWWA C-651.

B. Pipelines may, at the option of the Contractor, be chlorinated in sections isolated by means of gate valves or other approved means.

C. Each unit of the completed water line shall be sterilized as specified below or as prescribed by AWWA Standard C 651. The unit to be sterilized shall be thoroughly flushed with water until all entrained dirt and mud have been removed before introducing the chlorinating material. The chlorinating material shall provide a chlorine dosage of not less than 100 parts per million and shall be introduced into the waterline in an approved manner. The retention time shall be at least 24 hours and shall produce not less than 10 PPM of chlorine at the extreme end of the line at the end of the retention period. All valves on the lines being sterilized shall be opened and closed several times during the contact period.

D. Following chlorination, all treated water shall be thoroughly flushed from the pipe until the replacement water shall, upon test, both chemically and bacteriologically, be proven equal to the water quality served to the public from the existing water supply system. The Contractor shall responsibly discharge chlorinated water after disinfection period. These bacteriological tests shall be performed by a testing laboratory approved to do so by the State of North Carolina, as per Rule .1001(b).

E. During the flushing period, each fire hydrant on the line shall be opened and closed several times. The Contractor will take samples of water in properly sterilized containers for bacterial examination. The sterilizing shall be repeated until tests indicate the absence of pollution for at least two full days. The unit will not be accepted until satisfactory bacteriological results have been obtained. The samples shall not be taken from a fire hydrant.

F. Final connections to existing mains shall be made where indicated on the Contract Drawings or as directed after satisfactory samples have been obtained.

END OF SECTION 33 11 00

SECTION 33 31 00
SANITARY UTILITY SEWERAGE PIPING

PART 1 – GENERAL

1.01 SUMMARY

This section applies to the materials to be furnished and installed to complete the gravity sanitary sewer line installations in accordance with the Drawings. All pipe and appurtenances shall be of the class and type as indicated on the Drawings and designated herein.

1.02 REFERENCES

AASHTO M-43	Standard Specification for Sizes of Aggregate for Road and Bridge Construction
AASHTO M198b	Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants (superseded by ASTM C990)
ANSI A 21.11	Rubber Gasket Joints Cast & Ductile Iron Press Pipe (x-ref AWWA C111)
ANSI A 21.4	Cement-Mortar Lining/Cast & Ductile Iron Pipe & Ftg (x-ref AWWA C104)
ANSI A 21.51	Ductile-Iron Pipe Centrifugal Cast, In Metal Molds (x ref AWWA C151)
ASTM A48	Standard Specification for Gray Iron Castings
ASTM A53	Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A139	Standard Specification for Electric-Fusion (Arc)-Welded Steel Pipe (NPS 4 and Over)
ASTM C39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C42	Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM C62	Standard Specification for Building Brick (Solid Masonry Units Made From Clay or Shale)
ASTM C478	Standard Specification for Circular Precast Reinforced Concrete Manhole Sections
ASTM C828	Standard Test Method for Low-Pressure Air Test of Vitrified Clay Pipe Lines
ASTM C923	Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals
ASTM C924	Standard Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method
ASTM C929	Standard Practice for Handling, Transporting, Shipping, Storage, Receiving, and Application of Thermal Insulation Materials For Use in Contact with Austenitic Stainless Steel
ASTM C969	Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines
ASTM D488	Specification for Crushed Stone, Crushed Slag and Gravel for Waterbound Base and Surface Courses of Pavements (superseded by ASTM D694)

ASTM D1784	Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D1785	Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
ASTM D2122	Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings
ASTM D2321	Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
ASTM D2466	Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
ASTM D2680	Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Composite Sewer Piping
ASTM D3034	Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D3212	Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals

1.03 SUBMITTALS

A. General – Submit listed submittals in accordance with the General Conditions.

B. Action Submittals:
Product Data: Submit manufacturer's complete product literature for specified pipe, fittings, and accessories, including:
1. Physical properties and dimensions demonstrating compliance with the Specifications and suitability for the intended use.
2. Manufacturer's storage, handling, and installation requirements and recommendations.
3. Project-specific information.
4. Any clarifications or exceptions.

C. Closeout Submittals:
1. Manufacturer's standard warranty, and any project-specific warranty, if elsewhere required. Warranties that extend beyond the Contractor's correction period shall be project-specific documents executed by the manufacturer and shall clearly indicate beginning and ending dates of the warranty period.

1.04 DELIVERY STORAGE, HANDLING

The Contractor shall unload pipe so as to avoid deformation or other injury thereto. Pipe shall not be rolled or dragged over gravel or rock during handling. When any joint or section of pipe is damaged during transporting, unloading, handling, or storing, the undamaged portions of the joint or section may be used where partial lengths are needed, or, if damaged sufficiently, the Engineer will reject the joint or section as being unfit for installation.

If any defective pipe is discovered after installation, it shall be removed and replaced with sound pipe or shall be repaired by the Contractor in an approved manner and at his own expense.

The Contractor shall store all pipe in an approved manner. The pipe interior, sealing surfaces, fittings, and other accessories shall be kept clean. Pipe bundles shall be stored on flat surfaces with uniform support. Stored pipe shall be protected from prolonged exposure to sunlight with a canvas or other opaque covering. Air circulation shall be provided under any covering. Gaskets shall not be exposed to oil, grease, ozone, excessive heat, or direct sunlight. The pipe manufacturer for each type of pipe shall be consulted for specific storage and handling recommendations.

PART 2 – PRODUCTS

2.01 GENERAL

A. All materials shall be first quality with smooth interior and exterior surfaces, free from cracks, blisters, honeycombs and other imperfections, and true to theoretical shapes and forms throughout. All materials shall be subject to the inspection of the Engineer at the plant, trench, or other point of delivery, for the purpose of culling and rejecting material, which does not conform to the requirements of these specifications. Such material shall be marked by the Engineer and the Contractor shall remove it from the project site upon notice being received of its rejection.

2.02 PIPE AND FITTINGS

A. Polyvinyl Chloride Pipe

Polyvinyl Chloride Pipe (PVC) pipe shall meet the requirement of ASTM D 3034, latest edition, and be suitable for use as a gravity sewer conduit. The standard dimension ratio (SDR) shall be 26 unless otherwise specified. PVC compounds shall meet the requirements of ASTM D-1784, cell classification 12454-B. The pipe shall be supplied in standard laying lengths of 20 feet and 12.5 feet.

All PVC pipe joints shall be of an integral bell and spigot of the same material as the pipe with a solid cross-section rubber "O" ring securely locked in place at the point of manufacture. Service saddles and other fittings shall be supplied by the pipe manufacturer and shall be of the same material and type of construction as the pipe material.

B. Ductile Iron Pipe

Ductile Iron Pipe shall be manufactured in accordance with ANSI Specification A 21.51. All ductile iron pipe shall be Class 200 or higher unless otherwise specified and shall be lined with cement mortar not less than 1/16"-inch thick conforming to ANSI Specification A 21.4.

1. Slip or "push-on" joints shall be manufactured in accordance with ANSI Specification A 21.11. Bells of "slip" joint pipe shall be contoured to receive a bulbshaped, circular rubber gasket, and plain ends shall have a slight taper to facilitate installation. The lubricant used in making up the joints shall be furnished by the pipe manufacturer. The jointing shall be done by guiding the plain end into the bell until contact is made with the gasket and by exerting a sufficient compressive force to drive the joint home until plain end makes full contact with the base of the bell. Where Restrained Joint DI Pipe is noted on the Drawings, use slip joint pipe with specially designed gaskets that include stainless steel teeth that automatically provide restraint upon installation, such as US Pipe Field Lok 350, American Fast-Grip Gasket, McWane Sure Stop 350, or equal. Contractor shall ensure compatibility of pipe and gasket if not manufactured by the same company.

2. Flanged Joints: Flanged pipe shall have flanges with long hubs, shop fitted on the threaded end of the pipe. Pipe and flanges shall conform to ANSI/AWWA Specification C115/A21.15.
   Ductile iron flanged joint pipe shall be thickness Class 53 minimum and shall have ductile iron flanges conforming to ANSI B 16.1, 125 pound template. Pipe shall be ordered in lengths needed as no pipe shall be cut, threaded or flanged in the field.

Gaskets for flanged joints shall be the ring type of cloth inserted rubber or rubber with a minimum thickness of 1/8-inch. Dimensions shall conform to those in Table A.1 of AWWA C115, Appendix A.

All piping, fittings, and appurtenances installed above ground and/or in structures shall have flanged joints.

In general, flanged joints shall be made up with through bolts of the required type and size in accordance with Section A.1 of Appendix A of AWWA C115.

C. Steel Sanitary Sewer Pipe

Steel sanitary sewer pipe, if shown on the Drawings, shall conform to ASTM A-53 or ASTM A-139 Grade B standard specifications. Steel sewer pipe shall have a minimum yield strength of 35,000 psi and a minimum yield strength of 60,000 psi with a wall thickness of .375 inches.

External and internal surfaces shall have protective coatings. Coating shall consist of a coal-tar primer followed by hot coal-tar enamel at least 1/16-inch thick, or approved equal.

D. Service Lateral Pipe and Fittings

All 4" and 6" sewer service lateral pipe, shall be ductile iron or PVC Schedule 40 conforming to ASTM D1785 as shown on the Drawings. Fittings (except for tee or saddle at connection to main) shall be PVC Schedule 40 conforming to ASTM D2466, or cast iron if connection to ductile iron pipe.

1. Pipe Joints: Pipe joints will be supplied with elastomeric (gasketed) seals that conform to ASTM D2680, latest edition, and when assembled, the joints shall conform to the requirements of ASTM D3212, latest revision.
2. Fittings: All fittings shall conform to the requirements of ASTM D2680, latest edition. Service connections and other fittings shall be supplied by the pipe manufacturer as required on the Drawings and specifications.

2.03 MANHOLES

A. Precast Sections

Precast concrete manhole bases, risers and cones shall conform to ASTM C-478, latest revision for precast reinforced concrete manhole sections. Tapered sections and transition sections, where required, shall be of eccentric cone design, having the same wall thickness and reinforcement as the cylindrical ring sections. Flat slab tops shall be required for very shallow manholes and where shown or specified. Cast iron manhole covers and assemblies shall be cast into slab tops for access into manholes.

Minimum compressive strength of concrete shall be 4,000 psi and the maximum permissible absorption shall be 6.5 percent. Risers shall be reinforced with a single cage of steel placed within the center third of the wall. The tongue or the groove of the joint shall contain one lien of circumferential reinforcement equal in area to that on the barrel of the manhole riser. The minimum cross-sectional area of steel per linear foot shall be 0.12 square inches for larger sizes. Precast manhole sections shall fit together readily and shall have butyl rubber mastic sealant of sufficient size to completely fill all voids within the joints. Sealant shall conform to AASHTO M-198B.

The quality of materials, the process of manufacture, and the finished manhole sections shall be subject to inspection and approval by the Engineer and his inspector. The manhole sections shall be perpendicular to their longitudinal axis within the limits listed in ASTM C-478.

B. Frames and Covers

Castings for manhole frames and covers shall be tough, even grained, soft gray iron, free from burnt on sand and other injurious defects and conform to the requirements of ASTM-A-48, the latest revision, Class 30. The minimum weight of the manhole frame and cover shall be 310 pounds.

Where indicated on the Drawings, watertight manhole frames and covers shall be furnished and installed. Watertight manhole frames and covers shall be designed to create a watertight seal where the cover sits on the frame, using EDPM or neoprene gasket and camlocks. The gasket shall be fitted into a groove or dovetail in the cover such that it does not fall out or get misaligned when removing the cover. Cover shall have at least two hex-head camlocking bolts that secure cover to frame with quarter-turn action. Covers shall have no vent holes. Frame, cover, gasket, and camlocks assembly shall be as manufactured by US Foundry, EJ Iron Works, Neenah Foundry, or equal.

C. Resilient Connectors

A flexible pipe to manhole connector shall be employed in the connection of sanitary sewer pipe to precast manholes. All resilient connectors shall be in conformance with ASTM C-923—Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes.

The connector shall be designed such that positive seal is accomplished between the connector and the manhole wall and between the connector and the pipe. Stainless steel straps shall be used at each pipe to connector joint.

D. Brick

Brick for manholes and other structures shall conform to applicable requirements of ASTM Specifications C-62, latest revision, Grade SW.

E. Class B Concrete

Concrete for sewer structures shall consist of a mix of Portland cement, fine and coarse aggregate and water to produce concrete with a minimum compressive strength at 28 days of not less than 3,000 psi when tested according to ASTM Designation C-39 to C-42.

Air content (by volume) of the mix shall be between 4 and 8 percent when placed. The concrete shall be such as to allow it to be worked into place without segregation or excessive laitance. Slump shall be no more than 4 inches.

F. Mortar

Mortar for masonry in sewer structures shall be 1:2 cement sand mix, except that hydrated lime may be substituted for not more than 10% by weight of the cement.

PART 3 - EXECUTION

3.01 PREPARATION OF PIPE FOUNDATION

A. The pipe foundation shall be prepared to be uniformly firm and shape be true to the lines and grades as shown on the Drawings. Any deviation or field adjustment will require the approval of the Engineer. The Contractor shall be responsible for the finished work conforming to proper line and grade.

The sides of trenches shall be kept as nearly vertical as possible.

B. Whenever the nature of the ground will permit, the excavations at the bottom of the trench shall have the shape and dimensions of the outside lower third of the circumference of the pipe, care being taken to secure a firm bearing support uniformly throughout the length of the pipe. A space shall be excavated under and around each bell to sufficient depth to relieve it of any load and to allow ample space for filling and finishing the joint. The pipe, when thus bedded firmly, shall be on the exact grade. In case the bed shape in the bottom of the trench is too low, the pipe shall be completely removed from position, and earth of suitable quality shall be placed and thoroughly tamped to prepare a new foundation for the pipe. In no case shall the pipe be brought to grade by blocking up under the barrel or bell of the same, but a new and uniform support must be provided for the full length of the pipe. Where rock or boulders are encountered in the bottom of the trench, the same shall be removed to such depth that no part of the pipe, when laid to grade, will be closer to the rock or boulders than 6 inches. A suitable tamped and shaped foundation of approved material shall be placed to bring the bottom of the trench to proper subgrade over rock or boulders.

C. The preparation of pipe bedding shall be in accordance with the typical trench cross sections as shown on the Drawings for the type of pipe being installed. Crushed stone used for pipe bedding shall be placed so that the material fills and supports the haunch area and encases the pipe to the limits shown on the trench cross sections.

D. When the foundation material is found to be of poor supporting value, the Engineer may make minor adjustment in the location of the pipe to provide a more suitable foundation. Where this is not practical, the foundation shall be conditioned by removing the existing foundation material by undercutting to the depth as directed by the Engineer and backfilling with foundation conditioning material consisting of crushed stone.

E. Crushed stone for pipe bedding and for foundation conditioning is to be size #67 in ASTM designation D 488, "Standard Sizes of Coarse Aggregate for Highway Construction" (AASHTO M-43, size #67).

F. The Contractor shall remove all water, which may be encountered, or which may accumulate in the trenches by pumping or building and no pipes shall be laid until the water has been removed from the trench. Water so removed from the trench must be disposed of in such a manner as not to cause injury to work completed or in progress, and shall be disposed of in accordance with the North Carolina Sedimentation Pollution Control Act.

3.02 LAYING PIPE

A. All piping is to be installed in strict accordance with the manufacturer's recommendations and the contract material specifications.

B. Each piece of pipe being lowered into the trench shall be clean, sound and free from defects. It shall be laid on the prepared foundation, as specified elsewhere to produce a straight line on a uniform grade, each pipe being laid so as to form a smooth and straight inside flow line. Pipe shall be removed at any time if broken, injured or displaced in the process of laying same, or of backfilling the trench. When cutting short lengths of pipe, a pipe cutter as approved by the Engineer will be used and care will be taken to make the cut at right angles to the centerline of the pipe or on the exact skew as shown on the Drawings. In the case of push-on pipe, the cut ends shall be tapered with a portable grinder or coarse file to match the manufactured taper.

C. All pipe shall be laid with the groove or bell end upgrade, and the spigot or tongue fully inserted. All pipe joints will be constructed in strict accordance with the pipe manufacturer's specifications and materials and any deviation must have prior approval of the Engineer. If any pipe deflection is permitted by the Engineer, then the maximum deflection per joint of pipe shall be that deflection recommended by the manufacturer. A stopper or plug shall be installed in the pipe mouth when pipe laying is not in progress.

3.03 BACKFILLING

A. The initial backfill for class B, C, and D bedding shall be carefully placed to a level 12 inches over the top of the pipe. This backfill shall be excavated soil free from debris, organic material and rock and stones greater than 2" in any dimension. Initial backfill is to be deposited uniformly on both sides of the pipe so as to insure adequate stability of the installed pipe. Initial backfill shall be placed so that the material fills and supports the haunch area and encases the pipe to the limits shown on the trench cross sections on the Drawings.

B. Final backfill for pipelines shall be defined as that portion of the trench from an imaginary line drawn 12 inches above the top of the pipe to the original ground surface. Final backfill will be done with suitable excavated material. Debris, material not given to adequate compaction, and stone over one cubic foot will not be allowed within the trench limits. If material excavated is not suitable for backfilling, the Contractor shall, at no increased cost to the Owner, remove and dispose of such unsatisfactory material and shall backfill the trench with suitable material obtained elsewhere.

C. Where pipelines are installed within the ditch to ditch limits of any roadway, driveway or parking area etc., backfill shall be compacted to a minimum dry density of 95 percent of the maximum dry density in pounds per cubic foot as determined by the Standard Proctor Compaction Test. Backfill material shall be thoroughly tamped or rolled to the required degree of compaction by sheepsfoot or pneumatic rollers, mechanical tampers, vibrators, etc. Successive layers shall not be placed until the layer under construction has been thoroughly compacted.

D. In areas outside the ditch to ditch limits of a roadway, driveway, parking areas, etc., backfill shall be compacted to 80% of the maximum dry density as determined by the Standard Proctor Test. Any settlement shall be immediately corrected.

E. If determined necessary by the Engineer, or if indicated on the Drawings, compaction testing will be required to verify satisfactory compaction. Any backfill which does not have satisfactory density shall be handled and replaced with backfill compacted to the required density.

F. Heavy equipment shall not be operated over any pipe until it has been properly backfilled and has a minimum cover of 24 inches. Where any part of the required cover is above the proposed finish grade, the Contractor shall place, maintain, and finally remove such material at no cost to the Owner. Pipe which becomes misaligned, shows excessive settlement, or has been otherwise damaged by the Contractor's operations shall be removed and replaced by the Contractor at no cost to the Owner.

G. The Contractor shall maintain all pipes installed in a condition that they will function continuously from the time the pipe is installed until the project is accepted.

3.04 MANHOLE INSTALLATION

A. A precast concrete manhole shall be installed at each break in line or grade in each sanitary sewer as shown in detail on the Drawings. Manhole sections shall be set plumb and on a firm foundation. Each joint between sections and all wall openings shall be sealed with 2:1 sand-cement mortar mix and made watertight. An eccentric cone section and standard frame and cover is to be installed on each new manhole. Final adjustment to grade of all manholes shall be done with brick and mortar or precast rings and each frame and cover shall be grouted firmly into place.

B. Manhole inverts shall be constructed of concrete or concrete and brick of semicircular section conforming to the inside diameter of the outlet sewer. Changes in size of pipe or grade shall be made gradually and changes in direction constructed by using true curves. Each manhole shall be provided with such channels for all connecting sewer mains. Each side of manhole channels shall be provided with a bench sloping not less than one inch per foot. The invert elevation of all service connections and drop manhole pipes shall be above the bench surface elevation.

3.05 SERVICE LATERAL INSTALLATION

A Four and six-inch service laterals shall be extended from the sewer main to the building connection, as shown on the Drawings or as directed by the Engineer. Trenching and backfilling shall be in accordance with this Section and the minimum depth of cover over laterals shall be 24 inches.

All laterals shall be connected to the sewer main as shown on the Drawings.

3.06 INFILTRATION AND EXFILTRATION TESTING

A. All sanitary sewers shall be flushed with water in sufficient volume to obtain free, clear and unobstructed flow through each line. All obstructions shall be removed and all defects corrected.

B. When the sewers are completed, they shall be inspected by the Engineer for conformance with the provisions of the Drawings and specifications, particularly line and grade, and tested to determine the amount of ground water infiltration into the sewer. All visible and audible leaks will be stopped and the remaining infiltration will be measured using a V-notch weir and/or other devices, which shall be furnished by the Contractor. The Contractor shall also furnish all required assistance for measuring the infiltration.

C. If infiltration into the whole system or any segment thereof exceeds 100 gallons per 24 hours per inch of diameter per mile of sewer, necessary corrective measures shall be taken by the Contractor to limit the infiltration to the maximum specified above. The Engineer shall decide the number and length of segments of sewer line on which the testing shall be performed.

D. Each section of PVC, steel and ductile iron pipe line between manholes shall be tested with a low pressure air test in accordance with ASTM C-828, or an exfiltration test in accordance with ASTM C-969. Testing according to ASTM C-828 shall use a test pressure of 3.5 psig with a maximum drop to 2.5 psig in the time specified, based on pipe diameter and length, as shown in the table in this section.

E. Each section of reinforced concrete pipe shall be tested with either a low pressure air test in accordance with ASTM C-924 or an exfiltration test in accordance with ASTM C-969.

F. Should any test of any section of pipe line disclose an air loss or exfiltration greater than permitted, the Contractor shall at his own expense locate and repair the defective joints or pipe sections. After the repairs are completed, the line shall be retested until the pipe line holds the pressure within the allowable pressure drop or exfiltration limit. The Contractor shall furnish all devices and assistance necessary to conduct low pressure air tests and exfiltration tests.

G. Manholes which are to be tested for exfiltration shall be determined by the Engineer. Those manholes which are to be tested shall have inlet and outlet pipes plugged to withstand the test pressure. The manhole is to then be slowly filled with water by the Contractor. After absorption, into the manhole walls has stabilized, the water is filled to the test level. After a 15 minute test period, the drop in a water elevation is measured and the loss of water calculated, or the water level restored to the initial test level and the amount added used to determine the leakage rate. If the exfiltration exceeds 0.1 gallon per hour per foot of diameter per foot of head, necessary corrective measures shall be taken by the Contractor to limit the exfiltration to the maximum specified. The Contractor shall furnish all devices and assistance to conduct this exfiltration test.

H. The Engineer may elect to perform only visual inspection of manholes in lieu of hydrostatic testing. In this case, all manholes must be free of any appearance of infiltration or damage before being accepted. Also, each manhole must be clean and free of any debris.

3.07 DEFLECTION TESTING

A. Deflection tests shall be performed on all pipe installations. The testing shall be conducted after the final backfill has been in place at least 30 days, or as an alternative, the test may begin as soon as the backfill is certified by a soil testing firm to be compacted to at least 95% of maximum density.

B. All pipe shall pass a go-no go mandrel sized to 95% of the pipe diameter (as determined by ASTM D2122) with the pipe in place and properly backfilled. All pipe which will not pass the mandrel shall be re-installed or replaced by the Contractor at no additional cost. The allowable deflection (not to exceed 5%) shall be calculated using the pipe stiffness formula in ASTM D2321.

C. The Contractor shall supply the appropriate size mandrel for each size line being tested. The Contractor is also to supply all necessary pull ropes and assistance for passing the mandrel through the pipe. Mechanical pulling devices will not be permitted.

AIR TEST TABLE
Based on Formulas from ASTM C 828

Specification Time (min:sec) required for Pressure Drop
From 3-1/2 to 2-1/2 PSIG
When Testing One Pipe Diameter Only

Pipe Diameter (Inches)		8	12	15	18	21
Line Length (Feet)	25	0:18	0:40	1:02	1:29	2:01
	50	0:35	1:19	2:04	2:58	4:03
	75	0:53	1:59	3:06	4:27	6:04
	100	1:10	2:38	4:08	5:56	8:05
	125	1:28	3:18	5:09	7:26	9:55
	150	1:46	3:58	6:11	8:30	
	175	2:03	4:37	7:05		
	200	2:21	5:17			
	225	2:38	5:40			10:25
	250	2:56			8:31	11:35
	275	3:14			9:21	12:44
	300	3:31			10:12	13:53
	350	3:47		8:16	11:54	16:12
	400		6:03	9:27	13:36	18:31
	450		6:48	10:38	15:19	20:50
	500		7:34	11:49	17:01	23:09
	550		8:19	13:00	18:43	25:28
	600	4:02	9:04	14:11	20:25	27:47
	650	4:22	9:50	15:21	22:07	30:06

3.08 MEASUREMENT – PAYMENT

Measurement of pipelines shall be the actual number of lineal feet of pipe installed, complete in place and accepted. Measurement at manholes shall be to the inside face of wall.

Pipelines shall be paid for at the unit price for each pipe size and depth of cut below the original ground over the pipe invert as shown on the plans and itemized in the Bid Schedule. The unit contract price for pipelines is to include stone bedding for the type of pipe material being bid.

Each manhole 0'-6'0" deep measured vertically from the invert of the outlet pipe to the top of the manhole ring and cover casting will be paid for at the contract price per manhole.

Any manhole depth in excess of 6'0", measured vertically from the invert of the outlet pipe to the top of the manhole ring and cover casting will be paid for at the contract unit price for additional manhole depth. Payment will be made for the additional vertical feet of manhole installed above 6'0", measured to the nearest tenth of a foot.

END OF SECTION

SECTION 33 40 06
STORM DRAINAGE PIPE AND STRUCTURES

PART 1 – GENERAL

1.01 SUMMARY

This section includes the materials to be furnished and installed to complete the storm drainage installations in accordance with the Drawings. All pipe and appurtenances shall be of the class and type as indicated on the Drawings and designated herein.

1.02 REFERENCES

ASTM C-76	Reinforced Concrete Culvert, Storm Drain and Sewer Pipe
ASTM D-1248	Polyethylene Plastics Extrusion Materials for Wire and Cable
ASTM D2321	Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
ASTM D-3350	Standard Specification for Polyethylene Plastics Pipe and Fittings Materials
ASTM F2306	Standard Specification for 12 to 60 in. Annular Corrugated Profile-Wall Polyethylene (PE) Pipe and Fittings for Gravity-Flow Storm Sewer and Subsurface Drainage Applications
AASHTO M-36	Corrugated Metal Culvert Pipe
AASHTO M252	Standard Specification for Corrugated Polyethylene Drainage Pipe
AASHTO M294	Standard Specification for Corrugated Polyethylene Drainage Pipe 3 (12 to 60 inch Diameter)
NCDOT	North Carolina Department of Transportation, 2018 Standard Specifications, Special Provisions, Pay Items, and Other Resources and 2018 Roadway Standard Drawings, Details, and Other Resources (https://connect.ncdot.gov/resources/Specifications/Pages/default.aspx)

1.03 SUBMITTALS

A. General – Submit listed submittals in accordance with the General Conditions.

B. Action Submittals:
Product Data: Submit manufacturer's complete product literature for specified pipe, fittings, and accessories, including:
1. Physical properties and dimensions demonstrating compliance with the Specifications and suitability for the intended use.
2. Manufacturer's storage, handling, and installation requirements and recommendations.
3. Project-specific information.
4. Any clarifications or exceptions.

C. Closeout Submittals:
1. Manufacturer's standard warranty, and any project-specific warranty, if elsewhere required. Warranties that extend beyond the Contractor's correction period shall be project-specific documents executed by the manufacturer and shall clearly indicate beginning and ending dates of the warranty period.

1.04 DELIVERY, STORAGE, AND HANDLING

The Contractor shall unload pipe so as to avoid deformation or other injury thereto. Pipe shall not be rolled or dragged over gravel or rock during handling. When any joint or section of pipe is damaged during transporting, unloading, handling, or storing, the undamaged portions of the joint or section may be used where partial lengths are needed, or, if damaged sufficiently, the Engineer will reject the joint or section as being unfit for installation.

If any defective pipe is discovered after installation, it shall be removed and replaced with sound pipe or shall be repaired by the Contractor in an approved manner and at his own expense.

PART 2 – PRODUCTS

2.01 GENERAL

All materials shall be first quality with smooth interior and exterior surfaces, free from cracks, blisters, honeycombs, and other imperfections, and true to theoretical shapes and forms throughout. All materials shall be subject to the inspection of the Engineer at the plant, trench, or other point of delivery, for the purpose of culling and rejecting material which does not conform to the requirements of these specifications. Such material shall be marked by the Engineer, and the Contractor shall remove it from the project site upon notice being received of its rejection.

2.02 PIPE

A. Reinforced Concrete Pipe

All reinforced concrete pipe shall meet the requirements of ASTM C-76-Reinforced Concrete Culvert, Storm Drain and Sewer Pipe. Reinforced concrete pipe shall be Class III, Wall B or higher. Joints for reinforced concrete pipe storm drains shall be tongue and groove without O-rings. Joints shall be formed such that when the pipe is laid together, they will form a continuous and uniform line.

B. Corrugated Metal Pipe

Corrugated metal pipe culverts shall be fabricated from corrugated sheets and shall conform to American Association of State Highway Officials (AASHTO) designation M-36 for corrugated Metal Pipe Culvert Pipe.

Pipe may be circumferentially or helically corrugated and shall be half asphalt coated inside and outside, with paved invert unless otherwise noted on Drawings.

Coupling bands shall be used at all joints and shall be of a size as specified by the pipe manufacturer in accordance with the pipe size. Bands shall be fully asphalt coated on both sides and shall conform to AASHTO M-36.

The minimum thickness for corrugated metal pipe shall be 16 gauge or NCDOT requirements if heavier gauge is required.

C. High Density Polyethylene Pipe (HDPE)

Pipe Requirements: HDPE pipe (per AASHTO) shall have a smooth interior and annular exterior corrugations.

4- through 10-inch (100 to 250 mm) pipe shall meet AASHTO M252, Type S or SP.
12- through 60-inch (300 to 1500 mm) pipe shall meet AASHTO M294, Type S or SP, or ASTM F2306.

Pipe shall be joined using a bell & spigot joint meeting the requirements of AASHTO M252, AASHTO M294, or ASTM F2306. The joint shall be soil-tight and gaskets for diameters 12- through 60-inch, shall meet the requirements of ASTM F477. For diameters 4- through 10-inch, the joint shall be soil-tight using an engaging dimple connection. Gaskets shall be installed by the pipe manufacturer and covered with a removable, protective wrap to ensure the gasket is free from debris. A joint lubricant available from the manufacturer shall be used on the gasket and bell during assembly.

Fittings shall conform to AASHTO M252, AASHTO M294, or ASTM F2306. Bell and spigot connections shall utilize a welded bell and valley or saddle gasket meeting the soil-tight joint performance requirements of AASHTO M252, AASHTO M294, or ASTM F2306.

Material Properties: Material for pipe and fitting production shall be high density polyethylene conforming with the minimum requirements of cell classification 424420C for 4- through 10-inch (100 to 250 mm) diameters, and 435400C for 12- through 60-inch (300 to 1500 mm) diameters, as defined and described in the latest version of ASTM D3350, except that carbon black content should not exceed 4%. The 12- through 60-inch (300 to 1500 mm) pipe material shall comply with the notched constant ligament-stress (NCLS) test as specified in Sections 9.5 and 5.1 of AASHTO M294 and ASTM F2306, respectively.

HDPE pipe may not be used for sizes greater than permitted by NCDOT.

2.03 GENERAL DRAINAGE STRUCTURES

A. Foundation:
No masonry shall be placed until the foundation has been approved by the Engineer.

Where the foundation material is found to be of poor supporting value, the existing foundation material shall be removed by undercutting to the depth directed by the Engineer and backfilled with suitable material secured from locations along the project or from a borrow pit. The backfill placed in the undercut area shall be compacted to a degree satisfactory to the Engineer.

B. Concrete and Masonry:
Concrete shall be constructed in accordance with accepted construction standards and shall be given an ordinary surface finish. Furnishing and placing reinforcing steel shall be in accordance with plan details.

All concrete shall be NCDOT Class B concrete unless otherwise indicated on the Drawings, except that concrete for pipe collars shall be Class A concrete.

Where necessary to fit field conditions, the dimensions of the structure and footings shall be varied as directed by the Engineer.

C. Fittings and Connections:
Where fittings enter the masonry, they shall be placed as the work is built up, thoroughly bonded, and accurately spaced and aligned.

Pipe connections shall be cut flush with the inside wall of the drainage structure and grouted as necessary to make smooth and uniform surfaces on the inside of the structure.

Metal frames for grates and covers shall be set in full mortar beds or secured by methods approved by the Engineer.

D. Backfill:
After the structure has been completed, and all forms, falsework, sheet, and bracing have been removed, the excavation shall be backfilled with approved material compacted to the density required. Back filling shall not be done until the concrete or brick masonry has cured for at least seven curing days, unless otherwise permitted by the Engineer.

E. Pipe Collars and Pipe Plugs:
Pipe collars and pipe plugs shall be constructed in accordance with the details shown on the Drawings or as directed by the Engineer.

2.04 PRECAST DRAINAGE STRUCTURES

Unless otherwise indicated on the Drawings, catch basins and drop inlets shall be precast concrete rated for HS20 wheel loads. Structures shall conform to standard details and specifications of the NCDOT, latest editions. Provide transition sections and/or brick and mortar as required to fully support cast iron frames. The structure supplier (precaster) shall be fully responsible for the design of each structure, in accordance with ACI 318 for HS20 live loads.

PART 3 – EXECUTION

3.01 PIPE LAYING

Refer to Section 31 02 00 Earthwork. Additionally, installation shall be in accordance with ASTM D2321 and the pipe manufacturer's recommendations. HDPE pipe must have granular backfill up to the spring line and have 12 inches minimum earth cover over the crown of the pipe.

END OF SECTION