ROCKY MOUNT
FINANCE
THE CENTER OF IT ALL

PARKS & RECREATION DEPARTMENT

Request for Proposal #: 320-040222CC

Denton Street Pool Improvements

Date of Issue: 3/18/2022

Proposal Due Date: 4/26/2022

At 02:00 P.M. ET

Direct all inquiries concerning this RFP to:

Chynice Chapman

Purchasing Manager

Email: chynice.chapman@rockymountnc.gov

Phone: 252-972-1228

Contents

CITY OF ROCKY MOUNT
STANDARD FORM OF INFORMAL CONTRACT
AND GENERAL CONDITIONS

FOR

Project ID# - 320-040222CC

I. SCOPE OF WORK

Provide all necessary mobilization, site preparation, demolition, construction and cleanup work associated with the various Pool, Bathhouse and Site improvements as detailed in the project documents. Scope of work has been broken into Base Bid work as well as five (5) Add Alternates as described in the project documents.

PROJECT SCHEDULE

Event	Responsibility	Date and Time
Issue RFP	City	Friday, 3/18/2022 by 12:00 Noon
Pre-bid/Site Visit	City	Tuesday, 3/29/2022 at 10:30 AM EST
Submit Written Questions	Contractor	Thursday, April 14, 2022 by 2:00 PM
Provide Response to Questions	City	Wednesday, April 20, 2022 by 4:00 PM
Submit Proposals	Contractor	Tuesday, 4/26/2022 at 2:00 PM EST
Contract Award	City	Wednesday, 6/22/2022 by 5:00 PM EST
Estimated Completion Date	Contractor	Wednesday, 3/1/2023 by 4:00 PM

II. URGED & CAUTIONED SITE VISIT

Date: Tuesday, 3/29/2022
Time: 10:30 AM Eastern Time
Contact #: 252-972-1228

Instructions: It shall be urged and cautioned that each Contractor's representative be present for a pre-proposal site visit. Attendees must meet promptly at 1434 Denton Street, Rocky Mount, NC 27801.

The purpose of this visit is for all prospective Contractors to apprise themselves with the conditions and requirements which will affect the performance of the work called for by this Request for Proposals. Contractors must stay for the duration of the site visit. No allowances will be made for unreported conditions that a prudent Contractor would recognize as affecting the work called for or implied by this proposal.

Contractors are cautioned that any information released to attendees during the site visit, other than that involving the physical aspects of the facility referenced above, and which conflicts with, supersedes, or adds to requirements in this Request for Proposal, must be confirmed by written addendum before it can be considered to be a part of this proposal.

III. QUESTIONS

Written questions shall be e-mailed to Chynice.Chapman@rockymountnc.gov by the date and time specified above. Contractors will enter "RFP #320-040222CC – Questions" as the subject for the email.

Questions received prior to the submission deadline date, the Purchasing Managers response, and any additional terms deemed necessary by the City of Rocky Mount will be posted in the form of an addendum to the Interactive Purchasing System (IPS), http://www.ips.state.nc.us, and the City of Rocky Mount website and shall become an Addendum to this RFQ. No information, instruction or advice provided orally or informally by any City personnel,

whether made in response to a question or otherwise concerning this RFP, shall be considered authoritative or binding. Vendors shall rely only on written material contained in an Addendum to this RFP.

Inquiries submitted no later than the date and time noted in the project schedule. Questions answered verbally will be followed up by written addenda as deemed necessary; oral interpretations shall have no effect.

IV. PROPOSAL SUBMITTAL

Contractors interested in performing the services requested must submit the following information:

1. One (1) copy of their RFP response including name, address, and phone number of contact person. RFP responses shall be addressed to:

   Attn: RFP #320-040222CC
   City of Rocky Mount
   Purchasing- Chynice Chapman
   331 S. Franklin Street
   Rocky Mount, NC 27802

All RFP responses shall be received by the date and time noted in the schedule on page 4. RFP responses may be sent via US Mail, FedEx, UPS, or hand delivered. **Faxed RFP responses will not be accepted**.

V. REFERENCES

Contractors shall provide at least three (3) references for which your company has provided Services of similar size and scope to that proposed herein. City of Rocky Mount may contact these users to determine the Services provided are substantially similar in scope to those proposed herein and Contractor's performance has been satisfactory. The information obtained shall be considered in the evaluation of the proposal.

COMPANY NAME	CONTACT NAME	TELEPHONE NUMBER

ATTACHMENT A: PROPOSAL/ACCEPTANCE FORM

For

Denton Street Pool Improvements

320-040222CC

Work shall include the following: Contractor shall provide all necessary mobilization, site preparation, demolition, construction and cleanup work associated with the various Pool, Bathhouse and Site improvements as detailed in the project documents. Scope of work has been broken into Base Bid work as well as five (5) Add Alternates as described in the project documents. Work shall include but is not necessarily limited to:

Base Bid: shall include a new plaster / marcite finish to the pool, main drain grate replacements, various concrete repairs to the pool deck, stainless steel grab rails / anchors, lifeguard chair parts replacements, two new 1M diving towers and diving boards, a new water slide, shade structure repairs, removal of non-compliant underwater lights, a new ADA lift, pool signage, depth marker and no diving tiles, pool expansion joint replacements, partial tile replacements in various areas, a new filter system, a new feature pump, replacements and additions of various pipe, valves and fittings, chemical spill pallets, a new backwash pit grate, chemical signage and the addition of a portable eyewash station.

Add Alternate #1: shall include various additional pool finish upgrades (marcite replacement is listed in the base bid) including the beach entry pebble finish, waterline ceramic tile, racing lane tile, wall target tile, step nosing tile, expansion joint tile, and beach entry area tile. We have also included the replacement of several pool deck depth tile replacements within this add alternate.

Add Alternate #2: shall include a variety of architectural building bathhouse improvements. This includes various surface repairs and refinishes, fixture replacements, door and counter improvements, a drinking fountain replacement and various other bathhouse repairs.

Add Alternate #3: shall include some Civil / Site related items and a few electrical and mechanical / plumbing related scope. These shall include repairs to the existing outdoor water meter & spring box, crack and seal repairs to the parking lot, a small section of gutter repairs, various interior light repairs and a new electric hot water heater replacement.

Add Alternate #4: shall include the removal and replacement of the existing pool's recessed steps and the removal and replacement of the three existing shade structures.

Add Alternate #5: shall include repairs to the existing underwater lights as well as various improvements within the pool equipment room (new pipe supports, new chemical controller and flow cell, new chemical metering pumps, new chemical tubing and PVC chemical supply conduit and a new flow meter.

The undersigned, as bidder, proposes and agrees if this proposal is accepted to contract with the City of Rocky Mount for the furnishing of all materials, equipment, and labor necessary to complete the construction of the work described in these documents in full and complete in accordance with plans, specifications, and contract documents, and to the full and entire satisfaction of the City of Rocky Mount for the sum of:

Item No.	Description	Unit	Price
Base Bid			
1		LS	$
2	Construction Allowance (per Spec Section 012100)	LS	$ 50,000.00
	GRAND TOTAL BASE BID		**$**
Add Alternates:			
A1		LS	$

A2		LS	$
A3		LS	$
A4		LS	$
A5		LS	$

TOTAL BASE PROPOSAL: Dollars $

Respectively submitted this _____day of_____20_____

_____

(Contractor's Name)

(signatures next page)

Federal ID#:_____

Witness:_____

_____
(Proprietorship or Partnership)

Attest: *(corporation)*

(***Corporate Seal***)

By:_____

Title:_____
(*Owner, partner, corp. Pres. or Vice President)*
Address:_____

Email Address:_____

By:_____ License #:_____

Title:_____
(Corporation, Secretary. /Ass't Secretary.)

ATTACHMENT B: ACCEPTED by the City of Rocky Mount

For

Denton Street Pool Improvements

320-040222CC

City of Rocky Mount

Total amount of accepted by the owner, included base proposal and proposal alternates: $_____

BY:_____TITLE: Purchasing Manager

Date: _____

PRE-AUDIT

This instrument has been preaudited in the manner required by the Budget and Fiscal Control Act.

_____

Finance Director Date

ATTACHMENT C: G E N E R A L C O N D I T I O N S

1. GENERAL

It is understood and agreed that by submitting a proposal that the Contractor has examined these contract documents, drawings and specifications and has visited the site of the Work and has satisfied himself relative to the Work to be performed.

2. DEFINITIONS

Owner: "Owner" shall mean, The City of Rocky Mount

Contractor: "Contractor" shall mean the entity that will provide the services for the Owner.

Designer: The **designer(s)** are those referred to within this contract, or their authorized representatives. The Designer(s), as referred to herein, shall mean architect and/or engineer responsible for preparing the project plans and specifications. They will be referred to hereinafter as if each were of the singular number, masculine gender.

Contract Documents: "Contract Documents" shall consist of the Notice to Bidders; General Conditions of the Contract; special conditions if applicable; Supplementary General Conditions; the drawing and specifications, including all bulletins, addenda or other modifications of the drawings and specifications incorporated into the documents prior to their execution; the proposal; the contract; the performance bond if applicable; and insurance certificates. All of these items together form the contract.

INTENT AND EXECUTION OF DOCUMENTS

The drawings and specifications are complementary, one to the other. That which is shown on the drawings or called for in the specifications shall be as binding as if it were both called for and shown. The intent of the drawings and specifications is to establish the scope of all labor, materials, transportation, equipment, and any and all other things necessary to provide a complete job. In case of discrepancy or disagreement in the Contract Documents, the order of precedence shall be: Form of Contract, specifications, large-scale detail drawings, small-scale drawings.

In such cases where the nature of the work requires clarification by the Designer/ Owner, the Designer/ Owner shall furnish such clarification. Clarifications and drawings shall be consistent with the intent of the Contract Documents, and shall become a part thereof.

4. AS-BUILT MARKED-UP CONSTRUCTION DOCUMENTS

Contractor shall provide one complete set of legible "as-built" marked-up construction drawings and specifications recording any and all changes made to the original design during the course of construction. In the event no changes occurred, submit construction drawings and specifications set with notation "No Changes." The Designer/Owner must receive "As-built" marked-up construction drawings and specifications before the final pay request can be processed.

5. SUBMITTAL DATA

The Contractor awarded the contract shall submit all specified submittals to the Owner/Designer. A minimum number of copies as specified by the owner, of all required submittal data pertaining to construction, performance and general dimensional criteria of the components listed in the technical specifications shall be submitted. No material or equipment shall be ordered or installed prior to written approval of the submittals by the Designer/Owner. Failure to provide submittal data for review on equipment listed in the technical specifications will result in removal of equipment by the Contractor at his expense if the equipment is not in compliance with the specifications.

6. SUBSTITUTIONS

In accordance with the provisions of G.S. 133-3, material, product, or equipment substitutions proposed by the bidders to those specified herein can only be considered during the bidding phase until five (5) days prior to the

receipt of proposals or by the date specified in the pre proposal conference, when submitted to the Designer with sufficient data to confirm material, product, or equipment equality. Proposed substitutions submitted after this time will be considered only as potential change order.

Submittals for proposed substitutions shall include the following information:

a. Name, address, and telephone number of manufacturer and supplier as appropriate.

b. Trade name, model or catalog designation.

c. Product data including performance and test data, reference standards, and technical descriptions of material, product, or equipment. Include color samples and samples of available finishes as appropriate.

d. Detailed comparison with specified products including performance capabilities, warranties, and test results.

e. Other pertinent data including data requested by the Designer to confirm product equality.

If a proposed material, product, or equipment substitution is deemed equal by the Designer to those specified, all bidders of record will be notified by Addendum.

7. WORKING DRAWINGS AND SPECIFICATIONS AT THE JOB SITE

The contractor shall maintain, in readable condition at his job site one complete set of working drawings and specifications for his work including all shop drawings. Such drawings and specifications shall be available for use by the owner, designer or his authorized representative.

The contractor shall maintain at the job site, a day-to-day record of work-in-place that is at variance with the contract documents. Such variations shall be fully noted on project drawings by the contractor and submitted to the designer upon project completion and no later than 30 days after acceptance of the project.

8. MATERIALS, EQUIPMENT, EMPLOYEES

a. The contractor shall, unless otherwise specified, supply and pay for all labor, transportation, materials, tools, apparatus, lights, power, fuel, heat, sanitary facilities, water, scaffolding and incidentals necessary for the completion of his work, and shall install, maintain and remove all equipment of the construction, other utensils or things, and be responsible for the safe, proper and lawful construction, maintenance and use of same, and shall construct in the best and most workmanlike manner, a complete job and everything incidental thereto, as shown on the plans, stated in the specifications, or reasonably implied therefrom, all in accordance with the contract documents.

b. All materials shall be new and of quality specified, except where reclaimed material is authorized herein and approved for use. Workmanship shall at all times be of a grade accepted as the best practice of the particular trade involved, and as stipulated in written standards of recognized organizations or institutes of the respective trades except as exceeded or qualified by the specifications.

c. Upon notice, the contractor shall furnish evidence as to quality of materials.

d. Products are generally specified by ASTM or other reference standard and/or by manufacturer's name and model number or trade name. When specified only by reference standard, the Contractor may select any product meeting this standard, by any manufacturer. When several products or manufacturers are specified as being equally acceptable, the Contractor has the option of using any product and manufacturer combination listed. However, the contractor shall be aware that the cited examples are used only to denote the quality standard of product desired and that they do not restrict proposer alters to a specific brand, make, manufacturer or specific name; that they are used only to set forth and convey to proposer alters the general style, type, character and quality of product desired; and that equivalent product(s) will be acceptable. Request for substitution of materials, items, or

equipment shall be submitted to the designer for approval or disapproval; the designer prior to the opening of proposals shall make such approval or disapproval. Alternate materials may be requested after the award if it can clearly be demonstrated that it is an added benefit to the owner and the designer and owner approves.

e. The designer is the judge of equality for proposed substitution of products, materials or equipment.

f. If at any time during the construction and completion of the work covered by these contract documents, the language, conduct, or attire of any workman of the various crafts be adjudged a nuisance to the owner or designer, or if any workman be considered detrimental to the work, the contractor shall order such parties removed immediately from grounds.

g. The Contractor shall cooperate with the designer and the owner in coordinating construction activities.

h. The Contractor shall maintain qualified personnel and effective supervision at the site at all times during the project and exercise the appropriate quality control program to ensure compliance with the project drawings and specifications. The designer is responsible for determining compliance with the drawings and specifications.

9. CODES, PERMITS AND INSPECTIONS

The Contractor shall obtain the required permits, if required, give all notices, and comply with all laws, ordinances, codes, rules and regulations bearing on the conduct of the work under this contract. If the Contractor observes that the drawings and specifications are at variance therewith, he shall promptly notify the Designer in writing. If the Contractor performs any work knowing it to be contrary to such laws, ordinances, codes, rules and regulations, and without such notice to the Owner, he shall bear all cost arising there from.

All work under this contract shall conform to the current North Carolina Building Code and other state and national codes as are applicable.

All fire alarm work shall be in accordance with the latest State Construction Office (SCO) *Guidelines for Fire Alarm Installation* (NFPA72). Where the contract documents are in conflict with the SCO guidelines, the SCO guidelines shall govern. The Contractor shall be responsible for all the costs for the correction of the work where he installs it in conflict with the latest edition of the SCO *Guidelines for Fire Alarm Installation*.

*****Inspection and certification of compliance by local authorities is necessary if an architect or engineer was <u>not</u> employed on the project.

10. PROTECTION OF WORK, PROPERTY, THE PUBLIC AND SAFETY

a. The contractors shall be jointly responsible for the entire site and the building or construction of the same and provide all the necessary protections, as required by the owner or designer, and by laws or ordinances governing such conditions. They shall be responsible for any damage to the owner's property or of that of others on the job, by them, their personnel, or their subcontractors, and shall make good such damages. They shall be responsible for and pay for any damages caused to the owner. All contractors shall have access to the project at all times, except as indicated in the Supplemental General Conditions.

b. The contractor shall provide cover and protect all portions of the structure when the work is not in progress, provide and set all temporary roofs, covers for doorways, sash and windows, and all other materials necessary to protect all the work on the building, whether set by him, or any of the subcontractors. Any work damaged through the lack of proper protection or from any other cause, shall be repaired or replaced without extra cost to the owner.

c. No fires of any kind will be allowed inside or around the operations during the course of construction without special permission from the designer and owner.

d. The contractor shall protect all trees and shrubs designated to remain in the vicinity of the operations by building substantial boxes around it. He shall barricade all walks, roads, etc., as directed by the designer to keep the public away from the construction. All trenches, excavations or other hazards in the vicinity of the work shall be well barricaded and properly lighted at night.

e. The contractor shall provide all necessary safety measures for the protection of all persons on the job, including the requirements of the A.G.C. *Accident Prevention Manual in Construction*, as amended, and shall fully comply with all state laws or regulations and North Carolina State Building Code requirements to prevent accident or injury to persons on or about the location of the work. He shall clearly mark or post signs warning of hazards existing, and shall barricade excavations, elevator shafts, stairwells and similar hazards. He shall protect against damage or injury resulting from falling materials and he shall maintain all protective devices and signs throughout the progress of the work.

f. The contractor shall adhere to the rules, regulations and interpretations of the North Carolina Department of Labor relating to Occupational Safety and Health Standards for the Construction Industry (Title 29, Code of Federal Regulations, Part 1926, published in Volume 39, Number 122, Part II, June 24, 1974, *Federal Register*), and revisions thereto as adopted by General Statutes of North Carolina 95-126 through 155.

i. In the event of emergency affecting the safety of life, the protection of work, or the safety of adjoining properties, the contractor is hereby authorized to act at his own discretion, without further authorization from anyone, to prevent such threatened injury or damage. Any compensation claimed by the contractor on account of such action shall be determined as provided for under Article 13(b).

j. Any and all costs associated with correcting damage caused to adjacent properties of the construction site or staging area shall be borne by the contractor. These costs shall include but not be limited to flooding, mud, sand, stone, debris, and discharging of waste products.

11. SUBCONTRACTS AND SUBCONTRACTORS

The Contractor is and remains fully responsible for his own acts or omissions as well as those of any subcontractor or of any employee of either. The Contractor agrees that no contractual relationship exists between the subcontractor and the Owner in regard to the contract, and that the subcontractor acts on this work as an agent or employee of the Contractor.

12. CONTRACTOR-SUBCONTRACTOR RELATIONSHIPS

The Contractor agrees that the terms of these Contract Documents shall apply equally to each Subcontractor as to the Contractor, and the Contractor agrees to take such action as may be necessary to bind each Subcontractor to these terms. The Contractor further agrees to conform to the Code of Ethical Conduct as adopted by the Associated General Contractors of America, Inc., with respect to Contractor-Subcontractor relationships. The Owner reserves the right to limit the amount of portions of work to be subcontracted as hereinafter specified.

13. CHANGES IN THE WORK AND CLAIMS FOR EXTRA COST

a. The owner may have changes made in the work covered by the contract. These changes will not invalidate and will not relieve or release the contractor from any guarantee given by him pertinent to the contract provisions. These changes will not affect the validity of the guarantee bond and will not relieve the surety or sureties of said bond. All extra work shall be executed under conditions of the original contract.

b. Except in an emergency endangering life or property, no change shall be made by the contractor except upon receipt of approved change order from the designer, countersigned by the owner authorizing such change. No claim for adjustments of the contract price shall be valid unless this procedure is followed. Should a claim for extra compensation by the contractor be denied by the designer or the owner, the contractor may pursue his claim in accordance with G.S. 143-135.3.

In the event of emergency endangering life or property, the contractor may be directed to proceed on a time and material basis whereupon the contractor shall proceed and keep accurately on such form as specified by the designer or owner, a correct account of costs together with all proper invoices, payrolls and supporting data. Upon completion of the work the change order will be prepared as outlined under either Method "c(1)" or Method "c(2)" or both.

c. In determining the values of changes, either additive or deductive, contractors are restricted to the use of the following methods:

1. Where the extra work involved is covered by unit prices quoted in the proposal, or subsequently agreed to by the Contractor, Designer, an Owner the value of the change shall be computed by application of unit prices based on quantities, estimated or actual as agreed of the items involved, except is such cases where a quantity exceeds the estimated quantity allowance in the contract by one hundred percent (100%) or more. In such cases, either party may elect to proceed under subparagraph c (2) herein. If neither party elects to proceed under c (2), then unit prices shall apply.

2. The contracting parties shall negotiate and agree upon the equitable value of the change prior to issuance of the change order, and the change order shall stipulate the corresponding lump sum adjustment to the contract price.

d. Under Paragraph “b” and Methods "c(2)" above, the allowances for overhead and profit combined shall be as follows: all contractors (the single contracting entity (prime), his subcontractors(1st tier subs), or their sub-subcontractors (2nd tier subs, 3rd tier subs, etc.) shall be allowed a maximum of 10% on work they each self-perform; the prime contractor shall be allowed a maximum of 5% on contracted work of his 1st tier sub; 1st tier, 2nd tier, 3rd tier, etc. contractors shall be allowed a maximum of 2.5% on the contracted work of their subs. ; Under Method "c(1)", no additional allowances shall be made for overhead and profit. In the case of deductible change orders, under Method "c(2)" and Paragraph (b) above, the contractor shall include no less than five percent (5%***)*** profit, but no allowances for overhead.

e. The term "net cost" as used herein shall mean the difference between all proper cost additions and deductions. The "cost" as used herein shall be limited to the following:

1. The actual costs of materials and supplies incorporated or consumed as part of the work;

2. The actual costs of labor expended on the project site; labor expended in coordination, change order negotiation, record document maintenance, shop drawing revision or other tasks necessary to the administration of the project are considered overhead whether they take place in an office or on the project site.

3. The actual costs of labor burden, limited to the costs of social security (FICA) and Medicare/Medicaid taxes; unemployment insurance costs; health/dental/vision insurance premiums; paid employee leave for holidays, vacation, sick leave, and/or petty leave, not to exceed a total of 30 days per year; retirement contributions; worker’s compensation insurance premiums; and the costs of general liability insurance when premiums are computed based on payroll amounts; the total of which shall not exceed thirty percent (30%) of the actual costs of labor;

4. The actual costs of rental for tools, excluding hand tools; equipment; machinery; and temporary facilities required for the work;

5. The actual costs of premiums for bonds, insurance, permit fees and sales or use taxes related to the work.

Overtime and extra pay for holidays and weekends may be a cost item only to the extent approved by the owner.

f. Should concealed conditions be encountered in the performance of the work below grade, or should concealed or unknown conditions in an existing structure be at variance with the conditions indicated by the contract documents, the contract sum and time for completion may be equitably adjusted by change order upon claim by either party made within thirty (30) days after the condition has been identified. The cost of such change shall be arrived at by one of the foregoing methods. All change orders shall be supported by a unit cost breakdown showing method of arriving at net cost as defined above.

g. Change orders shall be submitted by the contractor in writing to the owner/designer for review and approval. The contractor will provide such proposal and supporting data in suitable format. The designer shall verify correctness. Delay in the processing of the change order due to lack of proper submittal by the contractor of all required supporting data shall not constitute grounds for a time extension or basis of a claim. Within fourteen (14) days after receipt of the contractor's accepted proposal including all supporting documentation required by the designer**,** the designer shall prepare the change order and forward to the contractor for his signature or otherwise respond, in writing, to the contractor's proposal. Within seven (7) days after receipt of the change order executed by the contractor, the designer shall, certify the change order by his signature, and forward the change order and all supporting data to the owner for the owner's signature. The owner shall execute the change order**,** within seven (7) days of receipt.

At the time of signing a change order, the contractor shall be required to certify as follows:

"I certify that my bonding company will be notified forthwith that my contract has been changed by the amount of this change order, and that a copy of the approved change order will be mailed upon receipt by me to my surety."

h. A change order, when issued, shall be full compensation, or credit, for the work included, omitted or substituted. It shall show on its face the adjustment in time for completion of the project as a result of the change in the work.

i. If, during the progress of the work, the owner requests a change order and the contractor's terms are unacceptable, the owner**,** may require the contractor to perform such work on a time and material basis whereupon the contractor shall proceed and keep accurately on such form as specified by the Designer or owner, a correct account of cost together with all proper invoices, payrolls and supporting data. Upon completion of the work a change order will be prepared with allowances for overhead and profit per paragraph d. above and "net cost" and "cost" per paragraph e. above. Without prejudice, nothing in this paragraph shall preclude the owner from performing or to have performed that portion of the work requested in the change order.

14. ANNULMENT OF CONTRACT

If the contractor fails to begin the work under the contract within the time specified, or the progress of the work is not maintained on schedule, or the work is not completed within the time specified, or fails to perform the work with sufficient workmen and equipment or with sufficient materials to ensure the prompt completion of said work, or shall perform the work unsuitably or shall discontinue the prosecution of the work, or if the contractor shall become insolvent or be declared bankrupt or commit any act of bankruptcy or insolvency, or allow any final judgment to stand against him unsatisfied for a period of forty-eight (48) hours, or shall make an assignment for the benefit of creditors, or for any other cause whatsoever shall not carry on the work in an acceptable manner, the owner may give notice in writing, sent by certified mail, return receipt requested, to the contractor and his surety (if applicable) of such delay, neglect or default, specifying the same, and if the contractor within a period of seven (7) days after such notice shall not proceed in accordance therewith, then the owner shall, declare this contract in default, and, thereupon, the surety shall promptly take over the work and complete the performance of this contract in the manner and within the time frame specified. In the event the contractor, or the surety (if applicable) shall fail to take over the work to be done under this contract within seven (7) days after being so notified and notify the owner in writing, sent by certified mail, return receipt requested, that he is taking the same over and stating that he will diligently pursue and complete the same, the owner shall have full power and authority, without violating the contract, to take the prosecution of the work out of the hands of said contractor, to appropriate or use any or all contract materials and equipment on the grounds as may be suitable and acceptable and may enter into an agreement, either by public letting or negotiation, for the completion of said contract according to the terms and

provisions thereof or use such other methods as in his opinion shall be required for the completion of said contract in an acceptable manner. All costs and charges incurred by the owner, together with the costs of completing the work under contract, shall be deducted from any monies due or which may become due said contractor and surety (if applicable). In case the expense so incurred by the owner shall be less than the sum which would have been payable under the contract, if it had been completed by said contractor, then the said contractor and surety (if applicable) shall be entitled to receive the difference, but in case such expense shall exceed the sum which would have been payable under the contract, then the contractor and the surety (if applicable) shall be liable and shall pay to the owner the amount of said excess.

15. TERMINATION FOR CONVENIENCE

a. Owner may at any time and for any reason terminate Contractor's services and work at Owner's convenience, after notification to the contractor in writing via certified mail. Upon receipt of such notice, Contractor shall, unless the notice directs otherwise, immediately discontinue the work and placing of orders for materials, facilities and supplies in connection with the performance of this Agreement.

b. Upon such termination, Contractor shall be entitled to payment only as follows: (1) the actual cost of the work completed in conformity with this Agreement; plus, (2) such other costs actually incurred by Contractor as approved by Owner; (3) plus ten percent (10%) of the cost of the balance of the work to be completed for overhead and profit. There shall be deducted from such sums as provided in this subparagraph the amount of any payments made to Contractor prior to the date of the termination of this Agreement. Contractor shall not be entitled to any claim or claim of lien against Owner for any additional compensation or damages in the event of such termination and payment.

16. OWNER'S RIGHT TO DO WORK

If, during the progress of the work or during the period of guarantee, the contractor fails to prosecute the work properly or to perform any provision of the contract, the owner, after seven (7) days' written notice sent by certified mail, return receipt requested, to the contractor from the designer, may perform or have performed that portion of the work. The cost of the work may be deducted from any amounts due or to become due to the contractor, such action and cost of same having been first approved by the designer. Should the cost of such action of the owner exceed the amount due or to become due the contractor, then the contractor or his surety, or both, shall be liable for and shall pay to the owner the amount of said excess.

17. REQUESTS FOR PAYMENT

Contractor shall refer to the Supplemental General Conditions for specific directions on payment schedule, procedures and the name and address where to send applications for payments for this project. It is imperative that invoices be sent only to the above address in order to assure proper and timely delivery and handling.

The Designer/Owner will process all Contractor pay requests as the project progresses. The Contractor shall receive payment within thirty (30) consecutive days after Designer/Owner's approval of each pay request. Payment will only be made for work performed as determined by the Designer/Owner.

Retainage:

a. Retainage withheld will not exceed 5% at any time.
b. The same terms apply to general contractor and subcontractors alike.
c. Following 50% completion of the project no further retainage will be withheld if the contractor/subcontractor has performed their work satisfactorily.
d. Exceptions:
    1. Owner/Contractor can reinstate retainage if the contractor/subcontractor does not continue to perform satisfactorily.
    2. Following 50% completion of the project, the owner is authorized to withhold additional retainage from a subsequent periodic payment if the amount of retainage withheld falls below 2.5%.

Final payment will be made within thirty (30) consecutive days after acceptance of the work, receipt of marked-up "as-built" drawings and specifications and the submission both of notarized Contractor's affidavit and final pay request. All pay requests shall be submitted to the Designer/Owner for approval.

THE CONTRACTOR'S FINAL PAYMENT AFFIDAVIT SHALL STATE: "THIS IS TO CERTIFY THAT ALL COSTS OF MATERIALS, EQUIPMENT, LABOR, SUBCONTRACTED WORK, AND ALL ELSE ENTERING INTO THE ACCOMPLISHMENT OF THIS CONTRACT, INCLUDING PAYROLLS, HAVE BEEN PAID IN FULL."

18. PAYMENTS WITHHELD

The designer with the approval of the Owner may withhold payment for the following reasons:

a. Faulty work not corrected.

b. The unpaid balance on the contract is insufficient to complete the work in the judgment of the designer.

c. To provide for sufficient contract balance to cover liquidated damages that will be assessed.

d. The secretary of the Department of Administration may authorize the withholding of payment for the following reasons:

i. Claims filed against the contractor or evidence that a claim will be filed.

ii. Evidence that subcontractors have not been paid.

When grounds for withholding payments have been removed, payment will be released. Delay of payment due the contractor without cause will make owner liable for payment of interest to the contractor as provided in G.S. 143-134.**1.** As provided in G.S. 143-134.1(e), the owner shall not be liable for interest on payments withheld by the owner for unsatisfactory job progress, defective construction not remedied, disputed work, or third-party claims filed against the owner or reasonable evidence that a third-party claim will be filed.

19. MINIMUM INSURANCE REQUIREMENTS

Requirements. Providing and maintaining adequate insurance coverage is a material obligation of the Contractor and is of the essence of The Contract. All such insurance shall meet all laws of the City of Rocky Mount. Such insurance coverage shall be obtained from companies that are authorized to provide such coverage and that are authorized by the Commissioner of Insurance to do business in North Carolina. The Contractor shall at all times comply with the terms of such insurance policies, and all requirements of the insurer under any such insurance policies, except as they may conflict with existing North Carolina laws or The Contract. The limits of coverage under each insurance policy maintained by the Contractor shall not be interpreted as limiting the Contractor's liability and obligations under the Contract.

Insurance. Contractor agrees to maintain **Commercial General Liability** in amount of $1,000,000 each occurrence, $1,000,000 each occurrence in Personal & Advertising Injury with $2,000,000 General Aggregate, and $2,000,000 Products/Completed Operations Aggregate. Contractor shall maintain $1,000,000 in **automobile liability,** and other appropriate insurance, as well as Workers Compensation in the required statutory amount of $500,000.00 for all employees participating in the provision of services under this Contract. Contractor also agrees to maintain $1,000,000 in **professional liability insurance** if the Contractor is engaged in a professional service pursuant to this Contract. The City of Rocky Mount shall be named by endorsement as an additional insured on the General and Automobile Liability policies. Certificates of such insurance shall be furnished by Contractor to the City and shall contain an endorsement to provide the City at least 30 days' written notice of any intent to cancel or terminate by either Contractor or the insuring company. Failure to furnish insurance certificates or maintain such insurance shall be a default under this contract and shall be grounds for immediate termination of this Contract.

20. ASSIGNMENT

No assignment of the Contractor's obligations or the Contractor's right to receive payment hereunder shall be permitted. However, upon written request approved by the Owner and solely as a convenience to the Contractor, the Owner may: (1) forward the Contractor's payment check directly to any person or entity designated by the Contractor, and (2) include any person or entity designated by Contractor as a joint payee on the Contractor's payment check. In no event shall such approval and action obligate the Owner to anyone other than the Contractor, and the Contractor shall remain responsible for fulfillment of all contract obligations.

21. CLEANING UP AND RESTORATION OF SITE

The Contractor shall keep the sites and surrounding area reasonably free from rubbish at all times and shall remove debris from the site from time to time or when directed to do so by the Owner. Before final inspection and acceptance of the project, the Contractor shall thoroughly clean the sites, and completely prepare the project and site for use by the Owner.

At the end of construction, the contractor shall oversee and implement the restoration of the construction site to its original state. Restoration includes but not limited to walks, drives, lawns, trees and shrubs, corridors, stairs and other elements shall be repaired, cleaned or otherwise restored to their original state.

22. GUARANTEE

The contractor shall unconditionally guarantee materials and workmanship against patent defects arising from faulty materials, faulty workmanship or negligence for a period of twelve (12) months following the final acceptance of the work and shall replace such defective materials or workmanship without cost to the owner.

Where items of equipment or material carry a manufacturer's warranty for any period in excess of twelve (12) months, then the manufacturer's warranty shall apply for that particular piece of equipment or material. The contractor shall replace such defective equipment or materials, without cost to the owner, within the manufacturer's warranty period.

Additionally, the owner may bring an action for latent defects caused by the negligence of the contractor, which is hidden or not readily apparent to the owner at the time of beneficial occupancy or final acceptance, whichever occurred first, in accordance with applicable law.

Guarantees for roofing workmanship and materials shall be stipulated in the specifications sections governing such roof, equipment, materials, or supplies.

23. STANDARDS

All manufactured items and/or fabricated assemblies subject to operation under pressure, operation by connection to an electric source, or operation involving a connection to a manufactured, natural, or LP gas source shall be constructed and approved in a manner acceptable to the appropriate State inspector which customarily requires the label or re-examination listing or identification marking of appropriate safety standard organization, such as the American Society of Mechanical Engineers for pressure vessels; the Underwriters Laboratories and/or National Electrical Manufacturers Association for electrically operated assemblies; or the American Gas Association for gas operated assemblies, where such approvals of listings have been established for the type of device offered and furnished. Further, all items furnished shall meet all requirements of the Occupational Safety and Health Act (OSHA), and State and federal requirements relating to clean air and water pollution.

All equipment and products must be independent third party tested and labeled (UL, FM, or CTS) before final connections to Owner services or utilities.

24. EQUAL OPPORTUNITY CLAUSE

The non-discrimination clause contained in Section 202 (Federal) Executive Order 11246, as amended by Executive Order 11375, relative to equal employment opportunity for all persons without regard to race, color,

religion, sex or national origin, and the implementing rules and regulations prescribed by the secretary of Labor, are incorporated herein.

The contractor(s) agree not to discriminate against any employee or applicant for employment because of physical or mental disabilities in regard to any position for which the employee or applicant is qualified. The contractor agrees to take affirmative action to employ, advance in employment and otherwise treat qualified individuals with such disabilities without discrimination based upon their physical or mental disability in all employment practices.

25. MINORITY BUSINESS PARTICIPATION

GS 143-128.2 establishes a ten percent (10%) goal for participation by minority businesses valued $100,000.00 or more for each State funded building project.

For construction contracts with a value of less than $300,000, the Owner has the responsibility to make a good faith effort to solicit minority proposals and to attain the goal. The contractor shall include with his proposal a completed Identification of HUB Certified/Minority Business Participation form. Contractor shall submit completed Appendix F MBE Documentation for Contract Payments form with final payment request.

For construction contracts with a value of $300,000 or greater, the contractor shall comply with the document *Guidelines for* Recruitment and Selection of Minority Businesses for Participation in State Construction Contracts including Identification of Minority Business Participation, Affidavits A, B, C, and D, and Appendix E. These forms provided herein are hereby incorporated and made a part of this contract. Forms can be found at rockymountnc.gov/mwbe

26. MINORITY BUSINESS RESOLUTION

The City Council Minority Business Resolution establishes a **five percent (5%) goal** for participation by minority business valued $100,000.00 or more for each City building project funded by local funds.

27. ACCESS TO PERSONS AND RECORDS

The State Auditor shall have access to persons and records as a result of all contracts or grants entered into by the Owner in accordance with General Statute 147-64.7. The Owner's internal auditors shall also have the right to access and copy the Contractor's records relating to the Contract and Project during the term of the Contract and within two years following the completion of the Project/close-out of the Contract to verify accounts, accuracy, information, calculations and/or data affecting and/or relating to Contractor's requests for payment, requests for change orders, change orders, claims for extra work, requests for time extensions and related claims for delay/extended general conditions costs, claims for lost productivity, claims for lost efficiency, claims for idle equipment or labor, claims for price/cost escalation, pass-through claims of subcontractors and/or suppliers, and/or any other type of claim for payment or damages from Owner and/or its project representatives.

28. GOVERNING LAWS

This contract is made under and shall be governed and construed in accordance with the laws of the State of North Carolina, without regard to its conflict of laws rules, and within which State all matters, whether sounding in Contract or tort or otherwise, relating to its validity, construction, interpretation and enforcement shall be determined.

ATTACHMENT D: SUPPLEMENTARY GENERAL CONDITIONS

TIME OF COMPLETION

The Contractor shall commence work to be performed under this Contract on a date to be specified in written order from the Designer/Owner and shall fully complete all work hereunder within **__252__** consecutive calendar days from the Notice to Proceed. The project over run, liquidated damages, shall be $200.00 per day.

If the Contractor is delayed at any time in the progress of his work by any act or negligence of the Owner, his employees or his separate contractor, by changes ordered in the work; by abnormal weather conditions; by any causes beyond the Contractor's control or by other causes deemed justifiable by Owner, then the contract time may be reasonably extended in a written order from the Owner upon written request from the contractor within ten days following the cause for delay. Time extensions for weather delays, acts of God, labor disputes, fire, delays in transportation, unavoidable casualties or other delays which are beyond the control of the Owner do not entitle the Contractor to compensable damages for delays. Any contractor claim for compensable damages for delays is limited to delays caused solely by the owner or its agents.

CONTRUCTION SCHEDULE

Project start date will be _____, 2022 with a completion date of _____, 2023.

PAYMENTS

Payment will be provided following the approved application and certification for payment throughout the project.

UTILITIES

Owner may provide certain utilities such as power or water with connections and extensions by the Contractor.

USE OF SITE

May be restricted. Work hours may be limited. Parking permits may be required.

ATTACHMENT E: SUPPLEMENTAL VENDOR INFORMATION

HISTORICALLY UNDERUTILIZED BUSINESSES

Historically Underutilized Businesses (HUBs) consist of minority, women and disabled business firms that are at least fifty-one percent owned and operated by an individual(s) of the categories. Also included in this category are disabled business enterprises and non-profit work centers for the blind and severely disabled.

Pursuant to G.S. 143B-1361(a), 143-48 and 143-128.4, the State invites and encourages participation in this procurement process by businesses owned by minorities, women, disabled, disabled business enterprises and non-profit work centers for the blind and severely disabled. This includes utilizing subcontractors to perform the required functions in this RFP. Any questions concerning NC HUB certification, contact the **North Carolina Office of Historically Underutilized Businesses** at (919) 807-2330. The Vendor shall respond to question #1 and #2 below.

a) Is Vendor a Historically Underutilized Business? ☐ **Yes** ☐ **No**

b) Is Vendor Certified with North Carolina as a Historically Underutilized Business? ☐ **Yes** ☐ **No**

If so, state HUB classification: _____

CONTRACTOR REGISTRATION

New vendors must complete a vendor registration form using the link below. If you are a current vendor that has not completed the online vendor registration also complete the form. Once registration is complete email a copy of your W9 an E-Verify Affidavit to the contact person listed on the coversheet.

rockymountnc.gov/vendor

ATTACHMENT F: MINORITY AND WOMEN BUSINESS PARTICIPATION

ATTACHMENT G: PROPOSED PRODUCTS FORM

No.	Item	Proposed Product(s)	Supplier Names & Addresses
1			
2			
3			
4			
5			

CERTIFICATION BY PRIME CONTRACTOR:

Each supplier listed above has established his ability and responsibility to supply the specified materials in accordance with the Contract Documents.

Contractor

By: _____ Date: _____
Signature & Title

Approved: CITY OF ROCKY MOUNT

By: _____ Date: _____
Property & Risk Manager

DENTON STREET POOL IMPROVEMENTS

REQUEST FOR PROPOSAL #: 320-040222CC

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Division 13 – Special Construction

Division 22 – Plumbing

Division 23 – Heating, Ventilation & Air Conditioning

Division 26 – Electrical

Division 32 – Exterior Improvements

END OF TABLE OF CONTENTS

SECTION 011000 - SUMMARY

PART 1 – GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification:
   1. Project Location: The Denton Street Outdoor Pool Facility is located at 1434 Denton Street, Rocky Mount, NC 27801.
   2. Owner: City of Rocky Mount, NC

B. Engineer Identification: The Contract Documents, dated March 4, 2022 were prepared for Project by CHA, 8601 Six Forks Road, Suite 477, Raleigh, NC 27615.

C. The Work consists of providing all the labor, materials, tools, equipment, and other means necessary and incidental to the completion of work shown on the plans and as described in the specifications as follows:
   1. Provide all necessary mobilization, site preparation, demolition, construction and cleanup work associated with the various Pool, Bathhouse and Site improvements as detailed in the project documents. Scope of work has been broken into Base Bid work as well as five (5) Add Alternates as described in the project documents. Work shall include but is not necessarily limited to:
      a. Base Bid: shall include a new plaster / marcite finish to the pool, main drain grate replacements, various concrete repairs to the pool deck, stainless steel grab rails / anchors, lifeguard chair parts replacements, two new 1M diving towers and diving boards, a new water slide, shade structure repairs, removal of non-compliant underwater lights, a new ADA lift, pool signage, depth marker and no diving tiles, pool expansion joint replacements, partial tile replacements in various areas, a new filter system, a new feature pump, replacements and additions of various pipe, valves and fittings, chemical spill pallets, a new backwash pit grate, chemical signage and the addition of a portable eyewash station.
      b. Add Alternate #1: shall include various additional pool finish upgrades (marcite replacement is listed in the base bid) including the beach entry pebble finish, waterline ceramic tile, racing lane tile, wall target tile, step nosing tile, expansion joint tile, and beach entry area tile. We have also included the replacement of several pool deck depth tile replacements within this add alternate.
      c. Add Alternate #2: shall include a variety of architectural building bathhouse improvements. This includes various surface repairs and refinishes, fixture replacements, door and counter improvements, a drinking fountain replacement and various other bathhouse repairs.
      d. Add Alternate #3: shall include some Civil / Site related items and a few electrical and mechanical / plumbing related scope. These shall include repairs to the existing outdoor water meter & spring box, crack and seal repairs to the parking lot, a small section of gutter repairs, various interior light repairs and a new electric hot water heater replacement.
      e. Add Alternate #4: shall include the removal and replacement of the existing pool's recessed steps and the removal and replacement of the three existing shade structures.
      f. Add Alternate #5: shall include repairs to the existing underwater lights as well as various improvements within the pool equipment room (new pipe supports, new chemical controller and flow cell, new chemical metering pumps, new chemical tubing and PVC chemical supply conduit and a new flow meter.

1.2 CONTRACT

A. Project will be constructed under a single prime construction contract.

1.3 WORK SEQUENCE

A. The work awarded shall be conducted in a single phase.

1.4 USE OF PREMISES

A. General: Contractor shall have full use of premises for construction operations, including use of Project site, during construction period. Contractor's use of premises is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

1.5 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are organized into Divisions and Sections using the 48-division format and CSI/CSC's "Master Format" numbering system.

1. Section Identification: The Specifications use section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of sections in the Contract Documents.

B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.

2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.

a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 011400 - WORK RESTRICTIONS

PART 1 – GENERAL

1.1 USE OF PREMISES

A. Use of Site: Limit use of premises to work in areas indicated. Do not disturb portions of site beyond areas in which the Work is indicated.
   1. Limits: Confine construction operations to areas within the contract limits indicated.
   2. Owner Occupancy: Allow for Owner occupancy of site.
   3. Driveways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
      a. Schedule deliveries to minimize use of driveways and entrances.
      b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

B. Use of Existing Building: Maintain existing bathhouse building in a weathertight condition throughout construction period. Repair damage caused by construction operations. Protect building and its occupants during construction period. Contractor shall take any means necessary to prevent any debris from falling into any open swimming pool areas.

1.2 OCCUPANCY REQUIREMENTS

A. Partial Owner Occupancy: Owner reserves the right to occupy and to place and install equipment in completed areas of site, before Substantial Completion, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and partial occupancy shall not constitute acceptance of the total Work.
   1. A Certificate of Substantial Completion will be prepared for each specific portion of the Work to be occupied before Owner occupancy.
   2. If necessary, obtain a Certificate of Occupancy from authorities having jurisdiction before Owner occupancy.
   3. Before partial Owner occupancy, pool recirculation, filtration, mechanical and chemical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will provide, operate, and maintain pool systems serving occupied portions of site.
   4. On occupancy, Owner will assume responsibility for maintenance and operation of swimming pools and pool systems.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 012100 – ALLOWANCES

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements governing allowances.
   1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.

B. Types of allowances include the following:
   1. Contingency allowances.

1.2 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, advice Engineer of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.

B. At Engineer's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

C. Purchase products and systems selected by Engineer from the designated supplier.

1.3 ACTION SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

1.4 INFORMATIONAL SUBMITTALS

A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.

C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.5 COORDINATION

A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.6 CONTINGENCY ALLOWANCES

A. Use the contingency allowance only as directed by Engineer for Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance.

B. Contractor's overhead, profit, and related costs for products and equipment ordered by Owner under the contingency allowance are included in the allowance and are not part of the Contract Sum. These costs include delivery, installation, taxes, insurance, equipment rental, and similar costs.

C. Change Orders authorizing use of funds from the contingency allowance will include Contractor's related costs and reasonable overhead and profit margins.

D. At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

A. Allowance No. 1: Contingency Allowance: Include a contingency allowance of **$50,000**, for use according to Owner's written instructions.

END OF SECTION

SECTION 012200 - UNIT PRICES

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for unit prices.

1.2 DEFINITIONS

A. Unit price is an amount proposed by bidders, stated on the Bid Form, as a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased.

1.3 PROCEDURES

A. Unit prices include all necessary material plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.

B. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

C. The unit prices listed are not anticipated to be required in the project; however, should the need arise whereby one or more are determined to be needed, the City is requesting these prices be listed for institution.

D. The Owner reserves the right to increase or diminish any or all the quantities of work as Owner sees appropriate. Increases or decreases in quantities from those estimated in the bid will not be considered sufficient grounds for granting an increase in the unit price bid.

E. No direct or separate payment will be made for any work required by the Specifications or Drawings unless it is defined as a pay item. Full payment for all such labor, materials, and work required is included under the unit price or lump sum pay items.

F. No direct or separate payment will be made for providing miscellaneous temporary or accessory works, plant, services, Contractor’s office, Engineer’s field office, layout surveys, job signs, sanitary requirements, testing, safety devices, approval and record drawings, water supplies, power, maintaining traffic, removal of remaining waste, watchman, bonds, insurance and all other items as required by the General Conditions, Supplementary Conditions, and the General Requirements. Compensation for all such services, materials, and related work is to be included in the prices stipulated for the unit and lump sum pay items listed herein.

G. List of Unit Prices: A list of unit prices is included at the end of this Section. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 UNIT PRICE SCHEDULE

A. Item No. 1 - Concrete Spall repair:
   1. Description: Provide unit pricing for spall repair as detailed within the project plans, plan sheet SP-811 Detail No. 3.
   2. Unit of Measurement: Per 100 cubic inches.

B. Item No. 2 – Concrete Crack repair:
   1. Description: Provide unit pricing for crack repair as detailed within the project plans, plan sheet SP-811 Detail No. 4.
   2. Unit of Measurement: Per 100 cubic inches.

END OF SECTION

SECTION 012300 - ALTERNATES

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for alternates.

1.2 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.3 PROCEDURES

A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.

C. Execute accepted alternates under the same conditions as other work of the Contract.

D. Schedule: A Schedule of Alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. ALTERNATE #1: shall include all material and necessary construction labor to provide and install various additional pool finish upgrades (marcite replacement is listed in the base bid) including the beach entry pebble finish, waterline ceramic tile, racing lane tile, wall target tile, step nosing tile, expansion joint tile, and beach entry area tile. We have also included the replacement of several pool deck depth tile replacements within this add alternate.

B. ALTERNATE #2: shall include all material and necessary construction labor to provide and install a variety of architectural building bathhouse improvements. This includes various surface repairs and refinishes, fixture replacements, door and counter improvements, a drinking fountain replacement and various other bathhouse repairs.

C. ALTERNATE #3: shall include all material and necessary construction labor to provide and install some Civil / Site related items and a few electrical and mechanical / plumbing related scope. These shall include repairs to the existing outdoor water meter & spring box, crack and seal repairs to the parking lot, a small section of gutter repairs, various interior light repairs and a new electric hot water heater replacement.

D. ALTERNATE #4: shall include all material and necessary construction labor to provide and install the removal and replacement of the existing pool's recessed steps and the removal and replacement of the three existing shade structures.

E. ALTERNATE #5: shall include all material and necessary construction labor to provide and install repairs to the existing underwater lights as well as various improvements within the pool equipment room (new pipe supports, new chemical controller and flow cell, new chemical metering pumps, new chemical tubing and PVC chemical supply conduit and a new flow meter.

END OF SECTION

SECTION 012600 – CONTRACT MODIFICATION PROCEDURES

PART 1 – GENERAL

1.1 SUMMARY

A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.

1.2 MINOR CHANGES IN THE WORK

A. Engineer will issue supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time.

1.3 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Engineer will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
   1. Proposal Requests issued by Engineer are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
   2. Within 7 days after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
      a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
      b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
      c. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to Engineer.
   1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
   2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
   3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
   4. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
   5. Comply with requirements in Division 1 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.

C. Proposal Request Form: For Change Order Proposals, use CSI Change Order Request (proposal format).

1.4 ALLOWANCES

A. Allowance Adjustment: To adjust allowance amounts, base each Change Order proposal on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
   1. Include installation costs in purchase amount only where indicated as part of the allowance.
   2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
   3. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost allowances.
   4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.

B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the Purchase Order amount or Contractor's handling, labor, installation, overhead, and profit. Submit claims within 21 days of receipt of the Change Order or Construction Change Directive authorizing work to proceed. Owner will reject claims submitted later than 21 days after such authorization.
   1. Do not include Contractor’s or subcontractor’s indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.
   2. No change to Contractor’s indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

1.5 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Proposal Request, Engineer will issue a Change Order for signatures of Owner and Contractor.

1.6 WORK CHANGE DIRECTIVE

A. Work Change Directive: Engineer may issue a Work Change Directive which instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
   1. Work Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Work Change Directive.
   1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 012900 - PAYMENT PROCEDURES

PART 1 – GENERAL

1.1 SUMMARY

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

1.2 DEFINITIONS

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

1.3 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
   1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
      a. Contractor’s progress schedule.
      b. Application for Payment form.
      c. List of subcontractors.
      d. Schedule of allowances.
      e. Schedule of alternates.
      f. List of products.
      g. List of principal suppliers and fabricators.
      h. Schedule of submittals.
   2. Submit the Schedule of Values to Engineer at earliest possible date but no later than 21 days before the date scheduled for submittal of initial Applications for Payment.
   3. Sub schedules: Where the Work is separated into phases requiring separately phased payments, provide sub schedules showing values correlated with each phase of payment.

B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one-line item for each Specification Section.
   1. Identification: Include the following Project identification on the Schedule of Values:
      a. Project name and location.
      b. Name of Engineer.
      c. Project number.
      d. Contractor's name and address.
      e. Date of submittal.
   2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
      a. Generic Name
      b. Related Specification Section or Division.
      c. Description of the Work.
      d. Name of subcontractor.
      e. Name of manufacturer or fabricator.

f. Name of supplier.

g. Change Orders (numbers) that affect value.

h. Dollar value.

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

3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.

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

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

a. Differentiate between items stored on-site and items stored off-site. Include evidence of insurance or bonded warehousing if required.

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

7. Allowances: Provide a separate line item in the Schedule of Values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.

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

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

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

1.4 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by Engineer and paid for by Owner.

1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.

C. Payment Application Forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets or EJCDC D rm for Applications for Payment.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Engineer will return incomplete applications without action.

1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.

2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

E. Transmittal: Submit 3 signed and notarized original copies of each Application for Payment to Engineer by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
   1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

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

G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.
   1. Submit partial waivers on each item for amount requested, before deduction for retainage, on each item.
   2. When an application shows completion of an item, submit final or full waivers.
   3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
   4. Waiver Delays: Submit each Application for Payment with Contractor's waiver of mechanic's lien for construction period covered by the application.
      a. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
   5. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.

H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
   1. List of subcontractors.
   2. Schedule of Values.
   3. Contractor's Construction Schedule (preliminary if not final).
   4. Products list.
   5. Schedule of unit prices.
   6. Submittals Schedule (preliminary if not final).
   7. List of Contractor's staff assignments.
   8. List of Contractor's principal consultants.
   9. Copies of building permits.
   10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
   11. Initial progress report.
   12. Report of preconstruction conference.
   13. Certificates of insurance and insurance policies.
   14. Performance and payment bonds.
   15. Data needed to acquire Owner's insurance.
   16. Initial settlement survey and damage report if required.

I. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
   1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.

2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

J. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
   1. Evidence of completion of Project closeout requirements.
   2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
   3. Updated final statement, accounting for final changes to the Contract Sum.
   4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
   5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
   6. AIA Document G707, "Consent of Surety to Final Payment."
   7. Evidence that claims have been settled.
   8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
   9. Final, liquidated damages settlement statement.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 013000 - PROJECT MANAGEMENT AND COORDINATION

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
   1. Coordination.
   2. Submittals.
   3. Administrative and supervisory personnel.
   4. Project meetings.
   5. General installation provisions.
   6. Cleaning and protection.

B. Where applicable, each prime Contractor shall participate in these coordination requirements, even though certain areas of responsibility are assigned to a specific prime Contractor.

1.2 COORDINATION

A. Coordination: Coordinate construction activities included under various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections of these Specifications that are dependent upon each other for proper installation, connection, and operation.

B. Coordination: Each prime contractor shall cooperate with Owner's, coordinate construction activities to assure efficient and orderly installation of each part of the Work.
   1. Where installation of one part of the Work is dependent on installation of other components, either before or after its own installation, cooperate with scheduled construction activities in the sequence required to obtain the best results.
   2. Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair.
   3. Make adequate provisions to accommodate items scheduled for later installation.
   4. Coordinate construction activities with public and private utilities.
      a. Notify "Underground Facilities Protective Organizations" (UFPO) a minimum of 48 hours prior to excavation or blasting.
      b. Notify the Owner and Engineer of any utility locations encountered which conflict with the work. Coordinate with the Owner and Utility Company in the protection, removal, relocation or replacement of conflicting utility locations.

C. Where necessary, prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.
   1. Prepare similar memoranda for the Owner and separate Contractors where coordination of their Work is required.

D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure

orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's Construction Schedule.
2. Preparation of the Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Pre-installation conferences.
7. Project closeout activities.

E. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

1.3 SUBMITTALS

A. Coordination Drawings: Prepare and submit coordination Drawings where close and careful coordination is required for installation of products and materials fabricated off-site by separate entities, and where limited space availability necessitates maximum utilization of space for efficient installation of different components.

1. Show the interrelationship of components shown on separate Shop Drawings.
2. Indicate required installation sequences.
3. Comply with requirements contained in Section "Submittals Procedures."
4. Refer to Division 13, Section 131100 – SWIMMING POOL GENERAL CONDITIONS for specific coordination Drawing requirements for swimming pool installations.

B. Staff Names: Within 15 days of starting construction operations, submit a list of principal staff assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone.

1.4 PROJECT MEETINGS

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

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Engineer of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Engineer, within 3 days of the meeting.

B. Preconstruction Conference: Schedule a preconstruction conference and organizational meeting at the Project site or other convenient site prior to commencement of construction activities. Conduct the meeting to review responsibilities and personnel assignments.

1. Attendees: Authorized representatives of Owner, the Engineer, Engineer and their consultants; the Contractor and its superintendent; major subcontractors; manufacturers; suppliers and other

concerned parties shall each be represented at the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Discuss items of significance that could affect progress, including the following:
   a. Tentative construction schedule.
   b. Phasing.
   c. Critical work sequencing.
   d. Designation of responsible personnel.
   e. Procedures for processing field decisions and Change Orders.
   f. Procedures for processing Applications for Payment.
   g. Distribution of the Contract Documents.
   h. Submittal procedures.
   i. Preparation of Record Documents.
   j. Use of the premises.
   k. Responsibility for temporary facilities and controls.
   l. Parking availability.
   m. Office, work, and storage areas.
   n. Equipment deliveries and priorities.
   o. Safety procedures.
   p. First aid.
   q. Security.
   r. Progress cleaning.
   s. Working hours.
   t. Housekeeping.
   u. Subcontractors.
   v. Preliminary Schedule of Shop Drawings and Samples.
   w. Minority Business Enterprise Goals.
   x. Co-ordination with other contractors.
   y. Insurance in Force.
   z. Contractor's Schedule of Values.

C. Pre-installation Conferences: Conduct a pre-installation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise the Engineer of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the activity under consideration at each pre-installation conference, including requirements for the following:
   a. Contract Documents.
   b. Options.
   c. Related Change Orders.
   d. Purchases.
   e. Deliveries.
   f. Shop Drawings, Product Data and quality control Samples.
   g. Review of mockups.
   h. Possible conflicts.

i. Compatibility problems.
j. Time schedules.
k. Weather limitations.
l. Manufacturer's written recommendations.
m. Warranty requirements.
n. Compatibility of materials.
o. Acceptability of substrates.
p. Temporary facilities and controls.
q. Space and access limitations.
r. Governing regulations.
s. Testing and inspecting requirements.
t. Required performance results.
u. Protection of construction and personnel.
v. Safety.
w. Recording requirements.

3. Record significant discussions and agreements and disagreements of each conference, along with the approved progress schedule. Distribute the record of the meeting to everyone concerned, promptly, including the Owner and Engineer.
4. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Progress Meetings: Conduct progress meetings at the Project Site at regularly scheduled intervals. Coordinate dates of meetings with preparation of payment requests.

1. Attendees: In addition to representatives of the Owner and Engineer, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the current status of Project.
   a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
   b. Review present and future needs of each entity present, including the following:
      1) Interface requirements.
      2) Time.
      3) Sequence of operations.
      4) Status of submittals.
      5) Deliveries.
      6) Off-site fabrication.
      7) Access.
      8) Site utilization.
      9) Temporary facilities and controls.
      10) Work hours.

11) Hazards and risks.
12) Progress cleaning.
13) Quality and work standards.
14) Change Orders.
15) Documentation of information for payment requests.

3. Reporting: No later than 3 days after each progress meeting date, distribute copies of minutes of the meeting to each party present and to parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.
   a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.

E. Coordination Meetings: Conduct Project coordination meetings at regularly scheduled intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and pre-installation conferences.
1. Attendees: In addition to representatives of the Owner and Engineer, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work
2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
   a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to Combined Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
   b. Schedule Updating: Revise Combined Contractor's Construction Schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
   c. Review present and future needs of each contractor present, including the following:
      1) Interface requirements.
      2) Time.
      3) Sequence of operations.
      4) Status of submittals.
      5) Deliveries.
      6) Off-site fabrication.
      7) Access.
      8) Site utilization.
      9) Temporary facilities and controls.
      10) Work hours.
      11) Hazards and risks.
      12) Progress cleaning.
      13) Quality and work standards.
      14) Change Orders.
3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION

3.1 GENERAL INSTALLATION PROVISIONS

A. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

B. Manufacturer's Instructions: Comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.

C. Inspect materials or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items.

D. Provide attachment and connection devices and methods necessary for securing Work. Secure Work true to line and level. Allow for expansion and building movement.

E. Visual Effects: Provide uniform joint widths in exposed Work. Arrange joints in exposed Work to obtain the best visual effect. Refer questionable choices to the Engineer for final decision.

F. Recheck measurements and dimensions, before starting each installation.

G. Install each component during weather conditions and Project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.

H. Coordinate temporary enclosures with required inspections and tests, to minimize the necessity of uncovering completed construction for that purpose.

I. Mounting Heights: Where mounting heights are not indicated, install individual components at standard mounting heights recognized within the industry for the particular application indicated. Refer questionable mounting height decisions to the Engineer for final decision.

3.2 CLEANING AND PROTECTION

A. During handling and installation, clean and protect construction in progress and adjoining materials in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

B. Clean and maintain completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

C. Limiting Exposures: Supervise construction activities to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Where applicable, such exposures include, but are not limited to, the following:
   1. Excessive static or dynamic loading.
   2. Excessive internal or external pressures.

3. Excessively high or low temperatures.
4. Thermal shock.
5. Excessively high or low humidity.
6. Air contamination or pollution.
7. Water or ice.
8. Solvents or Chemicals.
9. Light.
10. Radiation.
11. Puncture.
12. Abrasion.
13. Heavy traffic.
14. Soiling, staining and corrosion.
15. Bacteria.
16. Rodent and insect infestation.
17. Combustion.
18. Electrical current.
19. High speed operation,
20. Improper lubrication,
21. Unusual wear or other misuse.
22. Contact between incompatible materials.
23. Destructive testing.
24. Misalignment.
25. Excessive weathering.
26. Unprotected storage.
27. Improper shipping or handling.
28. Theft.
29. Vandalism.

END OF SECTION

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
   1. Preliminary Construction Schedule.
   2. Contractor's Construction Schedule.
   3. Submittals Schedule.
   4. Daily construction reports.
   5. Material location reports.
   6. Field condition reports.
   7. Special reports.
   8. Construction photographs.

1.2 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
   1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
   2. Predecessor activity is an activity that must be completed before a given activity can be started.

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

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

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

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

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

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

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

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

1.3 SUBMITTALS

A. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

B. Submittals Schedule: Submit 3 copies of schedule. Arrange the following information in a tabular format:
   1. Scheduled date for first submittal.
   2. Specification Section number and title.
   3. Submittal category (action or informational).
   4. Name of subcontractor.
   5. Description of the Work covered.
   6. Scheduled date for Engineer's final release or approval.

C. Preliminary Construction Schedule: Submit 3 printed copies; one a single sheet of reproducible media, and one a print.

D. Contractor's Construction Schedule: Submit 3 printed copies of initial schedule, one a reproducible print and one a blue- or black-line print, large enough to show entire schedule for entire construction period.
   1. Submit an electronic copy of schedule on a thumb drive. Include type of schedule (Initial or Updated) and date on label.

E. Construction Photographs: Submit a digital photo of each view within 7 days of taking photographs.
   1. Format: Digital JPG image with minimum resolution of 2584x1936 and image quality set to fine/high or better.
   2. Identification: A photo-log shall be provided containing a record for each submitted photo with the following information:
      a. File Name of Photo.
      b. Name of Project.
      c. Name and address of photographer.
      d. Name of Engineer.
      e. Name of Contractor.
      f. Date photograph was taken.
      g. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
      h. Photo-logs may be scanned hard-copy forms, though digital formats such as MS Word, MS Excel or MS Access are preferred. If the delivery method for the photos is via an online file management system, photo-log records should be entered into that system provided it supports entering the above information.
   3. Delivery: If an online document management system or project collaboration website is used on the project, all photos and accompanying identification will be uploaded to it. Otherwise, digital photos will be delivered via traditional media such as a thumb drive, or uploaded to an FTP site.

F. Daily Construction Reports: Submit 3 copies at weekly intervals.

G. Material Location Reports: Submit 3 copies at weekly intervals.

H. Field Condition Reports: Submit 3 copies at time of discovery of differing conditions.

I. Special Reports: Submit 3 copies at time of unusual event.

1.4 QUALITY ASSURANCE

A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting.

B. Photographer Qualifications: An individual of established reputation who has been regularly engaged as a professional photographer for not less than three years.

C. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section "Project Management and Coordination." Review methods and procedures related to the Preliminary Construction Schedule and Contractor's Construction Schedule, including, but not limited to, the following:
   1. Review software limitations and content and format for reports.
   2. Verify availability of qualified personnel needed to develop and update schedule.
   3. Discuss constraints, including phasing work, stages, interim milestones, and partial Owner occupancy.
   4. Review delivery dates for Owner-furnished products.
   5. Review schedule for work of Owner's separate contracts.
   6. Review time required for review of submittals and resubmittals.
   7. Review requirements for tests and inspections by independent testing and inspecting agencies.
   8. Review time required for completion and startup procedures.
   9. Review and finalize list of construction activities to be included in schedule.
   10. Review submittal requirements and procedures.
   11. Review procedures for updating schedule.

1.5 COORDINATION

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

B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.
   1. Secure time commitments for performing critical elements of the Work from parties involved.
   2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

C. Auxiliary Services: Cooperate with photographer and provide auxiliary services requested, including access to Project site and use of temporary facilities including temporary lighting.

PART 2 – PRODUCTS

2.1 SUBMITTALS SCHEDULE

A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.
   1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
   2. Initial Submittal: Submit concurrently with preliminary bar-chart schedule. Include submittals required during the first 60 days of construction. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
      a. At Contractor's option, show submittals on the Preliminary Construction Schedule, instead of tabulating them separately.
   3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

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

B. Time Frame: Extend schedule from date established for the Notice of Award to date of Final Completion.
   1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

C. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
   1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Engineer.
   2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
   3. Submittal Review Time: Include review and resubmittal times indicated in Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
   4. Startup and Testing Time: Include not less than 7 days for startup and testing.
   5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion and allow time for Engineer's administrative procedures necessary for certification of Substantial Completion.

D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule and show how the sequence of the Work is affected.
   1. Phasing: Arrange list of activities on schedule by phase.
   2. Work under More Than One Contract: Include a separate activity for each contract.
   3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.

4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
6. Work Restrictions: Show the effect of the following items on the schedule:
   a. Coordination with existing construction.
   b. Limitations of continued occupancies.
   c. Uninterruptible services.
   d. Partial occupancy before Substantial Completion.
   e. Use of premises restrictions.
   f. Provisions for future construction.
   g. Seasonal variations.
   h. Environmental control.
7. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
   a. Subcontract awards.
   b. Submittals.
   c. Purchases.
   d. Mockups.
   e. Fabrication.
   f. Sample testing.
   g. Deliveries.
   h. Installation.
   i. Tests and inspections.
   j. Adjusting.
   k. Curing.
   l. Startup and placement into final use and operation.
8. Area Separations: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
   a. Structural completion.
   b. Permanent space enclosure.
   c. Completion of mechanical installation.
   d. Completion of electrical installation.
   e. Substantial Completion.

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

F. Cost Correlation: At the head of schedule, provide a cost correlation line, indicating planned and actual costs. On the line, show dollar volume of the Work performed as of dates used for preparation of payment requests.
   1. Refer to Section "Payment Procedures" for cost reporting and payment procedures.

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

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

2.3 PRELIMINARY CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Submit preliminary horizontal bar-chart-type construction schedule within 7 days of date established for the Notice to Proceed.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.4 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

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

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
   1. For construction activities that require 3 months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

2.5 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
   1. List of subcontractors at Project site.
   2. List of separate contractors at Project site.
   3. Approximate count of personnel at Project site.
   4. High and low temperatures and general weather conditions.
   5. Accidents.
   6. Meetings and significant decisions.
   7. Unusual events (refer to special reports).
   8. Stoppages, delays, shortages, and losses.
   9. Meter readings and similar recording.
   10. Emergency procedures.
   11. Orders and requests of authorities having jurisdiction.
   12. Change Orders received and implemented.
   13. Work Change Directives received.
   14. Service connected and disconnected.
   15. Equipment or system tests and startups.
   16. Partial Completions and occupancies.
   17. Substantial Completions authorized.

B. Material Location Reports: At weekly intervals, prepare a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus

items recently delivered. Include with lit a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.

C. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare a detailed report. Submit with a request for information on CSI Form 13.2A. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.6 SPECIAL REPORTS

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

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

PART 3 – EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At by-weekly intervals, update schedule to reflect actual construction progress and activities. Issue schedule 1 day before each regularly scheduled progress meeting.
   1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
   2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
   3. As the Work progresses, indicate Actual Completion percentage for each activity.

B. Distribution: Distribute copies of approved schedule to Engineer, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
   1. Post copies in Project meeting rooms and temporary field offices.
   2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

3.2 CONSTRUCTION PHOTOGRAPHS

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

B. Date Stamp: Unless otherwise indicated, date and time stamp each photograph as it is being taken so stamp is integral to photograph.

C. Preconstruction Photographs: Before starting construction, take 10 photographs of Project site and surrounding properties from different vantage points, as directed by Engineer. Show existing conditions adjacent to property.

D. Periodic Construction Photographs: Take 10 color photographs monthly, coinciding with cutoff date associated with each Application for Payment. Photographer shall select vantage points to best show status of construction and progress since last photographs were taken.

1. Field Office Prints: Retain an electronic set of photographs in field office at Project site, available at all times for reference. Identify photographs the same as for those submitted to Engineer.

E. Final Completion Construction Photographs: Take 10 photographs after date of Substantial Completion for submission as Project Record Documents. Engineer will direct photographer for desired vantage points.

END OF SECTION

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 – GENERAL

1.1 SUMMARY

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

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Engineer's responsive action.

B. Informational Submittals: Written information that does not require Engineer's approval. Submittals may be rejected for not complying with requirements.

C. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1. Submittal Administrative Requirements:

a. Engineer's Digital Data Files: Electronic digital data files of the Contract Drawings will be provided by Engineer for Contractor's use in preparing submittals.

1) Engineer will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings.

a) Engineer makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.

b) Digital Drawing Software Program: The Contract Drawings are available in AutoCAD 2017.

c) Contractor shall execute data licensing agreement.

b. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

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

2) Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.

3) Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.

4) Retain subparagraph below if one submittal has an impact on another submittal. Submittals that require concurrent review should be so indicated in those Sections.

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

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

c. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Engineer's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
   1) Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Engineer will advise Contractor when a submittal being processed must be delayed for coordination.
   2) Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
   3) Resubmittal Review: Allow 15 days for review of each resubmittal.
   4) Sequential Review: Where sequential review of submittals by Engineer's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.

D. Paper Submittals: Place a permanent label or title block on each submittal item for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Engineer
3. Include the following information for processing and recording action taken:
   a. Project name.
   b. Date.
   c. Name of Engineer.
   d. Name of Construction Manager.
   e. Name of Contractor.
   f. Name of subcontractor.
   g. Name of supplier.
   h. Name of manufacturer.
   i. Submittal number or other unique identifier, including revision identifier.
      1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).
   j. Number and title of appropriate Specification Section.
   k. Drawing number and detail references, as appropriate.
   l. Location(s) where product is to be installed, as appropriate.
   m. Other necessary identification.
4. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Engineer or Construction Manager observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
   a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Engineer.
5. Transmittal for Paper Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Engineer and Construction Manager will return without review discard submittals received from sources other than Contractor.
   a. Transmittal Form for Paper Submittals: Use facsimile of sample form included in Project Manual.

E. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
   a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).
3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Engineer.
4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Owner, containing the following information:
   a. Project name.
   b. Date.
   c. Name and address of Engineer.
   d. Name of Construction Manager.
   e. Name of Contractor.
   f. Name of firm or entity that prepared submittal.
   g. Names of subcontractor, manufacturer, and supplier.
   h. Category and type of submittal.
   i. Submittal purpose and description.
   j. Specification Section number and title.
   k. Specification paragraph number or drawing designation and generic name for each of multiple items.
   l. Drawing number and detail references, as appropriate.
   m. Location(s) where product is to be installed, as appropriate.
   n. Related physical samples submitted directly.
   o. Indication of full or partial submittal.
   p. Transmittal number, numbered consecutively.
   q. Submittal and transmittal distribution record.
   r. Other necessary identification.
   s. Remarks.

F. Metadata: Include the following information as keywords in the electronic submittal file metadata:

   a. Project name.
   b. Number and title of appropriate Specification Section.
   c. Manufacturer name.
   d. Product name.

G. Options: Identify options requiring selection by Engineer.

H. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Engineer on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

I. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
   1. Note date and content of previous submittal.
   2. Note date and content of revision in label or title block and clearly indicate extent of revision.
   3. Resubmit submittals until they are marked with approval notation from Engineer's action stamp.

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

K. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Engineer's action stamp.

PART 2 – PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
   1. Submit electronic submittals via email as PDF electronic files.
      a. Engineer will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
   2. Action Submittals: Submit 3 paper copies of each submittal unless otherwise indicated. Engineer will return 2 copies.
   3. Informational Submittals: Submit 2 paper copies of each submittal unless otherwise indicated. Engineer will not return copies.
   4. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
      a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
      b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
   1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
   2. Mark each copy of each submittal to show which products and options are applicable.
   3. Include the following information, as applicable:
      a. Manufacturer's catalog cuts.
      b. Manufacturer's product specifications.
      c. Standard color charts.
      d. Statement of compliance with specified referenced standards.
      e. Testing by recognized testing agency.
      f. Application of testing agency labels and seals.
      g. Notation of coordination requirements.
      h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:
    a. Wiring diagrams showing factory-installed wiring.
    b. Printed performance curves.
    c. Operational range diagrams.
    d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
5. Submit Product Data before or concurrent with Samples.
6. Submit Product Data in the following format:
    a. PDF electronic file.
    b. Three paper copies of Product Data unless otherwise indicated. Engineer, through Construction Manager, will return two copies.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    a. Identification of products.
    b. Schedules.
    c. Compliance with specified standards.
    d. Notation of coordination requirements.
    e. Notation of dimensions established by field measurement.
    f. Relationship and attachment to adjoining construction clearly indicated.
    g. Seal and signature of professional engineer if specified.
2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.
3. Submit Shop Drawings in the following format:
    a. PDF electronic file.
    b. Three opaque copies of each submittal. Engineer will retain 2copies; remainder will be returned.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:
    a. Generic description of Sample.
    b. Product name and name of manufacturer.
    c. Sample source.
    d. Number and title of applicable Specification Section.
    e. Specification paragraph number and generic name of each item.
3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
    a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.

b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
   a. Number of Samples: Submit 1 full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Engineer will return submittal with options selected.
6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
   a. Number of Samples: Submit three sets of Samples. Engineer and Construction Manager will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record sample.
      1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
      2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least 3 sets of paired units that show approximate limits of variations.

E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
   1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
   2. Manufacturer and product name, and model number if applicable.
   3. Number and name of room or space.
   4. Location within room or space.
   5. Submit product schedule in the following format:
      a. PDF electronic file.
      b. Three paper copies of product schedule or list unless otherwise indicated. Engineer will return 2 copies.

F. Coordination Drawing Submittals: Comply with requirements specified in Division 01 Section "Project Management and Coordination."

G. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."

H. Application for Payment and Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."

I. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Division 01 Section "Quality Requirements."

J. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section "Closeout Procedures."

K. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of Engineers and owners, and other information specified.

L. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

M. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

N. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

O. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

P. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

Q. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

R. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

S. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
   1. Name of evaluation organization.
   2. Date of evaluation.
   3. Time period when report is in effect.
   4. Product and manufacturers' names.
   5. Description of product.
   6. Test procedures and results.
   7. Limitations of use.

T. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

U. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

V. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

W. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

X. Engineer Construction Photographs: Comply with requirements in Division 1 Section "Construction Progress Documentation."

2.2 CONTRACTOR'S PROJECT HEALTH & SAFETY PLAN

A. No later than the Pre-construction meeting, the Contractor shall submit to the Engineer a written Project Health & Safety Plan which states the Contractor's company policy relative to safety. The plan must also address specific health and safety concerns which are expected to be encountered on the project. As a minimum this plan shall include:

1. Listing of project and company safety officers
2. Specific company safety policies
3. Employee Safety Training Program
4. Administrative procedures to handle employee health & safety concerns
5. Procedures for insuring worker compliance with health and safety requirements.

B. The Contractor shall be responsible to ensure that each Subcontractor employed on the project complies with the requirements of this section either by submitting a copy of the subcontractor's Project Health & Safety Plan or by submitting a letter from the Subcontractor stating that they will comply with the provisions of the Contractor's Project Health & Safety Plan.

C. Submission of the required Project Health & Safety Plan by the Contractor is primarily for information or record purposes and shall not be construed to imply approval by the Engineer or to relieve the Contractor from the responsibility to adequately protect the health & safety of all workers involved in the project.

PART 3 – EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Review each submittal and check for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Engineer.

B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ENGINEER'S ACTION

A. General: Engineer will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: Engineer will review each submittal, make marks to indicate corrections or modifications required, and return it. Engineer will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:

1. Final Unrestricted Release: Where submittals are marked "No Exceptions Taken," that part of the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents; final acceptance will depend upon that compliance.
2. Final-But-Restricted Release: When submittals are marked "Make Corrections Noted," that part of the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents; final acceptance will depend on that compliance.
3. Returned for Resubmittal: When submittal is marked "Revise and Resubmit," "Rejected," or "Submit Specified Item," do not proceed with that part of the Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal in accordance with the notations; resubmit without delay. Repeat if necessary, to obtain a different action mark.
    a. Do not permit submittals marked "Revise and Resubmit," "Rejected," or "Submit Specified Item" to be used at the Project site, or elsewhere where Work is in progress.
4. Other Action: Where a submittal is primarily for information or record purposes, special processing or other activity, the submittal will be returned, marked "Action Not Required."

C. Informational Submittals: Engineer will review each submittal and will not return it or will reject and return it if it does not comply with requirements. Engineer will forward each submittal to appropriate party.

D. Submittals not required by the Contract Documents will not be reviewed and may be discarded.

END OF SECTION

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
   1. Specific quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
   2. Specified tests, inspections, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with the Contract Document requirements.
   3. Requirements for Contractor to provide quality-control services required by Engineer, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.2 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction complies with requirements. Services do not include contract enforcement activities performed by Engineer.

C. Mockups: Full-size, physical example assemblies to illustrate finishes and materials. Mockups are used to verify selections made under Sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples.

D. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

1.3 DELEGATED DESIGN

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
   1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Engineer.

1.4 SUBMITTALS

A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

C. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
   1. Specification Section number and title.
   2. Description of test and inspection.
   3. Identification of applicable standards.
   4. Identification of test and inspection methods.
   5. Number of tests and inspections required.
   6. Time schedule or time span for tests and inspections.
   7. Entity responsible for performing tests and inspections.
   8. Requirements for obtaining samples.
   9. Unique characteristics of each quality-control service.

D. Reports: Prepare and submit certified written reports, that include the following:
   1. Date of issue.
   2. Project title and number.
   3. Name, address, and telephone number of testing agency.
   4. Dates and locations of samples and tests or inspections.
   5. Names of individuals making tests and inspections.
   6. Description of the Work and test and inspection method.
   7. Identification of product and Specification Section.
   8. Complete test or inspection data.
   9. Test and inspection results and an interpretation of test results.
   10. Ambient conditions at time of sample taking and testing and inspecting.
   11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
   12. Name and signature of laboratory inspector.
   13. Recommendations on retesting and reinspecting.

E. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

C. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

D. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or products that are similar to those indicated for this Project in material, design, and extent.

F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
   1. Requirement for specialists shall not supersede building codes and similar regulations governing the Work, nor interfere with local trade-union jurisdictional settlements and similar conventions.

G. Testing Agency Qualifications: An agency with the experience and capability to conduct testing and inspecting indicated, as documented by ASTM E 548, and that specializes in types of tests and inspections to be performed. Each testing agency shall be authorized by the authorities having jurisdiction in the state in which the project is located.

H. Preconstruction Testing: Testing agency shall perform preconstruction testing for compliance with specified requirements for performance and test methods.
   1. Contractor responsibilities include the following:
      a. Provide test specimens and assemblies representative of proposed materials and construction. Provide sizes and configurations of assemblies to adequately demonstrate capability of product to comply with performance requirements.
      b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
      c. Fabricate and install test assemblies using installers who will perform the same tasks for Project.
      d. When testing is complete, remove assemblies; do not reuse materials on Project.
   2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Engineer through Construction Manager, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

I. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
   1. Build mockups in location and of size indicated or, if not indicated, as directed by Engineer.
   2. Notify Engineer (7) days in advance of dates and times when mockups will be constructed.
   3. Demonstrate the proposed range of aesthetic effects and workmanship.
   4. Obtain Engineer's approval of mockups before starting work, fabrication, or construction.
   5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

6. Demolish and remove mockups when directed, unless otherwise indicated.

1.6 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
   1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of the types of testing and inspecting they are engaged to perform.
   2. Payment for these services will be made from testing and inspecting allowances, as authorized by Change Orders.
   3. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

B. Contractor Responsibilities: Unless otherwise indicated, provide quality-control services specified and required by authorities having jurisdiction.
   1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
      a. Contractor shall not employ the same entity engaged by Owner, unless agreed to in writing by Owner.
   2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
   3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
   4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
   5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Special Tests and Inspections: Owner will engage a testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner.
   1. Testing agency will notify Engineer and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
   2. Testing agency will submit a certified written report of each test, inspection, and similar quality-control service to Engineer with copy to Contractor and to authorities having jurisdiction.
   3. Testing agency will submit a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
   4. Testing agency will interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
   5. Testing agency will retest and reinspect corrected work.

D. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing.

E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that revised or replaced Work that failed to comply with requirements established by the Contract Documents.

F. Testing Agency Responsibilities: Cooperate with Engineer and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
   1. Notify Engineer and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
   2. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
   3. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
   4. Do not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.
   5. Do not perform any duties of Contractor.

G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
   1. Access to the Work.
   2. Incidental labor and facilities necessary to facilitate tests and inspections.
   3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
   4. Facilities for storage and field-curing of test samples.
   5. Delivery of samples to testing agencies.
   6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
   7. Security and protection for samples and for testing and inspecting equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
   1. Schedule times for tests, inspections, obtaining samples, and similar activities.

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within 30 days of date established for commencement of the Work (i.e., Notice to Proceed).
   1. Distribution: Distribute schedule to Owner, Engineer, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
   1. Provide materials and comply with installation requirements specified in other Sections of these Specifications. Restore patched areas and extend restoration into adjoining areas in a manner that eliminates evidence of patching.

2. Comply with the Contract Document requirements for Division 1 Section "Cutting and Patching."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

SECTION 014200 - REFERENCES

PART 1 – GENERAL

1.1 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": The term "approved," when used in conjunction with Engineer's action on Contractor's submittals, applications, and requests, is limited to Engineer's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean directed by Engineer, requested by Engineer, and similar phrases.

D. "Indicated": The term "indicated" refers to graphic representations, notes, or schedules on Drawings; or to other paragraphs or schedules in Specifications and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the user locate the reference.

E. "Regulations": The term "regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": The term "furnish" is used to mean supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": The term "install" is used to describe operations at Project site including unloading, temporary storage, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": The term "provide" means to furnish and install, complete and ready for the intended use.

I. "Installer": An installer is the Contractor or another entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier, to perform a particular construction operation, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.

J. The term "experienced," when used with the term "installer," means having successfully completed previous projects similar in size and scope to this Project; being familiar with the special requirements indicated; and having complied with requirements of authorities having jurisdiction.
   1. Trades: Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.

2. Assignment of Specialists: Certain Sections of the Specifications require that specific construction activities shall be performed by specialists who are recognized experts in the operations to be performed. The specialists must be engaged for those activities, and assignments are requirements over which the Contractor has no choice or option. Nevertheless, the ultimate responsibility for fulfilling Contract requirements remains with the Contractor.
    a. This requirement shall not be interpreted to conflict with enforcement of building codes and similar regulations governing the Work. It is also not intended to interfere with local trade union jurisdictional settlements and similar conventions.

K. "Project site" is the space available to the Contractor for performing construction activities, either exclusively or in conjunction with others performing other work as part of Project. The extent of Project site is shown on the Drawings and may or may not be identical with the description of the land on which Project is to be built.

L. Testing Laboratories: A “testing laboratory” is an independent entity engaged to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1.2 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of the date of the Contract Documents, unless otherwise indicated.

C. Conflicting Requirements: Where compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Engineer for a decision before proceeding.
    1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. In complying with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements. Refer uncertainties to Engineer for a decision before proceeding.

D. Copies of Standards: Each entity engaged in construction on Project must be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
    1. Where copies of standards are needed to perform a required construction activity, the Contractor shall obtain copies directly from the publication source and make them available on request.

E. Abbreviations and Names: Abbreviations and acronyms are frequently used in the Specifications and other Contract Documents to represent the name of a trade association, standards-developing organization, authorities having jurisdiction, or other entity in the context of referencing a standard or publication. Where abbreviations and acronyms are used in the Specifications or other Contract Documents, they mean the recognized name of these entities. Refer to Gale Research's "Encyclopedia of Associations" or Columbia Books' "National Trade & Professional Associations of the U.S.," which are available in most libraries.

F. Government Agencies: The following government agencies develop standards referenced in the Contract Documents:

North Carolina Department of Health & Human Services
Division of Public Health Environmental Health Section
2001 Mail Service Center
Raleigh, NC 27699-2000
Customer Service Center: 1-800-662-7030

Edgecombe County Department of Health
Environmental Health Division
155 Atlantic Avenue
Rocky Mount, NC 27801
Tel: (252) 985-4100

City of Rocky Mount
331 S. Franklin Street
Rocky Mount, NC 27802-1180
Tel: (252) 972-1111

1.3 QUALITY ASSURANCE

A. Regulatory Requirements:
1. The Engineer has contacted authorities having jurisdiction where necessary to obtain information necessary for preparation of Contract Documents. Contact authorities having jurisdiction directly for information and decisions having a bearing on the Work.
2. Copies of Regulations: Obtain copies of the following regulations and retain at the Project Site, available for reference by parties who have a reasonable need for such reference.

1.4 SUBMITTALS

A. Permits, Licenses, and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, and similar documents, correspondence, and records established for compliance with standards and regulations bearing upon performance of the Work.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes requirements for temporary services, facilities and controls, including temporary utilities, support facilities, and security and protection facilities.

B. Temporary utilities include, but are not limited to, the following:
1. Sewers and drainage.
2. Water service and distribution.
3. Sanitary facilities, including toilets, wash facilities, and drinking-water facilities.
4. Heating and cooling facilities.
5. Ventilation.
6. Electric power.
7. Lighting.
8. Telephone.

C. Temporary construction and support facilities include, but are not limited to, the following:
1. Temporary roads and paving.
2. Dewatering facilities and drains.
3. Project identification and temporary signs.
4. Waste disposal facilities.
5. Field offices.
6. Storage and fabrication sheds.
7. Lifts and hoists.
8. Temporary stairs.
9. Construction aids and miscellaneous services and facilities.
10. Temporary enclosures.
11. Temporary heat.

D. Security and protection facilities include, but are not limited to, the following:
1. Environmental protection.
2. Stormwater control.
3. Tree and plant protection.
4. Sidewalk bridge and/or site enclosure fence.
5. Security enclosure and lockup.
6. Barricades, warning signs, and lights.
7. Covered walkways.
8. Temporary enclosures.
9. Temporary partitions.
10. Fire protection.

1.2 DEFINITIONS

A. Permanent Enclosure: As determined by Engineer, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures.

1.3 USE CHARGES

A. General: The cost of all use charges for temporary facilities are not chargeable to Owner or Engineer and shall be included in the Contract Sum. The contractor shall be responsible for paying all use charges until the project is substantially complete. Allow other entities to use temporary services and facilities without cost, including, but not limited to, the following:
   1. Owner's construction forces.
   2. Occupants of Project.
   3. Engineer.
   4. Testing agencies.
   5. Personnel of authorities having jurisdiction.

B. Sewer Service: Pay sewer service use charges for sewer usage, by all parties engaged in construction, at Project site.

C. Water Service: Pay water service use charges, whether metered or otherwise, for water used by all entities engaged in construction activities at Project site.

D. Electric Power Service: Pay electric power service use charges, whether metered or otherwise, for electricity used by all entities engaged in construction activities at Project site.

1.4 SUBMITTALS

A. Temporary Utility Reports: Submit reports of tests, inspections, utility billings, and similar procedures performed on temporary utilities.

B. Implementation and Termination Schedule: Within 15 days of date established for submittal of Contractor's Construction Schedule, submit a schedule indicating implementation and termination of each temporary utility.

1.5 QUALITY ASSURANCE

A. Standards: Comply with ANSI A10.6, NECA's "Temporary Electrical Facilities," and NFPA 241.
   1. Trade Jurisdictions: Assigned responsibilities for installation and operation of temporary utilities are not intended to interfere with trade regulations and union jurisdictions.
   2. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
   3. Refer to Guidelines for Bid Conditions for Temporary Job Utilities and Services, prepared jointly by AGC and ASC, for industry recommendations.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

C. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction, including but not limited to:
   1. Building Code requirements.

2. Health and safety regulations.
3. Utility company regulations.
4. Police, Fire Department and Rescue Squad rules.

1.1 PROJECT CONDITIONS

D. Temporary Utilities: At earliest feasible time, when acceptable to Owner, change over from use of temporary service to use of permanent service. Prepare a schedule indicating date for implementation and terminations of each temporary facility.
   1. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

E. Conditions of Use: The following conditions apply to use of temporary services and facilities by all parties engaged in the Work:
   1. Keep temporary services and facilities clean and neat.
   2. Relocate temporary services and facilities as required by progress of the Work.
   3. Operate in a safe and efficient manner.
   4. Take necessary fire prevention measures.
   5. Do not overload facilities or permit them to interfere with progress.
   6. Do not allow hazardous, dangerous or unsanitary conditions or public nuisances to develop or persist on the site.

PART 2 – PRODUCTS

2.1 MATERIALS

A. General: Provide new materials. Undamaged, previously used materials in serviceable condition may be used if approved by Engineer. Provide materials suitable for use intended.

2.2 EQUIPMENT

A. General: Provide new equipment; if acceptable to the Engineer, undamaged, previously used equipment in serviceable condition may be used. Provide equipment suitable for use intended.

B. Fire Extinguishers: Provide hand-carried, portable UL-rated, class "A fire extinguishers for temporary offices and similar spaces. In other locations provide hand-carried, portable, UL-rated, class "ABC dry chemical extinguishers, or a combination of extinguishers of NFPA recommended classes for the exposures.
   1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

C. Self-Contained Toilet Units: Single-occupant units of chemical, aerated recirculation, or combustion type; vented; fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.

D. Drinking-Water Fixtures: Containerized, tap-dispenser, bottled-water or drinking-water units, including paper cup supply.
   1. Where power is accessible, provide electric water coolers to maintain dispensed water temperature at 45 to 55 deg F.

E. Heating Equipment: Unless Owner authorizes use of permanent heating system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating Units: Listed and labeled, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use for type of fuel being consumed.

F. Electrical Outlets: Properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-V plugs into higher-voltage outlets; equipped with ground-fault circuit interrupters, reset button, and pilot light.

G. Power Distribution System Circuits: Where permitted and overhead and exposed for surveillance, wiring circuits, not exceeding 125-V ac, 20-A rating, and lighting circuits may be nonmetallic sheathed cable.

H. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered glass enclosures, where exposed to breakage. Provide exterior fixtures where exposed to moisture.

I. Water Hoses: Provide 3/4" heavy-duty, abrasion-resistant, flexible rubber hoses 100 ft. long, with pressure rating greater than the maximum pressure of the water distribution system; provide adjustable shut-off nozzles at hose discharge.

J. First Aid Supplies: Comply with governing regulations.

K. Storage and Fabrication Sheds: Install storage and fabrication sheds, sized, furnished and equipped to accommodate materials and equipment involved, including temporary utility service. Sheds may be open shelters or fully enclosed spaces within the building or elsewhere on the site.

PART 3 – EXECUTION

3.1 INSTALLATION, GENERAL

A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.

B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Engage appropriate local utility company to install temporary service or connect to existing service. Where utility company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with utility company recommendations.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
2. Provide adequate capacity at each stage of construction. Before temporary utility is available, provide trucked-in services.

3. Obtain easements to bring temporary utilities to Project site where Owner's easements cannot be used for that purpose.

B. Sewers and Drainage: If sewers are available, provide temporary connections to remove effluent that can be discharged lawfully. If sewers are not available or cannot be used, provide drainage ditches, dry wells, stabilization ponds, and similar facilities. If neither sewers nor drainage facilities can be lawfully used for discharge of effluent, provide containers to remove and dispose of effluent off-site in a lawful manner.

1. Filter out excessive soil, construction debris, chemicals, oils, and similar contaminants that might clog sewers or pollute waterways before discharge.
2. Connect temporary sewers to municipal system as directed by sewer department officials.
3. Maintain temporary sewers and drainage facilities in a clean, sanitary condition. After heavy use, restore normal conditions promptly.
4. Provide temporary filter beds, settlement tanks, separators, and similar devices to purify effluent to levels acceptable to authorities having jurisdiction.

C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction until permanent water service is in use. Sterilize temporary water piping before use.

D. Water Service: Use of Owner's existing water service facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

1. Provide rubber hoses as necessary to serve Project site.
2. As soon as water is required at each level, extend service to form a temporary water- and fire-protection standpipe. Provide distribution piping. Space outlets so water can be reached with a 100-foot (30-m) hose. Provide one hose at each outlet.
3. Where installations below an outlet might be damaged by spillage or leakage, provide a drip pan of suitable size to minimize water damage. Drain accumulated water promptly from pans.
4. Provide pumps to supply a minimum of 30-psi static pressure at highest point. Equip pumps with surge and storage tanks and automatic controls to supply water uniformly at reasonable pressures.

E. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking-water fixtures. Comply with regulations and health codes for type, number, location, operation, and maintenance of fixtures and facilities.

1. Disposable Supplies: Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Maintain adequate supply. Provide covered waste containers for disposal of used material.
2. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy.
3. Wash Facilities: Install wash facilities supplied with potable water at convenient locations for personnel who handle materials that require wash up. Dispose of drainage properly. Supply cleaning compounds appropriate for each type of material handled.
   a. Provide safety showers, eyewash fountains, and similar facilities for convenience, safety, and sanitation of personnel.
4. Drinking-Water Facilities: Provide bottled-water, drinking-water units.
   a. Where power is accessible, provide electric water coolers to maintain dispensed water temperature at 45 to 55 deg F.
5. Locate toilets and drinking-water fixtures so personnel need not walk more than two stories vertically to facilities.

F. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment from that specified that will not have a harmful effect on completed installations or elements being installed.

1. Maintain a minimum temperature of 50 deg F in permanently enclosed portions of building for normal construction activities, and 65 deg F for finishing activities and areas where finished Work has been installed.
2. Before building is considered enclosed, each Contractor shall provide temporary heat and enclosure for purposes as follows:
   a. To heat materials and maintain proper temperatures in connection with the installation and curing of concrete, mortar and masonry.
   b. To provide sufficient heat and protection so the Work can be accomplished to the standards set forth in the Contract Documents.
3. After building is considered enclosed, the Construction Contractor shall provide temporary heat to maintain temperature of at least 40ºF for the period of the working hours of the day or as required by the Engineer. Heat may be provided at this time by mobile oil or gas fired temporary units equipped with proper controls and safety devices approved by the Underwriters Laboratories.
4. The building shall be considered enclosed when the exterior construction is completed sufficiently to exclude the elements and retain heat.
5. After building is considered permanently enclosed the Construction Contractor shall maintain temperature of at least 50ºF throughout the spaces for twenty-four (24) hours a day. Provide higher temperatures if required to perform or protect the work. At this time, heat shall be provided by semi-permanently installed gas or oil-fired space heaters which are thermostatically controlled, vented properly to the outside and provided with piped fuel.
6. The building is considered permanently enclosed when:
   a. All exterior walls are insulated with permanent or temporary insulation.
   b. Permanent glazed windows are in place.
   c. Roof is permanently insulated.
   d. Door openings are provided with permanent doors or temporary plywood panels.
7. The permanent heating system may be used with approval of the Engineer, to provide temporary heat provided that all equipment is left in proper and acceptable condition on completion of the Work and all equipment construction filters have been replaced. Operating of heating plant during this temporary heating period shall be under the supervision of the Heating Contractor.
8. The period of the guarantee of the system will commence at the time of the Owners occupancy of the structure.
9. The costs of temporary heat shall be paid by the Construction Contractor until the Owners occupancy of the structure.

G. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment from that specified that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

H. Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include

meters, transformers, overload-protected disconnecting means, automatic ground-fault interrupters, and main distribution switchgear.

1. Install electric power service underground, unless overhead service must be used.
2. Install power distribution wiring overhead and rise vertically where least exposed to damage.
3. Connect temporary service to Owner's existing power source, as directed by electric company officials.

I. Electric Power Service: Use of Owner's existing electric power service will be permitted, as long as equipment is maintained in a condition acceptable to Owner.

J. Electric Distribution: Provide receptacle outlets adequate for connection of power tools and equipment.

1. Provide waterproof connectors to connect separate lengths of electrical power cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.
2. Provide warning signs at power outlets other than 110 to 120 V.
3. Provide metal conduit, tubing, or metallic cable for wiring exposed to possible damage. Provide rigid steel conduits for wiring exposed on grades, floors, decks, or other traffic areas.
4. Provide metal conduit enclosures or boxes for wiring devices.
5. Provide 4-gang outlets, spaced so 100-foot extension cord can reach each area for power hand tools and task lighting. Provide a separate 125-V ac, 20-A circuit for each outlet.

K. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
2. Provide one 100-W incandescent lamp per 500 sq. ft., uniformly distributed, for general lighting, or equivalent illumination.
3. Provide one 100-W incandescent lamp every 50 feet in traffic areas.
4. Provide one 100-W incandescent lamp per story in stairways and ladder runs, located to illuminate each landing and flight.
5. Install exterior-yard site lighting that will provide adequate illumination for construction operations, traffic conditions, and signage visibility when the Work is being performed.
6. Install lighting for Project identification sign.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Locate field offices, storage sheds, sanitary facilities, and other temporary construction and support facilities for easy access.
2. Provide incombustible construction for offices, shops, and sheds located within construction area or within 30 feet of building lines. Comply with NFPA 241.
3. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Dewatering Facilities and Drains: Comply with requirements in applicable Division 2 Sections for temporary drainage and dewatering facilities and operations not directly associated with construction

activities included in individual Sections. Where feasible, use same facilities. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining property nor endanger permanent Work or temporary facilities.
2. Before connection and operation of permanent drainage piping system, provide temporary drainage where roofing or similar waterproof deck construction is completed.
3. Remove snow and ice as required to minimize accumulations.

C. Project Identification and Temporary Signs: Prepare Project identification and other signs in sizes indicated. Install signs where indicated to inform public and persons seeking entrance to Project. Do not permit installation of unauthorized signs.

1. Engage an experienced sign painter to apply graphics for Project identification signs. Comply with details indicated.
2. Prepare temporary signs to provide directional information to construction personnel and visitors.
3. Construct signs of exterior-type Grade B-B high-density concrete form overlay plywood in sizes and thicknesses indicated. Support on posts or framing of preservative-treated wood or steel.
4. Paint sign panel and applied graphics with exterior-grade alkyd gloss enamel over exterior primer.

D. Waste Disposal Facilities: Collect waste from construction areas and elsewhere daily. Provide waste-collection containers in sizes adequate to handle waste from construction operations. Containerize and clearly label hazardous, dangerous, or unsanitary waste materials separately from other waste. Comply with Division 1 Section "Execution Requirements" for progress cleaning requirements.

1. If required by authorities having jurisdiction, provide separate containers, clearly labeled, for each type of waste material to be deposited.
2. Develop a waste management plan for Work performed on Project. Indicate types of waste materials Project will produce and estimate quantities of each type. Provide detailed information for on-site waste storage and separation of recyclable materials. Provide information on destination of each type of waste material and means to be used to dispose of all waste materials.

E. Janitorial Services: Provide janitorial services on a daily basis for temporary offices, first-aid stations, toilets, wash facilities, lunchrooms, and similar areas.

F. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment involved, including temporary utility services. Sheds may be open shelters or fully enclosed spaces within building or elsewhere on-site.

1. Construct framing, sheathing, and siding using fire-retardant-treated lumber and plywood.
2. Paint exposed lumber and plywood with exterior-grade acrylic-latex emulsion over exterior primer.

G. Lifts and Hoists: Provide facilities for hoisting materials and personnel. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

H. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate. Cover finished, permanent stairs with protective covering of plywood or similar material so finishes will be undamaged at time of acceptance.

I. Existing Stair Usage: Use of Owner's existing stairs will be permitted, as long as stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.

1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If, despite such protection, stairs become damaged, restore damaged areas so no evidence remains of correction work.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects. Avoid using tools and equipment that produce harmful noise. Restrict use of noisemaking tools and equipment to hours that will minimize complaints from persons or firms near Project site.

B. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.

1. Storage: Where materials and equipment must be stored, and are of value or attractive for theft, provide a secure lockup. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism.

C. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erecting structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and public of possible hazard. Where appropriate and needed, provide lighting, including flashing red or amber lights.

1. For safety barriers, sidewalk bridges, and similar uses, provide minimum 5/8-inch- (16-mm-) thick exterior plywood.

D. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is not complete, provide insulated temporary enclosures. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
2. Vertical Openings: Close openings of 25 sq. ft. or less with plywood or similar materials.
3. Horizontal Openings: Close openings in floor or roof decks and horizontal surfaces with load-bearing, wood-framed construction.
4. Install tarpaulins securely using fire-retardant-treated wood framing and other materials.
5. Where temporary wood or plywood enclosure exceeds 100 sq. ft. in area, use fire-retardant-treated material for framing and main sheathing.

E. Temporary Partitions: Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.

1. Construct dustproof partitions of not less than nominal 4-inch studs, 5/8-inch gypsum wallboard with joints taped on occupied side, and 1/2-inch fire-retardant plywood on construction side.
2. Construct dustproof, floor-to-ceiling partitions of not less than nominal 4-inch studs, 2 layers of 3-mil polyethylene sheets, inside and outside temporary enclosure. Cover floor with 2 layers of

3-mil polyethylene sheets, extending sheets 18 inches up the side walls. Overlap and tape full length of joints. Cover floor with 3/4-inch fire-retardant plywood.

a. Construct a vestibule and airlock at each entrance to temporary enclosure with not less than 48 inches between doors. Maintain water-dampened foot mats in vestibule.

3. Insulate partitions to provide noise protection to occupied areas.
4. Seal joints and perimeter. Equip partitions with dustproof doors and security locks.
5. Protect air-handling equipment.
6. Weatherstrip openings.

F. Temporary Fire Protection: Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.

1. Provide fire extinguishers, installed on walls on mounting brackets, visible and accessible from space being served, with sign mounted above.
   a. Field Offices: Class A stored-pressure water-type extinguishers.
   b. Other Locations: Class ABC dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for exposures.
   c. Locate fire extinguishers where convenient and effective for their intended purpose; provide not less than one extinguisher on each floor at or near each usable stairwell.
2. Store combustible materials in containers in fire-safe locations.
3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for firefighting. Prohibit smoking in hazardous fire-exposure areas.
4. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition.
5. Permanent Fire Protection: At earliest feasible date in each area of Project, complete installation of permanent fire-protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.
6. Develop and supervise an overall fire-prevention and first-aid fire-protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
7. Provide hoses for fire protection of sufficient length to reach construction areas. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.
8. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.5 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage caused by freezing temperatures and similar elements.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
2. Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.

C. Operate Project-identification-sign lighting daily from dusk until 12:00 midnight.

D. Temporary Facility Changeover: Except for using permanent fire protection as soon as available, do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

E. Termination and Removal: Unless the Engineer requests that it be maintained longer, remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are the property of Contractor. Owner reserves right to take possession of Project identification signs.
2. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
3. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements in Division 1 Section "Closeout Procedures."

END OF SECTION

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes the following administrative and procedural requirements: selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.

1.2 DEFINITIONS

A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
   1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation, shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
   2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
   3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

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

C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

D. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.

E. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

1.3 SUBMITTALS

A. Product List: Submit a list, in tabular from, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.
   1. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.

B. Form: Tabulate information for each product under the following column headings:
   a. Specification Section number and title.
   b. Generic name used in the Contract Documents.
   c. Proprietary name, model number, and similar designations.
   d. Manufacturer's name and address.

e. Supplier's name and address.
f. Installer's name and address.
g. Projected delivery date or time span of delivery period.
h. Identification of items that require early submittal approval for scheduled delivery date.

2. Initial Submittal: Within 5 days after date of commencement of the Work, submit 3 copies of initial product list. Include a written explanation for omissions of data and for variations from Contract requirements.
   a. At Contractor's option, initial submittal may be limited to product selections and designations that must be established early in Contract period.
3. Completed List: Within 10 days after date of commencement of the Work, submit 3 copies of completed product list. Include a written explanation for omissions of data and for variations from Contract requirements.
4. Engineer's Action: Engineer will respond in writing to Contractor within 10 days of receipt of completed product list. Engineer's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Engineer's response, or lack of response, does not constitute a waiver of requirement that products comply with the Contract Documents.

C. Substitution Requests: Requests for substitution will be considered if received within 20 days after commencement of the Work. Requests received more than 20 days after commencement of the Work may be considered or rejected at the discretion of the Engineer. Submit 3 copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. North Carolina and/or Edgecombe County Department of Health (DOH) Approval: It is EXTREMELY important to note that any product substitution requests will require approval from the DOH as all manufacturers and products listed within the project documents have been pre-reviewed and approved by DOH. The submitting Contractor will be fully responsible to obtain any product substitutions' pre-approval from DOH. A letter or e-mail documentation from DOH will need to be submitted by the Contractor to the Director's Representative clearly stating approval has been granted prior to considering any product substitutions.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
   a. Statement indicating why specified material or product cannot be provided.
   b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
   c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
   d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
   e. Samples, where applicable or requested.
   f. List of similar installations for completed projects with project names and addresses and names and addresses of Engineers and owners.
   g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
   h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
   i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If

specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.

j. Cost information, including a proposal of change, if any, in the Contract Sum.

k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.

l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Engineer's Action: If necessary, Engineer will request additional information or documentation for evaluation within one week of receipt of a request for substitution. Engineer will notify Contractor of acceptance or rejection of proposed substitution within 10 days of receipt of request, or 5 days of receipt of additional information or documentation, whichever is later.

a. Form of Acceptance: Change Order.

b. Use product specified if Engineer cannot make a decision on use of a proposed substitution within time allocated.

D. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 1 Section "Submittal Procedures." Show compliance with requirements.

E. Warranty and Bond Submittals: Submit written warranties to the Engineer prior to the date certified for Substantial Completion. If the Engineer's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Engineer.

1. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Engineer within fifteen days of completion of that designated portion of the Work.

2. When a special warranty is required to be executed by the Contractor, or the Contractor and a subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner through the Engineer for approval prior to final execution.

3. Forms for special warranties are included at the end of this Section. Prepare a written document utilizing the appropriate form, ready for execution by the Contractor, or the Contractor and subcontractor, supplier or manufacturer. Submit a draft to the Owner through the Engineer for approval prior to final execution.

a. Refer to individual Sections of Divisions-2 through -16 for specific content requirements, and particular requirements for submittal of special warranties.

4. Form of Submittal: At Final Completion compile two copies of each required warranty and bond properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.

5. Bind warranties and bonds in heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2" by 11" paper.

a. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address and telephone number of the installer.

b. Identify each binder on the front and the spine with the typed or printed title "WARRANTIES AND BONDS," the Project title or name, and the name of the Contractor.

c. When operating and maintenance manuals are required for warranted construction, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

1.4 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.

1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
2. If a dispute arises between contractors over concurrently selectable but incompatible products, Engineer will determine which products shall be used.

B. Source Limitations: To the fullest extent possible, provide products of the same kind, from a single source.

1. When specified products are available only from sources that do not or cannot produce a quantity adequate to complete project requirements in a timely manner, consult with the Engineer for a determination of the most important product qualities before proceeding. Qualities may include attributes relating to visual appearance, strength, durability, or compatibility. When a determination has been made, select products from sources that produce products that possess these qualities, to the fullest extent possible.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
5. Store products to allow for inspection and measurement of quantity or counting of units.
6. Store materials in a manner that will not endanger Project structure.
7. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
8. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
9. Protect stored products from damage.

B. Storage: Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.6 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
   1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
   2. Specified Form: Forms are included with the Specifications. Prepare a written document using appropriate form properly executed.
   3. Refer to Divisions 2 through 16 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Warranty Requirements: Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.
   1. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
   2. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.
   3. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.
      a. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.
   4. The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

PART 2 – PRODUCTS

2.1 PRODUCT OPTIONS

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged, and unless otherwise indicated, that are new at time of installation.
   1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
   2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.

3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Engineer will make selection.
5. Where products are accompanied by the term "match sample," sample to be matched is Engineer's.
6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
7. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures: Procedures for product selection include the following:
1. Product: Where Specification paragraphs or subparagraphs titled "Product" name a single product and manufacturer, provide the product named.
   a. Substitutions may be considered, unless otherwise indicated.
2. Manufacturer/Source: Where Specification paragraphs or subparagraphs titled "Manufacturer" or "Source" name single manufacturers or sources, provide a product by the manufacturer or from the source named that complies with requirements.
   a. Substitutions may be considered, unless otherwise indicated.
3. Products: Where Specification paragraphs or subparagraphs titled "Products" introduce a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
   a. Substitutions may be considered, unless otherwise indicated.
4. Manufacturers: Where Specification paragraphs or subparagraphs titled "Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
   a. Substitutions may be considered, unless otherwise indicated.
5. Available Products: Where Specification paragraphs or subparagraphs titled "Available Products" introduce a list of names of both products and manufacturers, provide one of the products listed or another product that complies with requirements. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
6. Available Manufacturers: Where Specification paragraphs or subparagraphs titled "Available Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed or another manufacturer that complies with requirements. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
7. Product Options: Where Specification paragraphs titled "Product Options" indicate that size, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide either the specific product or system indicated or a comparable product or system by another manufacturer. Comply with provisions in "Product Substitutions" Article.
8. Basis-of-Design Products: Where Specification paragraphs or subparagraphs titled "Basis-of-Design Product[s]" are included and also introduce or refer to a list of manufacturers' names, provide either the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
   a. Substitutions may be considered, unless otherwise indicated.
9. Visual Matching Specification: Where Specifications require matching an established Sample, select a product (and manufacturer) that complies with requirements and matches Engineer's sample. Engineer's decision will be final on whether a proposed product matches satisfactorily.

a. If no product available within specified category matches satisfactorily and complies with other specified requirements, comply with provisions of the Contract Documents on "substitutions" for selection of a matching product.

10. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product (and manufacturer) that complies with other specified requirements.
    a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Engineer will select color, pattern, or texture from manufacturer's product line that does not include premium items.
    b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Engineer will select color, pattern, or texture from manufacturer's product line that includes both standard and premium items.
11. Allowances: Refer to individual Specification Sections and "Allowance" provisions in Division 1 for allowances that control product selection and for procedures required for processing such selections.

2.2 PRODUCT SUBSTITUTIONS

A. Timing: Engineer will consider requests for substitution if received within 20 days after the Notice of Award. Requests received after that time may be considered or rejected at discretion of Engineer.

B. Conditions: Engineer will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Engineer will return requests without action, except to record noncompliance with these requirements:
1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Engineer for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
2. Requested substitution does not require extensive revisions to the Contract Documents.
3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
4. Substitution request is fully documented and properly submitted.
5. Requested substitution will not adversely affect Contractor's Construction Schedule.
6. Requested substitution has received necessary approvals of authorities having jurisdiction.
7. Requested substitution is compatible with other portions of the Work.
8. Requested substitution has been coordinated with other portions of the Work.
9. Requested substitution provides specified warranty.
10. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
11. The specified product or method of construction cannot be provided in a manner that is compatible with other materials, and where the Contractor certifies that the substitution will overcome the incompatibility.
12. The specified product or method of construction cannot be coordinated with other materials, and where the Contractor certifies that the proposed substitution can be coordinated.
13. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitution provide the required warranty.

2.3 COMPARABLE PRODUCTS

A. Where products or manufacturers are specified by name, submit the following, in addition to other required submittals, to obtain approval of an unnamed product:
   1. Evidence that the proposed product does not require extensive revisions to the Contract Documents that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
   2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
   3. Evidence that proposed product provides specified warranty.
   4. List of similar installations for completed projects with project names and addresses and names and addresses of Engineers and owners, if requested.
   5. Samples, if requested.

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 017300 - EXECUTION REQUIREMENTS

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
   1. Construction layout.
   2. Field engineering and surveying.
   3. General installation of products.
   4. Coordination of Owner-installed products.
   5. Progress cleaning.
   6. Starting and adjusting.
   7. Protection of installed construction.
   8. Correction of the Work.

1.2 SUBMITTALS

A. Qualification Data: For professional engineer to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

B. Certificates: Submit certificate signed by professional engineer certifying that location and elevation of improvements comply with requirements.

C. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

1.3 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

B. Engineer's 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.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
   1. Before construction, verify the location and points of connection of utility services.

B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.
   1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping, and underground electrical services.
   2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
   1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
      a. Description of the Work.
      b. List of detrimental conditions, including substrates.
      c. List of unacceptable installation tolerances.
      d. Recommended corrections.
   2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
   3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
   4. Examine pool walls, floors and surrounding concrete deck for suitable conditions where products and systems are to be installed.
   5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
   1. Notify Engineer and Owner not less than 48 hours in advance of proposed utility interruptions.
   2. Do not proceed with utility interruptions without Engineer's and/or Owner's written permission.

C. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

D. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

E. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Engineer. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents. Submit requests on CSI Form 13.2A, "Request for Interpretation."

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Engineer promptly.

B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
   1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
   2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
   3. Inform installers of lines and levels to which they must comply.
   4. Check the location, level and plumb, of every major element as the Work progresses.
   5. Notify Engineer when deviations from required lines and levels exceed allowable tolerances.
   6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Construction Lines and Levels: Locate and lay out control lines and levels as necessary for all pool structures and floor levels, including those required for gutter installation work. Contractor must ensure water depths are maintained. Transfer survey markings and elevations for use with control lines and levels.

D. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Engineer.

3.4 FIELD ENGINEERING

A. Identification: Owner will identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
   1. Do not change or relocate existing benchmarks or control points without prior written approval of Engineer. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Engineer before proceeding.
   2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of 2 permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
   1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
   2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
   3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
   1. Make vertical work plumb and make horizontal work level.
   2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
   3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
   4. Maintain minimum headroom clearance of 8 feet in spaces without a suspended ceiling.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
   1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Engineer.
   2. Allow for building movement, including thermal expansion and contraction.

G. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

H. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 OWNER-INSTALLED PRODUCTS

A. Site Access: Provide access to Project site for Owner's construction forces.

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction forces.
   1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
   2. Preinstallation Conferences: Include Owner's construction forces at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction forces if portions of the Work depend on Owner's construction.

3.7 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
   1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
   2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F.
   3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
   1. Remove liquid spills promptly.
   2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Cutting and Patching: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.
   1. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.

H. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

I. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

J. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

K. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 1 Section "Quality Requirements."

3.9 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.10 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 1 Section "Cutting and Patching."

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION

SECTION 017329 - CUTTING AND PATCHING

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

B. Refer to other sections for specific requirements and limitations applicable to cutting and patching individual parts of the work.

1.2 DEFINITIONS

A. Cutting: Removal of existing construction necessary to permit installation or performance of other Work.

B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.3 SUBMITTALS

A. Cutting and Patching Proposal: Where approval of procedures for cutting and patching is required before proceeding, submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:
   1. Extent: Describe the extent of cutting and patching and show how they will be performed.
   2. Changes to Existing Construction: Describe anticipated results in terms of changes to existing construction; include changes to structural elements and operating components as well as changes in appearance and other significant visual elements.
   3. Products: List products to be used and firms or entities that will perform the Work.
   4. Dates: Indicate dates when cutting and patching will be performed.
   5. Utilities: List utilities that cutting and patching procedures will disturb or affect. List utilities that will be relocated and those that will be temporarily out of service. Indicate how long service will be disrupted.
   6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
   7. Engineer’s Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right of the Engineer to later require removal and replacement of unsatisfactory work.
   8. Describe means for the protection of adjacent areas to where cutting and patching shall take place.

1.4 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
   1. Insert list of elements that might otherwise be overlooked as structural elements and that require Engineer's or Construction Manager's approval of a cutting and patching proposal.
      a. Pool Foundation construction
      b. Pool retaining walls
      c. Structural concrete deck

d. Reinforcing steel
e. Shoring, bracing, and sheeting

B. Operational Elements: Do not cut and patch the following operating elements or safety related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
1. Primary operational systems and equipment.

C. Miscellaneous Elements: Do not cut and patch the following elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
1. Pool wall construction.
2. Pool floor construction.
3. Concrete deck.
4. Anchors and imbeds.
5. Equipment supports.
6. Pool piping and equipment.

D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Engineer's opinion, reduce the aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
1. If possible, retain original Installer or fabricator to cut and patch exposed Work listed below. If it is impossible to engage original Installer or fabricator, engage another recognized, experienced, and specialized firm.
a. Swimming pool finishes.

E. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including all other trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.5 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 – PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections of these Specifications.

B. Existing Materials: Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces (i.e., concrete deck color and finish) to the fullest extent possible.
1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of existing materials.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Prior to cutting existing services, examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed. Take corrective action before proceeding. If unsafe or unsatisfactory conditions are encountered, investigate both sides of the surface involved. Determine exact location of structural members.
   1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
   2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Temporary Support: Provide temporary shoring and support of Work to be cut to prevent settlement or other damage to existing construction to remain.

B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Existing Services: Where existing services are required to be removed, relocated, or abandoned, bypass such services before cutting to avoid interruption of services to occupied areas.

E. Take all precautions necessary to avoid cutting existing recirculation pipe or conduit serving the pools but scheduled to be removed or relocated until provisions have been made to bypass them.

3.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
   1. Cut existing construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Cutting: Cut existing construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
   1. In general, where cutting is required, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
   2. Existing Finished Surfaces: To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
   3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
   4. Excavating and Backfilling: Comply with requirements in applicable Division 2 Sections where required by cutting and patching operations.

5. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Comply with specified tolerances. Provide materials and comply with installation requirements specified in other Sections of these Specifications. Perform patching around items penetrating existing construction in a manner that will maintain the water resistive capability of the existing construction.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
3. Pool Floor and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces. Provide an even surface of uniform finish, color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
4. Where reinstallation of removed items is indicated (i.e., pool deck equipment), reinstall them to a condition equal to or better than their condition before removal.

END OF SECTION

SECTION 017419 – CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 – GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for the following:
   1. Disposing of nonhazardous demolition and construction waste.

1.2 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

D. Solid Waste: Any garbage, refuse or material planned for disposal.

1.3 PERFORMANCE REQUIREMENTS

A. General: Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials, including the following:
   1. Demolition Waste:
      a. Concrete.
      b. Concrete reinforcing steel.
      c. Structural and miscellaneous steel.
      d. Piping.
   2. Construction Waste:
      a. Lumber (used for forms).
      b. Packaging: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following uncontaminated packaging materials:
         1) Paper.
         2) Cardboard.
         3) Boxes.
         4) Plastic sheet and film.
         5) Polystyrene packaging.
         6) Wood crates.
         7) Plastic pails.

1.4 INFORMATIONAL SUBMITTALS

A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Include the following information:
   1. Material category.
   2. Generation point of waste.

3. Identify final destination for waste salvaged, recycled or recovered.

B. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
1. Comply with operation, termination, and removal requirements in Section 015000 "Temporary Facilities and Controls."
2. Waste handling, containers, storage, signage, transportation and other applicable requirements shall be in accordance with applicable local, state and federal regulations.

B. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
2. Comply with Section 015000 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Remove waste materials from Owner's property and legally dispose of them.

END OF SECTION

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
   1. Inspection procedures.
   2. Operation and maintenance manuals.
   3. Warranties.
   4. Instruction of Owner's personnel.
   5. Final cleaning.

1.2 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
   1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
   2. Advise Owner of pending insurance changeover requirements.
   3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
   4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
   5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.
   6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
   7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
   8. Complete startup testing of pool systems.
   9. Submit test/adjust/balance records.
   10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
   11. Advise Owner of changeover in heat and other utilities.
   12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
   13. Complete final cleaning requirements, including touchup painting.
   14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Engineer, that must be completed or corrected before certificate will be issued.
   1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
   2. Results of completed inspection will form the basis of requirements for Final Completion.

1.3 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment according to Division 1 Section "Payment Procedures."
2. Submit certified copy of Engineer's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Engineer. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. See specification section 131159 “Swimming Pool Start-Up and Operations”.

B. Final Inspection: Submit a written request for final inspection for acceptance. This shall include the Edgecombe County Department of Health (ECDOH) construction completion inspection. On receipt of request, Engineer will proceed with inspection and shall include ECDOH site visit coordination. Inspection shall occur of which we will notify Contractor of unfulfilled requirements. Engineer will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified by ECDOH in previous inspections as incomplete is completed or corrected.

1.4 OPERATION AND MAINTENANCE MANUALS

A. Assemble a complete set of operation and maintenance data indicating the operation and maintenance of each system, subsystem, and piece of equipment not part of a system. Include operation and maintenance data required in individual Specification Sections and as follows:

1. Operation Data:
   a. System, subsystem, and equipment descriptions, including operating standards.
   b. Operating procedures, including startup and shutdown operations.
   c. Pool winterization procedures.
   d. Description of controls and sequence of operations.
2. Maintenance Data:
   a. Manufacturer's information, including list of spare parts.
   b. Name, address, and telephone number of Installer or supplier.
   c. Maintenance procedures (i.e., Marcite finish, Waterslide, Filter system, etc.).
   d. Maintenance and service schedules for preventive and routine maintenance.
   e. Maintenance record forms.
   f. Sources of spare parts and maintenance materials.
   g. Copies of maintenance service agreements.
   h. Copies of warranties and bonds.

B. Organize operation and maintenance manuals into suitable sets of manageable size. Bind and index data in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, with pocket inside the covers to receive folded oversized sheets. Identify each binder on front and spine with the printed title "OPERATION AND MAINTENANCE MANUAL," Project name, and subject matter of contents.

1.5 WARRANTIES

A. Submittal Time: Submit written warranties on request of Engineer for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
   1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
   2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
   3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 – EXECUTION

3.1 DEMONSTRATION AND TRAINING

A. Instruction: Instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
   1. Provide instructors experienced in operation and maintenance procedures.
   2. Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.
   3. Schedule training with Owner through Engineer with at least 7 days advance notice.
   4. Coordinate instructors, including providing notification of dates, times, length of instruction, and course content.

B. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections. For each training module, develop a learning objective and teaching outline. Include instruction for the following:
   1. System design and operational philosophy.
   2. Review of documentation.
   3. Operations.
   4. Adjustments.

5. Troubleshooting.
6. Maintenance.
7. Repair.

3.2 FINAL CLEANING

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Clean each area influenced by site construction. Comply with manufacturer's written instructions.
   1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
      a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
      b. Sweep pool and deck areas broom clean. Remove spills, stains, and other foreign deposits.
      c. Remove tools, construction equipment, machinery, and surplus material from Project site.
      d. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
      e. Remove labels that are not permanent.
      f. Touch up and otherwise repair and restore marred, exposed finishes and surfaces.
      g. Leave Project clean and ready for occupancy.

C. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION

SECTION 017823 – OPERATION AND MAINTENANCE DATA

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
   1. Operation manuals for the Waterslide, Feature pump and Filter system.
   2. Maintenance manuals for the care and maintenance of all Waterslide components, Feature pump, Filter system and pool finishes (Marcite, Tile, etc.).

1.2 SUBMITTALS

A. Initial Submittal: Submit 2 draft copies of each manual at least 15 days before requesting inspection for Substantial Completion. Include a complete operation and maintenance directory. Engineer will return one copy of draft and mark whether general scope and content of manual are acceptable.

B. Final Submittal: Submit 1 copy of each manual in final form at least 15 days before final inspection. Engineer will return copy with comments within 15 days after final inspection.
   1. Correct or modify each manual to comply with Engineer's comments. Submit 3 copies of each corrected manual within 15 days of receipt of Engineer's comments.

PART 2 – PRODUCTS

2.1 OPERATION MANUAL

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
   1. Gutter system, subsystem, and equipment descriptions.
   2. Performance and design criteria if Contractor is delegated design responsibility.
   3. Operating standards.
   4. Operating procedures.
   5. Piped system diagrams.
   6. Precautions against improper use.

B. Descriptions: Include the following:
   1. Product name and model number.
   2. Manufacturer's name.
   3. Equipment identification with serial number of each component.
   4. Equipment function.
   5. Operating characteristics.
   6. Engineering data and tests.
   7. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:
   1. Startup procedures.
   2. Routine and normal operating instructions.

3. Regulation and control procedures.
4. Instructions on stopping.
5. Normal shutdown instructions.

2.2 MAINTENANCE MANUALS

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Product Information: Include the following, as applicable:
1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.

C. Maintenance Procedures: Include manufacturer's written recommendations and the following:
1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

D. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

E. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

PART 3 – EXECUTION

3.1 MANUAL PREPARATION

A. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each product.

B. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

C. Comply with Division 1 Section "Closeout Procedures" for the schedule for submitting operation and maintenance documentation.

END OF SECTION

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:
   1. Record Drawings.

1.2 SUBMITTALS

A. Record Drawings: Comply with the following:
   1. Number of Copies: Submit copies of Record Drawings as follows:
      a. Initial Submittal: Submit 1set of plots from corrected Record CAD Drawings and 1set of marked-up Record Prints. Engineer will initial and date each plot and mark whether general scope of changes, additional information recorded, and quality of drafting are acceptable. Engineer will return plots and prints for organizing into sets, printing, binding, and final submittal.
      b. Final Submittal: Submit 1 set of marked-up Record Prints, 1 set of Record CAD Drawing files, 1 set of Record CAD Drawing plots, and 3 copies printed from record plots. Plot and print each Drawing, whether or not changes and additional information were recorded.
      c. Electronic Media: Thumb Drive.

PART 2 – PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.
   1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
      a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
      b. Accurately record information in an understandable drawing technique.
      c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
   2. Content: Types of items requiring marking include, but are not limited to, the following:
      a. Dimensional changes to Drawings.
      b. Revisions to details shown on Drawings.
      c. Swimming pool depths.
      d. Locations of depth markers.
      e. Locations of gutter piping connections.
      f. Changes made by Change Order or Work Change Directive.
      g. Changes made following Engineer's written orders.
      h. Details not on the original Contract Drawings.

i. Field records for variable and concealed conditions.

j. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Work Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record CAD Drawings: Immediately before inspection for Certificate of Substantial Completion, review marked-up Record Prints with Engineer. When authorized, prepare a full set of corrected CAD Drawings of the Contract Drawings, as follows:

1. Format: Same CAD program, version, and operating system as the original Contract Drawings.
2. Incorporate changes and additional information previously marked on Record Prints. Delete, redraw, and add details and notations where applicable.
3. Refer instances of uncertainty to Engineer for resolution.
4. Engineer will furnish Contractor one set of CAD Drawings of the Contract Drawings for use in recording information.
   a. Engineer makes no representations as to the accuracy or completeness of CAD Drawings as they relate to the Contract Drawings.
   b. CAD Software Program: The Contract Drawings are available in AutoCAD 2018.

C. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing Record Drawings where Engineer determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.

1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
2. Consult with Engineer for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared Record Drawings into Record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.

D. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Record CAD Drawings: Organize CAD information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each CAD file.
3. Identification: As follows:
   a. Project name and Date.
   b. Designation "PROJECT RECORD DRAWINGS."
   c. Name of Engineer.
   d. Name of Contractor.

PART 3 – EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.

B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Engineer's reference during normal working hours.

END OF SECTION

SECTION 017900 – DEMONSTRATION AND TRAINING

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
   1. Demonstration of operation of Waterslide, Feature pump and Filter system.
   2. Training in operation and maintenance of Waterslide, Feature pump and Filter system.

1.2 QUALITY ASSURANCE

A. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 1 Section "Quality Requirements," experienced in operation and maintenance procedures and training.

1.3 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.

PART 2 – PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:
   1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
      a. System and equipment descriptions.
      b. Operating standards.
      c. Regulatory requirements.
      d. Equipment function.
      e. Operating characteristics.
      f. Limiting conditions.
   2. Documentation: Review the following items in detail:
      a. Emergency manuals.
      b. Operations manuals.
      c. Maintenance manuals.
      d. Project Record Documents.
      e. Identification systems.
      f. Warranties and bonds.
   3. Emergencies: Include the following, as applicable:
      a. Instructions on stopping.
      b. Operating instructions for conditions outside of normal operating limits.
      c. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:
    a. Startup procedures.
    b. Routine and normal operating instructions.
    c. Regulation and control procedures.
    d. Control sequences.
    e. Safety procedures.
    f. Instructions on stopping.
    g. Normal shutdown instructions.
    h. Special operating instructions and procedures.
5. Adjustments: Include the following:
    a. Alignments.
    b. Checking adjustments.
6. Maintenance: Include the following:
    a. Inspection procedures.
    b. Types of cleaning agents to be used and methods of cleaning.
    c. List of cleaning agents and methods of cleaning detrimental to product.
    d. Procedures for routine cleaning
    e. Procedures for preventive maintenance.
    f. Procedures for routine maintenance.
7. Repairs: Include the following:
    a. Repair instructions.
    b. Instructions for identifying parts and components.
    c. Review of spare parts needed for operation and maintenance.

PART 3 – EXECUTION

3.1 INSTRUCTION

A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain Waterslide.

B. Scheduling: Provide instruction at mutually agreed on times.
    1. Schedule training with Owner with at least 7 days' advance notice.

END OF SECTION

SECTION 024119 – SELECTIVE DEMOLITION

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:
1. Demolition and removal of selected portions of bathhouse building or structure.
2. Demolition and removal of the swimming pool.
3. Demolition and removal of the pool decking and/or site elements.
4. Salvage of existing items to be reused or recycled.

1.2 BASE BID & ADD ALTERNATES

A. Project contains a Base Bid and (5) Add Alternates. Contractor shall pay close attention to bid documents to properly distinguish between them. If in doubt, a question should be raised during the bid period for clarification.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.

B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.

C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 PREINSTALLATION MEETINGS

A. Pre-demolition Conference: Conduct conference at Project site.
1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.

3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.

1.6 INFORMATIONAL SUBMITTALS

A. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for dust control and for noise control. Indicate proposed locations and construction of barriers.

B. Schedule of Selective Demolition Activities: Indicate the following:
1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's building manager's and other tenants' on-site operations are uninterrupted.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Use of elevator and stairs.
5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

C. Pre-demolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by salvage and demolition operations.

D. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.7 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

1.8 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
1. Hazardous materials will be removed by Owner before start of the Work.
2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

D. Storage or sale of removed items or materials on-site is not permitted.

E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
1. Maintain fire-protection facilities in service during selective demolition operations.

1.9 COORDINATION

A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

PART 2 – PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSP A10.6 and NFPA 241.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

C. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

D. Survey of Existing Conditions: Record existing conditions by use of measured drawings, preconstruction photographs or video and templates.
   1. Inventory and record the condition of items to be removed and salvaged.
   2. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.
   1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
   2. Arrange to shut off utilities with utility companies.
   3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.

4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.
    a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
    b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
    c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
    d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
    e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
    f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
    g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.3 PROTECTION

A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
    1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
    2. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
    3. Cover and protect furniture, furnishings, and equipment that have not been removed.

B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
    1. Strengthen or add new supports when required during progress of selective demolition.

C. Remove temporary barricades and protections where hazards no longer exist.

3.4 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated on the Drawings. Use methods required to complete the Work within limitations of governing regulations and as follows:
    1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
    2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
    3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.

4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
5. Maintain fire watch during and for at least 1/2 hours after flame-cutting operations.
6. Maintain adequate ventilation when using cutting torches.
7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
10. Dispose of demolished items and materials promptly.

B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

C. Removed and Salvaged Items:
1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

D. Removed and Reinstalled Items:
1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch (19 mm) at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.

B. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.

C. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.

D. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.
   1. Do not allow demolished materials to accumulate on-site.
   2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
   3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

B. Burning: Do not burn demolished materials.

3.7 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Related Sections: Refer to Section 131100 Swimming Pool General Construction, 131150 Swimming Pool Deck Equipment, 132145 Shade Structures and 321115 Concrete Deck Repair High Performance Coating.

1.2 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
1. Footings.
2. Concrete Surface repairs.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
1. Indicate amounts of mixing water to be withheld for later addition at Project site.

C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

D. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
1. Location of construction joints is subject to approval of the Structural Engineer.

1.5 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each of the following, signed by manufacturers:
1. Cementitious materials.
2. Admixtures.
3. Form materials and form-release agents.
4. Steel reinforcement and accessories.
5. Curing compounds.
6. Floor and slab treatments.

7. Adhesives.
8. Vapor retarders.
9. Semirigid joint filler.
10. Repair materials.

B. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

C. Field quality-control reports.

D. Minutes of preinstallation conference.

1.6 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/C 94M requirements for production facilities and equipment.
1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel."

E. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5.
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

F. Concrete Testing Service: The owner will engage a qualified independent testing agency to perform material evaluation tests.

G. Preinstallation Conference: Conduct conference at Project site.
1. Before 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. Ready-mix concrete manufacturer.
c. Concrete subcontractor.

2. Review 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, semirigid joint fillers, forms and form removal limitations, anchor rod and anchorage device installation tolerances, steel reinforcement installation, concrete repair procedures, and concrete protection.

1.7 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

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

C. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
   1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

D. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
   1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
   2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

2.3 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615/A 615M, 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.

2.4 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
   1. Portland Cement: ASTM C 150, Type I/II, gray. Supplement with the following:
      a. Fly Ash: ASTM C 618, Class F.
      b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

B. Silica Fume: ASTM C 1240, amorphous silica.

C. Do not exceed an alkali content of 0.6% unless the manufacturer certifies that no alkali reactivity is produced with the proposed combination of materials when tested in accordance with ASTM C227.

D. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate or better, graded. 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. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

E. Water: ASTM C 94/C 94M and potable.

2.5 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
   1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
   2. Retarding Admixture: ASTM C 494/C 494M, Type B.
   3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
   4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
   5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
   6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.6 LIQUID FLOOR TREATMENTS

A. VOC Content: Liquid floor treatments shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. ChemMasters; Chemisil Plus.
      b. ChemTec Int'l; ChemTec One.
      c. Conspec by Dayton Superior; Intraseal.
      d. Curecrete Distribution Inc.; Ashford Formula.
      e. Dayton Superior Corporation; Day-Chem Sure Hard (J-17).
      f. Edoco by Dayton Superior; Titan Hard.
      g. Euclid Chemical Company (The), an RPM company; Euco Diamond Hard.
      h. Kaufman Products, Inc.; SureHard.
      i. L&M Construction Chemicals, Inc.; Seal Hard.
      j. Meadows, W. R., Inc.; LIQUI-HARD.
      k. Metalcrete Industries; Floorsaver.
      l. Nox-Crete Products Group; Duro-Nox.
      m. Symons by Dayton Superior; Buff Hard.
      n. US SPEC, Division of US Mix Products Company; US SPEC Industraseal.
      o. Vexcon Chemicals, Inc.; Vexcon StarSeal PS Clear.

2.7 CURING MATERIALS

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

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Axim Italcementi Group, Inc.; CATEXOL CimFilm.
   b. BASF Construction Chemicals - Building Systems; Confilm.
   c. ChemMasters; SprayFilm.
   d. Conspec by Dayton Superior; Aquafilm.
   e. Dayton Superior Corporation; Sure Film (J-74).
   f. Edoco by Dayton Superior; BurkeFilm.
   g. Euclid Chemical Company (The), an RPM company; Eucobar.
   h. Kaufman Products, Inc.; Vapor-Aid.
   i. Lambert Corporation; LAMBCO Skin.
   j. L&M Construction Chemicals, Inc.; E-CON.
   k. Meadows, W. R., Inc.; EVAPRE.
   l. Metalcrete Industries; Waterhold.
   m. Nox-Crete Products Group; MONOFILM.
   n. Sika Corporation; SikaFilm.
   o. SpecChem, LLC; Spec Film.
   p. Symons by Dayton Superior; Finishing Aid.
   q. TK Products, Division of Sierra Corporation; TK-2120 TRI-FILM.
   r. Unitex; PRO-FILM.
   s. Vexcon Chemicals, Inc.; Certi-Vex Envio Set.

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, Type 1, Class B, dissipating.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
   b. BASF Construction Chemicals - Building Systems; Kure 200.
   c. ChemMasters; Safe-Cure Clear.
   d. Conspec by Dayton Superior; W.B. Resin Cure.
   e. Dayton Superior Corporation; Day-Chem Rez Cure (J-11-W).
   f. Edoco by Dayton Superior; Res X Cure WB.
   g. Euclid Chemical Company (The), an RPM company; Kurez W VOX; TAMMSCURE WB 30C.
   h. Kaufman Products, Inc.; Thinfilm 420.
   i. Lambert Corporation; AQUA KURE - CLEAR.
   j. L&M Construction Chemicals, Inc.; L&M Cure R.
   k. Meadows, W. R., Inc.; 1100-CLEAR.
   l. Nox-Crete Products Group; Resin Cure E.
   m. Right Pointe; Clear Water Resin.
   n. SpecChem, LLC; Spec Rez Clear.
   o. Symons by Dayton Superior; Resi-Chem Clear.

p. TK Products, Division of Sierra Corporation; TK-2519 DC WB.
q. Vexcon Chemicals, Inc.; Certi-Vex Enviocure 100.

2.8 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.

B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 ASTM D 2240.

C. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.9 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.10 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
   1. Fly Ash: 25 percent.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

D. Admixtures: Use admixtures according to manufacturer's written instructions.
   1. Use water-reducing, high-range water-reducing, or plasticizing admixture in concrete, as required, for placement and workability.
   2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
   3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
   4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

2.11 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings, Foundation Walls, and Exterior Slabs-on-Ground: Proportion normal-weight concrete mixture as follows:
   1. Minimum Compressive Strength: 4500 psi at 28 days.
   2. Maximum Water-Cementitious Materials Ratio: 0.45.
   3. Slump Limit: 5, plus or minus 1 inch.
   4. Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.

B. Interior Slabs-on-Ground: Proportion normal-weight concrete mixture as follows:
   1. Minimum Compressive Strength: 3000 psi at 28 days.
   2. Slump Limit: 5 inches, plus or minus 1 inch.
   3. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

2.12 FABRICATING REINFORCEMENT

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

2.13 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M, and furnish batch ticket information.
   1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
   1. Class A, 1/8 inch for smooth-formed finished surfaces.
   2. Class B, 1/4 inch for rough-formed finished surfaces.

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

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
   1. Install keyways, reglets, recesses, and the like, for easy removal.
   2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

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

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

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

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

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

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

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.
   1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved its 28-day design compressive strength.
   2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

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

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

3.4 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Carlisle Coatings & Waterproofing, Inc.; Blackline 400.
   b. Meadows, W. R., Inc.; Perminator 15 mil.
   c. Stego Industries, LLC; Stego Wrap 15 mil Class A.

B. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

3.5 STEEL REINFORCEMENT

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

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

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

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

3.6 JOINTS

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

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Structural 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. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
   4. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

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.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

3.7 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

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

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

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

1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. 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.

F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

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

G. Hot-Weather Placement: Comply with ACI 301 and as follows:
1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.8 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces not exposed to public view.

B. 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 that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.

C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:
1. Smooth-Rubbed Finish: Not later than one day 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.
2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

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

3.9 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. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.
   1. Apply scratch finish to surfaces indicated.

C. 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 indicated, and to receive trowel finish.

D. 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 indicated, exposed to view, or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.

3.10 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

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

C. Formed Surfaces: Cure formed concrete surfaces, 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 the remainder of the curing period.

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

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
   1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
      a. Water.
      b. Continuous water-fog spray.
      c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
   2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
   a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.11 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.
   1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
   2. Do not apply to concrete that is less than 14 days' old.
   3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

3.12 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
   1. Defer joint filling until concrete has aged at least **one** month. 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 joint clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.13 CONCRETE SURFACE REPAIRS

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

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing 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 will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Structural Engineer.

D. 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. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. 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.
7. 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.

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

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

3.14 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Inspections:
1. Steel reinforcement placement.
2. Headed bolts and studs.
3. Verification of use of required design mixture.
4. Concrete placement, including conveying and depositing.
5. Curing procedures and maintenance of curing temperature.

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C172 shall be performed according to the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cubic yards (4 cu. m), but less than 25 cubic yards (19 cu. m), plus one set for each additional 50 cubic yards (38 cu. m) or fraction thereof.
2. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
3. Slump: ASTM C143/C143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
4. Air Content: ASTM C231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
5. Concrete Temperature: ASTM C1064/C1064M; one test hourly when air temperature is 40 Deg F and below and when 80 Deg F and above, and one test for each composite sample.
6. Compression Test Specimens: ASTM C31/C31M.
   a. Cast and laboratory cure five standard cylinder specimens for each composite sample.
7. Compressive-Strength Tests: ASTM C39/C39M; test one laboratory-cured specimen at 7 days, three specimens at 28 days, and hold one.
8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).
9. Test results shall be reported in writing to Structural Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Structural Engineer but will not be used as sole basis for approval or rejection of concrete.

11. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Structural Engineer. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Structural Engineer.
12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

3.15 PROTECTION OF LIQUID FLOOR TREATMENTS

A. Protect liquid floor treatment 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 installer.

END OF SECTION

SECTION 033500 - CONCRETE FINISHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Single application cure-densifier-hardener for new and existing concrete floors.
2. Precautions for avoiding staining concrete before and after application.

B. Related Section:
1. Division 03 Cast-In-Place Concrete section.

1.2 REFERENCES

A. American National Standards Institute (ANSI):
1. ANSI B101.1 Test Method for Measuring Wet SCOF of Common Hard-Surface Floors.
2. ANSI B101.3 Test Method for Measuring Wet DCOF of Common Hard-Surface Floors.

B. ASTM International (ASTM):
1. ASTM C779 Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces.
2. ASTM C805 Standard Test Method for Rebound Number of Hardened Concrete.
3. ASTM C1028 Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method.
4. ASTM D3359 Standard Test Methods for Measuring Adhesion by Tape Test.
5. ASTM F150-06(2018) Standard Test Method for Electrical Resistance of Conductive and Static Dissipative Resilient Flooring.
6. ASTM G23 Practice for Operating Light-Exposure Apparatus (Carbon-Arc Type) With and Without Water for Exposure of Nonmetallic Materials (Withdrawn 2000).

C. National Floor Safety Institute (NFSI):
1. Certified as High Traction by the National Floor Safety Institute (NFSI), Phase 2 testing.

D. Health Product Declaration Collaborative (HPD)
1. HPD v1.0.
2. HPD v2.1.

1.3 SUBMITTALS

A. General: Submit listed submittals in accordance with Conditions of the Contract and Section 013300 - Submittal Procedures.

B. Product Data: Submit product data, including manufacturer's data sheets, installation instructions and technical bulletins for specified products.

C. Certificates: Manufacturer's certification that the installer is acceptable.

D. Maintenance Data: Maintenance instructions, including precautions for avoiding staining after application.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: In accordance with Section 014000 – Quality Requirements.

1.5 DELIVERY, STORAGE & HANDLING

A. General: Comply with Section 016000 – Product Requirements.

B. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

C. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.

D. Handling: Protect materials from dirt, corrosion, oil, grease and other contaminants.

PART 2 - PRODUCTS

2.1 MATERIAL

A. Manufacturer:
   1. Curecrete Distribution, Inc. – Ashford Formula (Basis of Design).
   2. Approved equal.

B. Cure-Densifier-Hardener:
   1. Abrasion Resistance to Revolving Disks: At least a 32.5% improvement over untreated samples when tested in accordance with ASTM C779.
   2. Surface Adhesion: At least a 22% increase in adhesion for epoxy when tested in accordance with ASTM D3359.
   3. Hardening: As follows when tested in accordance with ASTM C39:
      a. After 7 Days: An increase of at least 40% over untreated samples.
      b. After 28 Days: An increase of at least 38% over untreated samples.
   4. Coefficient of Friction: 0.86 dry, 0.69 wet when tested in accordance with ASTM C1028.
   5. Rebound Number: An increase of at least 13.3% over untreated samples when tested in accordance with ASTM C805.
   6. Electrical Resistance: To ASTM F150.
   7. Light Exposure Degradation: No evidence of adverse effects on treated samples when tested in accordance with ASTM G23.
   8. Test Method for Measuring Wet SCOF of Common Hard-Surface Floors in accordance with ANSI B101.1.
   9. Test Method for Measuring Wet DCOF of Common Hard-Surface Floors in accordance with ANSI B101.3.
   10. Certified as High Traction by the National Floor Safety Institute (NFSI), Phase 2 testing.
   11. Certified Compliant according to California Department of Public Health CDPH/EHLB/Standard Method Version 1.2, 2017.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

A. Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions and product carton instructions for installation.

3.2 EXAMINATION

A. Do not begin installation until substrates have been properly prepared and are suitable for application of product.

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

3.3 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.

C. Do not use frozen material. Thaw and agitate prior to use.

D. If construction equipment must be used for application, diaper all components that might drip oil, hydraulic fluid or other liquids.

3.4 INSTALLATION

A. New Concrete: Apply cure-densifier hardener to new concrete as soon as the concrete is firm enough to work on after troweling; with colored concrete, wait a minimum of 30 days before application.
   1. Spray on at rate of 200 ft^2/gal (5 m^2/L).
   2. Keep surface wet with cure-densifier-hardener for a minimum soak-in period of 30 minutes without allowing it to dry or become slippery. If slipperiness occurs before the 30 minute time period has elapsed, apply additional cure-densifier- hardener, as needed, to keep the entire surface in a non-slippery state for the first 15 minutes; for the remaining 15 minutes, mist the surface as needed with water to keep the material in a non-slippery state. In hot weather conditions, follow manufacturer's special application procedures.
   3. When the treated surface becomes slippery after this period, lightly mist with water until slipperiness disappears.
   4. Wait for surface to become slippery again, and then flush entire surface with water to remove all cure-densifier-hardener residue.
   5. Squeegee surface completely dry, flushing any remaining slippery areas until no residue remains.
   6. Wet vacuum or scrubbing machines can be used in accordance with manufacturer's instructions to remove residue.

B. Existing Concrete: Apply cure-densifier-hardener only to clean, bare concrete.
   1. Thoroughly remove previous treatments, laitance, oil and other contaminants.
   2. Saturate surface with cure-densifier-hardener; respray or broom excess onto dry spots.
   3. Keep surface wet with cure-densifier-hardener for a minimum soak-in period of 30–40 minutes.
   4. If most of the material has been absorbed after the 30 minute soak-in period, remove all excess material, especially from low spots, using broom or squeegee.

5. If most of the material remains on the surface after the 30 minute soak-in period, wait until the surface becomes slippery and then flush with water, removing all cure-densifier-hardener residue. Squeegee completely dry, flushing any remaining slippery areas until no residue remains.
6. If water is not available, remove residue using squeegee.

3.5 PROTECTION

A. Protect installed floors for as long as reasonably possible until chemical reaction process is complete.
   1. Do not allow traffic on floors for 3 hours after application.
   2. Do not allow parking of vehicles on concrete slab.
   3. If vehicles must be temporarily parked on slab, place drop cloths under vehicles during entire time parked.
   4. Do not allow pipe cutting using pipe cutting machinery on concrete slab.
   5. Do not allow temporary placement and storage of steel members on concrete slabs.
   6. Clean up spills immediately and spot-treat stains with degreaser or oil emulsifier.
   7. Clean floor regularly in accordance with manufacturer's recommendations.

END OF SECTION

SECTION 079200 - JOINT SEALANTS

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:
1. Silicone joint sealants.
2. Mildew-resistant joint sealants.
3. Butyl joint sealants.
4. Latex joint sealants.

1.2 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Joint-Sealant Schedule: Include the following information:
1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Product Test Reports: For each kind of joint sealant, for tests performed by manufacturer and witnessed by a qualified testing agency or a qualified testing agency.

C. Sample Warranties: For special warranties.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.

B. Product Testing: Test joint sealants using a qualified testing agency.
1. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.

C. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1.5 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:
   1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
   2. When joint substrates are wet.
   3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
   4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.6 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.

PART 2 – PRODUCTS

2.1 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

A. Sealant Type 1: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. DOWSIL; 790; 756 SMS for cold applications.
      b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
      c. Pecora Corporation; 890.
      d. Sika Corporation, Construction Products Division; SikaSil WS-290.
      e. Tremco Incorporated; Spectrem 1.

B. Sealant Type 2: Not used.

C. Sealant Type 3: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Uses T and NT.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Pecora Corporation; 301 NS (VOC 50).
      b. Tremco Incorporated; Spectrem 800 (VOC 1).

D. Sealant Type 4: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant: ASTM C 920, Type S, Grade NS, Class 25, Use NT.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. DOWSIL; 786(VOC 33) (Food)
      b. GE - Silicones; Sanitary SCS1700.
      c. Tremco Incorporated; Tremsil 200 Sanitary (VOC 1).

E. Sealant Type 4A: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant: ASTM C 920, Type S, Grade NS, Class 25, Use NT.
   1. Provide elastomeric sealant NSF certified for end-use application indicated. Provide sealant that, when cured and washed, meets requirements of Food and Drug Administration's 21 CFR, Section 177.2600 for use in areas that come in contact with food.
   2. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. DOWSIL; 786(VOC 33).
      b. Kason; 3700 Series Rubbaseal Silicone Sealant.
      c. C. R. Laurence Co.; CRL 33S Silicone (VOC 39).

2.3 LATEX JOINT SEALANTS

A. Sealant Type 5: Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. MasterBuilders Solutions; MasterSeal NP 520.
      b. Pecora Corporation; AC-20 (VOC 31).
      c. Sherwin-Williams 950A
      d. Tremco Incorporated; Tremflex 834.

2.4 BUTYL JOINT SEALANTS

A. Sealant Type 6: Butyl-Rubber-Based Joint Sealants: ASTM C 1311.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Pecora Corporation; BC-158

2.5 JOINT-SEALANT BACKING

A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.6 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

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

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
   1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
   2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
      a. Concrete.
      b. Masonry.
   3. Remove laitance and form-release agents from concrete.
   4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
      a. Metal.
      b. Glass.
      c. Porcelain enamel.
      d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint- sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
   1. Do not leave gaps between ends of sealant backings.
   2. Do not stretch, twist, puncture, or tear sealant backings.
   3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
   1. Place sealants so they directly contact and fully wet joint substrates.
   2. Completely fill recesses in each joint configuration.
   3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
   1. Remove excess sealant from surfaces adjacent to joints.
   2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
   3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.
      a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.4 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.6 JOINT-SEALANT SCHEDULE

A. Exterior Control, Expansion, and Soft Joints in Masonry and Between Masonry and Adjacent Work.
   1. Silicone Joint Sealant: Sealant Type 1.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

B. Exterior Control, Expansion, and Soft Joints Between Masonry and Storefronts.
   1. Silicone Joint Sealant: Sealant Type 1.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

C. Under Exterior Door Thresholds.
   1. Silicone Joint Sealant: Sealant Type 1.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

D. Exterior Conditions where Fasteners are penetrating the Air Barrier System.
   1. Butyl Joint Sealant: Sealant Type 6.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

E. Exterior Joints for Which No Other Sealant Type is Indicated.
   1. Silicone Joint Sealant: Sealant Type 1.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

F. Interior Isolation and Contraction Joints in Cast-In-Place Concrete Slabs.
   1. Silicone Joint Sealant: Sealant Type 3.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

G. Concealed Interior Perimeter Joints of Exterior Openings.
   1. Silicone Joint Sealant: Sealant Type 1.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

H. Exposed Interior Perimeter Joints of Exterior Openings.
   1. Latex Joint Sealant: Sealant Type 5.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

I. Perimeter Joints Between Interior Wall Surfaces and Frames of Interior Doors Windows and Elevator Entrances.
   1. Latex Joint Sealant: Sealant Type 5.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

J. Vertical Joints on Exposed Surfaces of Interior Unit Masonry Walls.
   1. Latex Joint Sealant: Sealant Type 5.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

K. Joints between Plumbing Fixtures and Walls and Floors and Between Countertops and Walls.
   1. Silicone Joint Sealant: Sealant Type 4.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

L. Interior Joints in Food Service Areas.
   1. Silicone Joint Sealant: Sealant Type 4A.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

M. Interior Joints for Which No Other Sealant is Indicated.
   1. Latex Joint Sealant: Sealant Type 5.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
1. Exterior standard steel doors and frames.

1.2 COORDINATION

A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
1. Inspect and discuss condition of substrate and other preparatory work performed by other trades.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, and finishes.

B. Shop Drawings: Include the following:
1. Elevations of each door type.
2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of moldings, removable stops, and glazing.

C. Product Schedule: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For door inspector.
1. Egress Door Inspector: Submit documentation of compliance with NFPA 101, section 7.2.1.15.4.

B. Field quality control reports.

1.6 QUALITY ASSURANCE

A. Egress Door Inspector Qualifications: Inspector for field quality control inspections of egress door assemblies shall meet the qualifications set forth in NFPA 101, section 7.2.1.15.4 and the following:
   1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAI) certification.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow-metal doors and frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.
   1. Provide additional protection to prevent damage to factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow-metal doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch-high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Standard Steel Doors and Frames:
      a. Ceco Door Products; an Assa Abloy Group company.
      b. Curries Company.
      c. J/R Metal Frames Manufacturing, Inc.
      d. Steelcraft; a division of Ingersoll-Rand.
      e. Approved equal.

B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.2 EXTERIOR STANDARD STEEL DOORS AND FRAMES

A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Extra-Heavy-Duty Doors: SDI A250.8, Level 3; SDI A250.4, Level A.
   1. Doors:
      a. Type: As indicated in the Door and Frame Schedule.
      b. Thickness: 1-3/4 inches.
      c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A60coating.
      d. Edge Construction: Model 2, Seamless.
      e. Edge Bevel: Bevel lock edge 1/8 inch in 2 inches.
      f. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets. Seal joints against water penetration.

g. Bottom Edges: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets. Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape.

h. Core: Manufacturer's polyurethane core.

2. Exposed Finish: Prime.

2.3 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042-inch-thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
3. Compression Type for Drywall Slip-on Frames: Not allowed.
4. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches of frame height above 7 feet.
5. Postinstalled Expansion Anchor: Minimum 3/8-inch-diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.

B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.

C. Material: ASTM A 879/A 879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M; hot-dip galvanized according to ASTM A 153/A 153M, Class B.

2.4 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum A60 metallic coating.

1. Wipe Coat Galvanneal materials will not be considered acceptable.

D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

E. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

F. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.5 FABRICATION

A. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.
   1. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
   2. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
      a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.

B. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
   1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
   2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.

2.6 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
   1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces. Touch up factory-applied finishes where spreaders are removed.

B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

C. Field apply bituminous coating to backs of frames that will be filled with grout or located in exterior walls.

3.2 INSTALLATION

A. General: Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.

B. Hollow-Metal Frames: Comply with SDI A250.11.
   1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.
      a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.

b. Install frames with removable stops located on secure side of opening.

2. Floor Anchors: Secure with postinstalled expansion anchors.
   a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
3. Exterior Hollow Metal Door Frames: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces. Prior to installing frames, pre-fill frames with spray foam insulation around frame as indicated on the drawings. Voids around installed frames to be foamed as specified in Section 07 21 00 - Thermal Insulation.
4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout or mortar.
5. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
6. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:
   a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
   b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
   c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
   d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.
   1. Non-Fire-Rated Steel Doors: Comply with SDI A250.8.

3.3 FIELD QUALITY CONTROL

A. Inspection Agency: Engage a qualified inspector to perform inspections and to furnish reports to Architect.

B. Inspections:
   1. Egress Door Inspections: Inspect each door equipped with panic hardware, each door equipped with fire exit hardware, each door located in an exit enclosure, each electrically controlled egress door, and each door equipped with special locking arrangements according to NFPA 101, section 7.2.1.15.

C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.

D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.

E. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80 and NFPA 101.

3.4 CLEANING AND TOUCHUP

A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

B. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

C. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes items known commercially as finish or door hardware that are required for swing, sliding, and folding doors, except special types of unique hardware specified in the same sections as the doors and door frames on which they are installed.

B. This Section includes the following:
1. Hinges.
2. Key control system to match existing.
3. Lock cylinders and keys.
4. Lock and latch sets.
5. Closers.
6. Overhead holders.
7. Miscellaneous door control devices.
8. Door trim units.
9. Protection plates.
10. Weatherstripping for exterior doors.
11. Thresholds.
12. Hardware items noted on the Drawings.

C. Related Sections: The following Sections contain requirements that relate to this Section:
1. Section 081113 "Hollow Metal Doors and Frames".

1.3 SUBMITTALS

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

B. Product data including manufacturers' technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessaryto show compliance with requirements.

C. Final hardware schedule coordinated with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
1. Final Hardware Schedule Content: Based on hardware indicated, organize schedule into "hardware sets" indicating complete designations of every item required for each door or opening. Include the following information:
a. Type, style, function, size, and finish of each hardware item.
b. Name and manufacturer of each item.
c. Fastenings and other pertinent information.
d. Location of each hardware set cross referenced to indications on Drawings both on floor plans and in door and frame schedule.
e. Explanation of abbreviations, symbols, and codes contained in schedule.

f. Mounting locations for hardware.
g. Door and frame sizes and materials.

2. Submittal Sequence: Submit final schedule at earliest possible date particularly where acceptance of hardware schedule must precede fabrication of other work that is critical in the Project construction schedule. Include with schedule the product data, samples, shop drawings of other work affected by door hardware, and other information essential to the coordinated review of schedule.

D. Templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

1.4 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from a single manufacturer.

B. Supplier Qualifications: A recognized architectural door hardware supplier, with warehousing facilities in the Project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that employs an experienced architectural hardware consultant (AHC) who is available to Director's Representative and Contractor, at reasonable times during the course of the Work, for consultation.
1. Require supplier to meet with Director's Representative to finalize keying requirements and to obtain final instructions in writing.

1.3 PRODUCT HANDLING

A. Tag each item or package separately with identification related to final hardware schedule and include basic installation instructions with each item or package.

B. Packaging of door hardware is responsibility of supplier. As material is received by hardware supplier from various manufacturers, sort and repackage in containers clearly marked with appropriate hardware set number to match set numbers of approved hardware schedule. Two or more identical sets may be packed in same container.

C. Inventory door hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.

D. Deliver individually packaged door hardware items promptly to place of installation (shop or Project site).

E. Provide secure lock-up for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable so that completion of the Work will not be delayed by hardware losses both before and after installation.

1.4 MAINTENANCE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Director's Representative's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Hardware and cylinders: To match existing.

2.3 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers. Where no other manufacturer is allowed, it is so noted next to the product. Subject to compliance with requirements, products of other manufacturers may be submitted for review and approval by the Architect. Model numbers of products indicated in "Hardware Schedule" refer to following manufacturers listed as "Basis of Specification":

1. Butts and Hinges:
   a. Ives Hinge Co.
   b. Bommer.
   c. McKinney.

2. Locksets:
   a. Best Locks – 40H Series
   b. Corbin Russwin – ML2000 Series
   c. Falcon – MA Series

3. Overhead Closers:
   a. Falcon – SC71 Series
   b. Dorma- 8900 Series
   c. LCN – 4050 Series

4. Overhead Stops:
   a. Glynn Johnson – 90s Series
   b. Rixson – 9 series

5. Door Trim Units:
   a. Ives
   b. Rockwood
   c. Trimco

6. Kick, Mop, and Armor Plates:
   a. Ives
   b. Trimco

2.2 SCHEDULED HARDWARE

A. ANSI/BHMA designations are used to describe hardware items or to define quality or function are derived from the following standards. Provide products complying with these standards and requirements.
   1. Butts and Hinges: ANSI/BHMA A156.1.
   2. Bored and Preassembled Locks and Latches: ANSI/BHMA A156.2.
   3. Door Controls - Closers: ANSI/BHMA A156.4.
   4. Architectural Door Trim: ANSI/BHMA A156.6.
   5. Template Hinge Dimensions: ANSI/BHMA A156.7.
   6. Door Controls - Overhead Holders: ANSI/BHMA A156.8.

7. Closer Holder Release Devices: ANSI/BHMA A156.15.
8. Auxiliary Hardware: ANSI/BHMA A156.16.
9. Materials and Finishes: ANSI/BHMA A156.18.

2.3 MATERIALS AND FABRICATION

A. Base Metals: Produce hardware units of basic metal and forming method indicated using manufacturer's standard metal alloy, composition, temper, and hardness, but in no case of lesser (commercially recognized) quality than specified for applicable hardware units for finish designations indicated.

B. Fasteners: Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation. Do not provide hardware that has been prepared for self-tapping sheet metal screws, except as specifically indicated.

C. Furnish screws for installation with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including "prepared for paint" surfaces to receive painted finish.

D. Provide concealed fasteners for hardware units that are exposed when door is closed except to the extent no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless their use is the only means of reinforcing the work adequately to fasten the hardware securely. Where thru-bolts are used as a means of reinforcing the work, provide sleeves for each thru-bolt or use sex screw fasteners.

2.4 HINGES, BUTTS, PIVOTS, AND CORES

A. Templates: Provide only template-produced units.

B. Screws: Provide Phillips flat-head screws complying with the following requirements:
1. For metal doors and frames install machine screws into drilled and tapped holes.
2. Finish screw heads to match surface of hinges or pivots.

C. Number of Hinges: Provide 3 hinges per door leaf for doors 90 inches or less in height.

D. Cores: Contractor to provide temporary construction cores. Use temporary construction cores during contractor work period with final cores to be provided by Owner or other locksmith designated by Owner to provide the final cores and locksmith work.

2.5 LOCK CYLINDERS AND KEYING

A. Locksets to be grade 1 heavy duty mortise.

B. Keying Conference: Conduct a keying conference to comply with requirements in Division 01.

2.6 LOCKS, LATCHES, AND BOLTS

A. Strikes: Provide manufacturer's standard wrought box strike for each latch or lock bolt, with curved lip extended to protect frame, finished to match hardware set, unless otherwise indicated.
1. Provide flat lip strikes for locks with 3-piece, antifriction latchbolts as recommended by manufacturer.

2. Provide recess type top strikes for bolts locking into head frames, unless otherwise indicated.
3. Provide dust-proof strikes for foot bolts, except where special threshold construction provides non-recessed strike for bolt.

B. Lock Throw: Provide 5/8-inch minimum throw of latch on pairs of doors. Comply with UL requirements for throw of bolts and latch bolts on rated fire openings.
1. Provide 3/4-inch minimum throw of latch for mortise locks. Provide 1-inch minimum throw for dead bolts.

C. Flush and Deadbolts: As indicated on the Drawings.

2.7 CLOSERS AND DOOR CONTROL DEVICES

A. Size of Units: Except as otherwise specifically indicated, comply with the manufacturer's recommendations for size of door control unit depending on size of door, exposure to weather, and anticipated frequency of use.

B. Access-Free Manual Closers: Where manual closers are indicated for doors required to be accessible to the physically handicapped, provide adjustable units complying with ANSI A117.1 provisions for door opening force and delayed action closing.

C. Provide brackets or plates required for proper installation of the door closer. Wherever possible, locate the closer on the inside of the room.

2.8 DOOR TRIM UNITS

A. Fasteners: Provide manufacturer's standard exposed fasteners for door trim units consisting of either machine screws or self-tapping screws.

B. Fabricate edge trim of stainless steel to fit door thickness in standard lengths or to match height of protection plates.

C. Fabricate protection plates not more than 1-1/2 inches less than door width on hinge side and not more than 1/2 inch less than door width on pull side by height indicated.
1. Metal Plates: Stainless steel, 0.050 inch (U.S. 18 gage).

2.9 HARDWARE FINISHES

A. Match items to the manufacturer's standard color and texture finish for the latch and lock sets (or push- pull units if no latch or lock sets).

B. Provide finishes that match those established by BHMA or, if none established, match the Director’s Representative's sample.

C. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.

D. Provide protective lacquer coating on exposed hardware finishes of brass, bronze, and aluminum, except as otherwise indicated. The suffix "-NL" is used with standard finish designations to indicate "no lacquer."

E. The designations used in schedules and elsewhere to indicate hardware finishes are those listed in ANSI/BHMA A156.18, "Materials and Finishes," including coordination with the traditional U.S. finishes shown by certain manufacturers for their products.

F. To match existing.

PART 3 - EXECUTION

3.5 INSTALLATION

A. Mount hardware units at heights indicated in "Recommended Locations for Builders Hardware for Custom Steel Doors and Frames" by the Door and Hardware Institute.

B. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Where cutting and fitting is required to install hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation or application of surface protection with finishing work specified in the Division 9 Sections. Do not install surface-mounted items until finishes have been completed on the substrates involved.

C. Set units level, plumb, and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

D. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

E. Weatherstripping and Seals: Comply with manufacturer's instructions and recommendations to the extent installation requirements are not otherwise indicated.

3.6 ADJUSTING, CLEANING, AND DEMONSTRATING

A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate freely and smoothly or as intended for the application made.
   1. Where door hardware is installed more than one month prior to acceptance or occupancy of a space or area, return to the installation during the week prior to acceptance or occupancy and make final check and adjustment of hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

B. Clean adjacent surfaces soiled by hardware installation.

C. Instruct Owner’s personnel in the proper adjustment and maintenance of door hardware and hardware finishes.

D. Six-Month Adjustment: Approximately six months after the date of Substantial Completion, the Installer, of latchsets and locksets and of door control devices, and of other major hardware suppliers, shall return to the Project to perform the following work:
   1. Examine and re-adjust each item of door hardware as necessary to restore function of doors and hardware to comply with specified requirements.
   2. Consult with and instruct Owner’s personnel in recommended additions to the maintenance procedures.

3. Replace hardware items that have deteriorated or failed due to faulty design, materials, or installation of hardware units.
4. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware.

3.7 HARDWARE SCHEDULE

A. General: Provide hardware for each door to comply with requirements of the Drawings.

END OF SECTION

SECTION 099100 - PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes surface preparation and application of paint systems on the following:
   1. Interior metal doors and frames.
   2. Exterior metal door and frames.
   3. Walls.
   4. Metal louvers.
   5. Toilet partitions and frames.
   6. Steel lintel at Concessions door.
   7. Bird screens and frames.
   8. Wood ceiling.
   9. Wood rafters.
   10. Wood Deck.
   11. Other items as necessary.

1.2 REFERENCES

A. Master Painters Institute (MPI)
   1. MPI Architectural Painting Specifications Manual.

1.3 MOCK-UPS

A. Mock-ups: Apply mock-ups of each paint system indicated and each color and finish selected to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
   1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
      a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft.
      b. Other Items: Architect will designate items or areas required.
   2. Final approval of color selections will be based on mockups.
      a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
   3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 WASTE MANAGEMENT AND DISPOSAL

A. Ensure emptied containers are sealed and stored safely.

B. Unused paint materials must be disposed of at official hazardous material collections site.

C. Material which cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.

D. Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.

E. Set aside and protect surplus and uncontaminated finish materials. Deliver to or arrange collection by individuals or organizations for verifiable re-use or re-manufacturing.

1.5 WORK SITE CONDITIONS

A. Heating, Ventilation and Lighting:
   1. Ventilate enclosed spaces.
   2. Provide continuous ventilation for seven days after completion of application of paint.
   3. Provide temporary ventilating and heating equipment where permanent facilities are not available or supplemental ventilating and heating equipment if ventilation and heating from existing system is inadequate to meet minimum requirements.

B. Temperature, Humidity and Substrate Moisture Content Levels:
   1. Unless pre-approved written approval by Architect and product manufacturer, perform no painting when:
      a. Ambient air and substrate temperatures are below 50 degrees F.
      b. Substrate and ambient air temperatures are not expected to fall within MPI or paint manufacturer's prescribed limits.

C. Additional interior application requirements:
   1. Apply paint finishes when temperature at location of installation can be satisfactorily maintained within manufacturer's recommendations.

1.6 MAINTENANCE MATERIALS

A. Extra Materials:
   1. Submit one - one gallon can of each type and color of finish coating. Identify type and color in relation to established color schedule and finish system.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers include, but are not limited to:
   1. Sherwin Williams (Basis of Design).
   2. Benjamin Moore.
   3. Tnemec.
   4. PPG Architectural Coatings (PPG).
   5. Devoe.
   6. California Paints.

2.2 MATERIALS, GENERAL

A. Paint materials listed in the MPI Approved Products List (APL) are acceptable for use on this project.

B. Material Compatibility:
   1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
   2. For each coat in a paint system, provide products recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

C. Where required by authorities having jurisdiction, paints and coatings to provide a fire-resistant rating.

D. Paints, coatings, adhesives, solvents, cleaners, lubricants, and other fluids:
   1. Use water-based coatings where available.
   2. Non-flammable.
   3. Manufactured without compounds which contribute to ozone depletion in the upper atmosphere.
   4. Manufactured without compounds which contribute to smog in the lower atmosphere.
   5. Do not contain methylene chloride, chlorinated hydrocarbons, toxic metal pigments.

E. Formulate and manufacture water-borne surface coatings with no aromatic solvents, formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavalent chromium or their compounds.

2.3 PAINT COLORS

A. Colors: Refer to “Material & Color Legend” on the Drawings.

PART 3 - EXECUTION

3.1 GENERAL

A. Perform preparation and operations for interior and exterior painting in accordance with MPI - Architectural Painting Specifications Manual except where specified otherwise.

B. Apply paint materials in accordance with paint manufacturer's written application instructions.

3.2 EXAMINATION

A. Investigate substrates for problems related to proper and complete preparation of surfaces to be painted. Report to Architect damages, defects, unsatisfactory or unfavourable conditions before proceeding with work.

B. Do not commence until such adverse conditions and defects have been corrected and surfaces and conditions are acceptable to Painting Subcontractor and Inspection Agency.

C. Degree of surface deterioration (DSD) to be assessed using MPI Identifiers and Assessment criteria indicated in MPI Maintenance Repainting Manual. MPI DSD ratings and descriptions are as follows:

Condition	Description
DSD-0	Sound Surface (includes visual (aesthetic) defects that do not affect film's protective properties).
DSD-1	Slightly Deteriorated Surface (indicating fading; gloss reduction, slight surface contamination, minor pin holes scratches).

Condition	Description
DSD -2	Moderately Deteriorated Surface (small areas of peeling, flaking, slight cracking, and staining).
DSD -3	Severely Deteriorated Surface (heavy peeling, flaking, cracking, checking, scratches, scuffs, abrasion, small holes and gouges).
DSD -4	Substrate Damage (repair or replacement of surface required).

3.3 PREPARATION

A. Protection:
   1. Protect building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore surfaces as directed by Architect.
   2. Protect items that are permanently attached such as Fire Labels on doors and frames.
   3. Protect factory finished products and equipment.

B. Surface Preparation:
   1. Remove surface hardware on doors prior to undertaking painting operations. Identify and store items in secure location and re-installed after painting is completed.
   2. Place "WET PAINT" signs in occupied areas as painting operations progress. Signs to approval of Architect.

C. Clean and prepare surfaces in accordance with MPI - Architectural Painting Specification Manual requirements and coating manufacturer's recommendations.

D. Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats. Apply primer, paint, or pre-treatment as soon as possible after cleaning and before deterioration occurs.

E. Clean metal surfaces to be painted by removing rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances in accordance with MPI requirements. Remove traces of blast products from surfaces, pockets and corners to be painted by brushing with clean brushes, blowing with clean dry compressed air or vacuum cleaning.

F. Touch up of shop primers with primer as specified.

G. Do not apply paint until prepared surfaces have been accepted by Architect.

3.4 APPLICATION

A. Apply paint by brush, roller, air sprayer or airless sprayer. Conform to manufacturer's application instructions unless specified otherwise.

B. Brush and Roller Application:
   1. Apply paint in uniform layer using brush and/or roller type suitable for application.
   2. Work paint into cracks, crevices and corners.
   3. Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.
   4. Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces free of roller tracking and heavy stipple.

5. Remove runs, sags and brush marks from finished work and repaint.

C. Spray application:
1. Provide and maintain equipment that is suitable for intended purpose, capable of atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.
2. Keep paint ingredients properly mixed in containers during paint application either by continuous mechanical agitation or by intermittent agitation as frequently as necessary.
3. Apply paint in uniform layer, with overlapping at edges of spray pattern. Back roll first coat application.
4. Brush out immediately all runs and sags.
5. Use brushes and rollers to work paint into cracks, crevices and places which are not adequately painted by spray.

D. Use dipping, sheepskins or daubers only when no other method is practical in places of difficult access.

E. Apply coats of paint continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.

F. Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.

G. Sand and dust between coats to remove visible defects.

H. Finish top, bottom, edges and cutouts of doors after fitting as specified for door surfaces.

3.5 WORK SITE TOLERANCES

A. Final coat to exhibit uniformity of color and uniformity of sheen across full surface area.

3.6 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written instructions, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written instructions.

3.7 CLEANING

A. Remove paint where spilled, splashed, splattered or sprayed as work progresses using means and materials that are not detrimental to affected surfaces.

B. Keep work area free from unnecessary accumulation of tools, equipment, surplus materials and debris.

C. Remove combustible rubbish materials and empty paint cans each day and safely dispose of same in accordance with requirements of authorities having jurisdiction.

D. Clean equipment and dispose of wash water used for water borne materials, solvents used for oil-based materials as well as other cleaning and protective materials (e.g. rags, drop cloths, and masking papers), paints, thinners, paint removers/strippers in accordance with safety requirements of authorities having jurisdiction and as noted herein.

E. Clean painting equipment in leak-proof containers that will permit particulate matter to settle out and be collected. Sediment remaining from cleaning operations to be recycled or disposed of in manner acceptable to authorities having jurisdiction.

F. Recycle paint and coatings in excess of repainting requirements as specified.

3.8 RESTORATION

A. Clean and re-install hardware items removed before undertaken painting operations.

B. Remove protective coverings and warning signs as soon as practical after operations cease.

C. Remove paint splashings on affected exposed surfaces. Remove smears and spatter immediately as operations progress, using compatible solvent.

D. Protect freshly completed surfaces from paint droppings and dust to approval of Architect. Avoid scuffing newly applied paint.

E. Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by Architect.

3.9 GLOSS/SHEEN RATINGS SCHEDULE

A. Paint gloss is defined as sheen rating of applied paint, in accordance with following values:
   1. MPI Gloss Level 1, Flat: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D523.
   2. MPI Gloss Level 3, Low-Sheen/Eggshell: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.
   3. MPI Gloss Level 4, Low-Sheen/Satin: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D523.
   4. MPI Gloss Level 5, Semigloss: 35 to 70 units at 60 degrees, according to ASTM D523.
   5. MPI Gloss Level 6, Gloss: 70 to 85 units at 60 degrees, according to ASTM D523.
   6. MPI Gloss Level 7, High Gloss: More than 85 units at 60 degrees, according to ASTM D523.

3.10 EXTERIOR PAINTING SCHEDULE

A. Unless otherwise specified, exterior painting work to be in accordance with MPI Premium Grade finish requirements.

B. Galvanized-Metal Substrates, metal doors and frames:
   1. Latex System MPI EXT 5.3A:
      a. Prime Coat: by door manufacturer.
      b. Topcoat: Latex, exterior, MPI #11.
         1) Benjamin Moore; DTM Acrylic Semi-Gloss Enamel M29: Applied at a dry film thickness of not less than 2.0 mils.
         2) PPG: 6-900XI Speedhide Exterior Semi-Gloss Latex: Applied at a dry film thickness of not less than 1.5 mils.

3) Sherwin-Williams; IMC DTM Acrylic Coating Semi-Gloss (Waterborne) B66W200 Series. (250 g/L)

3.11 INTERIOR PAINTING SCHEDULE

A. Unless otherwise specified, interior painting work to be in accordance with MPI Premium Grade finish requirements.

B. Metal: doors, frames, partitions, louvers, and misc. steel.
   1. INT 5.3M - High performance architectural latex (over primer) Level 5 semi-gloss coating.
      a. Prime Coat: shop finished or prime by material manufacturer.
      b. Topcoat:
         1) Benjamin Moore: Ultra Spec 500 Interior Semi-Gloss Finish, No. N539. (0 g/L)
         2) PPG: 1500-0100 Series, Ultra-Hide Zero Interior Latex Paint, Semi-Gloss. (0 g/L)
         3) Sherwin Williams: ProMar 200 Zero VOC Interior Latex Semi-Gloss B31-2600 Series. (0 g/L)

C. Wood rafters, wood ceilings and wood deck.
   1. Basis of Design: Sherwin Williams products. Follow all product sheets for application and surface preparation.
      a. Prime Coat: Exterior Latex Wood Primer – No. B42W08141.
      b. Finish Coat: (2) coats of Pro Industrial Pre-Catalyzed Waterbased Urethane – No. B65-1100 Series.

END OF SECTION

SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:
1. Public-use washroom accessories.
2. ADA shower seat.
3. Childcare accessories.
4. Benches

1.2 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Include electrical characteristics.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
1. Identify locations using room designations indicated.
2. Identify accessories using designations indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For manufacturer's special warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For accessories to include in maintenance manuals.

B. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, visible silver spoilage defects.
2. Warranty Period: 15 years from date of Substantial Completion.

PART 2 – PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Source Limitations: Obtain each type of public-use washroom accessory from single source from single manufacturer.

2.2 WASHROOM ACCESSORIES

A. ADA Shower Seat:
1. Acceptable Manufacturer: As indicated in the "Toilet Accessory Schedule" on the Drawings – or approved e qual.
2. Color/Finish: Solid phenolic with matte finish, antique white colored.
3. Mounting: Surface mounted and recessed mounted for ADA requirements.
4. Dry time: not greater than 8 seconds.

B. Sanitary-Napkin Disposal Unit:
1. Acceptable Manufacturer: As indicated in the "Toilet Accessory Schedule" on the Drawings – or approved equal.
2. Mounting: Surface mounted.
3. Door or Cover: Self-closing, push flap.
4. Receptacle: Removable.
5. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).

C. Grab Bars:
1. Acceptable Manufacturer: As indicated in the "Toilet Accessory Schedule" on the Drawings – or approved equal.

D. Hand Dryer:
1. Acceptable Manufacturer: As indicated in the "Toilet Accessory Schedule" on the Drawings – or approved equal.

E. Soap Dispenser:
1. Acceptable Manufacturer: As indicated in the "Toilet Accessory Schedule" on the Drawings – or approved equal.
2. Description: Automatic dispenser with infrared sensor to detect presence of hands; battery powered; designed for dispensing soap in liquid or lotion form.
3. Mounting: Surface mounted.

F. Baby Changing Station:
1. Acceptable Manufacturer: As indicated in the "Toilet Accessory Schedule" on the Drawings – or approved equal.

2. Description: Horizontal unit that opens by folding down from stored position and with adjustable strap.
   a. Engineered to support minimum of 250-lbs static load when opened.
3. Mounting: Surface mounted, with unit projecting not more than 4 inches (102 mm) from wall when closed.
4. Operation: By pneumatic shock-absorbing mechanism.
5. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin), with replaceable insulated polystyrene tray liner and rounded plastic corners.
6. Liner Dispenser: Provide built-in separate, locking dispenser for disposable sanitary liners.

G. Mirror Unit:
1. Acceptable Manufacturer: As indicated in the “Toilet Accessory Schedule” on the Drawings – or approved equal.
2. Frame: Stainless steel angle, 0.05 inch (1.3 mm) thick.
   a. Corners: Welded and ground smooth.
3. Hangers: Manufacturer's standard rigid, tamper and theft resistant.

H. Toilet Paper Dispenser:
1. Acceptable Manufacturer: As indicated in the "Toilet Accessory Schedule" on the Drawings or approved equal.

2.3 MATERIALS

A. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304, 0.031-inch- (0.8-mm-) minimum nominal thickness unless otherwise indicated.

B. Steel Sheet: ASTM A1008/A1008M, Designation CS (cold rolled, commercial steel), 0.036-inch- (0.9-mm-) minimum nominal thickness.

C. Galvanized-Steel Sheet: ASTM A653/A653M, with G60 (Z180) hot-dip zinc coating.

D. Galvanized-Steel Mounting Devices: ASTM A153/A153M, hot-dip galvanized after fabrication.

E. Fasteners: Screws, bolts, and other devices of same material as accessory unit, unless otherwise recommended by manufacturer or specified in this Section, and tamper and theft resistant where exposed, and of stainless or galvanized steel where concealed.

F. Mirrors: ASTM C1503, Mirror Glazing Quality, clear-glass mirrors, nominal 1/4-inch thick.

2.4 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
   1. Remove temporary labels and protective coatings.
   2. Ensure electrical requirements are met for the installation of hand dryers.

B. Grab Bars: Install to comply with specified structural-performance requirements.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Clean and polish exposed surfaces according to manufacturer's written instructions.

END OF SECTION

SECTION 131100 - SWIMMING POOL GENERAL CONDITIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. This Section includes general administrative and procedural requirements for all work. The administrative and procedural requirements included in this Section are to expand the requirements specified in Division 1.

1.2 SUMMARY

A. Introduction: Contractor shall furnish all labor, materials, equipment and services necessary to complete the related upgrades as listed in the project documents to the Swimming Pool and Pool equipment.

B. Project contains a Base Bid and (5) Add Alternates. Contractor shall pay close attention to bid documents to properly distinguish between them. If in doubt, a question should be raised during the bid period for clarification.

C. Work included in this Section: It is the intent of this Section to place the entire responsibility for the construction of the pool under one vested Swimming Pool Contractor under the General Construction contract. The Swimming Pool Contractor under the General Construction contract will do the work noted below. Under this Section, the Swimming Pool Contractor will provide but is not necessarily limited to the following:

1. Provide all necessary mobilization, site preparation, demolition, construction and cleanup work associated with the various Swimming Pool, Bathhouse and Site improvements as detailed in the project documents. Scope of work has been broken into Base Bid work as well as five (5) Add Alternates as described in the project documents. Work shall include but is not necessarily limited to:
   a. Base Bid: shall include a new plaster / marcite finish to the pool, main drain grate replacements, various concrete repairs to the pool deck, stainless steel grab rails / anchors, lifeguard chair parts replacements, two new 1 Meter diving towers and diving boards, a new water slide, shade structure repairs, removal of non-compliant underwater lights, a new ADA lift, pool signage, depth marker and no diving tiles, pool expansion joint replacements, partial tile replacements in various areas, a new filter system, a new feature pump, replacements and additions of various pipe, valves and fittings, chemical spill pallets, a new backwash pit grate, chemical signage and the addition of a portable eyewash station.
   b. Add Alternate #1: shall include various additional pool finish upgrades (marcite replacement is listed in the base bid) including the beach entry pebble finish, waterline ceramic tile, racing lane tile, wall target tile, step nosing tile, expansion joint tile, and beach entry area tile. We have also included the replacement of several pool deck depth tile replacements within this add alternate.
   c. Add Alternate #2: shall include a variety of architectural building bathhouse improvements. This includes various surface repairs and refinishes, fixture replacements, door and counter improvements, a drinking fountain replacement and various other bathhouse repairs.
   d. Add Alternate #3: shall include some Civil / Site related items and a few electrical and mechanical / plumbing related scope. These shall include repairs to the existing outdoor water meter & spring box, crack and seal repairs to the parking lot, a small section of

gutter repairs, various interior light repairs and a new electric hot water heater replacement.

e. Add Alternate #4: shall include the removal and replacement of the existing pool's recessed steps and the removal and replacement of the three existing shade structures.

f. Add Alternate #5: shall include repairs to the existing underwater lights as well as various improvements within the pool equipment room (new pipe supports, new chemical controller and flow cell, new chemical metering pumps, new chemical tubing and PVC chemical supply conduit and a new flow meter.

D. Additional Work included in this Section will include but is not necessarily limited to the following:

1. Provide all equipment and services required for erection and delivery onto the premises of any equipment or apparatus furnished. Remove equipment from premises when no longer required.

2. Provide for the temporary storage and protection of all pool related equipment, materials, and systems. All items are the responsibility of the Swimming Pool Contractor until final acceptance by City.

3. Obtain progress inspection approval and final inspection approval by jurisdictional health department. Document all inspections and submit to Owner in Project Closeout Manual.

4. Start, test, calibrate, and adjust all pool mechanical, recirculation, and chemical equipment as well as other supplied pool systems including deck, loose, maintenance, and safety equipment. Instruct the Owner in the systems operation and maintenance as described herein.

5. Layout and installation of all deck mounted anchors, sockets, and inserts for the pool and pool decks.

1.3 RELATED SECTIONS

A. Work related to the swimming pool to be completed under the General Construction contract.

1. Provide all bathhouse improvements.

2. Provide all swimming pool electrical related equipment. Reference Division 26- Electrical.

3. Coordinate and arrange any required electrical, plumbing, and/or building inspections to be performed. Reference Divisions 21-Plumbing 23- Mechanical and Division 26- Electrical.

4. Provide and install all building architectural structures.

5. Provide and install all building signage as required by code.

6. Provide and install caulking (sealant) for slabs on grade.

1.4 REFERENCES

A. The entire system shall be installed to meet all National and Local codes and be in compliance with applicable sections of the American National Standards Institute/ National Spa and Pool Institute (ANSI/NSPI-4 1992).

B. The system shall comply with all necessary approvals from local regulatory agencies governing the design and construction of public swimming pools including but not necessarily limited to the State of North Carolina Pool Design Standards.

C. The Swimming Pool Contractor shall include in the work, without extra cost to the City, any labor, materials, services, apparatus or drawings in order to comply with all applicable laws, ordinances, rules and regulations, whether or not shown on drawings and/or specified.

1.5 QUALITY ASSURANCE

A. Certain technical aspects of the design are common only to pool systems planned for public use. Understanding these aspects, their functions, and interaction through experience is vital to completing a successful operating system. It is a mandatory requirement that all bidders will have achieved such experience as a prerequisite for bidding this project.

1. The Swimming Pool Contractor shall show evidence of having adequate experience in construction of public pools. In order to be considered for this project, the Swimming Pool Contractor must have completed at least five (5) public use pools of similar nature within the last five years. The pools must be complete and currently in operation. Submit a list of such projects with the name, address, and current telephone number of the Owner's Operator and Architect of Record to the Owner.

1.6 SUBMITTALS & OPERATION AND MAINTENANCE MANUALS

A. All submittals shall be made in accordance with the General Requirements of Division 1.

B. Engineering/ Shop Drawings and Product Data

1. Reference Section 131147- Swimming Pool Finish
2. Reference Section 131148- Swimming Pool Ceramic Tile
3. Reference Section 131150- Swimming Pool Deck Equipment
4. Reference Section 131151 - Swimming Pool Main Drains
5. Reference Section 131155- Swimming Pool Sealants
6. Reference Section 131165 – Swimming Pool Expansion Joints
7. Reference Section 131451- Swimming Pool Pipe, Valves & Fittings
8. Reference Section 131452- Swimming Pool Recirculation & Filtration Equipment
9. Reference Section 131455 – Swimming Pool Chemical Treatment Systems
10. Reference Section 131475- Swimming Pool Miscellaneous Metals
11. Reference Section 131490 – Swimming Pool Waterslide
12. Reference Section 132145 – Shade Structures
13. The Contractor shall submit an Electrical Bonding submittal which shall consist of a Bonding Plan to review / confirm all necessary metallics will be electrically bonded (ie: rebar, tower foundations, anchors, wall drain sumps, etc.)

C. Detailed operation and maintenance information shall be supplied for all equipment requiring maintenance or other attention. The equipment supplier and/or Swimming Pool Contractor shall prepare an operation and maintenance manual for all equipment. Parts lists and operating and maintenance instructions shall be included.

D. Operation and maintenance manuals shall include the following:

1. Equipment function and calibration, normal operating characteristics, and limiting conditions.

2. Assembly, installation, alignment, adjusting, and checking instructions.

3. Operating instructions for start-up, routing, and normal operation, regulation and control, shutdown and emergency condition.

4. Operating cycles shall be specifically described in outline format and in referenced detail. A wall-mounted color-coded piping flow diagram shall be provided in equipment room. Diagram to be engraved on laminated plastic with color coded piping to match color coding on piping, and including valves identified with number on tags. Minimum size to be 11 inches x 17 inches.

5. Include manufacturer recommended maintenance schedule, parts list, piping diagram (to agree with wall mounted diagram) and trouble shooting information for all pool and spa equipment.

6. Using reference to keyed valves and wall diagrams, include specific written instructions for procedures to be followed for: a) water level control adjustment and chemical control operation; b) filter operation and backwashing; and c) chlorination.

7. Lubrication and maintenance instruction.

8. Guide to "troubleshooting".

9. Parts lists.

10. Outline, cross section, and assembly drawings.

11. Engineering data and wiring diagrams.

12. Test data and performance curves, when applicable.

E. The operation and maintenance manuals shall be in addition to any instructions or parts lists packed with or attached to the equipment when delivered, or which may be required by the Swimming Pool Contractor.

F. All material shall be marked with project identification. Non-applicable information shall be deleted.

G. Shipment of equipment shall not be considered complete until all required manuals and data have been received.

1.7 PRODUCT HANDLING

A. Deliver material in manufacturer's original, unopened containers and crates with all labels intact and legible.

B. Deliver materials in sufficient time and quantity to allow continuity of work and compliance with approved construction schedule.

C. Handle materials in a manner to prevent damage.

D. Store all materials on clean raised platforms with weather protective covering. Provide continuous protection of materials against damage or deterioration.

E. Remove damaged materials from site.

1.8 COORDINATION

A. Coordinate with other Contractors all work relating to Division 13.

B. The Swimming Pool Contractor must establish with other Sub-Contractors, having related work in this Section that all work necessary to complete the pool renovations as shown on the drawings and in the specifications is included in the base bid and alternates to the City.

C. If in doubt regarding the responsibility for work covered in the Section and/or discovery of errors or omissions in the bidding documents, the Swimming Pool Contractor shall notify the Architect through channels established by the specifications and request a clarification ten (10) days prior to the bid date.

1.9 WARRANTIES

A. The Swimming Pool Contractor warrants to the City and Architect that materials and equipment furnished under the contract will be of good quality and new unless otherwise required or permitted by the Contract Documents, that the work will be free from defects not inherent in the quality required or permitted, and that the work will conform with the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized may be considered defective. The Swimming Pool Contractor's warranty may exclude remedies for damage or defect caused by abuse, improper or insufficient maintenance, and improper operations, modifications not executed by the Swimming Pool Contractor or wear and tear under normal use. If required by the Architect, the Swimming Pool Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. All warranties shall be for a period of <u>two years</u> unless otherwise specified herein.

B. The Swimming Pool Contractor shall agree to repair or replace any defective or non-complying work at no cost to the Owner upon written notification from the Owner within the warranty period. Pro-rated warranties are not acceptable unless otherwise stipulated herein.

C. Submit all manufacturer's warranties covering, but not limited to, the following:

1. Deck Equipment: All pool deck equipment and accessories against defects in material, manufacturer's workmanship, and installation for a period of two (2) years.

2. Pool Finish:
   a. Base Bid finish shall be 2 years from date of application.
   b. Add Alternate #1 finishes shall be 3 years from date of application.

3. Shade Structures: Shade structure shall be warranted free from defect in materials and/or workmanship for a 5-year warranty period from date of purchase.

4. Water Slide shall be warranted as per manufacturer's warranty.

1.10 SYSTEM TRAINING

A. A qualified representative of the Swimming Pool Contractor performing work under this Section shall put the equipment into operation and instruct the City's Representative(s) in the operation of this equipment to the City's satisfaction immediately after project substantial completion.

B. Training on the following equipment and systems will be required and included within the Pool Contractor's scope of work. Contractor shall include training within their submitted base bid (and not as an Add-on service): No exceptions taken.

1. Swimming Pool Finishes: Contractor shall provide training and instruction on how to maintain the surfaces as well as any maintenance related items.

2. Swimming Pool Deck Equipment: Contractor shall provide training and instruction on all supplied deck equipment. Instruction shall include operation of all supplied equipment and any required routine maintenance.

3. Swimming Pool Recirculation, Filtration and Chemical Equipment: Contractor shall provide training and instruction on all supplied mechanical and chemical equipment and controls. Should OEM support require involvement, they shall be sub-contracted and compensated by the Contractor (and not the City). Instruction shall include operation of all supplied equipment and any required routine maintenance. Technical operation and maintenance manuals shall be supplied as required.

4. Swimming Pool Water Slide: Contractor shall provide training and instruction on the waterslide and all supplied systems. Should OEM support require involvement, they shall be sub-contracted and compensated by the Contractor (and not the City). Instruction shall include operation of all supplied equipment and any required routine maintenance. Technical operation and maintenance manuals shall be supplied as required.

C. Training periods shall be a total of 16 hours on-site training scheduled as follows:

1. 8 hours initial training at substantial completion of project's construction.

2. 8 hours after City staff has experience operating the systems. This time may be requested any time after the pool has been placed in operation within a period of one (1) year from the time the pool was accepted by the City (performed on one trip).

3. Prior to leaving the job, the Contractor shall obtain written certification from the designated City Representative acknowledging that the instruction period has been completed and all necessary operating information has been provided.

1.11 POOL FILL WATER QUALITY

A. The Contractor shall bear the cost of the water required for one (1) complete filling of the pool. Additional fillings, or partial fillings (more than 25%) of the pool, shall be by the City at their expense.

B. The Swimming Pool Contractor shall provide the necessary chemicals to adjust and balance the water chemistry in the pool and spa to the following levels:
1. pH: 7.4
2. Calcium Hardness: 250-300 ppm
3. Total Alkalinity: 100-300 ppm
4. Langelier Saturation Index: -0.3 - +0.3

PART 2 - PRODUCTS

2.1 START-UP CHEMICALS

A. Swimming Pool Contractor to provide initial chemicals required to balance the water for the pool.

B. Swimming Pool Contractor shall maintain the chemical balance of the pool water (chemicals provided by City) until the pool mechanical systems are fully operational and accepted by the Architect and City.

2.2 RECORD DRAWINGS

A. Provide a complete set of record drawings of the entire pool system including all sub-systems. All record drawings shall be prepared in accordance with the General Swimming Pool Requirements of Division 1.

PART 3 - EXECUTION

3.1 EXISTING CONDITIONS, INSPECTION AND PREPARATION

A. Carefully examine all the Contract Documents for requirements that affect the work of this Section. Prior to starting of work, notify the General Contractor of defects requiring correction. Do not begin work until conditions are satisfactory.

B. Verify that all work by others, related to this Section, has been completed. This includes all earthwork, concrete work, and mechanical, electrical, and plumbing connections.

C. Protect all materials and work completed by others from damage while completing the work in this Section.

3.2 FIELD MEASUREMENTS

A. Verify benchmark and pool location prior to layout.

B. If field measurements differ from the construction drawing dimensions, notification shall be given to the Architect prior to proceeding with work.

3.3 PIPING INSTALLATION

A. General:

1. Provide and install, according to the best practices of the trade, all piping shown on the drawings and required for the complete installation of these systems. The piping shown on the Drawings shall be considered as diagrammatic in indicating the general run and connections and may or may not in all parts be shown in its true position. The piping may have to be offset, lowered or raised as required or as directed at the site. This does not relieve the Swimming Pool Contractor from responsibility for the proper installation of the systems or piping in every respect suitable for the work intended as described in the specifications and approved by the Architect. In the installation of all piping, it shall be properly supported, and proper provisions shall be made for expansion, contraction and anchoring of piping. All piping shall be cut accurately for fabrication to measurements established at the construction site. Pipe shall be worked into place without springing and/or forcing, properly clearing all windows, doors, and other openings and equipment. Cutting or other weakening of the building structure to facilitate installation will not be permitted. All pipes shall have burrs and/or cutting slag removed by reaming or other cleaning methods in strict accordance with the manufacturer's instructions. All changes in direction shall be made with fittings. All open ends of pipe and equipment shall be properly capped or plugged to keep dirt and other foreign materials out of the systems. Plugs of rags, wool, cotton waste, or similar materials may not be used in plugging. All piping shall be arranged so as not to interfere with removal and maintenance of equipment, filters or devices, and so as not to block access to manholes, access openings, etc. Flanges or unions as applicable for the type of piping specified shall be provided in the piping at connections to all items of equipment. All piping shall be installed to ensure noiseless circulation. All valves and specialties shall be so placed to permit easy operation and access.

B. Flushing, Draining, and Cleaning Pipe Systems:

1. The Swimming Pool Contractor shall flush out all water systems with water before placing them in operation. Other systems shall be cleaned by using compressed air or nitrogen. After systems are in operation and during the test period, all strainer screens shall be removed and thoroughly cleaned.

C. Expansion and Contraction:

1. The Swimming Pool Contractor shall make all necessary provisions for expansion and contraction of piping with offsets or loops and anchors as required to prevent undue strain. Contractor shall provide shop drawings for proposed method and arrangement for control of expansion and contraction of piping.

3.4 EQUIPMENT AND SYSTEMS INSTALLATION

A. The Swimming Pool Contractor shall assemble and install all equipment, special parts, and accessories as shown on pool drawings, specifications, and shop drawings of the equipment of the equipment suppliers.

B. Swimming Pool Contractor shall furnish all anchors and inserts to be embedded in the deck including all fittings, inserts, and structure sleeves and required anchorages as shown in the plans and as indicated in this Section of specifications. Equipment shall be set true and plumb using factory supplied jigs and/or templates where available. Swimming Pool Contractor shall ensure anchor bolts are of the correct size and spacing as required by the equipment manufacturer. All anchor bolts shall be Type 304 stainless steel and of a length capable of adequate anchorage into rough slab-on-grade allowing for finish deck tile and setting bed. Anchors shall be set and cast into place during building concrete work. Swimming Pool Contractor shall inspect all anchor settings for horizontal and vertical alignment prior to pouring concrete. Removable equipment items shall be easily removable from anchors and shall fit without noticeable wobble.

C. Swimming Pool Contractor to install all equipment and systems in accordance with manufacturer's directions. Equipment shall be assembled and in place for final observation.

D. All items necessary to complete this Section are shown on the plans or described in the specifications including items that may be purchased by the Owner. Items are detailed and specified as a guide for dimensional purposes. The Swimming Pool Contractor must make provisions accordingly and submit shop drawings and submittals based on that data.

3.5 CONCLUSION

A. It is the intention of these specifications to provide a complete installation. All necessary construction and apparatus necessary in the operation or testing of the performance of the work shall be included. The omission of specific reference to any part of the work necessary for such complete installation shall not be interpreted as relieving the Swimming Pool Contractor from furnishing and installing such parts. Any such omission or clarification shall be brought to the attention of the Architect prior to bidding as provided in this Section.

END OF SECTION

SECTION 131147 - SWIMMING POOL FINISH

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. This Section includes general administrative and procedural requirements for all work. The administrative and procedural requirements included in this Section are to expand the requirements specified in Division 01.

1.2 SUMMARY

A. All preparation of the swimming pool structure and labor and materials required to provide swimming pool finish as indicated on the drawings and herein specified.

B. Base Bid Finish: Swimming pool to receive a white marcite / plaster finish.

C. Add Alternate #1 Finish: Swimming pool beach entry area to receive a pebble finish.

D. Add Alternate #1 Finish: Various areas in and around the swimming pool to receive a ceramic tile finish. Refer to specification no. 131148 for tile details.

1.3 RELATED SECTIONS

A. Division 2- Existing Conditions

B. Division 3- Concrete

C. Division 13- Special Construction

1.4 REFERENCES

A. ASTM C150

B. LPCA "Reference Specifications"

C. CLPCA "Reference Specifications" – California Lathing and Plastering Contractors Association

D. North Carolina Swimming Pool State Code

E. Plasterer's Council Technical Manual

1.5 QUALITY ASSURANCE

A. All work of this section shall be performed by the Swimming Pool Contractor or Sub-Contractor under the General Construction contract

B. Qualification of Workers:

1. The installer of this portion of work shall have been successfully engaged in the business of swimming pool plastering for at least five (5) years immediately prior to commencement of this work. Installer shall provide a list of five (5) completed projects of similar size and magnitude, which have been completed within the last three (3) years which shall demonstrate to the

approval of the Director's Representative that its record of workmanship is satisfactory. The list of projects shall include Project Name, Owner, Contact Information, Depth of Pool(s), Surface area of Pool(s), and Year completed.

2. For actual plastering and finish operations, use only thoroughly trained and experienced plasterers completely familiar with the materials and methods specified.

3. Provide at least one person who shall be present at all times during the execution of this portion of work and who shall be thoroughly familiar with the materials and methods specified, and who shall direct all work performed under this Section.

C. Standards: Swimming pool plaster shall be designed to comply with the published standards of the State and Local Health Department as they apply to the material and services furnished herein. In addition, meet requirements of applicable portions of most current editions of the following:

1. CLPCA: "Reference Specifications" - California Lathing and Plastering Contractors Association

2. ASTM: American Society for Testing Materials

3. North Carolina Swimming Pool Code

1.6 SUBMITTALS

A. Provide submittals in accordance with the requirements of the General Requirements of the Owner's Contract and Section 131100.

B. Mix Design and Product Data.

C. Certificates: Submit certificates attesting that the materials furnished meet the requirements specified herein.

D. Test Report: Submit results of domestic water analysis and calculation of amounts of chemicals required to balance pool water on initial fill of pool.

E. Qualification information.

1.7 PRODUCT HANDLING

A. Delivery: Deliver materials to the Project Site in the manufacturer's original unopened containers with all labels intact and legible.

B. Storage: Materials shall be stored in a manner as to prevent damage and/or contamination. Only specified materials are to be stored at the Project Site.

C. Protection: Use all means necessary to ensure protection of the swimming pool plaster before, during, and after installation and to protect the installed work of other trades.

D. Replacements: Examine delivery of materials to determine if any damage has been sustained and make necessary repairs and/or replacements necessary to the approval of the Director's Representative and at no additional cost to the Owner.

1.8 COORDINATION

A. Coordinate preparation of interior pool surface with swimming pool tile, swimming pool fittings, and swimming pool equipment.

B. Coordinate with other Contractors all work relating to this Section.

1.9 WARRANTIES

A. Base Bid Finish: Contractor / Installer shall provide a two (2) year warranty specifically for the installation of the plaster pool finish. Any degradation of the pool(s) finish that is deemed not typical 'wear and tear' will be replaced at no additional cost to the City. This shall include all necessary labor to repair or refinish the degraded material.

B. Add Alternate #1 Finish: Contractor / Installer shall provide a three (3) year warranty specifically for the installation of the pebble pool finish (to be installed in the beach entry area only). Any degradation of the pool(s) finish that is deemed not typical 'wear and tear' will be replaced at no additional cost to the City. This shall include all necessary labor to repair or refinish the degraded material.

1.10 EXTRA MATERIALS

A. No extra materials required for this Section.

1.11 ENVIRONMENTAL CONDITIONS

A. No plastering shall be done under unsuitable conditions of weather or temperature. No plastering shall be done when prevailing temperature is 40 degrees Fahrenheit or less.

B. Do not install plaster during rain, and if rain commences after plastering has begun, immediately protect the plaster from rain by all means necessary until the plaster has set.

C. Do not install plaster during wind greater than 10 mph, and if wind commences after plastering has begun, immediately protect the plaster from wind by all means necessary until the plaster has set.

PART 2 - PRODUCTS

2.1 BASE BID

A. CEMENT

1. Swimming pool plaster cement shall be white Portland cement conforming to ASTM C-150 as manufactured by Riverside Cement, Lehigh Cement, or approved equal.

B. AGGREGATE

1. Swimming pool aggregate shall be Riverside Premium Pool Aggregate, Pfizer Pool Aggregate, Georgia Marble Pool Aggregate, or approved equal. Mix as per manufacturer's recommendations.

C. WATER

1. Water for swimming pool plaster shall be clean and free from injurious amounts of acid, alkali, and organics.

2.2 ADD ALTERNATE #1

A. PEBBLE FINISH

1. Swimming pool beach entry area shall be a pebble finish by Pebble Technology or approved equal. PebbleTec original finish to be applied.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Inspection:

1. Prior to Work of this Section, carefully inspect the installed Work of other trades and verify that all such Work is complete to the point where this installation can properly commence.

2. Verify that swimming pool plaster/pebble finish can be installed in accordance the original design and all referenced standards.

B. Discrepancies:

1. In the event of discrepancies, immediately notify the Director's Representative.

2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3. Failure to notify the Director's Representative and give written notice of discrepancies shall constitute acceptance by the Contractor of existing conditions as fit and proper to receive the Work.

3.2 INSTALLATION OF POOL PLASTER

A. Completion of Other Work:

1. Do not commence plastering of swimming pool until all concrete deck area, landscaping, and other construction adjacent to the pool is completed and all construction equipment used for those portions of the Work have been moved from the immediate area.

B. Preparation:

1. Do not apply plaster over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to the formation of a durable plaster finish.

2. Consult with manufacturer on application to specific surfaces being treated. Follow manufacturer's recommendation for curing of Concrete surfaces prior to application of plaster.

3. Protect ceramic tile, decking, deck equipment, gratings, fittings, and other items by suitable covering or masking.

4. Mask or remove all hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place not to receive pool plaster. Following completion of plaster for each space or area, remove masking. Re-install all removed items utilizing workers skilled in the trades involved.

C. Application:

1. Into the parging coat of the concrete surfaces, trowel a finish coat of the specified marble plaster to a thickness between ¼" and 3/8" maximum. If leveling coat is required, use a brown coat application of one part cement to three parts clean, washed sand.

2. Float the plaster to a uniform plane and trowel to a smooth, dense, impervious surface using extreme care to avoid stains.

3. Take special care in finishing around pool fittings, making sure to mask off or plug openings so as not to fill such openings with excess plaster. Be certain to completely enclose pool fittings with plaster to insure a leak-proof seal around pipes, fittings, lights, anchors, etc.

4. Accurately interface with the finish planes of items installed by other trades.

3.3 CURING

A. Preparation: Anticipate the need for required equipment and have all such equipment immediately available for use upon completion of pool plastering.

B. Pool Filling:

1. After the plaster has sufficiently dried and before drying has proceeded to a damaging point, cure the plaster by gradually filling the pool with water, preventing all damage to finished plaster surfaces.

2. Flow the water continuously until the pool is filled.

3. When the weather is hot and/or water pressure low, keep the pool walls damp while the pool is filling.

4. Coordinate with the appropriate parties to ensure that the pool is continuously monitored while filling to prevent overfill.

3.4 CLEAN-UP

A. Upon completion of pool plaster, remove all materials, equipment and debris occasioned by this Work and leave the job site in a clean and presentable condition. Perform all such clean-up to the approval of the Owner's Representative.

3.5 PRE-FILL SPECIFICATION

A. The pool(s) shall not be plastered until directed by Owner's Representative and the filtration system and chlorination system are complete and ready for start-up. The Contractor shall supply all chemicals required for initial water chemistry balance. Reference Section 131459- Swimming Pool Start-up and Operation.

B. Contractor shall submit domestic water analysis to Owner at least (2) two weeks prior to filling the pool.

3.6 MAINTENANCE

A. For the first (14) fourteen days after completion of the pool plaster, brush all plastered surfaces at least twice a day and coordinate with Owner to ensure that the plaster is carefully maintained after the initial fourteen-day period. In addition, coordinate with Owner to ensure that the pool filtration equipment is continuously running during the initial fourteen-day period.

B. Contractor shall test and record water chemistry values once a day and adjust as indicated per water-balance table recommendations above. Brush entire pool, walls and floor weekly. Remove any debris and foreign materials immediately to prevent staining. Check and maintain filter and recirculation pump to maintain proper flow and filtering action. This shall be performed until construction is handed over to City.

END OF SECTION

SECTION 131148 - SWIMMING POOL CERAMIC TILE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. This Section includes general administrative and procedural requirements for all work. The administrative and procedural requirements included in this Section are to expand the requirements specified in Division 01.

1.2 SUMMARY

A. This section applies to a variety of ceramic tiles in and around the Swimming Pool and is a part of both the Base Bid and Add Alternate No. 1.

B. Work Included: Provide all swimming pool ceramic tile as detailed on the Drawings including, but not limited to, the following:

1. Base Bid Replacement Tile
   a. Beach Entry Tile (between pool concrete deck and start of beach entry ramp)
   b. Waterline Tile (partial replacement only)
   c. Depth Marker Tile (partial replacement of damaged tile located on pool deck)
   d. No Diving Tile (full replacement on pool deck)

2. Add Alternate #1 Replacement Tile
   a. Beach Entry Tile (between pool pebble finish and marcite / plaster finish)
   b. Waterline Tile (replacement of remaining waterline tile)
   c. Expansion Joint Tile
   d. Step Nosing Tile
   e. 25 Yard Racing Lane Floor Tile
   f. Wall Target Tile (All lanes)
   g. Borderline Tile (at ends of racing lanes)
   h. Depth Marker Tile (replacement of remaining tile located on pool deck)

1.3 RELATED SECTIONS

A. Division 02: Existing Conditions

B. Division 03: Concrete

C. Division 07: Thermal & Moisture Protection

D. Division 13: Special Construction

1.4 REFERENCES

A. Tile Council of America Inc. (TCA) Pub: Handbook for Ceramic Tile Installation.

B. ANSI A-137.1 – 1976

C. NCDOH Swimming Pool Code

1.5 QUALITY ASSURANCE

A. All work of this section shall be performed by the Swimming Pool Contractor or Sub-Contractor under the General Construction contract.

B. Qualifications of Workers:

1. For cutting, installing, and grouting of ceramic tile, use only thoroughly trained and experienced tile setters completely familiar with the materials and methods specified.

2. In acceptance or rejection of installed ceramic tile, no allowance will be made for lack of skill on the part of the workers.

C. Standards: In addition to complying with all pertinent codes and regulations:

1. Manufacturer of all tile shall be in accordance with ANSI A-137.1 – 1976.

2. Install ceramic tile in accordance with the recommendations contained in the "1997 Handbook for Ceramic Tile Installation" (35th Edition) of the Tile Council of America, Inc.

1.6 SUBMITTALS

A. Provide submittals in accordance with the requirements of the General Requirements of Section 01.

B. Samples: Submit six (6) samples of each color and pattern in the specified groups. Character samples can be representative for review prior to screening of actual tile.

C. Master Grade Certificate: Prior to opening ceramic tile containers, submit a Master Grade Certificate, signed by the manufacturer of the tile used and issued when the shipment is made, stating the grade, kind of tile, identification marks for the tile containers, and the name and location of the project.

D. Specifications: Submit copies of the manufacturer's recommended installation specifications for this work.

1.7 PRODUCT HANDLING

A. Delivery: Deliver all materials to the project site in the manufacturer's original unopened containers with all labels intact and legible.

B. Storage: Store all materials under cover in a manner to prevent damage and contamination and store only the specified materials at the project site.

C. Protection: Use all means necessary to protect the ceramic tile before, during, and after installation and to protect the installed work of other trades.

D. Replacement: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Director's Representative and at no additional cost to the City.

1.8 COORDINATION

A. Coordinate installation of the swimming pool tile with the excavation work, swimming pool gutter system, cast-in-place concrete work, swimming pool finishing, swimming pool equipment and fittings, and swimming pool sealants.

B. The Swimming Pool Contractor must establish with other Sub-Contractors, having related work in this Section that all work necessary to complete the improvements as shown on the drawings and in the specifications is included in the base bid and add alternate #1 to the City.

C. If in doubt regarding the responsibility for work covered in the Section and/or discovery of errors or omissions in the bidding documents, the Swimming Pool Contractor shall notify the Director's Representative through channels established by the specifications and request a clarification ten (10) days prior to the bid date.

1.9 WARRANTIES

A. In accordance with the General Requirements of Division 01.

1.10 EXTRA MATERIALS

A. Provide four (4) square feet of loose tile used in the following locations:

1. Beach Entry Tile
2. Waterline Tile
3. Expansion Joint Tile
4. 25 Yard Racing Lane Floor Tile
5. Wall Target Tile (All lanes)

PART 2 - PRODUCTS

2.1 BASE BID TILE REPLACEMENTS

A. Beach Entry Tile

1. Location: Between the concrete deck and the start of beach entry ramp.

2. Material: Beach Entry tile shall be unglazed ceramic mosaic tile with an absorption rate of less than 1% as manufactured by Daltile, National Pool Tile or approved equal.

3. Size: One row of 2" x 2" non-skid ceramic tile.

4. Color: White

5. Qty: Approximately 45 linear feet. To be verified in field by Contractor.

6. See detail in plans for layout.

B. Waterline Tile

1. Location: Just below the pool deck edge at the top of the pool wall. Various locations are damaged and require replacement.

2. Material: Waterline tile shall be glazed ceramic mosaic tile with an absorption rate of less than 1% as manufactured by Daltile, National Pool Tile or approved equal.

3. Size: One (1) row of 6" x 6" ceramic tile.

4. Color: Royal Blue (match existing tile as close as possible).

5. Qty: Approximately 60 linear feet will require replacement.

6. See detail in plans for layout.

C. Depth Number Marker Tile

1. Location: On/In concrete deck surface - see plans for specific depths required. All damaged tiles to be replaced. Verify specific markers in field.

2. Material: Frost proof non-skid ceramic tile as manufactured by Inlays Inc. or approved equal.

3. Size: 6” x 6” for depth number and 6” x 6” for FT

4. Color: White background and black 4” high letters/numbers as required by depth location.

5. Letter shall spell “X FT” deep.

6. Qty = (6) depth locations

D. NO DIVING Word and No Diving Symbol Marker Tiles

1. Location: On/In concrete deck surface - see plans for specific depths required. All painted markers to be replaced.

2. Material: Frost proof non-skid ceramic tile as manufactured by Inlays Inc. or approved equal.

3. Size: 6” x 6” (for no diving symbol tile) and 6” x 12” for “NO DIVING” wording tile.

4. Color: White background and black 4” high letters as indicated in plans. Warning-No diving sign tile shall have white background, red symbols, and black lettering.

5. Qty = (17) NO DIVING word tiles and Qty = (17) No Diving Symbol tile

6. See detail in plans for layout.

2.2 ADD ALTERNATE #1 TILE REPLACEMENTS

A. Beach Entry Tile

1. Location: Between the pool’s beach entry pebble finish and the adjacent marcite / plaster finish.

2. Material: Beach Entry tile shall be unglazed ceramic mosaic tile with an absorption rate of less than 1% as manufactured by Daltile, National Pool Tile or approved equal.

3. Size: One row of 2” x 2” non-skid ceramic tile.

4. Color: White

5. Qty: Approximately 55 linear feet. To be verified in field by Contractor.

6. See detail in plans for layout.

B. Waterline Tile

1. Location: Just below the pool deck edge at the top of the pool wall. This is to replace the remaining waterline tile not included in the Base Bid.

2. Material: Waterline tile shall be glazed ceramic mosaic tile with an absorption rate of less than 1% as manufactured by Daltile, National Pool Tile or approved equal.

3. Size: One (1) row of 6” x 6” ceramic tile.

4. Color: Royal Blue (match existing tile as close as possible).

5. Qty: Approximately 400 linear feet will require replacement.

6. See detail in plans for layout.

C. Expansion Joint Tile

1. Location: This consists of two single rows of tile that sandwich the pool’s three expansion joints.

2. Material: Expansion joint tile shall be unglazed ceramic mosaic tile with an absorption rate of less than 1% as manufactured by Daltile, National Pool Tile or approved equal.

3. Size: Two rows of 2” x 2” tile (one row before expansion joint and one row after expansion joint).

4. Color: White or Black (depending on location).

5. Qty: Approximately 80 linear feet will require replacement at expansion joint #1 (white tile), 70 linear feet will require replacement at expansion joint #2 (white tile) and 100 linear feet will require replacement at expansion joint #3 (black tile). Note: There are two rows of tile so double the quantities.

6. See detail in plans for layout.

D. Step Nosing Tile

1. Location: At the front edge of the pool step treads.

2. Material: Step nosing tile shall be unglazed ceramic mosaic tile with an absorption rate of less than 1% as manufactured by Daltile, National Pool Tile or approved equal.

3. Size: One (1) row of 2” x 2” tile at front edge of steps.

4. Color: Black

5. Qty: Approximately 44 linear feet will require replacement.

6. See detail in plans for layout.

E. 25 Yard Racing Lane Floor Tile

1. Location: At the pool’s swim lanes (8 total lanes) in the pool floor.

2. Material: Racing Lane tile shall be unglazed ceramic mosaic tile with an absorption rate of less than 1% as manufactured by Daltile, National Pool Tile or approved equal.

3. Size: Each lane shall be (6) rows of 2” x 2” tile (12” wide). See plans for details.

4. Color: Black

5. Qty: Approximately 70 square feet per lane (560 square feet total).

6. See detail in plans for layout.

F. Wall Target Tile

1. Location: At the pool’s swim lanes (8 total lanes) in the pool wall (at both ends of lanes).

2. Material: Wall Target tile shall be unglazed ceramic mosaic tile with an absorption rate of less than 1% as manufactured by Daltile, National Pool Tile or approved equal.

3. Size: Each target shall be (6) rows of 2” x 2” tile (12” wide).

4. Color: Black

5. Qty: Approximately 5 square feet per target (800 square feet total).

6. See detail in plans for layout.

G. Racing Lane Borderline Tile

1. Location: At the ends of the racing lanes, a single row of borderline tile exists in the existing pool floor for a plaster break.

2. Material: Expansion joint tile shall be unglazed ceramic mosaic tile with an absorption rate of less than 1% as manufactured by Daltile, National Pool Tile or approved equal.

3. Size: One row of 2” x 2” tile.

4. Color: White

5. Qty: Approximately 90 linear feet will require replacement.

6. See detail in plans for layout.

H. Depth Number Marker Tile

1. Location: On/In concrete deck surface - see plans for specific depths required. This is to replace the remaining depth markers not included in the Base Bid.

2. Material: Frost proof non-skid ceramic tile as manufactured by Inlays Inc. or approved equal.

3. Size: 6” x 6” for depth number and 6” x 6” for FT

4. Color: White background and black 4” high letters/numbers as required by depth location.

5. Letter shall spell “X FT” deep.

6. Qty = (21) depth locations

2.3 MORTAR

A. Sand for mortar shall comply with requirements of fine aggregate for concrete.

B. Cement: Type I Portland Cement conforming to ASTM C150.

C. Hydrated Lime: Conforming to ASTM C206 or 207, Type S.

D. Water: From a potable source.

2.4 GROUT

A. All tile grout shall be waterproof grout complying with the recommendations of referenced standards. Grout color shall be white. Joints over 1/8" wide shall include silica sand passing No. 30 sieve or standard sanded grout.

2.5 OTHER MATERIALS

A. All other materials not specifically described but required for complete and proper installation of ceramic tile as indicated on the drawings shall be new, top quality of their respective kinds, and subject to the approval of the Director's Representative.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Inspection:

1. Prior to all work in this Section, carefully inspect the installed work and verify that all such work is complete to the point where this installation may properly commence.

2. Verify that ceramic tile can be installed in accordance with the original design and all referenced standards.

3.2 INSTALLATION

A. Method:

1. Install all ceramic tile in strict accordance with installation method P601-90 of the "1997 Handbook for Ceramic Tile Installation" of the Tile Council of America, Inc.

2. Be certain to install all ceramic tile perfectly level, flush, plumb, and to the finish grades and elevations indicated on the drawings.

B. Interface:

1. Carefully establish and follow the required horizontal and vertical elevations.

2. Coordinate and cooperate as required with other trades to ensure proper and adequate interface of ceramic tile work with the work of other trades.

C. Tolerances: Top of waterline tile shall be level to 1/8” (+/- 1/16”) around entire pool.

3.3 GROUTING

A. Follow grout manufacturer’s recommendations as to grouting procedures and precautions.

B. Remove all grout haze, observing grout manufacturer’s recommendations as to use of acid and chemical cleaners.

3.4 CLEAN-UP

A. Upon completion of the work in this Section, thoroughly clean and polish the exposed surfaces of tile work. Completely clean work areas of debris and rubbish occasioned by this work to the approval of the City

3.5 PROTECTION

A. Protection: The Pool Contractor shall use whatever methods are required to protect the pool tile from any damage during remainder of the construction period. Any tile incurring such shall be removed and replaced in like kind at the Contractor’s expense.

END OF SECTION

SECTION 131150 – SWIMMING POOL DECK EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. This Section includes general administrative and procedural requirements for all work. The administrative and procedural requirements included in this Section are to expand the requirements specified in Division 01.

1.2 SUMMARY

A. Work Included: Supply and install all swimming pool deck equipment items as required for this work as indicated in the Contract Documents and Drawings.

B. Work in this section shall include deck equipment in both the Base Bid and Add Alternates #4 and #5.

1.3 RELATED SECTIONS

A. Division 02: Existing Conditions

B. Division 3- Concrete

C. Division 13: Special Construction

1.4 REFERENCES

A. NCDOH Swimming Pool Code.

B. ADAAG: Americans with Disabilities Act Accessibility Guidelines

1.5 QUALITY ASSURANCE

A. All work of this section shall be performed by the Contractor or Sub-Contractor.

1.6 SUBMITTALS

A. Provide submittals in accordance with the requirements of the General Requirements of Division 01.

B. Provide all shop drawings and catalog data for a complete submittal.

C. Substitutions: Include with request specified item, design, catalog number(s), and finish for each item on which approval is being requested ten (10) days prior to bid opening. Blanket approval by manufacturer's name only will not be given. Substitutions may not be granted after the ten-day period or after the project bid.

1.7 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the swimming pool imbeds before, during, and after installation and to protect the installed work of other trades.

B. Replacement: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Director's Representative and at no additional cost to the City.

1.8 COORDINATION

A. Coordinate with other Contractors all work relating to this Section.

B. The Contractor must establish with other Sub-Contractors, having related work in this Section that all work necessary to complete renovations as shown on the drawings and in the specifications is provided.

C. If in doubt regarding the responsibility for work covered in the Section and/or discovery of errors or omissions in the bidding documents, the Contractor shall notify the Director's Representative through channels established by the specifications and request a clarification ten (10) days prior to the bid date.

1.9 WARRANTIES

A. All pool deck equipment, anchors, and imbeds shall be free against defects in material, manufacturer's workmanship, and installation for a period of two (2) years.

1.10 EXTRA MATERIALS

A. No extra materials required for this Section.

PART 2 - PRODUCTS

2.1 BASE BID

A. Custom Diving Towers: (Qty. 2) shall be the Paragon Aquatics 1 Meter Paraflyte Ladder at Rear Superflyte material model #12003CUSTOM or approved equal. The superstructure of the diving tower shall be fabricated of ASTM A-554 certified, 1.90" OD x .065", Type 304 stainless steel polished to a 320 grit finish. The back brace and rear support bar shall be made of 1.90" OD x .145" material, the remainder of the rails shall be made of 1.90" OD x .145" material. The front support pedestal shall be constructed of primed carbon steel which shall be vertical (non-standard). The pedestal shall be constructed of 12" diameter circular pipe. The bottom pedestal flange shall have eight (8) 1" diameter holes for mounting. The fulcrum range shall be capable of being located over a +/- 12" range. The diving board shall attach at the rear using 1/2"-13x 51/2" carriage bolts through the 1.90" OD x .145" rear support bar. Mounting steps (2 per tower) shall be made of white, UV stabilized, ABS plastic with an integral, non-skid surface. The steps shall fit a 19" post spacing (center to center) and have a 4" tread depth.

B. Diving Tower Pedestal Anchors: (Qty. 2) sets shall be Paragon Aquatics model # 12307 or approved equal. Pedestal Anchor Bolt Assembly shall consist of eight (8) 1/2" "J" bolts and bushings, fully embedded in concrete. The "J" bolts and bushing shall be made of carbon steel. Rear Anchor Deluxe shall be two-piece construction comprised of a cast bronze body with a chrome plated cast bronze flange cap. Anchor footing shall be concrete and designed to resist applied loading to the tower from use. These loads include a 4,200 lbs. vertical load and a 2,000 ft.-lb. moment at the front anchor, and a combined upward vertical load of 1,800 lbs. at the rear anchors.

C. Diving Tower Rear Anchor Deluxe: (Qty. 4) shall be Paragon Aquatics model # 28201 or approved equal. Rear anchor bronze body and clamp flange assembly shall be included.

D. Diving Boards: (Qty. 2) shall be SR Smith 16' Paraflex diving board and shall be ID # 26107-1 or approved equal.

E. Custom Figure 4 Grab Rails: (Qty. 6 sets) shall be Paragon Aquatics I.D. No CUSTOM, or approved equal, fabricated of stainless steel, 1.90″ O.D. x .109″ wall thickness, Type 304 polished to 320 grit finish. Length shall be 2'-10" as shown in plans. All bends shall be smooth and free of wrinkles.

F. Lifeguard Chair Parts Replacements: (Qty. 3) shall be SR Smith (no known equal). The existing lifeguard chairs are from SR Smith model number PLS-204. The following parts require replacement:
1. Fiberglass seats (qty. 3)
2. Stainless steel Seat support assemblies (qty. 3)
3. Front wheels (qty. 6)
4. Footboards (qty. 3)
5. Front steps and hardware (qty. 9)

G. Portable Aquatic Handicapped Lift: (Qty. 1) shall be the PAL2 lift as manufactured by SR Smith or approved equal. Lifting capacity shall be 300 lbs. minimum. Arms shall be powder coated aluminum; mast powder coated, zinc plated steel, handle powder coated aluminum, housing vacuum formed ABS plastic. Casters on front shall be Tente 8477 precision ball bearing, stainless steel 5" total lock swivel. Rear casters shall be Tente 5328 precision ball bearing, stainless steel, 5" fixed polyurethane tread. Lifting shall be variable to suit the needs of each pool/spa with a 44" total travel (with standard actuator). Seat depth shall be 18"-20" below water line with a total rotation of 240 degrees (120 degrees from each side). Complete cover shall be provided for PAL lift, Recreonics model No. 46-727, or approved equal. Lift shall comply with 2010 ADA regulations. Dimensions shall be 30" x 60" x 74".

H. Wedge Anchor Sockets shall be Paragon Aquatics I.D. No. 28102, Spectrum Products, or approved equal and shall be used for anchoring stair rails. Wedge anchor shall be cast bronze with a locking bronze wedge assembly (with a stainless-steel bolt) and shall be 4" deep penetration. Anchors shall be coordinated and installed by the Swimming Pool Contractor. A quantity of (24) anchors shall be provided. Verify quantity with drawings.

I. Wedge Anchor Socket Covers shall be Paragon Aquatics I.D. No. 28104, Spectrum Products, or approved equal and shall be provided by Contractor. Wedge anchor shall be covered when not in use. cast bronze with a locking bronze wedge assembly (with a stainless-steel bolt) and shall be 4" deep penetration. Anchors shall be coordinated and installed by the Swimming Pool Contractor. A quantity of (24) anchors shall be provided. Verify quantity with drawings.

J. Escutcheon Covers shall be Spectrum Products I.D. No. 35214 or approved equal and shall be used for anchor locations at stair and grab rails. Escutcheons shall be stainless steel and shall be fabricated via investment casting method (Stamped covers are not considered an equal). It shall have a set screw for fastening cover to rail. Escutcheons shall be coordinated and installed by the Swimming Pool Contractor. A quantity of (24) escutcheons shall be provided. Verify quantity with drawings.

2.2 ADD ALTERNATE #4

A. Recessed Steps (Qty. 18) shall be Paragon Aquatics ID No. 32102, Spectrum Products, or equal. It shall be fully recessed, prefabricated modular unit of .25" thick injection molded plastic, or equal. Features integrated .5" wide decorative lip and a slightly textured, non-slip stepping surface. Measures 17.5" x 7" at the outer edges of the decorative lip, step proper measures 15.5" x 5" x 5.5" deep.

2.3 ADD ALTERNATE #5

A. Underwater Lights (Qty. 7) shall be Pentair SwimQuip ID No. 05086-0100, or equal. Light shall be a 500-Watt 120 Volt wet niche style underwater light and shall be supplied with a 100-foot-long cord. Underwater lights are to be replaced like for like in the existing niches installed in the pool's wall. Contractor shall supply all material and labor necessary to complete installation as per manufacturer's written installation instructions.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Inspection: Prior to all work in this Section, carefully inspect the installed work of other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that the swimming pool deck anchor items may be installed in strict accordance with the original design, pertinent codes and regulations, and the manufacturer's recommendations.

3.2 ELECTRICAL BONDING

A. Electrically bonding each anchor sleeve shall be required. A bonding screw is supplied with each of the anchor sleeves installed. Locate the bonding screw and connect the bonding screw to the bonding grid as per the Electrical plans and specifications.

B. Electrical bonding of anchors shall comply with NEC 680. See electrical for details. (Note: Electrical inspections may be required by DOH prior to work completion. Contact City to verify.)

3.3 INSTALLATION

A. Supply and install anchors / imbeds of swimming pool deck equipment in strict accordance with pertinent codes and regulations, the original design, and the manufacturer's published recommendations, anchoring firmly and securely for long life under frequent use. Coordinate with other trades to ensure all imbedded items are set plumb and flush.

3.4 EQUIPMENT ASSEMBLY

A. Once final inspection and approval is met by the City, the Contractor shall re-install all deck equipment removed from the pools before construction. This shall be done after concrete is adequately cured.

END OF SECTION

SECTION 131151 - SWIMMING POOL MAIN DRAINS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. This Section includes general administrative and procedural requirements for all work. The administrative and procedural requirements included in this Section are to expand the requirements specified in Division 1.

1.2 SUMMARY

A. This section applies to the Swimming pool's main drains located in the deep end of the pool.

B. Work Included: Supply and install all swimming pool main drain equipment items as required for this work as indicated in the Contract Documents and Drawings.

C. This scope shall be included in the Base Bid.

1.3 REFERENCES

A. NCDOH Swimming Pool Code

B. ADAAG: Americans with Disabilities Act Accessibility Guidelines

C. Virginia Graeme Baker Pool and Spa Safety Act

D. ANSI/APSP/ICC-16 2017 (PA) American National Standard for Suction Outlet Fitting Assemblies (SOFA)

1.4 QUALITY ASSURANCE

A. All work of this section shall be performed by the Swimming Pool Contractor or Sub-Contractor under the General Construction contract.

1.5 SUBMITTALS

A. Provide submittals in accordance with the requirements of the General Requirements of Division

B. Provide all shop drawings and catalog data for a complete submittal.

C. Substitutions: Include with request specified item, design, catalog number(s), and finish for each item on which approval is being requested ten (10) days prior to bid opening. Blanket approval by manufacturer's name only will not be given. Substitutions may not be granted after the ten-day period or after the project bid.

1.6 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the swimming pool items before, during, and after installation and to protect the installed work of other trades.

B. Replacement: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner's Representative and at no additional cost to the City.

1.7 COORDINATION

A. Coordinate with other Contractors all work relating to this Section.

B. The General Contractor must establish with all Sub-Contractors, having related work in this Section that all work necessary to complete pool as shown on the drawings and in the specifications is included in the Base bid to the City.

C. If in doubt regarding the responsibility for work covered in the Section and/or discovery of errors or omissions in the bidding documents, the General Contractor shall notify the Architect through channels established by the specifications and request a clarification ten (10) days prior to the bid date.

1.8 WARRANTIES

A. In accordance with the General Requirements of Division 1.

1.9 SYSTEM TRAINING

A. Refer to section 131100 section 1.10 for specifics.

1.10 EXTRA MATERIALS

A. No extra materials required for this Section.

PART 2 - PRODUCTS

2.1 POOL FITTINGS

A. Main Drain Covers: (Qty. 4 for pool) shall be the Anti-Entrapment Drain Cover model number 3030AEC as manufactured by Neptune Benson or pre-approved equal. Main drain cover shall be 30” x 30” and shall be an anti-entrapment main drain certified to ASME A112.19.8.a-2008 VGB-2008 & NSF Certified. Main drain covers shall be manufactured of fiberglass construction which shall not require electrical bonding. Cover shall have a slip resistant surface and shall be rated for a 1,432 GPM maximum flow rate (per floor mounted drain). Cover shall include stainless steel mounting hardware and shall be rated for 15 years life expectancy. Covers shall be installed in accordance with the manufacturer’s instructions and per the contract documents.

B. Main Drain Sumps: (Qty. 4) shall remain unchanged.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Inspection: Prior to all work in this Section, carefully inspect the installed work of other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that the swimming pool equipment items may be installed in strict accordance with the original design, pertinent codes and regulations, and the manufacturer’s recommendations.

3.2 INSTALLATION / ASSEMBLY

A. Supply, assemble and install items of swimming pool fittings in strict accordance with pertinent codes and regulations, the original design, and the manufacturer's published recommendations, anchoring firmly and securely for long life under frequent use. Coordinate with other trades to ensure all fittings are set plumb and flush.

B. Be certain that all metallic fittings are properly electrically bonded prior to imbedding (Note: Electrical inspections will be required to check for electrical bonding of all deck equipment prior to work completion).

C. Ensure all fittings are securely fastened / anchored. Adjust as necessary before final punch list. Loose or missing fittings will not be accepted.

3.3 INSTRUCTION

A. Once final inspection and approval is met by the City, the Contractor(s) shall instruct the maintenance personnel in the proper operations and maintenance of installed equipment.

END OF SECTION

SECTION 131155 - SWIMMING POOL SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. This Section includes general administrative and procedural requirements for all work. The administrative and procedural requirements included in this Section are to expand the requirements specified in Division 1.

1.2 SUMMARY

A. This section applies to the Swimming pool.

B. This section includes joint sealants for the following locations:
1. Caulk joint below deck coping at pool wall (between deck edge and pool waterline tile).
2. Caulk joint below waterline tile.
3. Caulk joint at Beach Entry tile.
4. Caulk joint around construction joints within pool.

C. This section applies to the Base Bid and Add Alternate #1.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that have been produced and installed to establish and to maintain watertight and airtight continuous seals without causing staining or deterioration of joint substrates.

1.4 SUBMITTALS

A. Provide submittals in accordance with the requirements of the General Requirements of Division

B. Product data from manufacturers for each joint sealant product required. Certification by joint sealant manufacturer that sealants plus the primers and cleaners required for sealant installation comply with local regulations controlling the use of volatile organic compounds.

C. Samples for initial selection purposes in form of manufacturer's standard bead samples, consisting of strips of actual products showing full range of colors available, for each product exposed to view.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed joint sealant applications similar in material, design, and extent to that indicated for project, which have resulted in construction with a record of successful in-service performance.

B. Single Source Responsibility for Joint Sealant Materials: Obtain joint sealant materials from a single manufacturer for each different product required.

1. Use test methods standard with manufacturer to determine if priming and other joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates. Perform tests under normal environmental conditions that will exist during actual installation.

2. Submit not less than 9 pieces of each type of material including joint substrates, shims, joint sealant backings, secondary seals, and miscellaneous materials.

3. Schedule sufficient time for testing and analysis of results to prevent delay in the progress of work.

4. Investigate materials failing compatibility or adhesion tests and obtain joint sealant manufacturer's written recommendations for corrective measures, including use of specially formulated primers.

5. Testing will not be required when joint sealant manufacturer is able to submit joint preparation data required above that is acceptable to the Owner's Representative and is based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.

B. Store and handle materials in compliance with manufacturer's recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.7 PROJECT CONDITIONS

A. Environmental Conditions: Do not proceed with installation of joint sealants under the following conditions:
   1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer.
   2. When joint substrates are wet.

B. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than allowed by joint sealant manufacturer for application indicated.

C. Joint Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

1.8 SEQUENCING AND SCHEDULING

A. Sequence installation of joint sealants to occur not less than 21 or more than 30 days before substantial completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

B. Colors: Provide selections made by Owner's Representative from manufacturer's full range of standard colors for products of type indicated.

2.2 ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing elastomeric sealants that comply with ASTM C 920 and other requirements indicated on each Elastomeric Joint Sealant Data Sheet at end of this Section, including those requirements referencing ASTM C 920 classifications for Type, Grade, Class, and Uses. Where additional movement capability is specified in Elastomeric Joint Sealant Data Sheet, provide products with the capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the specified percentage change in the joint width existing at time of installation and remain in compliance with other requirements of ASTM C 920 for Uses indicated.

B. Available Products: Synthacalk GC2+ High Performance Two-Part Polysulfide Rubber sealant, or equal. Contractor to provide manufacturer's recommended joint backing material, primer, tools, and accessories for a proper installation. Contractor to verify that joint sealant is approved for each application, specifically, but not necessarily limited to exterior pool decks, coping stones, interior pool expansion joints and pool tile.

2.3 JOINT SEALANT BACKING

A. General: Provide sealant backings of material and type that are non-staining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Plastic Foam Joint Fillers: Preformed, compressible, resilient, non-staining, non-waxing, non-extruding strips of flexible plastic foam of material indicated below and of size, shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

1. Open-cell polyurethane foam.

2. Closed-cell polyethylene foam, non-absorbent to liquid water and gas, non-outgassing in unruptured state.

3. Proprietary, reticulated, closed-cell polymeric foam, non-outgassing, with a density of 2.5 pcf and tensile strength of 35 psi per ASTM D 1623, and with water absorption less than 0.02 gms/cc per ASTM C 1083.

4. Any material indicated above.

C. Elastomeric Tubing Joint Fillers: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, non-absorbent to water and gas, capable of remaining resilient at temperatures down to -26 degrees Fahrenheit (-32 degrees Celsius). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance.

D. Bond-Breaker Tape: Polyethylene tape or plastic tape as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.4 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealant-substrate tests and filed tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming in any way joint substrates and adjacent nonporous surfaces and formulated to promote optimum adhesion of sealants with joint substrates.

C. Masking Tape: Non-staining, non-absorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with the requirements for joint configuration, installation tolerances, and other conditions affecting joint sealant performance. Do not proceed with installation of joint sealants until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with recommendations of joint sealant manufacturer and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellants, water, surface dirt, and frost.

2. Clean concrete, masonry, unglazed surfaces of ceramic tile, and similar porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.

3. Remove laitance and form release agents from concrete.

4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile, and other nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint sealant manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Acoustical Sealant Application Standard: Comply with recommendations of ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.

D. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:

1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
   a. Do not leave gaps between ends of joint fillers.
   b. Do not stretch, twist, puncture, or tear joint fillers.
   c. Remove absorbent joint fillers that have become wet prior to sealant application and replace with dry material.

2. Install bond breaker tape between sealants where backer rods are not used between sealants and joint fillers or back of joints.

E. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability. Install sealants at the same time sealant backings are installed.

F. Tooling of Non-sag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

1. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

2. Provide flush joint configuration, per Figure 5B in ASTM C 1193, where indicated. Use masking tape to protect adjacent surfaces of recessed tooled joints.

3. Provide recessed joint configuration, per Figure 5C in ASTM C 1193, of recess depth and at locations indicated.

4. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, and to comply with sealant manufacturer's directions for installation methods, materials, and tools that produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in conformance with sealant manufacturer's recommendations.

3.4 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of substantial completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so that the installation of repaired areas is indistinguishable from original work (at Contractor's expense).

END OF SECTION

SECTION 131165 – SWIMMING POOL EXPANSION JOINTS

PART 1 – GENERAL

1.1 WORK INCLUDED

A. The work shall consist of furnishing and installing waterproof expansion joints in accordance with the details shown on the plans and the requirements of the specifications. Preformed sealant shall be silicone pre-coated, preformed, pre-compressed, self-expanding, sealant system.

B. Related Work:
   1. Division 3 - Cast-in-Place Concrete

C. The scope in this section shall be included in the Base Bid.

1.2 SUBMITTALS

A. General – Submit the following according to Division 1 Specification Section.

B. Standard Submittal Package – Submit typical expansion joint drawing(s) indicating pertinent dimensions, general construction, expansion joint opening dimensions and product information.

C. Sample of material is required at time of submittal.

D. All products must be certified by independent laboratory test report to be free in composition of any waxes or wax compounds using FTIR and DSC testing.

E. All products shall be certified in writing to be: a) capable of withstanding 150°F (65°C) for 3 hours while compressed down to the minimum of movement capability dimension of the basis of design product (-25% of nominal material size) without evidence of any bleeding of impregnation medium from the material; and b) that the same material after the heat stability test and after first being cooled to room temperature will subsequently self-expand to the maximum of movement capability dimension of the basis-of-design product (+25% of nominal material size) within 24 hours at room temperature 68°F (20°C).

F. Quality and Environmental control: Manufacturer shall be certified to both ISO-9001:2015 (quality management) and ISO-14001:2015 (environmental management) and shall provide written confirmation that formal Quality and Environmental management systems and processes have been adopted.

1.3 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in Manufacturer's original, intact, labeled containers. Handle and protect as necessary to prevent damage or deterioration during shipment, handling and storage. Store in accordance with manufacturer's installation instructions.

1.4 BASIS OF DESIGN

A. All joints shall be designed to meet the specified performance criteria of the project as manufactured by: (USA & International) EMSEAL JOINT SYSTEMS, LTD 25 Bridle Lane, Westborough, MA 01581-2603, Toll Free: 800-526-8365. (Canada) EMSEAL, LLC 120 Carrier Drive, Toronto, Ontario, Canada M9W 5R1 Toll Free: 800-526-8365. www.emseal.com

B. Alternate manufacturers must demonstrate that their products meet or exceed the design criteria and must submit certified performance test reports performed by nationally recognized independent laboratories as called for in section 1.02 Submittals. Submittal of alternates must be made three weeks prior to bid opening to allow proper evaluation time.

1.5 QUALITY ASSURANCE

A. The General Contractor will conduct a pre-construction meeting with all parties and trades involved in the treatment of work at and around expansion joints including, but not limited to, concrete, mechanical, electrical, landscaping, masonry, waterproofing, fire-stopping, caulking, flooring and other finish trade subcontractors. All superintendents and foremen with responsibility for oversight and setting of the joint gap must attend this meeting. The General Contractor is responsible to coordinate and schedule all trades and ensure that all subcontractors understand their responsibilities in relation to expansion joints and that their work cannot impede anticipated structural movement at the expansion joints or compromise the achievement of water tightness or life safety at expansion joints in any way.

B. Warranty – Manufacturer's standard warranty shall apply.

C. LEED Building Performance Requirements: The VOC of the silicone must not exceed 50 grams/liter.

PART 2 – PRODUCT

2.1 GENERAL

A. Provide durable, watertight, expansion joint by EMSEAL Joint Systems for expansion joints and isolation joints in submerged applications. Typical locations include but are not limited to the following: applications for joints where continuous or intermittent immersion or contact with chlorinated (up to 5ppm), saline, or potable water is planned, over occupied space, construction, and structural expansion joints. System shall perform waterproofing, traffic bearing and movement-accommodation functions as the result of a single installation and without the addition of gutters, vapor barriers, bladders, or other devices suspended beneath or within the system in any way.

B. Provide Submerseal as manufactured by EMSEAL JOINT SYSTEMS LTD and as indicated on drawings for horizontal-plane expansion joint locations.

C. Sealant system shall be comprised of three components: 1) cellular polyurethane foam impregnated with hydrophobic 100% acrylic, water-based emulsion, factory coated with chemically resistant, potable water safe silicone per NSF/ANSI Standard 61; NSF Standard 51, FDA Regulation CFR 177.2600; MIL-A-46146; an UL Flame Class 94 HB; 2) field-applied epoxy adhesive primer, 3) field-injected silicone sealant bands.

D. Material shall be capable as of movements of +25%, -25% (50% total) of nominal material size. Standard sizes from 1/2" (12mm) to 4" (150mm). Depth of seal as recommended by manufacturer.

E. Silicone coating to be low-modulus silicone applied to the impregnated foam sealant at a width greater than maximum allowable joint extension and which when cured and compressed will form a single bellow.

F. Submerseal to be installed into manufacturer's standard field-applied epoxy adhesive.

G. Submerseal is to be installed slightly recessed from the surface such that when the field-applied injection band of silicone is installed between the substrates and the foam-and-silicone-bellow, the system will be essentially flush with the substrate surface.

H. Select the sealant system model appropriate to the movement, head pressure and design requirements at each joint location that meet the project specification or as defined by the structural engineer of record.

I. Manufacturer's Checklist must be completed by expansion joint subcontractor and returned to manufacturer at time of ordering material.

2.2 LOCATIONS

A. The swimming pool shell is constructed with three separate expansion joints as located within the plans. The Contractor shall provide all necessary materials and labor to remove the existing expansion joints and supply the new expansion joints (both pool floor and walls) as detailed in this specification.

2.3 FABRICATION

A. Submerseal by EMSEAL must be supplied pre-compressed to less than the joint size, packaged in shrink-wrapped lengths (sticks).

B. Directional changes and terminations into horizontal plane surfaces to be provided by factory-manufactured universal-90-degree single units containing minimum 12-inch long leg and 6-inch long leg or custom leg on each side of the direction change or through field fabrication in strict accordance with installation instructions.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Preparation of the Work Area:
   1. The contractor shall provide properly formed and prepared expansion joint openings constructed to the exact dimensions and elevations shown on manufacturer's standard system drawings or as shown on the contract drawings. Deviations from these dimensions will not be allowed without the written consent of the engineer of record.
   2. The contractor shall clean the joint opening of all contaminants immediately prior to installation of expansion joint system. Repair spalled, irregular or unsound joint surfaces using accepted industry practices for repair of the substrates in question. Remove protruding roughness to ensure joint sides are smooth. Ensure that there is sufficient depth to receive the full depth of the size of the Submerseal being installed. Refer to Manufacturers Installation Guide for detailed step-by-step instructions.
   3. No drilling, or screwing, or fasteners of any type are permitted to anchor the sealant system into the substrate.
   4. System to be installed by qualified sub-contractors only according to detailed published installation procedures and/or in accordance with job-specific installation instructions of manufacturer's field technician.

3.2 CLEAN AND PROTECT

A. Protect the system and its components during construction. Subsequent damage to the expansion joint system will be repaired at the general contractor's expense. After work is complete, clean exposed surfaces with a suitable cleaner that will not harm or attack the finish.

END OF SECTION

SECTION 131451 – SWIMMING POOL PIPE & FITTINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. This Section includes general administrative and procedural requirements for all work. The administrative and procedural requirements included in this Section are to expand the requirements specified in Division 01.

1.2 SUMMARY

A. Work Included:

1. Provide and install all Swimming Pool pipe and fitting connections as required to complete the necessary work outlined in the plans.

2. Provide and complete all pool pipe pressure testing as outlined below.

B. Work listed within this section shall be included in both the Base Bid and Add Alternate #5.

1.3 RELATED SECTIONS

A. Division 02: Existing Conditions

B. Division 03: Concrete

C. Division 13: Special Construction

1.4 REFERENCES

A. NCDOH Swimming Pool Code

B. NSF 50- National Sanitation Foundation

C. ASTM D1784

D. ASTM D2467

1.5 QUALITY ASSURANCE

A. All work of this section shall be performed by the Pool Contractor or Sub-Contractor.

1.6 SUBMITTALS

A. Provide submittals in accordance with the requirements of the General Requirements of Division 01.

B. Provide all shop drawings, product data and certificates of compliance for all pipe and fittings for a complete submittal.

C. Substitutions: Include with request specified item, design, catalog number(s), and finish for each item on which approval is being requested ten (10) days prior to bid opening. Blanket approval by

manufacturer's name only will not be given. Substitutions may not be granted after the ten-day period or after the project bid.

1.7 PRODUCT HANDLING

A. Delivery: Deliver all materials to the project site in the manufacturer's original unopened containers with all labels intact and legible.

B. Storage: Store all materials under cover in a manner to prevent damage and contamination and store only the specified materials at the project site.

C. Protection: Use all means necessary to protect piping materials before, during, and after installation and to protect the installed work of other trades.

D. Replacement: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Director's Representative and at no additional cost to the City.

1.8 COORDINATION

A. Coordinate with other Contractors all work relating to this Section.

B. The Contractor must establish with other Sub-Contractors, having related work in this Section that all work necessary to complete all pipe work as shown on the drawings and in the specifications is provided.

C. If in doubt regarding the responsibility for work covered in the Section and/or discovery of errors or omissions in the bidding documents, the Contractor shall notify the Director's Representative through channels established by the specifications and request a clarification ten (10) days prior to the bid date.

1.9 WARRANTIES

A. Defects in material or workmanship of any pipe and pipe fitting replacements shall be warranted for a period of two (2) years.

1.10 EXTRA MATERIALS

A. No extra materials required for this Section.

PART 2 - PRODUCTS

2.1 PIPE, FITTINGS & FLANGES

A. Swimming Pool Piping: NSF approved Schedule 80 PVC (Base Bid).

B. Pool Chemical Conduit Piping: NSF approved Schedule 40 PVC (Add Alternate #5).

C. All PVC Schedule 40 / 80 pipe and fittings shall be produced by Spears Manufacturing Company from PVC Type I, cell classification 12454, conforming to ASTM Standard D1784. All injection molded PVC Schedule 80 fittings shall be certified for potable water service by NSF International and manufactured in strict compliance to ASTM D2467. All fabricated fittings shall be produced in accordance with Spears General Specifications for Fabricated Fittings. All PVC flanges shall be designed and manufactured to meet CL150 bolt pattern per ANSI Standard B16.5 and rated for

maximum internal pressure of 150 psi, non-shock at 73-degree F. Fabricated fittings are only allowed on fitting sizes greater than 12”.

D. All pipe/fittings shall bear the company’s name or trademark, material designation, size, applicable IPS or class rating, and the NSF stamp.

E. All flanges shall be PVC molded class 150 flange fitting coupling devices designed for joining IPS (Iron Pipe Size) plastic piping systems. Flanges shall be designed such that frequent disassembly may be required. Flanges shall also exhibit the use as a transitional fitting for joining plastic to metal piping systems. Injection molded flanges shall be produced from either PVC materials approved for potable water use by the National Sanitation Foundation (NSF®). Flange pressure ratings shall be 150 psi for water at 73°F. Flange type shall be Van Stone Style which is a two-piece design with rotating flange ring. Flanges shall be provided in socket configurations, sizes 1/2" through 16". Flanges shall be produced by Spears Manufacturing Company or approved equal.

F. Couplings (Base Bid) shall be slip-fit PVC Schedule 80 as produced by Spears Manufacturing Company. Connections shall be glued (no exceptions) and shall be leak tested (see below for testing protocol).

2.2 BUTTERFLY VALVES:

A. Butterfly valves (Base Bid – qty: 2) shall be Lever Operated style which shall be provided per plans on the 6” PVC pipes (backwash and pool return). Valves shall be the ASAHI Pool-Pro Type SP or approved equal. All “Pool-Pro” Type SP Butterfly Valves sizes shall be of a PVC Body, PVC Disc and EPDM construction suitable for chlorinated water applications. Stem shall be of 316 stainless steel and non-wetted. Valves shall be a self-gasketing design with a convex sealing arrangement. All Pool-Pro Type SP valves shall be rated to 150 psi as manufactured by Asahi/America, Inc. Material of construction allows complete submersion of valve body as all components are compatible with chlorinated water. Allows for field mounting of accessories including stem extensions, gear operators & automation. Eighteen (18) position throttle plate for lever handle style is provided.

2.3 BALL VALVES:

A. Ball valves (Add Alternate #5) shall be True Union 2000 Industrial Ball valves as manufactured by Spears Manufacturing Company or approved equal. All thermoplastic ball valves shall be manufactured to ASTM F1970 and constructed from PVC Type I, ASTM D1784 Cell Classification 12454 or CPVC Type IV, ASTM D1784 Cell Classification 23447. All O-rings shall be EPDM or genuine Viton®. All valves shall have Safe-T-Shear® stem with double O-ring stem seals. All valve handles shall be polypropylene with built-in lock out mechanism. All valve union nuts shall have Buttress threads. All seal carriers shall be Safe-T-Blocked®. All valve components shall be replaceable. All valves shall be listed by NSF for use in potable water service. All ½” thru 2” valves shall be pressure rated to 235 psi. All 2 ½” thru 4” and all flanged valves shall be pressure rated to 150 psi for water at 73 degrees F.

2.4 FLOW MONITORING EQUIPMENT

A. Flow monitor equipment (Add Alternate #5) shall be provided and installed as indicated within the project documents in the pool’s return line (6”). Flowmeter shall be a direct reading, battery powered, digital type and shall be connected to a flow sensor of same manufacturer. Sensor shall be installed in spray pad return piping according to manufacturer’s recommendations. Flow meter shall provide reading in gallons per minute. Flow monitor equipment shall be GF Signet, Model Numbers: 9900 Flow Meter and 515 Paddlewheel Flow Sensor, or approved equivalent. Contractor shall install the flow sensor in the piping as shown in the plans and mount the flow meter (reading) in an easily accessible location (ie: on the wall).

PART 3 - EXECUTION

3.1 EXISTING CONDITIONS, INSPECTION AND PREPARATION

A. Verify that all work by others related to this Section is installed. This includes but is not limited to all earthwork, concrete foundations, and mechanical/electrical connections.

B. Prior to starting work, notify the Construction Manager of defects requiring correction. Do not begin work until conditions are satisfactory.

C. Protect other materials and installed work against damage caused by completing work in this section.

3.2 PIPE AND FITTINGS

A. Workmanship: Workmanship shall be in accordance with good commercial practice. Fittings shall be homogeneous throughout and free from visible cracks, holes, foreign inclusions, or other injurious defects in color, opacity, density, and other physical properties.

B. Installation: All pipe and fittings shall be installed according to the best recommendations of the manufacturer.

C. All piping shall be properly supported, braced, and secured as necessary to minimize vibration.

3.3 POOL PIPING PRESSURE TESTS

A. All newly installed piping on the project, unless specifically shown otherwise, shall be hydraulically tested as specified herein. Air and/or gas pressure testing is prohibited. All pipe pressure testing shall be inspected by Engineer for compliance.

B. Tests to be Performed:

1. The Contractor shall fill the section of pipe to be tested with water. The tests shall be conducted by the Contractor. These tests shall be conducted before any gutter pipe joint installed is covered.

2. Duration of Tests: All tests shall apply full test pressure to the piping until piping of the aquatic equipment has begun.

3. Pressure of Tests: All tests shall be conducted at 30 psi for a minimum 4-hour time period. Air pressure tests are not acceptable.

3.4 SYSTEM START-UP

A. Contractor shall perform a system startup at the conclusion of all pipe and equipment to ensure no leaks are present. Any leaks will be promptly repaired at no additional cost to the Owner.

END OF SECTION

SECTION 131452 - SWIMMING POOL PUMP & FILTRATION EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. This Section includes general administrative and procedural requirements for all work. The administrative and procedural requirements included in this Section are to expand the requirements specified in Division 1.

1.2 SUMMARY

A. This section applies to the Swimming Pool.

B. Work Included: Provide materials, labor, and equipment as required to install swimming pool mechanical equipment as specified and noted on the drawings.

C. Work included in this section shall all be included within the Base Bid.

1.3 RELATED SECTIONS

A. Division 13: Special Construction

B. Division 26: Electrical

1.4 REFERENCES

A. NCDOH Swimming Pool Code

B. NSF- National Sanitation Foundation

C. UL - Underwriters Laboratory

1.5 QUALITY ASSURANCE

A. All work of this section shall be performed by the Swimming Pool Contractor or Sub-Contractor under the General Construction contract.

B. The Swimming Pool Contractor/Sub-Contractor for work included in this section shall have been successfully engaged in business of swimming pool mechanical equipment for at least five (5) years immediately prior to commencement of this work. This Contractor shall provide a satisfactory record of workmanship that meets with the approval of the Owner's Representative.

C. In addition, the Filter Manufacturer shall provide a prior list of installations (minimum of 20 installations or 5-10 years). This shall be required prior to reviewing any substitute from the Basis of Design listed within the bid documents.

D. Use only trained and experienced workers who are familiar with the materials and methods specified in this section.

E. There shall be at least one person present at all times during the execution of this phase of work that shall be thoroughly familiar with the materials and methods specified and direct all work performed under this specification.

1.6 SUBMITTALS

A. Provide submittals in accordance with the requirements of the General Requirements of Division.

B. Provide all shop drawings and catalog data for a complete submittal.

1.7 PRODUCT HANDLING

A. Materials shall be delivered to the Project Site in the manufacturer's original, unopened containers with all labels intact and legible.

B. Materials shall be stored in a manner as to prevent damage and/or contamination. Only specified materials are to be stored at the Project Site.

C. Use all means necessary to ensure protection of mechanical equipment before, during, and after installation and to protect the installed work of other trades.

D. Examine delivery of materials to determine if any damage has been sustained and make necessary repairs and/or replacements necessary to the approval of the Owner's Representative and at no additional cost to the City.

1.8 COORDINATION

A. Coordinate with other Contractors all work relating to this Section.

B. The Swimming Pool Contractor must establish with other Sub-Contractors, having related work in this Section that all work necessary to complete the pool equipment as shown on the drawings and in the specifications is included in the Base bid to the Owner.

C. If in doubt regarding the responsibility for work covered in the Section and/or discovery of errors or omissions in the bidding documents, the Swimming Pool Contractor shall notify the Architect through channels established by the specifications and request a clarification ten (10) days prior to the bid date.

1.9 GUARRANTEE/WARRANTY

A. The Contractor shall guarantee that the equipment to be furnished is of the correct capacity, that the various parts are designed to operate correctly and in conjunction with each other, that if the installation is made in accordance with the project drawings and operated in accordance with the suppliers instructions, the system will perform the prescribed functions correctly, the water entering the pool will be clear, bright, free from suspended matter visible to the unaided eye, and will be sanitary to the satisfaction of all authorities having jurisdiction.

B. Filters shall carry a 15-year warranty as regularly offered by the tank manufacturer.

C. Filter linkage shall carry a 5 year fully rated warranty.

D. Unless otherwise specified, workmanship is to be guaranteed first class and carry a one (1) year warranty.

1.10 SYSTEM TRAINING

A. Refer to section 131100 section 1.10 for specifics.

1.11 EXTRA MATERIALS

A. No extra materials required for this Section.

PART 2 - PRODUCTS

2.1 BASIS OF DESIGN

A. FILTER SYSTEM

1. Pool Filter System: (Qty. 1) shall be as manufactured by Mermade Filter (phone 551-427-1395) or approved equal. The Swimming pool filter system shall be a horizontal style stacked fiberglass high-rate sand filter system Model No. 143-105 with side access manways which shall contain (1) stack of two high-rate type filter tanks, with each tank containing 31.0 square feet of filter area totaling 62.0 square feet of effective filtration area. The system shall have the capacity of filtering 788 gpm when filtered at 12.71 gpm per square foot.

B. FILTER CRITERIA

1. System Criteria shall exhibit the following characteristics:

2. Filter System Requirements:
   a. The system shall be supplied complete by the manufacturer and shall include internals, face piping and valves, gauge panel with tubing and petcocks, sight glass, air relief connection, bottom drain connection with internal strainer.
   b. System shall be fabricated and fully assembled at the manufacturer's plant for pressure testing and dimensional verification. System shall be knocked down for shipping purposes in subassemblies for minimum field assembly. Internal manifold and lateral piping shall be factory installed and shipped in place.

3. Filter System Capacity:
   a. The filter system capacity, size, performance and model number shall be as shown on the drawings.

4. Fiberglass Filter Tanks:
   a. The equipment described herein shall be products of a manufacturer regularly engaged in the fabrication of pressure vessels for at least 15 years.
   b. The filter tank shall be suitable for 50 psi working pressure, hydrostatically tested to 75 psi and designed with a 4:1 safety factor.
   c. Saddle bases (2) shall be provided for tank support. Systems which incorporate stacked tanks shall include similar bases and mounting saddles for the upper vessel. Access to the tank shall be provided by a 12” x 16” manhole. Manhole seal shall be complete with one-piece gasket and positioned so that internal pressure from the filter will augment the seal. Externally mounted bolt-on covers will not be accepted.
   d. Drain out system shall consist of one (1) 1" fiberglass coupling mounted to the tank bottom. Each coupling to be fitted with a slotted PVC sand retainer. Air relief connection shall be one (1) 1/2" coupling provided on top of the tank.
   e. Each filter tank shall be equipped with the necessary flanges and connections for the internal and external piping. Connections shall be comprised of 1" minimum thickness fiberglass flanges with ANSI standard 150 lb. bolt pattern.
   f. The resin used shall be a commercial grade, premium corrosion resistant vinylester that has been intended for the service and recommended for this filter system by the manufacturer.

g. Ultraviolet absorbers shall be added to the exterior surface for improved exterior resistance.
h. Chopped strand mat shall be constructed from commercial grade E- type glass strands bonded together using a binder. The strands shall be treated with a sizing that is chemically compatible with the resin system used. Continuous roving shall be a commercial grade of E-type glass fiber with a sizing that is chemically compatible with the resin system used.
i. The inner surface exposed to the corrosive environment shall be followed with a layer composed of vinyl ester resin, reinforced only with non-continuous glass fiber strands applied to a minimum thickness of 0.100 inches. The combined wall thickness of the inner surface and exterior layer shall be 0.3 inches.

5. Filter Piping (Internal):
   a. The upper and lower internal distribution system shall be a horizontal diffuser header/slotted underdrain pipe arrangement. The headers shall be 6" Schedule 80 PVC (for upper header) construction, and Schedule 40 PVC (for lower slotted under-drain) capped on one end and flanged on the other end with diffusers installed throughout the manifold. Lower pipe manifold shall be slotted style pipe which shall be machined to keep sand out. Slotted manifold shall be assembled and installed by the manufacturer and supported to be maintained.
   b. All hardware in wetted areas shall be T304L stainless steel or non- metallic.

6. Face Piping:
   a. External face piping shall be 6" Schedule 80 PVC pipe and fittings. All 6" fittings shall be molded type. Fabricated or fiberglass wrapped fittings will not be acceptable. Flanges shall be located so as to allow for easy dismantling of face piping. All fittings shall be solvent cemented.
   b. Piping shall be drilled and tapped where necessary to accommodate gauge tubing connectors.
   c. Standard accessory items shall include sight glass rated for 50 psi with polycarbonate glass, remote mounted gauge panel with two 4½" diameter pressure gauges, ¼" petcocks, ¼" poly vent tubing with PVC compression adapters.
   d. Face piping shall be fully factory assembled, knocked down and crated for shipment. The warranty of the face piping shall be provided by the filter manufacturer. Field gluing or assembly of the face piping by anyone other than the filter manufacturer will not be accepted.
   e. Face piping arrangement shall be as indicated on the drawings.

7. Backwash Valve Control Assembly:
   a. A single lever mechanical linkage assembly shall be provided which shall operate in order to create simultaneous movement. Connecting pieces shall vary with the size of face piping in order to operate with suitable mechanical advantage.
   b. Linkage shall be designed so that filter and backwash cycles can be accomplished in a single linkage operation.
   c. All linkage parts shall be T304L stainless steel and shall be factory assembled to ensure fit.

8. Automatic Air Relief Valve:
   a. A valve shall be provided to automatically and continuously release air in the filter. The valve shall be fabricated of plastic with Buna-N seals. A plumbing kit shall be provided with two (2) PVC ball valves to allow manual air relief and isolation of the automatic valve.

9. Filter System Packaging:
   a. All filter piping and valves shall be factory assembled and knocked down into sub-assemblies for shipment.
   b. The components shall be carefully packaged in a totally enclosed wooden crate to prevent damage during transport.

10. Filter Media:
   a. A total of four layers of media shall be utilized as per the filter manufacturer's recommendations. Failure to follow procedure violates the NSF certification.
   b. Two grades of gravel support media of a hard-coarse aggregate with a subangular grain shape with a manufacturer's recommended particle size shall be used on the inside of the bottom head to the elevation where the filter media commences. Support media shall be placed by hand to avoid damage to the underdrain system and leveled before the addition of the upper layer of filter media. Support gravel shall be delivered and stored in bags for ease of handling and elimination of possible contamination. Media shall be free from minerals which may precipitate onto pool surfaces.
   c. Two grades of Sand media (one course grade and one fine grade) shall be a carefully selected grade of hard, uniformly graded silica material. Media shall be naturally rounded particles of silica or milled angularly shaped particles of silica quartz. Filter shall contain a minimum bed depth as shown on the drawings. Systems which do not provide a minimum bed depth, as shown on the drawings, will not be acceptable. Sand shall be delivered and stored in bags for ease of handling and elimination of possible contamination. Media shall be free from minerals which may precipitate onto pool surfaces.
   d. Each filter tank shall be provided with the media quantities as shown on the drawings. Contractor shall provide within the base bid pricing.

C. FILTER PRESSURE GAUGES

1. Equipment Contractor shall provide and install the following Pressure gauges for each of the filter systems:

2. Pool Filter Tanks Gauges: Differential pressure gauges (4 total required) shall be provided and installed as per the project documents and shall be Ashcroft Type 1131 or approved equal. Gauge range readout shall be between 0 and 15 psi. Contractor shall provide all necessary tubing and taps for a complete installation.

D. FEATURE PUMP

1. Water Features Pump: (Qty. 1) shall be Pentair Pool Products Model EQK-1500 self-priming pump with integral hair & lint strainer or equal (Pump P/N: 340035). Pump shall have 15 horsepower and shall have a design flowrate of 650 gpm with a total dynamic head of 50 feet. The pump body shall have a single suction port with a 6" ANSI® STD. flange and a discharge port of 4" ANSI® STD. flange. The pump shall be tested and certified by a nationally recognized testing laboratory to conform to National Sanitation Foundation Standard 50. See electrical for pump power requirements. A spare strainer basket shall be provided by the Contractor at no additional cost to the City.

2. Pressure Gauge
   a. A Pressure gauge shall be provided and installed on the pressure side of the pump discharge to detect pressures at that location.
   b. The pressure gauge shall:
      1) Have a soft soldered phosphor bronze bourdon tube and brass socket.
      2) Have a black finish steel case with plastic face (3 ½" diameter).
      3) Have a scale range of 0-60 psi readout.
      4) The pressure gauge is to provide a 3-2-3% accuracy.
      5) Be Ashcroft Model #1005 or approved equivalent.

3. Compound Gauge
   a. A compound gauge shall be provided and installed on the suction side of the pump to detect vacuum at this location.
   b. The vacuum gauge shall:
      1) Have a soft soldered phosphor bronze bourdon tube and brass socket.
      2) Have a black finish steel case with plastic face (3 ½" diameter).
      3) Have a scale range of 30-inch Hg to 30 psi readout.
      4) The compound gauge is to provide a 3-2-3% accuracy.
      5) Be Ashcroft Model #1005PH or approved equivalent.

4. Safety Vacuum Release System (SVRS)
   a. Feature pump (qty. 1) shall be installed with a Safety Vacuum Release System (SVRS). SVRS shall be the Vacless automatic Breather I or approved equal.

PART 3 - EXECUTION

3.1 EXISTING CONDITIONS, INSPECTION AND PREPARATION

A. Verify that all work by others related to this Section is installed. This includes but is not limited to all concrete work and mechanical/electrical connections.

B. Prior to starting work, notify the Director's Representative of defects requiring correction. Do not begin work until conditions are satisfactory.

C. Protect other materials and installed work against damage caused by completing work in this section.

3.2 DEMOLITION

A. Contractor shall be responsible for the demolition of all existing systems to be replaced including the existing filters. Note that both existing filters will require careful demolition and removal in sections as the existing filters are too large to fit through existing exit doors. Contractor shall account for this in the base bid.

B. All demoed items are to be removed and discarded without damaging existing / surrounding equipment and structures.

3.3 EQUIPMENT DELIVERY

A. Coordinate all equipment deliveries with the Engineer and the City.

B. Deliver material in manufacturer's original, unopened containers and crates with all labels intact and legible.

C. Deliver materials in sufficient time and quantity to allow continuity of work and compliance with approved construction schedule.

3.4 EQUIPMENT AND SYSTEMS INSTALLATION

A. The Contractor shall assemble and install all pumps and filter equipment, special parts, and accessories as shown on pool drawings, specifications, and shop drawings of the equipment of the equipment suppliers.

B. Contractor shall furnish all equipment anchors and inserts as shown in the plans and as indicated in this Section of specifications. Equipment shall be set true and plumb using factory supplied jigs and/or templates where available.

C. Contractor to install all equipment and systems in accordance with manufacturer's directions. Equipment shall be assembled and in place for final observation.

3.5 EQUIPMENT TRAINING

A. Contractor shall provide the necessary training for the operation and maintenance of the newly installed pump and filtration system. Training shall be provided by the Contractor at no additional cost to the City (see specification section 131100). Contractor shall also provide a detailed operation and maintenance manual prior to commissioning.

END OF SECTION

SECTION 131455 - SWIMMING POOL CHEMICAL TREATMENT SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. This Section includes general administrative and procedural requirements for all work. The administrative and procedural requirements included in this Section are to expand the requirements specified in Division 01.

1.2 SUMMARY

A. This section applies to the Swimming Pool.

B. Work Included: Provide labor, materials, and equipment as required to install all Swimming Pool chemical system including all controllers, flow cells, disinfection equipment, pH control equipment and chemical spill containment basins as specified and noted in the project documents.

C. Work included in this section will be included in both the Base Bid and Add Alternate #5.

1.3 RELATED SECTIONS

A. Division 13: Special Construction

B. Division 22: Plumbing

C. Division 26: Electrical

1.4 REFERENCES

A. NCDOH Swimming Pool Code

B. NSF 50- National Sanitation Foundation

1.5 QUALITY ASSURANCE

A. All work of this section shall be performed by the Swimming Pool Contractor or Sub-Contractor under the General Construction contract.

1.6 SUBMITTALS

A. Provide submittals in accordance with the requirements of the General Requirements of Division 01.

B. Provide all shop drawings, product data, and chemical ratings curves for all chemical equipment for a complete submittal.

C. Substitutions: Include with request specified item, design, catalog number(s), and finish for each item on which approval is being requested ten (10) days prior to bid opening. Blanket approval by manufacturer's name only will not be given. Substitutions may not be granted after the ten-day period or after the project bid.

1.7 PRODUCT HANDLING

A. Delivery: Deliver all materials to the project site in the manufacturer's original unopened containers with all labels intact and legible.

B. Storage: Store all materials under cover in a manner to prevent damage and contamination and store only the specified materials at the project site.

C. Protection: Use all means necessary to protect equipment before, during, and after installation and to protect the installed work of other trades.

D. Replacement: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Director's Representative and at no additional cost to the City.

1.8 COORDINATION

A. Coordinate with other Contractors all work relating to this Section.

B. The Swimming Pool Contractor must establish with other Sub-Contractors, having related work in this Section that all work necessary to complete all work as shown on the drawings and in the specifications is included in the Base Bid and Add Alternate #5 to the City.

C. If in doubt regarding the responsibility for work covered in the Section and/or discovery of errors or omissions in the bidding documents, the Swimming Pool Contractor shall notify the Director's Representative through channels established by the specifications and request a clarification five (5) days prior to the bid date.

1.9 WARRANTIES

A. In accordance with the General Requirements of Division 01.

1.10 EXTRA MATERIALS

A. No extra materials required for this Section.

PART 2 - PRODUCTS

2.1 DISINFECTION EQUIPMENT

A. Sodium Hypochlorite Containment Tank Repairs (Base Bid): Existing tank shall remain. However, Contractor shall supply and install a new tank cover and re-route the chemical feed tubing. See plans for details.

B. Disinfection Metering Pump (Add Alternate #5): (Qty. 1) shall be the Stenner 85M5 chemical metering pump as manufactured by the Stenner Pump Company or approved equal. All housings shall be Lexan® polycarbonate plastic. Peristaltic tube shall be Santoprene® TPR-FDA approved. Suction and discharge tubing shall be LDPE polyethylene, NSF/FDA approved. Tube fittings, connection nuts, check valve fittings, and ceramic weight clip shall be Type 1 Rigid PVC, NSF listed. Suction weight shall be ceramic. All fasteners shall be stainless steel. Output range shall be 4.3 – 85 gallons per day at 25 psi maximum. Pump shall be sized for 120-volt 60 Hz and shall draw 1.7 amps. Pump shall be rated to handle sodium hypochlorite.

C. Spill Containment platform (Base Bid): (Qty. 1) shall be model 1640 as manufactured by Eagle Safety Products. High Performance Engineered Plastic High-Density Polyethylene HDPE construction for excellent chemical resistance, the 1640 features a spill capacity of 120 gallons and a flat top grating which removes easily for cleaning. Forkliftable design with a 3/4" drain plug. Meets EPA requirements for secondary spill containment of hazardous materials (40 CFR 264.175). Spill capacity shall be 120 gallons per platform. Size of platform shall be 52.4” x 51.5” x 13.75” high.

2.2 pH CONTROL

A. Muriatic Acid Metering Pump (Add Alternate #5): (Qty. 1) shall be the Stenner 45M5 as manufactured by the Stenner Pump Company or approved equal. All housings shall be Lexan® polycarbonate plastic. Peristaltic tube shall be Santoprene® TPR-FDA approved. Suction and discharge tubing shall be LDPE polyethylene, NSF/FDA approved. Tube fittings, connection nuts, check valve fittings, and ceramic weight clip shall be Type 1 Rigid PVC, NSF listed. Suction weight shall be ceramic. All fasteners shall be stainless steel. Output range shall be 2.5 – 50 gallons per day at 25 psi maximum. Pump shall be sized for 120-volt 60 Hz and shall draw 1.7 amps. Pump shall be rated for Hydrochloric/Muriatic acid.

B. Muriatic Acid Tanks: To remain, no action necessary.

C. Spill Containment platform (Base Bid): (Qty. 1) shall be model 1620 as manufactured by Eagle Safety Products. High Performance Engineered Plastic High-Density Polyethylene HDPE construction for excellent chemical resistance, the 1620 features a spill capacity of 66 gallons and a flat top grating which removes easily for cleaning. Forkliftable design with a 3/4" drain plug. Meets EPA requirements for secondary spill containment of hazardous materials (40 CFR 264.175). Spill capacity shall be 66 gallons per platform. Size of platform shall be 51” x 26.25” x 15” high.

2.3 CHEMICAL AUTOMATION EQUIPMENT

A. Chemical Controller & Flow Cell Assembly (Add Alternate #5): (Qty. 1) shall be a programmable chemical automation system for continuous monitoring of water chemistry (ORP, PPM, pH and Temperature), Langelier Saturation Index and temperature and for automatic control of the chemical feeders. The controller shall include a programmable microprocessor with an eight (8)-line display screen and a sixteen (16)-key keyboard for operator access. The system shall be a Prominent Fluid Control Systems model number DCM-2CL controller and flow cell assembly or approved equal. The following characteristics shall be met:

1. The controller shall automatically activate the appropriate chemical feeders in order to maintain the sanitizer level within +/-0.1 parts per million (PPM) or +/- 10 mV (millivolts) of Oxidation-Reduction Potential (ORP) and the pH within +/- 0.1 pH unit of the setpoints selected by the operator. ORP and Sanitizer functions shall include seven-day, level-based chemical saver programs. All setpoint and calibration levels shall be adjustable with a numeric keypad mounted on the front panel of the unit. Controllers with internal switches or calibration adjustments will not be considered equal.

2. A solid-state PPM SENSOR shall monitor and display the Free Chlorine concentration in water in ppm or mg/l and shall be used to control the chlorine feed device. The sensor readings must be accurate to 0.01 PPM and be compatible with CYA levels in excess of 20 PPM. PPM values derived from ORP sensor readings shall not be acceptable. The PPM sensor shall not require the use of chemical reagents and/or of a special flow cell for water flow and pressure regulation.

3. The controller shall be capable of actuating all outputs in the following operator-selectable modes: off, manual, automatic and timer cycle. In the automatic mode, the operator shall be

able to choose between on/off control with adjustable deadband or proportional feed control with adjustable deadband and progressive control zones.

4. The controller shall include a programmable seven-day shock program with operator selectable ON and OFF times for each day of the week and optional separate chemical feeder relay control.

5. The controller shall include automatic control of a chemical feeder for Automated Chloramine Treatment (A.C.T.).

6. The controller shall have the capability to operate an Ozone generator utilizing an internal spare relay with high ORP lockout.

7. The controller shall include a temperature sensor and automatic control of the heater with a seven-day energy saver program.

8. The controller shall continuously calculate and display the Langelier Saturation Index using either sensor data and/or manual input for pH, temperature, total alkalinity and calcium hardness. The resulting calculated water condition shall be displayed on the main screen as either "Scaling", "Corrosive" or "OK".

9. The controller shall be contained in a NEMA Type 4X (rain and splash proof) lockable fiberglass cabinet with an LCD graphic display screen of eight (8) lines of twenty-two (22) alphanumeric characters. The main screen shall display current readings, control modes and operational status for ORP, PPM, pH, temperature (flow rate, influent and effluent pressure displays available with optional installation.) A 16-key touch pad shall be provided for direct access to all the menus and submenus and for entering numerical data. Controllers with smaller displays or displays that require scrolling through menus will not be considered equal. All screens shall have the capability of being displayed at any time in unabbreviated English, French or Spanish and in US or metric units.

10. The sensor bypass line shall include an in-line filter, a flowmeter, a safety flow switch, a sampling spigot and two flow control valves, or shall include a flow cell assembly with a safety flow switch.

11. The controller shall be factory set to water treatment industry standards. The operator shall be able at any time to adjust all programmable functions to preferred settings. The controller shall have a reset mode to reset all or selected functions to the original factory standards.

12. The controller shall have the capability to calibrate all sensor inputs, depending on the accuracy needed, using 1-, 2-, or 3-point calibration to determine respectively the origin, slope and curvature of the calibration curve.

13. The controller shall include programmable high and low alarm levels for all control functions with operator-selectable feed lockout and alarm buzzer options. A Remote Alarm relay shall be included in parallel with alarm buzzer for operator-selectable voltage or dry contact output.

14. The controller shall continuously monitor and alert for failure of ORP and pH probes using dynamic probe testing before the water chemistry gets out of range. Failure alarms based on safety timers or out-of-range alarms will not be considered equal.

15. The controller shall include a seven (7) day program for automatic sensor cleaning.

16. The controller shall record and display the elapsed run time for each activation event and a cumulative run time resettable at any time by the operator. The controller shall provide for operator-adjustable event run time limits & total run time alarms for all control functions.

17. The controller shall include a memory storage battery with minimum reserve power for six (6) months.

18. The controller shall include an on-board memory chip for storing of test data on operator-selectable schedules. RS-232 serial communications port shall be included for on-site downloading of the test data. Test data storage must consist of the following sensor inputs: ORP, PPM, pH, Temperature (Conductivity or TDS, Pressure influent of filter, Main flow rate available with optional sensors). The controller shall insert a test data every time power is turned on to indicate power failures. Controllers failing to data log all listed parameters will not be considered equal.

19. The controller shall include an on-screen visual display of all test data logged in memory. Controllers that require the use of external accessories or equipment, such as portable computers or remote access computers, to retrieve or display test data shall not be considered equal.

20. TEL3: The controller shall have telephone voice communication capability including report of test data, adjustment of controller and automatic dial to six (6) telephone numbers to report alarm conditions.

21. WARRANTY: The controller shall be covered by a standard manufacturer warranty of five (5) years. Special extensions of more limited warranties shall not be considered acceptable. All sensors will be covered by a standard one (1) year warranty. Other parts shall be covered by their own manufacturer's warranty. The controller shall not require a service technician for annual calibration, seasonal start up, or whenever chemicals supplier or type are changed.

22. The manufacturer shall supply a complete instruction, operating and maintenance manual. Check-out of installation, start up, and instruction of operating personnel shall be performed by an authorized and properly trained manufacturer representative.

2.4 CHEMICAL SUPPLY TUBING REPLACEMENT

A. Chemical Supply tubing and connections (Add Alternate #5): shall be ½” poly tubing with all necessary connections and valves which shall be supplied and installed by the Contractor. Tubing shall be routed through new chemical conduit to eliminate loose / hanging tubing.

B. Chemical supply tube conduits (Add Alternate #5): shall be 1 ½” schedule 40 PVC (see specification section 131451) and shall be supplied and installed by the Contractor such that the chemical supply tubing will be concealed but function correctly. Contractor shall supply and install conduit wall mounted brackets to mount against room walls.

PART 3 - EXECUTION

3.1 EXISTING CONDITIONS, INSPECTION AND PREPARATION

A. Verify that all work by others related to this Section is installed. This includes but is not limited to all earthwork, concrete foundations, and mechanical/electrical connections.

B. Prior to starting work, notify the Construction Manager of defects requiring correction. Do not begin work until conditions are satisfactory.

C. Protect other materials and installed work against damage caused by completing work in this section.

D. Pool Contractor shall provide the necessary training (ie: Chemical Controller) to the City for all equipment specified. Contractor shall also provide a detailed operation and maintenance manual prior to commissioning.

END OF SECTION

SECTION 131459 – SWIMMING POOL START-UP AND OPERATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. This Section includes general administrative and procedural requirements for all work. The administrative and procedural requirements included in this Section are to expand the requirements specified in Division 01.

1.2 SUMMARY

A. Work Included: Provide start-up and operation of pools to City at beginning of summer season and properly balance pool chemistry upon start-up.

1.3 RELATED SECTIONS

A. Division 13: Special Construction

1.4 REFERENCES

A. NCDOH Swimming Pool Code

1.5 QUALITY ASSURANCE

A. If necessary, Contractor shall retain a qualified chemistry consultant, familiar with operation and maintenance of aquatic facilities, to supervise and properly balance pool chemistry.

B. Demonstrate to City Parks Department and appropriate officials that gutter systems are fully operational and that calcium hardness, chlorine residual, and pH levels are within specified limits.

C. Standards: The following swimming pool water standards are recommended for implementation (or as required by the Pool finish manufacturer):
1. Calcium Hardness: 250 to 300 ppm
2. Total Alkalinity: 100 ppm
3. Chlorine Residual: 1.00 – 3.00 ppm
4. pH Factor: 7.2 – 7.6
5. Langelier Saturation Index: -0.3 - +0.3

D. All work of this section shall be performed by the Contractor or Sub-Contractor.

PART 2 - EXECUTION

2.1 POOL EQUIPMENT ACTIVATION

A. All recirculation, water chemistry and filtration equipment shall be fully operational upon filling of pool after finishing surfaces are applied. Chemicals and other related support items as supplied by the Contractor or Sub-Contractor shall be in ample supply at start-up.

2.2 POOL FILL WATER QUALITY

A. The Contractor shall bear the cost of the water required for one (1) complete filling of the pool. Additional fillings, or partial fillings (more than 25%) of the pool, shall be by the City at their expense.

B. The Contractor shall provide the necessary chemicals to adjust and balance the water chemistry in the pools based on the aforementioned standards listed in section 1.5.

2.3 SYSTEM TRAINING

A. A qualified representative of the Swimming Pool Contractor (or sub-Contractor) performing work under this Section shall put the equipment into operation and provide detailed instruction to Rocky Mount Parks Department in the operation of this equipment to their satisfaction immediately after project substantial completion.

B. Training periods shall be coordinated with the Director's Representative to provide the necessary system training to City personnel. A mutually agreed upon time and date shall be established at construction substantial completion. A total of 16 hours of on-site training shall be provided by the Contractor which shall be scheduled as follows:

1. 4 hours initial training at completion of project's construction.
2. 4 hours after City staff has experience with operating the systems. This time may be requested any time after the pool has been placed in operation within a period of one (1) year from the time the pool was accepted by City (performed in one trip).
3. Prior to leaving the job, the Contractor shall obtain written certification from the Director's Representative acknowledging that the instruction period has been completed and all necessary operating information has been provided.

C. All training sessions will be coordinated by the Contractor through the Director's Representative to train City personnel on all newly installed systems and equipment. Contractor shall conduct and provide Video recording of all training sessions to the Owner.

2.4 WINTERIZATION

A. Contractor or Sub-Contractor shall properly train City personnel in the winterization procedures for all pools' newly installed equipment and new pool finishes at the end of construction.

END OF SECTION

SECTION 131475 - SWIMMING POOL MISCELLANEOUS MATERIALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. This Section includes general administrative and procedural requirements for all work. The administrative and procedural requirements included in this Section are to expand the requirements specified in Division 01.

1.2 SUMMARY

A. Work Included: Provide labor, materials, and equipment as required to install miscellaneous materials as specified and noted on the drawings.

B. Work included in this section will be included in both the Base Bid and Add Alternate #5.

1.3 RELATED SECTIONS

A. Division 02: Existing Conditions

B. Division 03: Concrete

C. Division 13: Special Construction

1.4 REFERENCES

A. NCDOH Swimming Pool Code.

B. NEC Article 680

1.5 QUALITY ASSURANCE

A. All work of this section shall be performed by either the Swimming Pool Contractor or General Contractor under the General Construction contract.

1.6 SUBMITTALS

A. Provide submittals in accordance with the requirements of the General Requirements of Division 01.

B. Provide all shop drawings and catalog data for a complete submittal.

1. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and design calculations for, but not limited to, the following:
   a. Metal pipe framing systems
   b. Pipe stands, supports, and bracing

2. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the “Quality Assurance” Article.

1.7 PRODUCT HANDLING

A. Delivery: Deliver all materials to the project site in the manufacturer's original unopened containers with all labels intact and legible.

B. Storage: Store all materials under cover in a manner to prevent damage and contamination and store only the specified materials at the project site.

C. Protection: Use all means necessary to protect piping materials before, during, and after installation and to protect the installed work of other trades.

D. Replacement: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Director's Representative and at no additional cost to the City.

1.8 COORDINATION

A. The Contractor must establish with other Sub-Contractors, having related work in this Section that all work necessary to complete the improvements as shown on the drawings and in the specifications is included in the Base Bid and Add Alternate #5 to the City.

B. If in doubt regarding the responsibility for work covered in the Section and/or discovery of errors or omissions in the bidding documents, the Contractor shall notify the Director's Representative through channels established by the specifications and request a clarification ten (10) days prior to the bid date.

1.9 WARRANTIES

A. In accordance with the General Requirements of Division 01.

1.10 EXTRA MATERIALS

A. No extra materials required for this Section.

1.11 DELEGATED DESIGN (PIPE SUPPORTS)

A. Delegated Design: Contractor shall design all swimming pool pipe supports, including comprehensive engineering analysis signed and sealed by a qualified professional engineer registered in the State of North Carolina, based on system specific criteria such as pipe systems weight and hydraulic conditions.

B. Structural Performance: All supports for swimming pool piping shall be designed to fully withstand the effects of gravity loads, stresses, thrust forces, etc., including the combined operating weight of supported equipment and connected systems and components. A safety factor of 2.5 shall be utilized in design calculations.

C. Shop Drawings: As per section 1.6 Submittals.

PART 2 - PRODUCTS

2.1 BASE BID MISCELLANEOUS MATERIALS

A. BACKWASH PIT GRATING

1. The existing backwash pit grating shall be removed and replaced with new. New grating shall be supplied by McNichols or approved equal.

2. Grating Size: 3'-3" long x 3'-3" wide x 1 ¼" deep (Contractor shall verify actual grate size in the field.)

3. McNichols Bar Grating brings safety, strength, durability and character when installed in either industrial or architectural applications. It regularly appears on catwalks, factory floors, platforms, railing infill panels and as Stair Treads. A series of bearing bars is welded, swage-locked or press-locked together with perpendicular crossbars to form the panels. Bar Grating is a rugged, high-performance, low-maintenance and slip-resistant product capable of handling pedestrian or vehicular loads. Common material types include Aluminum, Carbon Steel, Powder Coated Carbon Steel, Galvanized Steel and Stainless Steel. We also supply a hexagonally clinched product referred to as HEXMESH™ which is commonly used as a liner in concrete structural shapes to help prevent cracking. If your application requires ADA compliant Grating, CLOSE MESH (close space Grating) options are available in welded and press-locked construction types. Swage-Locked Aluminum SAFE-T-GRID® TB-940 Bar Grating is also a great ADA compliant choice. McNichols has the nation's largest selection of Bar Grating and is certain to have what you need for your application.

4. Qty. (1) required.

B. PORTABLE EYEWASH ADDITION

1. Safety Eye Wash Station: (Qty. 1) shall be manufactured by Haws Corporation (or approved equal). Model #7501, Portable gravity operated eyewash features a 9-gallon capacity, FDA high density green polyethylene tank that provides full pattern flushing at 0.4 gpm for a full 15 minutes. Model supplied with wall bracket (unit must be wall hung) and eyewash preservation to permit storage of water for up to six months. Measurements: 14 ½" high, 22" wide, and 10 1/8" deep.

C. CHEMICAL SAFETY SIGNAGE

1. Sodium Hypochlorite Chemical Safety Sign: (Qty. 3) shall be provided and installed by Contractor. The NFPA 704 diamond system is intended to provide basic information to firefighting, emergency and other personnel. This standard provides a readily recognized, easily understood system for identifying specific hazards and their severity using spatial, visual, and numerical methods to describe in simple terms the relative hazards of a material. These placards act as an immediate warning system for emergency service personnel, addressing health, flammability, instability, and special hazards that may be present, acute exposures that are most likely to occur as a result of fire, spill, or similar emergencies. Signs shall be in locations approved by the authority having jurisdiction and as a minimum must be posted at each access to a room or area where the chemical is used and/or stored.

2. Muriatic Acid Chemical Safety Sign: (Qty. 3) shall be provided and installed by Contractor. The NFPA 704 diamond system is intended to provide basic information to firefighting, emergency and other personnel. This standard provides a readily recognized, easily understood system for identifying specific hazards and their severity using spatial, visual, and numerical

methods to describe in simple terms the relative hazards of a material. These placards act as an immediate warning system for emergency service personnel, addressing health, flammability, instability, and special hazards that may be present, acute exposures that are most likely to occur as a result of fire, spill, or similar emergencies. Signs shall be in locations approved by the authority having jurisdiction and as a minimum must be posted at each access to a room or area where the chemical is used and/or stored.

D. POOL SIGNAGE

1. No Diving Sign: (Qty. 8) shall be provided and installed by Contractor. Signage shall be provided by Recreonics Inc, Lincoln Aquatics, or approved equal. Signs shall be installed around the pool deck along the fence as required by the Owner.

2. No Running Sign: (Qty. 8) shall be provided and installed by Contractor. Signage shall be provided by Recreonics Inc, Lincoln Aquatics, or approved equal. Signs shall be installed around the pool deck along the fence as required by the Owner.

3. Warning Shallow Water - No Diving: Qty. (10) shall be provided and installed by Contractor. Signage shall be provided by Recreonics Inc, Lincoln Aquatics, or approved equal. Signs shall be installed around the pool deck along the fence as required by the Owner.

2.2 ADD ALTERNATE #5 MISCELLANEOUS MATERIALS

A. PIPE SUPPORTS

1. Swimming pool piping shall be rigidly supported by means of stainless-steel assemblies properly selected and sized for the application in accordance with the manufacturer's recommendations and specifications. Approved manufacturer shall be Unistrut or approved equal.

2. Do not hang or support pipe from ceilings and/or ductwork.

3. Pipe Sizes: Install floor mounted supports as per the pipe diameters in the project documents.

4. Anchors: Each floor base shall be provided with (4) ½" diameter holes for anchoring. Use 3/8" x 2 ½" stainless steel lag bolts with lead expansion shields (or approved equal) for mounting to concrete floor.

5. Load Distribution: Install support so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.

6. Pipe Slopes: Install supports to provide indicated pipe slopes and so that maximum pipe deflections allowed by ASME B31.9 "Building Services Piping" is not exceeded.

7. Quantity: (8)

PART 3 - EXECUTION

3.1 EXISTING CONDITIONS, INSPECTION AND PREPARATION

A. Verify that all work by others related to this Section is installed. This includes but is not limited to concrete foundations, building structures, swimming pool piping systems, and mechanical and electrical systems.

B. Prior to starting work, notify the Construction Manager of defects requiring correction. Do not begin work until conditions are satisfactory.

C. Protect other materials and installed work against damage caused by completing work in this section.

3.2 METAL SUPPORT FABRICATION

A. Per support manufacturer's instructions, cut, drill, and fit miscellaneous metal fabrications for swimming pool pipe supports. Install and align fabricated supports in locations as per delegated design calculations.

B. Install supports to avoid all sharp edges and corners to prevent potential injury. If necessary, review all proposed pipe support installation locations with Director's Representative.

C. Field Welding: If field welding is required, comply with AWS D1.1 procedure for manual shielded metal-arc welding, appearance and quality of welds, methods used in correcting welding work, and the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. Finish welds at exposed connections so that no roughness shows after finishing, and so that contours of welded surfaces match adjacent contours.

3.3 ADJUSTING

A. Pipe Support Adjustment: If necessary, adjust supports to distribute loads equally on attachments and to achieve indicated slope of pipe.

END OF SECTION

SECTION 132190 – SWIMMING POOL WATERSLIDE

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. This Section includes general administrative and procedural requirements for all work. The administrative and procedural requirements included in this Section are to expand the requirements specified in Division 01.

1.2 SUMMARY

A. This section applies to the Swimming Pool.

B. Work Included: Provide labor, materials, and equipment as required to install a Swimming Pool waterslide as specified and noted in the project documents.

C. Work included in this section will be included in the Base Bid.

1.3 RELATED SECTIONS

A. Division 13: Special Construction

B. Division 22: Plumbing

C. Division 26: Electrical

1.4 REFERENCES

A. NCDOH Swimming Pool Code

B. NSF 50- National Sanitation Foundation

C. NEC 680

1.5 QUALITY ASSURANCE

A. All work of this section shall be performed by the Swimming Pool Contractor or Sub-Contractor under the General Construction contract.

B. Manufacturer Qualifications:
   1. The company specializing in manufacturing products specified in this section with not less than 20 years of documented experience.

C. Installer Qualifications:
   1. The company specializing in performing the work of this section with minimum 5 years of experience and must meet all Workers Compensation Insurance requirements.

1.6 SUBMITTALS

A. Provide submittals in accordance with the requirements of the General Requirements of Division 01.

B. Provide all shop drawings, product data, and waterslide systems & equipment for a complete submittal.

C. Substitutions: Include with request specified item, design, catalog number(s), and finish for each item on which approval is being requested ten (10) days prior to bid opening. Blanket approval by manufacturer's name only will not be given. Substitutions may not be granted after the ten-day period or after the project bid.

1.7 PRODUCT HANDLING

A. Delivery: Deliver all materials to the project site in the manufacturer's original unopened containers with all labels intact and legible.

B. Storage: Store all materials under cover in a manner to prevent damage and contamination and store only the specified materials at the project site.

C. Protection: Use all means necessary to protect equipment before, during, and after installation and to protect the installed work of other trades.

D. Replacement: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Director's Representative and at no additional cost to the City.

1.8 COORDINATION

A. Coordinate with other Contractors all work relating to this Section.

B. The Swimming Pool Contractor must establish with other Sub-Contractors, having related work in this Section that all work necessary to complete all work as shown on the drawings and in the specifications is included in the Base Bid to the City.

C. If in doubt regarding the responsibility for work covered in the Section and/or discovery of errors or omissions in the bidding documents, the Swimming Pool Contractor shall notify the Director's Representative through channels established by the specifications and request a clarification five (5) days prior to the bid date.

1.9 WARRANTIES

A. In accordance with the General Requirements of Division 01.

1.10 EXTRA MATERIALS

A. No extra materials required for this Section.

PART 2 – PRODUCTS

2.1 BASIS OF DESIGN

A. The slide manufacturer basis of design is Natural Structures. The following company has been pre-approved for this project:
   1. Natural Structures.
   2. Or pre-approved equal.

2.2 WATERSLIDE

A. Pool Slide Water Slide
   1. Model 0083
   2. Description: Double 24" O.D. flume slide, one with a 90° elbow.
   3. Centerline Run: 12' 8" & 16' 3"
   4. Entry Height: 7' 0"
   5. Platform Size: 4' x 4'
   6. Space Requirements: 13' 5" x 14’ 2”– Space requirements may vary with options chosen.
   7. 24" Outside diameter polyethylene flumes
   8. 14-20 gpm water flow (each flume) recommended; 8 to 40 gpm required.
   9. Splash down dimension: 17' 2" x 20' 0"
   10. Minimum water depth: 4'

B. Slide Features:
   1. Designed for 2' minimum or deeper water
   2. 24" Outside Diameter or 30" Inside Diameter flumes for children & adults
   3. Flume: color impregnated UV stabilized
   4. Deck: Aqua-Plast coated textured aluminum surface
   5. Stairs: 8" rise, 8" tread, 24" wide.
   6. Aqua-Plast coated textured aluminum surface.
   7. Multiple stair locations and configurations
   8. Low maintenance
   9. Sweeping 7' - 3" radius curves for safety and comfort for 30" flumes
   10. Stainless steel base plates, hardware and anchor bolts
   11. Designed with flexibility to allow for sloping pool decks
   12. Designs for your unique application & budget requirements
   13. Single, double or triple flumes
   14. USA made

C. Options to be Included in Bid:
   1. Deluxe Series: Complete package is stainless steel polyester powder coated except the stair treads and deck which are textured Aqua-Plast coated aluminum.
   2. Stairs shall be 7" rise, 11" tread, 36" wide; textured aluminum; closed risers with inner handrails.
   3. Tower Roof: Polyethylene plastic
   4. Factory Installation or On-site Technical Assistance (or by an approved Contractor).

PART 3 – EXECUTION

3.1 SURFACE CONDITIONS

A. Inspection:
   1. Prior to installation of the work of this section, the slide manufacturer or manufacturer-certified installation company will carefully inspect the installed work of other trades and verify that all such work is complete to the point where this installation may properly commence.
   2. They will also verify that the slide and structural support systems are fabricated and erected in strict accordance with original design.

B. Discrepancies:

1. In the event of discrepancy, will immediately notify the Engineer.
2. They will not proceed with fabrication or installation in areas of discrepancy until all such discrepancies are fully resolved.

3.2 FABRICATION

A. Fabrication of all waterslides and structural support systems will be in strict accordance with shop drawings and referenced standards.

B. Use of dissimilar metals in contact shall not be permitted.

3.3 INSTALLATION OF FOOTINGS AND FOUNDATIONS

A. Foundations shall be constructed and installed by the Contractor in strict accordance with the Shop Drawings. All supplies, labor, and installation will be the sole responsibility of the contractor and not the responsibility of the slide manufacturer. Install footings and foundations in accordance with manufacturer's structural drawings and instructions.

3.4 INSTALLATION & SUPPLY OF WATER SUPPLY

A. Contractor shall reinstall the existing potable water supply to slide flumes.

3.5 ERECTION

A. General: Erect all waterslide and structural support systems in strict accordance with the shop drawings and all pertinent regulations and standards.

B. Tolerance: Align all structural steel straight, plumb, and level.

C. Joints: All flange-to-flange connections shall be made utilizing the waterproof caulking and custom triple layer gasketing system supplied by the fiberglass manufacturer and shall be joined in such a way as to provide for a safe and matless ride. All joints shall be aligned for a completely smooth riding surface, that is, alignment must be within 1/16" and in no case shall the downstream side of the joint above the upstream side of the joint.

3.6 CLEANUP

A. Upon completion of the work of this section, immediately remove all debris and rubbish occasioned by this work to the approval of the owner and at no additional cost to the Owner.

3.7 OWNER INSTRUCTION

A. Installer shall train City's personnel in the operation and maintenance of the waterslide at the job site during pool start-up.

END OF SECTION

SECTION 107113 - SHADE STRUCTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. This Section includes general administrative and procedural requirements for all work. The administrative and procedural requirements included in this Section are to expand the requirements specified in Division 01.

1.2 SUMMARY

A. This section applies to the three (3) outdoor shade structures located in the site plan on sheet SP-101.

B. The Contractor shall furnish and install the following Shade Structure repairs / replacement as follows:

1. Base Bid Scope: Shade structures are to remain but will undergo the following repairs:
   a. Bead blast and strip existing paint on all shade structure metal columns and supports. Paint all metallic columns and supports.
   b. Replace existing shade structure fabric with new.

2. Add Alternate #4 Scope: Remove and discard existing shade structures and replace with new with same quantities, sizes and in same locations.

1.3 RELATED SECTIONS

A. Division 02: Existing Conditions

B. Division 03: Concrete

C. Division 13: Special Construction

D. Division 26: Electrical

1.4 PERFORMANCE REQUIREMENTS

A. Shade structures must be designed to resist wind loads listed within the project plans.

1.5 QUALITY ASSURANCE

A. All work of this section shall be performed by the Contractor or Sub-contractor as it relates to the specific scope of work.

B. Installer Qualifications: Engage an experienced Installer who has completed shade structure applications similar in material, design, and extent to that indicated for project, which have resulted in construction with a record of successful in-service performance.

1.6 SUBMITTALS

A. Provide submittals in accordance with the requirements of the General Requirements of Division 01.

B. Product data from manufacturers for each shade structure required. Include detailed design drawing and all loading calculations.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation.

B. Store and handle materials in compliance with manufacturer's recommendations to prevent damage.

1.8 SEQUENCING, SCHEDULING & COORDINATION

A. Coordinate with other Contractors all work relating to this Section.

B. The Contractor must establish with other Sub-Contractors, having related work in this Section that all work necessary to complete the shade improvements as shown on the drawings and in the specifications is included in the Base Bid or Add Alternate #4 to the City.

C. If in doubt regarding the responsibility for work covered in the Section and/or discovery of errors or omissions in the bidding documents, the Contractor shall notify the Director's Representative through channels established by the specifications and request a clarification ten (10) days prior to the bid date.

1.9 WARRANTIES

A. In accordance with the General Requirements of Division 01.

1.10 EXTRA MATERIALS

A. No extra materials required for this Section.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Existing Shade Structure manufacturer is Sun Ports International, Inc. (phone: 800-966-5005). Replacement fabric shades listed within the Base Bid shall be received from OEM.

B. New Shade Structure manufacturer shall be USA Shade & Fabric Structures Inc and distributed by World Playgrounds , Inc. or approved equal.

2.2 SIZES

A. Shade Structures shall be as follows:
   1. Qty. (2) square shade structures are 12' long x 12' wide x 8' high.
   2. Qty. (1) square shade structure is 24' long x 24' wide x 8' high.

2.3 MATERIALS, GENERAL

A. All structures shall be designed and fabricated to the IBC (Latest Edition) or current local building code with standard load designs of the greater value of 20# per S.F. minimum live load and 90 mph sustained wind load or site-specific conditions and the applicable zone for seismic loads.

B. All members shall be designed according to the "American Institute of Steel Construction (AISC) specifications and the American Iron and Steel Institute (AISI) specifications for cold-formed members.

C. All fabrication welds shall be in strict accordance with the structural welding code of the American Welding Society (AWS) specifications. All structural welds shall be in compliance with the requirements of "Pre-qualified" welded joints. All welding shall conform to ASTM A-233 series E-70XX electrodes - low hydrogen. Field welding shall not be required.

D. When required, after award of bid, the shade structure manufacturer shall submit structural calculations, sealed by a registered engineer in the state in which the structure is to be erected for review and approval by the approving agency.

E. Manufacturer qualifications: All manufacturers shall have a minimum of (20) twenty years' experience in the fabrication of tubular steel shade structures. Shade structure and kiosk fabrication shall be the manufacturer's primary business. Manufacturer shall have fabricated similar structures to that which is specified. All non-specified manufacturers shall submit complete shop drawings indicating type, size & gauge of material used, with detailed connections to the specifying agency or design firm at least 10 days prior to bid opening for review and written pre-approval.

2.4 ANCHORING, FOOTINGS & FOUNDATIONS

A. Shade structure anchoring methods, footings and foundations shall be a delegated design by the Contractor and/or Shade Structure manufacturer. Foundation design shall be completed by a licensed Structural P.E. in the State of which the system is to be installed. All necessary structure anchoring materials and labor to install shall be supplied by the Contractor and/or Shade Structure manufacturer. Anchoring materials and methods shall be formally submitted during the shop drawing review process for record.

2.5 FRAME MEMBERS AND COMPRESSION RING

A. Only American (domestic) made steel shall be used in the construction of this shelter. Mill certification shall be made available upon request. All frame members shall be one-piece hollow steel shape (HSS) tube with a minimum 11-gauge wall thickness, sized according to engineering. All frame members shall be bolted together with bolts totally concealed. Compression rings shall be fabricated from hollow steel shape tube, or flat plate steel and shall have all connections concealed from view. All tubing for frame members shall be ASTM 500 grade B. Beam end plates shall be ASTM A36 fy=36,000 psi UNO. Bolts shall be A 325's unless noted otherwise in the structural engineering calculations. "I" beams, Angle iron, "C", "Z" or "S" purlins or beams, open or closed, shall not be allowed.

2.6 ROOFING / FABRIC

A. High strength shade fabric shall used with any replacement of this component.

2.7 PAINT

A. All frame members shall be media blasted to a white finish removing all rust, scale, oil and grease. Powdercoat all frame members with zinc rich primer, (min. 2.5-3 mil) and TGIC polyester, (min. 2.5-3 mil for a total minimum thickness of 5-6 mils. Finish shall be a smooth uniform surface with no pits, runs or sags.

B. Apply (2) coats of finish paint (color to be selected by City) of Tnemec paint or equal.

PART 3 - EXECUTION

3.1 ERECTION

A. Manufacturer shall supply complete layout and detail plans with installation instructions for the structure. The structure shall be erected in a work-man-like manner with framing, roofing and trim installed according to the manufacturer's installation instructions. Care shall be taken to avoid damaging the structure during installation. Touch up powder coat paint with paint provided to prevent rusting. Components of the structure shall be covered and kept dry prior to erection.

3.2 PROTECTION

A. Protect completed shade structures from all construction work following erection. If, despite such protection, damage occurs, remove damaged area(s) immediately so that the installation of repaired areas is indistinguishable from original work (at Contractor's expense).

END OF SECTION

SECTION 132190 – SWIMMING POOL WATERSLIDE

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. This Section includes general administrative and procedural requirements for all work. The administrative and procedural requirements included in this Section are to expand the requirements specified in Division 01.

1.2 SUMMARY

A. This section applies to the Swimming Pool.

B. Work Included: Provide labor, materials, and equipment as required to install a Swimming Pool waterslide as specified and noted in the project documents.

C. Work included in this section will be included in the Base Bid.

1.3 RELATED SECTIONS

A. Division 13: Special Construction

B. Division 22: Plumbing

C. Division 26: Electrical

1.4 REFERENCES

A. NCDOH Swimming Pool Code

B. NSF 50- National Sanitation Foundation

C. NEC 680

1.5 QUALITY ASSURANCE

A. All work of this section shall be performed by the Swimming Pool Contractor or Sub-Contractor under the General Construction contract.

B. Manufacturer Qualifications:
   1. The company specializing in manufacturing products specified in this section with not less than 20 years of documented experience.

C. Installer Qualifications:
   1. The company specializing in performing the work of this section with minimum 5 years of experience and must meet all Workers Compensation Insurance requirements.

1.6 SUBMITTALS

A. Provide submittals in accordance with the requirements of the General Requirements of Division 01.

B. Provide all shop drawings, product data, and waterslide systems & equipment for a complete submittal.

C. Substitutions: Include with request specified item, design, catalog number(s), and finish for each item on which approval is being requested ten (10) days prior to bid opening. Blanket approval by manufacturer's name only will not be given. Substitutions may not be granted after the ten-day period or after the project bid.

1.7 PRODUCT HANDLING

A. Delivery: Deliver all materials to the project site in the manufacturer's original unopened containers with all labels intact and legible.

B. Storage: Store all materials under cover in a manner to prevent damage and contamination and store only the specified materials at the project site.

C. Protection: Use all means necessary to protect equipment before, during, and after installation and to protect the installed work of other trades.

D. Replacement: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Director's Representative and at no additional cost to the City.

1.8 COORDINATION

A. Coordinate with other Contractors all work relating to this Section.

B. The Swimming Pool Contractor must establish with other Sub-Contractors, having related work in this Section that all work necessary to complete all work as shown on the drawings and in the specifications is included in the Base Bid to the City.

C. If in doubt regarding the responsibility for work covered in the Section and/or discovery of errors or omissions in the bidding documents, the Swimming Pool Contractor shall notify the Director's Representative through channels established by the specifications and request a clarification five (5) days prior to the bid date.

1.9 WARRANTIES

A. In accordance with the General Requirements of Division 01.

1.10 EXTRA MATERIALS

A. No extra materials required for this Section.

PART 2 – PRODUCTS

2.1 BASIS OF DESIGN

A. The slide manufacturer basis of design is Natural Structures. The following company has been pre-approved for this project:
   1. Natural Structures.
   2. Or pre-approved equal.

2.2 WATERSLIDE

A. Pool Slide Water Slide
   1. Model 0083
   2. Description: Double 24" O.D. flume slide, one with a 90° elbow.
   3. Centerline Run: 12' 8" & 16' 3"
   4. Entry Height: 7' 0"
   5. Platform Size: 4' x 4'
   6. Space Requirements: 13' 5" x 14’ 2”– Space requirements may vary with options chosen.
   7. 24" Outside diameter polyethylene flumes
   8. 14-20 gpm water flow (each flume) recommended; 8 to 40 gpm required.
   9. Splash down dimension: 17' 2" x 20' 0"
   10. Minimum water depth: 4'

B. Slide Features:
   1. Designed for 2' minimum or deeper water
   2. 24" Outside Diameter or 30" Inside Diameter flumes for children & adults
   3. Flume: color impregnated UV stabilized
   4. Deck: Aqua-Plast coated textured aluminum surface
   5. Stairs: 8" rise, 8" tread, 24" wide.
   6. Aqua-Plast coated textured aluminum surface.
   7. Multiple stair locations and configurations
   8. Low maintenance
   9. Sweeping 7' - 3" radius curves for safety and comfort for 30" flumes
   10. Stainless steel base plates, hardware and anchor bolts
   11. Designed with flexibility to allow for sloping pool decks
   12. Designs for your unique application & budget requirements
   13. Single, double or triple flumes
   14. USA made

C. Options to be Included in Bid:
   1. Deluxe Series: Complete package is stainless steel polyester powder coated except the stair treads and deck which are textured Aqua-Plast coated aluminum.
   2. Stairs shall be 7" rise, 11" tread, 36" wide; textured aluminum; closed risers with inner handrails.
   3. Tower Roof: Polyethylene plastic
   4. Factory Installation or On-site Technical Assistance (or by an approved Contractor).

PART 3 – EXECUTION

3.1 SURFACE CONDITIONS

A. Inspection:
   1. Prior to installation of the work of this section, the slide manufacturer or manufacturer-certified installation company will carefully inspect the installed work of other trades and verify that all such work is complete to the point where this installation may properly commence.
   2. They will also verify that the slide and structural support systems are fabricated and erected in strict accordance with original design.

B. Discrepancies:

1. In the event of discrepancy, will immediately notify the Engineer.
2. They will not proceed with fabrication or installation in areas of discrepancy until all such discrepancies are fully resolved.

3.2 FABRICATION

A. Fabrication of all waterslides and structural support systems will be in strict accordance with shop drawings and referenced standards.

B. Use of dissimilar metals in contact shall not be permitted.

3.3 INSTALLATION OF FOOTINGS AND FOUNDATIONS

A. Foundations shall be constructed and installed by the Contractor in strict accordance with the Shop Drawings. All supplies, labor, and installation will be the sole responsibility of the contractor and not the responsibility of the slide manufacturer. Install footings and foundations in accordance with manufacturer's structural drawings and instructions.

3.4 INSTALLATION & SUPPLY OF WATER SUPPLY

A. Contractor shall reinstall the existing potable water supply to slide flumes.

3.5 ERECTION

A. General: Erect all waterslide and structural support systems in strict accordance with the shop drawings and all pertinent regulations and standards.

B. Tolerance: Align all structural steel straight, plumb, and level.

C. Joints: All flange-to-flange connections shall be made utilizing the waterproof caulking and custom triple layer gasketing system supplied by the fiberglass manufacturer and shall be joined in such a way as to provide for a safe and matless ride. All joints shall be aligned for a completely smooth riding surface, that is, alignment must be within 1/16" and in no case shall the downstream side of the joint above the upstream side of the joint.

3.6 CLEANUP

A. Upon completion of the work of this section, immediately remove all debris and rubbish occasioned by this work to the approval of the owner and at no additional cost to the Owner.

3.7 OWNER INSTRUCTION

A. Installer shall train City's personnel in the operation and maintenance of the waterslide at the job site during pool start-up.

END OF SECTION

SECTION 220000 – GENERAL REQUIREMENTS FOR PLUMBING SYSTEMS

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes general administrative and procedural requirements for all work. The administrative and procedural requirements included in this Section are to expand the requirements specified in Division 1.

1.2 SCOPE OF WORK

A. Provide all labor, material, equipment, and services necessary for and incidental to completion of all work as indicated on the Drawings and/or as specified herein. This includes all incidentals, equipment, appliances, services, hoisting, scaffolding, supports, sleeves, inserts, anchor bolts, tools, supervision, labor, consumable items, fees, licenses, etc., necessary to provide complete and workable systems.

1.3 DRAWING USE AND INTERPRETATION

A. Unless indicated by specific dimensions, drawings are meant to be diagrammatic. Exact equipment locations and routing of utilities shall be governed by field conditions and/or Owner's Representative's instructions.

B. All dimensions which relate to the building shall be taken as construction progresses. All errors incurred as result of the failure to check or verify dimensions, measurements, etc., shall be corrected.

C. The drawings show the general arrangement of utilities, equipment, and accessories. Drawings do not indicate all offsets, fittings, accessories, and changes in elevation, which may be necessary. Make all changes in equipment, locations, etc., to accommodate the work and to avoid obstacles at no increase in contract price. Provide offsets, fittings, and accessories as may be required to meet such conditions.

1.4 SPECIFICATION FORMAT AND CONTENT EXPLANATION

A. Specification Content: This Specification uses certain conventions regarding the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explained as follows:

1. Abbreviated Language: Language used in Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be interpolated as the sense requires. Singular words will be interpreted as plural and plural words interpreted as singular where applicable as the context of the Contract Documents indicates.
2. Streamlined Language: The Specifications generally use the imperative mood and streamlined language. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the Text, subjective language is used for clarity to describe responsibilities that must be fulfilled indirectly by the Contractor or by others when so noted.
   a. The words "shall be" are implied where a colon (:) is used within a sentence or phrase.

1.5 DEFINITIONS

A. General: Basic Contract definitions are included in the conditions of the Contract.

B. Indicated: The term "indicated" refers to graphic representations, notes or schedules on the Drawings, or other Paragraphs or Schedules in the Specifications, and similar requirements in the Contract Documents. Where terms such as "shown," "noted," "scheduled," and "specified" are used, it is to help the reader locate the reference; no limitation on location is intended.

C. Directed: Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean "directed by the Engineer," "requested by the Engineer," and similar phrases.

D. Approved: The term "approved," where used in conjunction with the Engineer's action on the Contractor's submittals, applications, and requests, is limited to the Engineer's duties and responsibilities as stated in the Conditions of the Contract.

E. Regulations: The term "Regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

F. Furnish: The term "furnish" is used to mean "supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations."

G. Install: The term "install" is used to describe operations at project site including the actual "unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations."

H. Provide: The term "provide" means "to furnish and install, complete and ready for the intended use."

I. Installer: An "installer" is the Contractor or an entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier for performance of a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.
   1. The term "experienced," when used with the term "installer," means having a minimum of five previous projects similar in size and scope to this Project, being familiar with the special requirements indicated, and having complied with requirements of the authority having jurisdiction.
   2. Trades: Use of titles such as "carpentry" is not intended to imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to trades persons of the corresponding generic name.
   3. Assignment of Specialists: Certain Sections of the Specifications require that specific construction activities shall be performed by specialists who are recognized experts in the operations to be performed. The specialists must be engaged for those activities, and assignments are requirements over which the Contractor has no choice or option. Nevertheless, the ultimate responsibility of fulfilling Contract requirement remains with the Contractor.
      a. This requirement shall not be interpreted to conflict with enforcement of building codes and similar regulations governing the Work. It is also not intended to interfere with local trade union jurisdictional settlements and similar conventions.

J. The term "concealed": embedded in masonry or other construction, installed behind wall furring, within partitions or hung ceilings (permanent or removable), in trenches, or in crawl spaces.

K. The term "exposed": not installed underground or concealed. Equipment in rooms with exposed construction (i.e., mechanical rooms, electrical rooms, janitor's closets, etc.) are classified as exposed.

L. The term "piping": piping fittings, flanges, valves, controls, hangers, traps, drains, insulation and items necessary or required in connection with or relating thereto.

M. The "Project Site" is the space available to the contractor for performance of construction activities, either exclusively or in conjunction with other performing other work as part of the Project.

N. Testing Laboratories: A "testing laboratory" is an independent entity engaged to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1.6 COMPLETE SYSTEMS

A. General: Provide all materials as required for complete systems, including all parts obviously or reasonably incidental to a complete installation, whether specifically indicated or not. All systems shall be completely assembled, tested, adjusted and demonstrated to be ready for operation prior to Owner's acceptance.

B. Systems: The systems specified and/or shown on the Drawings are for complete and workable systems. Any deviation from these systems due to a particular manufacturer's requirements shall be made at no additional cost to the Owner.

1.7 CODES AND REGULATIONS

A. General: Comply with all governing federal, state, and local laws, ordinances, codes, rules, and regulations. Where the Contract Documents exceed these requirements, the Contract Documents shall govern. In no case shall work be installed contrary to or below minimum legal standards.

B. Utilities: Comply with all applicable rules, restrictions, and requirements of the utility companies serving the project site/facilities. Contractor shall be required to contact state regulated "call before you dig" service prior to any excavation work.

C. Non-Compliance: Should any work be performed which is found not to comply with any of the above codes and regulations, provide all work and pay all costs necessary to correct the deficiencies.

1.8 REFERENCE STANDARDS

A. All published standards of the following associations/organizations, as mandated by specific state standards, shall be followed and applied as a minimum:
   1. AABC, Associated Air Balance Council
   2. ACI, American Concrete Institute
   3. AGA, American Gas Assoc.
   4. AIA, The American Institute of Architects
   5. AISC, American Institute of Steel Construction
   6. ANSI, American National Standards Institute
   7. API, American Petroleum Institute
   8. ASME, American Society of Mechanical Engineers
   9. ASPE, American Society of Plumbing Engineers
   10. ASSE, American Society of Sanitary Engineering

11. ASTM, American Society for Testing and Materials
12. AWS, American Welding Society
13. AWWA, American Water Works Assoc.
14. CAGI, Compressed Air and Gas Institute
15. CGA, Compressed Gas Assoc.
16. CISPI, Cast Iron Soil Pipe Institute
17. DIPRA, Ductile Iron Pipe Research Assoc.
18. ETL, ETL SEMKO a Division of Intertek Group
19. FMG, Factory Mutual Global
20. HEI, Heat Exchange Institute
21. HI, Hydronics Institute
22. ISA, Instrument Society of America
23. MSS, Manufacturers Standardization Society
24. NACE, National Association of Corrosion Engineers International
25. NEC, National Electrical Code (from NFPA)
26. NEMA, National Electrical Manufacturers Assoc.
27. NFPA, National Fire Protection Assoc.
28. NSF, National Sanitation Foundation
29. PDI, Plumbing and Drainage Institute
30. SSPMA, Sump and Sewage Pump Manufacturers Assoc.
31. STI, Steel Tank Institute
32. SWPA, Submersible Wastewater Pump Assoc.
33. UL, Underwriters Laboratories Inc.
34. WSC, Water Systems Council

B. Federal Government Agencies: Names and titles of federal government standard- or Specification-producing agencies are often abbreviated. The following acronyms or abbreviations referenced in the Contract Documents indicate names of standard- or Specification-producing agencies of the federal government. Names are subject to change and are believed, but are not assured, to be accurate and up-to-date as of the date of the Contract Documents:
   1. CE, Corps of Engineers (U.S. Department of the Army).
   2. EPA, Environmental Protection Agency.
   3. UFC, United Facilities Criteria.
   4. MIL, Military Standardization Documents (U.S. Department of Defense).
   5. NIST, National Institute of Standards and Technology (U.S. Department of Commerce).
   6. OSHA, Occupational Safety and Health Administration (U.S. Department of Labor).

C. Applicability of Standards: Except where the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents. Such standards are made a part of the Contract Documents by reference.

D. Copies of Standards: Each entity engaged in construction on the project is required to be familiar with industry standards applicable to that entity's construction activity. Copies of applicable standards are not bound with the Contract Documents. Where copies of standards are needed for performance of a required construction activity, the contractor shall obtain copies directly from the publication source.

1.9 QUALITY ASSURANCE

A. Manufacturers' Qualifications: Not less than 5 years of experience in the actual production of the specified products.

B. Installers' Qualifications:
   1. Firm with not less than 5 years of experience in the installation of mechanical systems and equipment similar in scope and complexity to those required for this Project, and having successfully completed at least ten comparable scale projects.
   2. Painting, patching, carpentry and the like related to or required for Division 22 work shall be performed by craftsman skilled in the appropriate trade.
   3. All welding shall be performed by ASME certified welders.

1.10 INSPECTIONS

A. General: During and upon completion of the work, arrange and pay all associated costs for inspections of all work installed under this Contract in accordance with the Conditions of the Contract.

B. Inspections Required: As per the laws and regulations of the local and/or state agencies having jurisdiction at the project site.

C. Inspection Agency: Approved by the local and/or state agencies having jurisdiction at the project site.

PART 2 – PRODUCTS

2.1 GENERAL

A. Where Specified: Materials and equipment shall be as specified in subsequent sections of the Project Manual and/or as indicated on the Drawings.

B. General: All materials and equipment to be new, clean, undamaged, and free of defects and corrosion.

C. Acceptable Products: The product will be acceptable only when that product complies with all requirements of the Contract Documents as determined by the Engineer.

D. Common Items: Where more than one of any specific item is required, all shall be of the same type and manufacturer.

E. Listing: All materials and equipment shall be Underwriters' Laboratories (UL) or ETL SEMKO (ETL) listed and labeled, where UL or ETL standards and listings exist for the specified materials or equipment.

F. Special Tools: Provide all special tools needed for proper operation, adjustment and maintenance of equipment.

PART 3 – EXECUTION

3.1 GENERAL

A. The installation of all mechanical work shall be in accordance with the letter and intent of the Contract Documents, as determined by the Engineer.

B. Installation Requirements: All materials and equipment shall be installed as recommended by the respective manufacturers, by mechanics experienced and skilled in their particular trade, in a neat and workmanlike manner, in accordance with the standards of the trade, and so as not to void any warranty, UL or ETL listing.

3.2 DELIVERY STORAGE AND HANDLING

A. Packing and Shipping: Deliver products in original, unopened packaging, properly identified with manufacturer's identification, and compliance labels.

B. Storage and Protection: Comply with all manufacturer's written recommendations. Protect all equipment, materials and work from the weather elements, paint, mortar, construction debris and damage throughout duration of project.

C. Damaged Products: Do not install damaged products. Arrange for prompt replacement.

3.3 EXAMINATION

A. Conditions Verification: Examine the areas and conditions under which the work is to be performed. Identify and report any conditions detrimental to the proper and timely completion of the work to the Owner's Representative.

3.4 DIMENSIONS

A. Building Dimensions: Exact locations of building elements shall be based on Contractor's field measurements.

B. Limiting Dimensions: Where equipment dimension and clearances are indicated on the Drawings, do not provide equipment larger than equipment dimensions or clearances specified.

C. Verify all dimensions by field measurements.

3.5 ROUGH-IN

A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.

3.6 CUTTING AND PATCHING

A. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.

B. Perform cutting and patching of mechanical equipment and materials required to:
   1. Uncover Work to provide for installation of non-coordinated and/or improperly installed work.
   2. Remove and replace defective Work.
   3. Remove and replace Work not conforming to requirements of the Contract Documents.
   4. Remove samples of installed Work as specified for testing.

5. Install equipment and materials in existing structures.
6. Uncover and restore Work to provide for Engineer observation of concealed Work.

C. Cut, remove, and legally dispose of equipment, components, and materials as indicated. Removal shall include all ancillary items associated with items removed. Remove all items made obsolete by the new work.

D. Protect the structure, furnishings, finishes, and adjacent materials not indicated to be removed.

E. Provide and maintain temporary dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.

F. Patch surfaces and building components using new materials matching existing adjacent materials.

3.7 ADMINISTRATION AND SUPERVISION

A. The Contractor shall supervise the work and shall have at all times some competent person, approved by the Owner, following the work to receive instructions and to act with authority.

3.8 TESTING AND ADJUSTING

A. General: Provide testing equipment, materials, instruments, and personnel to perform all test procedures and adjustments required by other Division 22 Sections and/or deemed necessary by the Engineer to establish proper performance and installation of systems and equipment. All test instruments to be accurately calibrated and in good working order.

B. Scheduling: Schedule tests at least three days in advance, and so as to allow Engineer and Owner representative(s) to witness the test, unless directed otherwise. Do not schedule tests until the system installation is complete and fully operational, unless indicated or directed otherwise.

C. Correction/Replacement: After testing, correct any deficiencies, and replace materials and equipment shown to be defective or unable to perform at design or rated capacity. Retest without additional cost to the Owner or Contract. Submit finalization report indicating corrective measures taken, and satisfactory results of retest.

3.9 SYSTEMS DEMONSTRATION

A. Instruct the Owner's representative(s) in the start-up, operation and maintenance of all systems and equipment in accordance with the Contract Documents.

3.10 CLEANING

A. General: Remove from the project site, all waste, rubbish, and construction debris weekly unless indicated otherwise. The premises shall be left clean and free of any debris and unused construction materials, prior to final acceptance.

B. Equipment: Remove all dust, dirt, debris, mortar, rust, and other foreign materials from the interior and exterior of all equipment and enclosures and wipe down.

C. Utilities: Thoroughly clean all utilities, just prior to final inspection.

3.11 TOUCH-UP PAINTING

A. Touch-Up Painting: Restore and refinish to original condition, all surfaces of equipment scratched, marred and/or dented during shipping, handling, or installation. Remove all rust, and prime and paint as recommended by the manufacturer.

END OF SECTION

SECTION 220004 – COORDINATION WITH OTHER TRADES

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK

A. This section describes the coordination and procedural requirements for Contractors.

B. Definitions:
1. Owners Representative - Architect, Engineer, Construction Manager, General Contractor, Clerk of the works or any stipulated Agent or Representative of the Owner.
2. GC - General Contractor.
3. MC - Mechanical Contractor/Subcontractor.
4. PC - Plumbing Contractor/Subcontractor.
5. EC - Electrical Contractor/Subcontractor.
6. SM - Sheet Metal Subcontractor.

1.2 COMPLIANCE

A. Cost incurred including those of other contractors and/or Owner, due to non-compliance with this Section shall be the responsibility of the non-compliant contractor.

1.3 SUBMITTALS

A. Complete coordinated shop drawing shall be submitted in PDF format to the Engineer for their record by the MC. Submitted coordinated shop drawing shall include all signatures required by sign off procedure.

PART 2 – PRODUCTS – NOT APPLICABLE

PART 3 – EXECUTION

3.1 COORDINATION

A. General: Sequence, coordinate and integrate the installation of all materials and equipment for efficient flow of work, in conjunction with the other trades. Review and become familiar with all of the Drawings and work of all the other trades. Report and resolve any discovered discrepancies and/or interferences prior to commencing work.

B. Cooperation: Cooperate with the other Contractors and individual disciplines for placement, anchorage and accomplishment of the work.

C. Chases, Slots, and Openings: Arrange for chases, slots, and openings during the progress of construction, as required to allow for installation of the work.

D. Supports and Sleeves: Coordinate the location installation of required supporting devices and sleeves to be set in concrete and other structural components, as they are constructed.

E. Right-Of-Way:

1. Adjust location of utilities, equipment, etc., to accommodate the work to prevent interferences, both anticipated and encountered.
2. Determine the exact route and location prior to fabrication.
3. Pitched piping has the right-of-way over utilities which do not pitch.
4. Furnish and install ancillary materials and equipment including but not limited to traps, air vents, drains, etc., as required to accommodate offsets, transitions, and changes in direction.

F. Headroom: Install systems, materials, and equipment to maximize headroom unless noted otherwise.

G. Utility Connections: Coordinate connection with underground and overhead utility services. Comply with requirements of governing regulations, utility providers, and controlling agencies. Provide required connection for each service.

3.2 COORDINATED SHOP DRAWINGS

A. The coordination shop drawing process shall occur in the following manner:

1. The MC shall create 3/8-inch scale AutoCAD (2002 or newer) base plans, which shall incorporate and coordinate with structural steel and ceiling system framing supports and show framing members on the shop drawings. This shall include existing building components not shown on Contract Documents.
2. The MC shall require the Sheet Metal Subcontractor to submit AutoCAD shop drawings, as expeditiously as possible, to the Engineer (through normal channels) for review and approval. The shop drawings shall incorporate all ductwork (including top and bottom of duct elevations at a maximum interval of 25 linear feet and at each elevation change), structural steel (building and misc. support steel), equipment and accessories as shown and/or specified in the contract documents.
3. All roof penetrations, wall and floor openings shall be coordinated with the structural steel Subcontractor, Supplier and/or Erector, through the Owner's Representative. All conflicts with structural steel members shall be resolved through the Owner's Representative.
4. After review and final approval of the sheet metal shop drawing by the Engineer, the sheet metal Subcontractor shall incorporate all required corrections, additions and modifications on the AutoCAD ductwork shop drawings.
5. The approved AutoCAD ductwork shop drawings shall be utilized for coordination with all other Contractors or Subcontractors whose involvement is mandated. The SM shall submit the AutoCAD ductwork shop drawings (hard copy and electronic files) to the MC to initiate the "coordination" process. The MC shall review the drawings for accuracy and completeness prior to distribution.
6. The MC shall forward, with transmittal, the ductwork shop drawings (hard copy and electronic files) to the PC for coordination of the plumbing work. The MC shall forward a copy of the transmittal to the Owner's Representative.
7. The PC shall (upon receipt of drawings from the MC) superimpose his scope of work on the AutoCAD ductwork shop drawings illustrating all plumbing equipment, piping and hangers.
8. The PC shall include invert of pipes; elevations (top and bottom) and pipe sizes including insulation at a maximum of 25-foot intervals and at each elevation change.
9. Any conflicts between the plumbing and ductwork shall be clouded by the PC on the AutoCAD ductwork shop drawing file.
10. PC shall request coordination meeting to resolve the conflicts as clouded on the coordinated shop drawings. PC shall provide clouded shop drawing at the coordination meeting. All conflicts that arise between the plumbing and ductwork shall be resolved through and by the Owner's Representative.

11. The PC and/or the SM shall correct and shall complete the AutoCAD drawings depicting all resolutions.
12. When it is ascertained that no conflicts exist between the ductwork and plumbing work, the PC shall forward the final ductwork/plumbing coordinated drawings (hard copy and electronic files) to the MC with transmittal, and provide the Owner's Representative with a copy of the transmittal.
13. The MC shall (upon receipt of drawings from the PC) superimpose all heating and air conditioning piping, equipment, hangers, and insulation, including elevations (top and bottom) and pipe sizes (including insulation), on the AutoCAD drawings.
14. Any conflicts between the ductwork/plumbing/mechanical work shall be clouded by the MC on the AutoCAD shop drawing file.
15. MC shall request coordination meeting to resolve the conflicts as clouded on the coordinated shop drawings. MC shall provide clouded shop drawing at the coordination meeting. All conflicts that arise between the MC, SM and PC shall be resolved through and by the Owner's Representative.
16. The MC, PC and SM shall correct and complete the AutoCAD drawings depicting all resolutions.
17. When it is ascertained that no conflicts exist between the MC, SM and PC, the MC shall forward the final ductwork/plumbing/mechanical coordinated drawings (hard copy and electronic files) to the EC with transmittal, and provide the Owner's Representative with a copy of the transmittal.
18. The EC shall (upon receipt of drawings from the MC) superimpose all electrical equipment including but not limited to light fixtures, conduit and hangers on the AutoCAD drawings.
19. The EC shall include elevations of light fixtures, electrical conduit and conduit sizes.
20. Any conflicts with the ductwork/plumbing/mechanical/electrical work shall be clouded by the EC on the AutoCAD shop drawing file.
21. EC shall request coordination meeting to resolve any conflicts as clouded on the coordinated shop drawings. EC shall provide clouded coordinated shop drawing at the coordination meeting. All conflicts that arise between the EC, MC, PC and SM shall be resolved through and by the Owner's Representative.
22. The EC and/or the SM, PC, MC shall correct and complete the AutoCAD drawings depicting all resolutions.
23. When it is ascertained that no conflicts exist between the EC, MC, PC and SM, the EC shall forward the final ductwork/plumbing/mechanical/electrical coordinated drawings (hard copy and electronic file) to the SC with transmittal, and provide the Owner's Representative with a copy of the transmittal.
24. drawing to the MC with transmittal, and provide the Owner's Representative with a copy of the transmittal.
25. Sign Off:
    a. The MC shall provide the final coordinated shop drawing to the Engineer and the Owner's Representative. The final coordinated shop drawing shall contain signatures from SM, PC, MC, and EC on each sheet.
    b. Upon completion of the coordination process by all Contractors and Subcontractors as described above, they shall sign off on all drawings in ink indicating company, name, date of sign-off and signature of company representative.
    c. Each contractor signature shall certify that each Contractor has shown their respective work on the drawings and have resolved all points of conflict and interference with other Contractors and Subcontractors.

3.3 COORDINATION MEETINGS

A. During the coordination process, separate meetings apart from project meetings concerning the progress and schedules may be called by the Owner's Representative when required or at the request of one or more of the coordinating Contractors:

1. The Owner's Representative shall contact the Contractors and make all required arrangements (e.g., time, place, etc.).
2. All Contractors shall place emphasis and importance on equipment purchases, so as to not delay approvals, shop drawings and the coordinated drawings.

3.4 SCHEDULE OF COORDINATED SHOP DRAWINGS

A. The MC and SM shall complete the ductwork shop drawings within 2 weeks after award of contract (or authorization to proceed).

B. Turn-around time for each Contractor shall be 2 weeks maximum.

3.5 "AS-BUILT" DRAWINGS

A. At the completion of the project, "As-Built" corrections shall be made to each AutoCAD drawing by each of the aforementioned Contractors and returned to the Owner's Representative for the Owner's permanent files and records. These "As-Builts" do not remove the obligation of "As-Builts" and record drawings as outlined under other sections of the specifications unless the Owner's Representative elects to do so.

END OF SECTION

SECTION 220500 – BASIC PLUMBING MATERIALS AND METHODS

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes the following basic materials and methods to complement other Division 22 Sections:
   1. Piping installation instructions common to most piping systems.
   2. Dielectric fittings.
   3. Flexible connectors.
   4. Escutcheons.
   5. Identifying devices and labels.
   6. Grout.
   7. Installation requirements common to equipment specification sections.
   8. Touch-up painting.
   9. Removals.
   10. Repairs.

B. Pipe, pipe fittings, and joining materials and methods are specified in Division 22 piping system sections.

1.2 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:
   1. ABS: Acrylonitrile-butadiene-styrene plastic.
   2. CPVC: Chlorinated polyvinyl chloride plastic.
   3. NP: Nylon plastic.
   4. HDPE: High Density Polyethylene plastic.
   5. PVC: Polyvinyl chloride plastic.

G. Existing: Condition present prior to award of this Contract.

1.3 SUBMITTALS

A. Product Data: For all materials specified within this section.

B. Fire Rated Penetration Listing Details: Submit Underwriters Laboratory penetration listing details specific to the penetrations required by the project along with fire stopping material data.

C. Quality Control Submittals: Fire stopping certificates specified in Quality Assurance below.

1.4 QUALITY ASSURANCE

A. Fire Stopping: Fire stopping installer shall be certified by the fire stopping manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Protect piping, flanges, fittings, and piping specialties to prevent pipe end damage. Maintain end caps through shipping, storage, and handling.

B. Store plastic pipes in locations not subject to direct sunlight.

C. Protect all stored materials from moisture and dirt. Elevate above grade and support to prevent sagging and bending. Do not exceed structural capacity of floor, if stored inside.

1.6 SEQUENCING AND SCHEDULING

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where identifying devices are to be applied.

B. Install identifying devices before concealment.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Dielectric Components:
      a. Watts Water Technologies, Inc.
      b. Grinnell Corp.; Grinnell Supply Sales Co.
      c. Victaulic Co. of America.
   2. Metal, Flexible Connectors:
      a. Engineered Flexible Products.
      b. Flexicraft Industries.
      c. Grinnell Corp.; Grinnell Supply Sales Co.
      d. Mercer Rubber Co.
      e. Metraflex Co.
   3. Pipe Escutcheons:
      a. Chicago Specialty Mfg. Co.
      b. Sanitary-Dash Mfg. Co.
      c. Grinnell.

4. Identifying Devices:
    a. Craftsmark Identification Systems.
    b. Seton Identification Products.
    c. W.H. Brady Company.

2.2 DIELECTRIC FITTINGS

A. General: Assembly or fitting with insulating material isolating joined dissimilar metals, to prevent galvanic action and stop corrosion.

B. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld-neck end types and matching piping system materials.

C. Insulating Material: Suitable for system fluid, pressure, and temperature.

D. Dielectric-Flange Kits: Field-assembled, companion-flange assembly, full-face or ring type. Components include neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers. Dielectric flange kit materials shall be compatible with system fluid, temperature and pressure.

E. Dielectric Couplings: ARE NOT ALLOWED.

F. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; and 300-psig (2070-kPa) minimum working pressure at 225 DegF (107 DegC). Coordinate end selection with piping system specifications.

2.3 FLEXIBLE CONNECTORS

A. General: Fabricated from materials suitable for system fluid and that will provide flexible pipe connections. Include 125-psig (860-kPa) minimum working-pressure rating at 220 DegF unless higher working pressure or temperature is indicated. Coordinate end selection with piping system specifications.

B. Stainless-Steel-Hose/Stainless-Steel Pipe, Flexible Connectors: Corrugated, stainless-steel, inner tubing covered with stainless-steel wire braid. Include stainless-steel nipples or flanges, welded to hose.

2.4 SLEEVES

A. General: The following materials are for wall, floor, slab, and roof penetrations.

B. Pipe:
1. Steel Sheet Metal: 0.0359-inch (0.9-mm) minimum thickness, galvanized, round tube closed with welded longitudinal joint.
2. Steel Pipe: ASTM A53, Type E, Grade A, Schedule 40, galvanized, and plain ends. Provide integral waterstop where indicated.
3. Cast Iron: Cast or fabricated pipe equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop.
4. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
    a. Underdeck Clamp: Clamping ring with set screws.

C. Ductwork:
   1. All sleeves shall be per SMACNA.

2.5 ESCUTCHEONS

A. General: Manufactured wall, ceiling, and floor plates; deep-pattern type if required to conceal protruding fittings and sleeves.
   1. ID: Closely fit around pipe, tube, and insulation of insulated piping.
   2. OD: Completely cover opening.
   3. Stamped Steel: One piece, with set screw and chrome-plated finish.
   4. Stamped Steel: Split plate, with concealed hinge, set screw, and chrome-plated finish.

2.6 IDENTIFYING DEVICES AND LABELS

A. Equipment Nameplates: Metal nameplate with operational data engraved or die-stamped; permanently fastened to equipment:
   1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data.

B. Stick-on Pipe Markers: Manufacturer's standard preprinted, permanent adhesive, color-coded, pressure-sensitive vinyl, complying with ASME A13.1.

C. Stick-on Duct Markers: Manufacturer's standard preprinted, permanent adhesive, color-coded, pressure-sensitive vinyl, complying with ASME A13.1.

D. Stick-on Flow Marker: Manufacturer's standard preprinted, permanent adhesive, color-coded, pressure-sensitive vinyl, 2-inch wide band, color coded complying with ASME A13.1.

E. Rigid Pipe Markers: Manufacturer's standard preprinted, color coded, rigid plastic with flow arrows and fluid medium designed to be applied to piping systems without the need of adhesives. For markers up to 6 inches, markers shall wrap completely around the pipe, and their own tension shall secure them in place. For markers over 6 inches, markers shall be provided with nylon ties to secure marker to piping system Markers comply with ANSI/ASME A13.1.

F. Valve Tags: Stamped or engraved 0.032-inch- (0.8-mm-) thick, polished brass, 1-1/2-inches (40-mm) diameter, with 1/4-inch (6-mm) piping system abbreviation letters and 1/2-inch (13-mm) sequenced numbers. Include 5/32-inch (4-mm) hole and brass, wire-link or beaded chain; or brass S-hook fastener.

G. Framed Valve Schedule: Glazed display frame for removable mounting on masonry walls for each page of valve schedule. Include appropriate mounting hardware. Valve schedule shall be 8-1/2 inches by 11 inches with a minimum font height of 12 point. Frame shall be extruded aluminum with ASTM C 1036, Type I, Class 1, Glazing Quality B, 2.5-mm, single-thickness glass. Schedule shall include valve number, piping system, system abbreviation as shown on valve tag, location of valve (room or space), normal operating position (open, closed or modulating). Indicate valves utilized for emergency shut off or other special purposes.

H. Access Panel Markers: 1/16-inch (2-mm) thick, engraved plastic-laminate markers, with abbreviated terms and numbers corresponding to concealed valve. Provide 1/8-inch (3-mm) center hole for attachment.

I. Plastic Equipment Markers: ASME A13.1, color-coded, laminated plastic. Include lettering identifying name, equipment service, design capacity, pressure drop, entering and leaving conditions

and RPM indicated on the contract documents. Size shall be 2-1/2 by 4 inches (65 by 100 mm) for control devices, dampers, and valves; and 4-1/2 by 6 inches (115 by 150 mm) for equipment. Identifying names and/or abbreviations shall match those indicated on the contract documents.

2.7 GROUT

A. Non-shrink, Non-metallic Grout: ASTM C1107, Grade B, post-hardening, volume-adjusting, dry, non-staining, non-corrosive, non-gaseous, hydraulic-cement grout recommended for interior and exterior applications. Design mix shall be 5000-psig (34.5-MPa), 28-day compressive strength.

PART 3 – EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

A. General: Install piping as described below, unless piping sections specify otherwise.

B. General Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated, unless deviations to layout are approved on Coordination Drawings.

C. Install components with pressure and temperature ratings equal to or greater than system operating pressure and temperature.

D. Install piping free of sags and bends. Install fittings for changes in direction and branch connections. Install fittings, couplings, and accessories according to manufacturer's written instructions.

E. Install piping at parallel and perpendicular to building walls. Diagonal runs are prohibited, unless otherwise indicated. Locate groups of pipes parallel to each other, spaced to permit valve servicing.

F. In areas of exposed piping, install piping to maximize headroom. In areas with ceilings, install piping to maximize clearance between ceiling and pipe. Allow sufficient space for ceiling panel removal.

G. Install piping to allow application of insulation plus 1-inch (25-mm) clearance around insulation.

H. Install pipe escutcheons for pipe penetrations of walls, partitions, floors, and ceilings.

I. Install drains at low points in mains, risers, and branch lines consisting of a tee fitting, 3/4-inch ball valve, threaded nipple and chained cap.

J. Install line size manual shutoff valve at each connection to each piece of equipment.

K. Install piping so that accessories are accessible for operation, maintenance, repair, and replacement.

L. Install piping with sufficient clearance to allow for expansion and contraction.

M. Sleeves are not required for core drilled holes through interior solid concrete walls and floors, above grade exterior solid concrete walls and existing underground solid concrete walls. Floors in mechanical equipment areas or other wet areas shall be provided with a sleeve with waterstop.

N. Install sleeves for pipes passing through walls, partitions, and slabs.
   1. Cut sleeves to length for mounting flush with both surfaces.
      a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches (50 mm) above finished floor level. In floors with water stop extend cast-iron sleeve fittings below floor slab as required to secure clamping ring.
   2. Build sleeves into new walls and slabs as walls and slabs are being constructed.
   3. Install sleeves in non-fired rated assemblies large enough to provide 1/2-inch (12.7-mm) annular clear space between sleeve and pipe or pipe insulation.
   4. Install sleeves in fire rated assemblies per ASTM E814 by Underwriters Laboratory, Inc., or other testing and inspecting agency acceptable to authorities having jurisdiction.

O. Interior Wall and Floor Pipe Penetrations: Sleeves shall be steel pipe except steel sheet metal shall be used for gypsum wall penetrations.

P. Water Proof Floor and Roof Pipe Penetrations: For pipes penetrating floors and roofs with membrane waterproofing install stack sleeve fitting. Secure flashing between clamping flanges. Seal space outside of sleeve fittings with non-shrink, non-metallic grout. Provide Type S, Grade NS, Class 25, Use O, neutral-curing silicone sealant between sleeve and pipe.

Q. Aboveground, Exterior-Wall, Pipe Penetrations:
   1. Masonry Wall: Provide steel pipe wall sleeve. Seal space outside of sleeve with non-shrink, non-metallic grout. Provide Type S, Grade NS, Class 25, Use O, neutral-curing silicone sealant between sleeve and pipe.
   2. Non-Masonry or Non-Concrete Walls: Provide wall plate matching surrounding construction. Fill gap between wall opening and pipe with mineral wool. Provide Type S, Grade NS, Class 25; use O, neutral-curing silicone sealant between wall plate and wall.

R. Underground, Exterior-Wall, Pipe Penetrations: Provide cast-iron or galvanized steel sleeves with integral waterstop, except for existing walls. Seal pipe penetrations using mechanical sleeve seals. Size sleeve for annular clear space between pipe and sleeve for installing mechanical sleeve seals. Annular clear space shall be per mechanical sleeve seal manufacturer's written recommendation. Assemble and install mechanical sleeve seals according to manufacturer's written instructions.

S. Verify final equipment locations for roughing-in.

T. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping specification sections:
   1. Threaded Steel Pipe Joints: Thread pipe with tapered pipe threads in accordance with ANSI B2.1 and ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded ends to remove burrs and restore full inside diameter. Apply pipe joint lubricant or sealant suitable for the service for which the pipe is intended on the male threads at each joint and tighten joint to leave not more than 3 threads exposed. Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
   2. Welded Steel Pipe Joints: Weld pipe joints in accordance with applicable ASME Codes and AWS D10.12, "Recommended Practices and Procedures for Welding Low Carbon Steel Pipe."
   3. Flanged Steel Pipe Joints: Clean flange faces and install gaskets. Align flange surfaces parallel. Use suitable lubricants on bolt threads. Tighten bolts to torque specified by manufacturer of flange and flange bolts, to provide uniform compression of gaskets.
   4. Grooved Steel Pipe Joints: Install per grooved piping manufacturer's written installation instructions.

5. Copper Pipe Joints: Thoroughly clean tube surface and inside surface of the cup of the fittings, using very fine emery cloth, prior to making soldered or brazed joints. Wipe tube and fittings clean and apply flux. Flux shall not be used as the sole means for cleaning tube and fitting surfaces.
6. Gasket Materials: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned.
7. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
8. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
9. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join pipe and fittings according to the following:
   a. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements.
   b. ABS Piping: ASTM D2235 and ASTM D2661.
   c. CPVC Piping: ASTM D2846 and ASTM F493.
   d. PVC Pressure Piping: ASTM D2672.
   e. PVC Nonpressure Piping: ASTM D2855.
   f. PVC to ABS Nonpressure Transition Fittings: Procedure and solvent cement according to ASTM D3138.

U. Piping Connections: Make connections according to the following, unless otherwise indicated:
1. Remake leaking joints using new materials.
2. Install unions, in piping 2-inch NPS (DN50) and smaller, adjacent to each valve and at final connection to each piece of equipment.
3. Install flanges, in piping 2-1/2-inch NPS (DN65) and larger, adjacent to flanged valves and at final connection to each piece of equipment.
4. Piping Systems: Install dielectric fittings to connect piping materials of dissimilar metals.

3.2 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to provide maximum possible headroom, if mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components, unless otherwise indicated.

C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of com–ponents. Connect equipment for ease of disconnecting and without interference(s) to other installations.

D. Extend grease fittings to accessible locations.

3.3 LABELING AND IDENTIFYING

A. Piping Systems: Install pipe markers on all piping of each system (insulated and un-insulated), including pipe sizes, fluid medium and direction of flow arrows.

B. Interior, non-metal jacketed piping systems: Provide stick-on markers. Install flow marker 360 degrees at each end of each pipe marker.
1. Interior metal jacketed and exterior piping systems: Provide rigid markers (for markers on piping over 6 inches provide nylon ties). Provide stick-on size marker attached to rigid marker.

2. Markers shall be spaced at a maximum of 25-foot (7.5-m) intervals along each run. In addition to the 25-foot intervals, provide markers at the following locations:
   a. Near each valve and control device.
   b. Near each branch, excluding short takeoffs for fixtures and terminal units.
   c. Near locations where pipes pass through walls, floors, ceilings, or enter non-accessible enclosures.
   d. At access doors, manholes, and similar access points that permit view of concealed piping.
   e. Near major equipment items and other points of origination and termination.

C. Valve Tags:
   1. Install on all valves and control devices (factory and field installed), except check valves, plumbing fixture supply stops, faucets, and hose connections. List tagged valves in valve schedule.
   2. Provide framed valve schedule(s) where directed by Owner's representative.

D. Install plastic equipment marker on all equipment provided under this Contract.

E. Provide additional mechanical identification materials and devices to supplement field or factory supplied nameplates that have become visually blocked by work of this or other Divisions.

F. Clean faces of identification devices and glass frames of valve charts.

3.4 TOUCH-UP PAINTING

A. Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.5 GROUTING

A. Install nonmetallic, non-shrink, grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors. Mix and cure grout according to manufacturer's written instructions.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placing of grout.

E. Place grout to provide smooth bearing surface for equipment base.

F. Place grout, completely filling equipment bases.

G. Place grout around anchors.

3.6 REMOVALS

A. Disconnect and remove work where indicated on the contract documents in its entirety.

B. Removal: Remove indicated equipment, piping, ductwork, insulation and associated components from Project site and dispose of in a legal manner. Provide Owner's right of first refusal for all equipment removed.

C. Where work is indicated to be abandoned in place, cut and remove pipe or ductwork a minimum of 2 inches (50 mm) beyond the wall, floor, ceiling or roof. Patch surface to match existing finish of adjacent construction.

D. Temporary Disconnection: Remove, store, clean, reinstall, reconnect, and make operational equipment indicated for relocation.

3.7 REPAIRS

A. If existing or new work is damaged or disturbed, remove damaged sections and install new products of equal capacity and quality.

END OF SECTION

SECTION 220513 – ELECTRICAL REQUIREMENTS FOR PLUMBING EQUIPMENT

PART 1 – GENERAL

1.1 SUMMARY

A. This section specifies the basic requirements for electrical components which are furnished with mechanical equipment (factory or field installed).

1.2 REFERENCES

A. The following references shall be applicable:
1. NEMA Standards MG 1: Motors and Generators.
2. NEMA Standards ICS 2: Industrial Control Devices, Controllers, and Assemblies.
3. NEMA Standard 250: Enclosures for Electrical Equipment.
4. NEMA Standard KS 1: Enclosed Switches.
5. Comply with National Electrical Code (NFPA 70).

1.3 SUBMITTALS

A. Factory furnished electrical component product data submittal requirements are specified within the individual equipment specification sections.

1.4 QUALITY ASSURANCE

A. Electrical components and materials shall be UL or ETL labeled.

PART 2 – PRODUCTS

2.1 MOTORS

A. Electrical Characteristics shall meet the following unless otherwise indicated:
1. Frequency Rating: 60 Hertz.
2. Voltage Rating: Determined by voltage of circuit to which motor is connected for the following motor voltage ratings (utilization voltages):
a. 120V circuit: 115V motor rating.
b. 208V circuit: 200V motor rating.
c. 240V circuit: 230V motor rating.
d. 480V circuit: 460V motor rating.

B. Torque characteristics shall be sufficient to satisfactorily accelerate the driven loads:
1. Motor sizes shall be large enough so that the driven load will not require the motor to operate in the service factor range.

C. Service Factor: 1.15 for poly-phase motors and 1.35 for single phase motors unless otherwise indicated.

D. Temperature rating: Rated for 104 DegF (40 DegC) environment.

E. Temperature rise: Rated for maximum of 194 DegF (90 DegC) rise for continuous duty at full load, Class B insulation, except for inverter duty rated motors which shall use Class F insulation.

F. Starting capability: Frequency of starts as required to meet automatic control system sequence of operation, and not less than five (5) evenly timed starts per hour.

G. Capacity: Sufficient to start and operate connected loads without exceeding name plate ratings.

H. Motor construction: NEMA Standard MG 1, general purpose, continuous duty, Design "B" except "C" where required for high starting torque.
   1. Bearings:
      a. Re-greasable, except permanently sealed motor.
      b. Designed to resist thrust loading where belt drives or other drives produce lateral or axial thrust in motor.
   2. Mounting:
      a. Horizontal: Foot mounted.
      b. Vertical: Base mounted.
   3. Enclosure Type: See individual equipment specifications for enclosure type.
   4. Lifting Lug: Lifting eye or lug for all motors exceeding 50 pounds.
   5. Stamped Nameplate: Indicate the full identification of manufacturer, ratings, characteristics, construction, efficiency, special features, and similar information.
   6. All motors 1 horsepower and larger shall be premium efficiency, constant speed, rpm as specified, squirrel cage, unless otherwise required to meet driven equipment's maximum starting duty. Minimum full-load nominal efficiencies per IEEE Standard 112, Test Method B shall be equal to or greater than those listed in ASHRAE 90.1.

I. Polyphase Motors:
   1. General: Squirrel-cage induction-type conforming to the following requirements except as otherwise indicated.
   2. Variable Speed Motors for Use with Solid-State Drives: Energy efficient, invertor ready, Design B units with ratings, characteristics, and features coordinated with drive manufacturer.
   3. Bearings: Suitable for radial and thrust loading of the application.
   4. Severe Duty Motors: Minimum 1.25 service factor. Provide motors with regreasable bearings and equipped with capped relief vents. Insulate windings with non-hygroscopic material.
   5. Motors for Reduced Inrush Starting: Coordinate with reduced inrush controller type and with characteristics of driven equipment load. Provide required wiring leads in motor terminal box to suit control method.

J. Single-Phase Motors:
   1. Energy Efficient Motors: One of the following types as selected to suit the starting torque and other requirements of the specific motor application:
      a. Permanent Split Capacitor.
      b. Split-Phase Start, Capacitor-Run
      c. Capacitor-Start, Capacitor-Run
      d. Shaded-Pole.
      e. Capacitor Start, Induction Run.
   2. Internal Thermal Overload Protection for Motors: Protection shall automatically open the power supply circuit to the motor, or a control circuit. Protection shall operate when winding temperature exceeds a safe value calibrated to the temperature rating of the motor insulation. Motor shall automatically reset when motor temperature returns to normal range.

3. Bearings: Belt connected motors or other motors with high radial forces on motor shaft shall be ball bearing type. Sealed, prelubricated sleeve bearings may be used for other single-phase motors.

2.2 STARTERS, DISCONNECTS, AND ACCESSORIES

A. Motor Starter Characteristics:

1. Type and size of starter shall be as recommended by motor manufacturer and the driven equipment manufacturer for applicable protection and start-up condition. Minimum size starter shall be NEMA Size 1.

B. Manual Disconnect Switches:

1. Fusible switches: fused, each phase; general duty; horsepower rated; non-teasible quick-make, quick-break mechanism; dead front line side shield; solderless lugs suitable for copper or aluminum conductors; spring reinforced fuse clips; electro silver plated current carrying parts; hinged doors; operating lever arranged for locking in the "OPEN" position; arc quenchers; capacity and characteristics as required by equipment manufacturer.
2. Non-fusible switches: horsepower rated toggle switch type; quantity of poles and voltage rating as required by equipment manufacturer.

C. Magnetic Starters:

1. Hand-off-auto, selector switches and pilot lights.
2. Trip-free thermal overload relays, each phase.
3. Interlocks, switches, contacts and similar devices as required for coordination with control requirements.
4. Built-in control circuit transformer, sized by manufacturer. Provide with minimum two normally-open and two normally closed spare auxiliary contacts.
5. Externally operated manual reset.
6. High voltage and low voltage protection in all three (3) phases.
7. Internal Thermal Overload Protection for Motors: Protection shall automatically open control circuit. Protection shall operate when winding temperature exceeds safe value calibrated to the temperature rating of the motor insulation.

D. Starter Enclosures:

1. NEMA rated as required for environment in which equipment is to be installed.
2. Interlock covers of combination starters with operating handle providing access to inside of enclosure only when disconnect is in "OFF" position. Provide means to attach multiple padlocks for locking external operating handle in either the "ON" or "OFF" position.
3. Provide red colored RESET Button in cover of starter.
4. Provide and secure wiring diagram corresponding to motor and control wiring of associated equipment on inside of each magnetic and combination starter.
5. Manual starter shall have means for externally locking operating mechanism in "OFF" position.

E. Factory Installed Motor Connections:

1. Flexible conduit, except where plug-in electrical cords are specifically indicated.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Motors: Install field-installed motors in accordance with manufacturer's published instructions and the following:
   1. Direct Connected Motors: Mount securely in accurate laser alignment.
   2. Belt Drive Motors: Use adjustable motor mounting bases. Align pulleys and install belts. Use belts identified by the manufacturer and tension belts in accordance with manufacturer recommendations.
   3. Bearings: Provide extended lube lines for regreasable motors.

B. Motor Controllers (Starters, Disconnects and Drives): Install field-installed starters, disconnects and drives in accordance with manufacturer's published instructions and the following:
   1. Locate controllers within sight of motors controller.
   2. Mounting: For control equipment at walls, bolt units to wall or mount on light-weight structural steel channels bolted to the wall. For controllers not at walls, provide freestanding racks fabricated of structural steel members and lightweight slotted structural steel channels. Use feet consisting of 3/8-inch thick steel plates, 6 inch square, bolted to the floor. Use feet for welded attachment of 1-1/2-inch thick steel plates, 6 inch square, bolted to the floor. Use feet for welded attachment of 1-1/2-inch by 1-1/2-inch by 1/4-inch vertical angle pots not over three feet on centers. Connect the posts with horizontal lightweight slotted steel channels and bolt the control equipment to the channels.
   3. Clearances: All motor controllers shall be installed per NEC requirements.

3.2 ACCEPTANCE

A. The right is reserved by the Owner's Representative to reject any motor which, in his opinion, either under test or in actual service is found to be overloaded, develops excessive mechanical noise, magnetic hum, or otherwise operates unsatisfactorily, within the speed range and load specified. The contractor shall adjust, or if necessary, replace any such deflected motor with one satisfactory to the Owner or Owner's Representative without any extra cost to the Owner.

END OF SECTION

SECTION 220523 – VALVES

PART 1 – GENERAL

1.1 SUMMARY

A. Section includes: This section includes general duty valves common to most plumbing piping systems. Special purpose valves are specified in individual piping system specifications.

1.2 SUBMITTALS

A. Product Data: Product data, including body material, valve design, pressure and temperature classification, end connection details, seating materials, trim material and arrangement, dimensions and required clearances.

B. Valve Schedule: Valve schedule indicating manufacturer's figure number, size, location, and valve features for each required valve, and installation instructions.

1.3 QUALITY ASSURANCE

A. American Society of Mechanical Engineers (ASME) Compliance: Comply with ASME B31.9 for building services piping and ASME B31.1 for power piping.

B. Manufacturers Standardization Society of the Valve and Fittings Industry (MSS) Compliance: Comply with the various MSS Standard Practices referenced.

C. Low Lead Content: All valves submitted for use in potable water systems shall meet NSF/ANSI 372 Standard for Low Lead Content.

1.4 STORAGE AND HANDLING

A. Storage: Use the following precautions during storage:
   1. Do not remove valve end protectors unless necessary for inspection; then reinstall for storage.
   2. Protect valves from weather. Store valves indoors. Maintain valve temperature higher than the ambient dew point temperature. If outdoor storage is necessary, support valves off the ground or pavement in watertight enclosures.

B. Handling: Use a sling to handle valves whose size requires handling by crane or lift. Rig valves to avoid damage to exposed valve parts. Do not use handwheels and stems as lifting or rigging points.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide products from one of the manufacturers listed in valve schedule.

B. Provide valves of same manufacturer throughout where possible. Manufacturer's name, valve size, and pressure rating shall be clearly marked on outside of body.

2.2 VALVE FEATURES, GENERAL

A. Valve Design: Rising stem or rising outside screw and yoke stems.
   1. Non-rising stem valves may be used where headroom prevents full extension of rising stems.

B. Pressure and Temperature Ratings: As scheduled and required to suit system pressures and temperatures.

C. Sizes: Same size as upstream pipe unless otherwise indicated.

D. Operators: Provide the following special operator features:
   1. Handwheels, fastened to valve stem, for valves other than quarter turn.
   2. Lever handles, on quarter-turn valves 6 inches and smaller, except for plug valves. Provide plug valves with square heads; provide one wrench for every 10 plug valves.
   3. Chain-wheel operators, for valves 2-1/2 inches and larger, install 72 inches or higher above finished floor elevation. Extend chains to an elevation of 5 feet 0 inches above finished floor elevation.
   4. Gear drive operators, on quarter-turn valves, 8 inches and larger.

E. Extended Stems: Where insulation is indicated or specified, provide extended stems arranged to receive insulation.

F. Bypass and Drain Connections: Comply with MSS SP-45 bypass and drain connections.

G. End Connections: As indicated in the valve specifications:
   1. Threads: Comply with ANSI B1.20.1.
   2. Flanges: Comply with ANSI B16.1 for cast iron, ANSI B16.5 for steel, and ANSI B16.24 for bronze valves.
   3. Solder-Joint: Comply with ANSI B16.18:
      a. Caution: Where soldered end connections are used, use solder having a melting point below 840 DegF for gate, globe, and check valves – below 421 DegF for ball valves.

H. All valves submitted for use in potable water systems use shall meet NSF/ANSI 372 Standard for Low Lead Content.

2.3 GATE VALVES

A. Gate Valves, 3 Inches and Smaller: MSS SP-80; Class 125, body and bonnet of ASTM B62 cast bronze, with threaded or solder ends, solid disc, copper-silicon alloy stem, brass packing gland, “Teflon” impregnated packing, and malleable iron handwheel.

2.4 BALL VALVES

A. Ball Valves, 1 Inch and Smaller: Rated for 150 psi saturated steam pressure, 600 psi WOG pressure; two-piece construction; with bronze body conforming to ASTM B62, standard (or regular) port, chrome-plated brass ball, replaceable “Teflon” or “TFE” seats and seals, blowout-proof stem, and vinyl-covered steel handle. Provide solder ends for domestic hot and cold water service.

B. Ball Valves, 1-1/4 Inches to 2-1/2 Inches: Rated for 150 psi saturated steam pressure, 400 psi WOG pressure, three-piece construction, with bronze body conforming to ASTM B62, full port, stainless steel ball, replaceable “Teflon” or “TFE” seats and seals, blowout proof stem, and vinyl-covered steel handle. Provide solder ends for domestic hot and cold water service.

2.5 CHECK VALVES

A. Swing Check Valves, 2 Inches and Smaller: MSS SP-80, Class 125, cast-bronze body and cap conforming to ASTM B62, with horizontal swing, Y-pattern, and bronze disc; and having threaded or solder ends. Provide valves capable of being reground while the valve remains in the line.

PART 3 – EXECUTION

3.1 VALVE ENDS SELECTION

A. Select valves with the following ends or types of pipe/tube connections:
   1. Copper Tube Size, 2 Inches and Smaller: Solder ends.

3.2 VALVE INSTALLATIONS

A. General Application: Use gate, ball, and butterfly valves for shut-off duty; globe, ball, and butterfly for throttling duty. Refer to piping system specification sections for specific valve applications and arrangements.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves and unions for each fixture and item of equipment arranged to allow equipment removal without system shutdown. Unions are not required on flanged devices.

D. Install balance valves in the hot water recirculation piping where shown on the drawings.

E. Install three-valve bypass around each pressure reducing valve.

F. Install valves in horizontal piping with stem at or above the center of the pipe.

G. Install valves in a position to allow full stem movement.

H. Installation of Swing Check Valves: Install for proper direction of flow and with horizontal position with hinge pin level.

I. Install access doors in ceilings or walls as required in the types and sizes to accommodate easy valve access and construction (sheet rock, etc., and fire rating).

3.3 SOLDER CONNECTIONS

A. Apply heat evenly to outside of valve around joint until solder will melt upon contact. Feed solder until it completely fills the joint around tube. Avoid hot spots or overheating valve. Once the solder starts cooling, remove excess amounts around the joint with a cloth or brush.

3.4 FLANGED CONNECTIONS

A. For dead-end service, butterfly valves require flanges both upstream and downstream for proper shutoff and retention.

3.5 FIELD QUALITY CONTROL

A. Tests: After piping systems have been tested and put into service, but before final adjusting and balancing, inspect valves for leaks. Adjust or replace packing to stop leaks; replace valves if leak persists.

3.6 ADJUSTING AND CLEANING

A. Cleaning: Clean mill scale, grease, and protective coatings from exterior of valves and prepare valves to receive finish painting or insulation.

3.7 VALVE PRESSURE/TEMPERATURE CLASSIFICATION SCHEDULES

SERVICE	GATE	BALL	CHECK
Domestic Hot and Cold Water	125	150	125

SERVICE	GATE	CHECK
Domestic Hot and Cold Water	125	125

3.8 VALVE SCHEDULE

A. Gate Valves – 3 Inches and Smaller - Class 125:

	THREADED		SOLDERED	
MANUFACTURER	NRS	RS	NRS	RS
Milwaukee	UP105	UP148	UP115	UP149
Nibco	T-113-LF	T-111-LF	S-113-LF	S-111-LF
Stockham	LFB-103	N/A	LFB-104	N/A

B. Ball Valves – 1 Inch and Smaller:

MANUFACTURER	OS & Y RS	NRS
Conbraco (Apollo)	70LF-100	70LF-200
Milwaukee	UPBA-100	UPBA-150
Nibco	T-580-66-LF	S-580-66-LF

C. Ball Valves – 1-1/4 Inches to 2-1/2 Inches:

MANUFACTURER	THREADED ENDS	SOLDER ENDS
Conbraco (Apollo)	82LF-100	82LF-200
Milwaukee	UPBA-300S	UPBA-350S
Nibco	T-595-Y-66-LF	S-595-Y-66-LF

D. Swing Check Valves – 2 Inches and Smaller:

MANUFACTURER	CLASS 125 THREADED ENDS	CLASS 125 SOLDER ENDS
Milwaukee	UP509	UP1509
Nibco	T-413-Y-LF	S-413-Y-LF
Stockham	LFB-319Y	LFB-309Y

END OF SECTION

SECTION 220529 – HANGERS, SUPPORTS, AND ANCHORS

PART 1 – GENERAL

1.1 SUMMARY

A. This section includes the following:
1. Horizontal-piping hangers and supports.
2. Vertical-piping clamps.
3. Hanger-rod attachments.
4. Building attachments.
5. Saddles and shields.
6. Spring hangers and supports.
7. Miscellaneous materials.
8. Pipe alignment guides.
9. Anchors.
10. Equipment supports.

1.2 SUBMITTALS

A. Product data, including installation instructions for each type of support and anchor. Submit pipe hanger and support schedule showing Manufacturer's figure number, size, location, and features for each required pipe hanger and support.

B. Assembly-type shop drawings for each type of support and anchor, indicating dimensions, weights, required clearances, and methods of assembly of components.

C. Details of trapeze hangers and upper attachments for piping 4 inches in diameter and over. Include the number and size of pipe lines to be supported on each type of trapeze hanger.

D. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.

1.3 QUALITY ASSURANCE

A. NFPA Compliance: Hangers and supports shall comply with NFPA standard No. 13 when used as a component of a fire protection system.

B. MSS Compliance: Provide hangers, supports and components conforming to the latest requirements of MSS Standard Practices SP-58 and SP-69.

C. Qualify welding processes and welding operators according to AWS D1.1 "Structural Welding Code-Steel."
1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

D. Qualify welding processes and welding operators according to ASME "Boiler and Pressure Vessel Code," Section IX, "Welding and Brazing Qualifications."

E. Listing and Labeling: Provide hangers and supports that are listed and labeled as defined in NFPA 70, Article 100:

1. UL and FM Compliance: Hangers, supports, and components include listing and labeling by UL and FM where used for fire protection piping systems.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

PART 2 – PRODUCTS

2.1 MANUFACTURED UNITS

A. Hangers and support components shall be factory fabricated of materials, design, and manufacturer complying with MSS SP-58:

1. Components shall have zinc chromate or red oxide coatings where installed for piping and equipment.

B. Hangers, Supports, and Components: Factory-fabricated according to MSS SP-58:

1. Components include galvanized coatings where installed for piping and equipment that will not have a field-applied finish.
2. Pipe attachments include nonmetallic coating for electrolytic protection where attachments are in direct contact with copper tubing.

C. Thermal-Hanger Shield Inserts: 100-psi (690-kPa) average compressive strength, waterproofed calcium silicate, encased with sheet metal shield. Insert and shield cover entire circumference of pipe and are of length indicated by manufacturer for pipe size and thickness of insulation.

D. Powder-Actuated Drive-Pin Fasteners: Powder-actuated-type, drive-pin attachments with pull-out and shear capacities appropriate for supported loads and building materials where used. Fasteners for fire protection systems include UL listing and FM approval.

E. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used. Fasteners for fire protection systems include UL listing and FM approval.

2.2 PIPE HANGERS AND SUPPORTS

A. Pipe Insulation Shields: Fabricated of steel with a minimum of 180 degrees unless otherwise indicated. Shields for use with hangers and supports, with the exception of combination clevis type hangers, shall be in accordance with the following schedule:

PIPE OR TUBING SIZE (INCHES)	SHIELD LENGTH (INCHES)	SHIELD GAGE
Up to 2	12	18
3 & 4	12	16
6	18	16
8 & up	24	12

B. Pipe Covering Protection Saddles: 3/16-inch thick steel, of sufficient depth for the insulation thickness specified, notched so that saddle contact with the pipe is approximately 50 percent of the total axial cross section. Saddles for pipe 12 inches in size and larger shall have a center support.

C. Pipe Hangers: Height adjustable standard duty, clevis-type with cross bolt and nut. Pipe spreaders or spacers shall be used on cross bolts of clevis hangers, when supporting piping 10 inches IPS and larger.

D. Adjustable Floor Rests and Base Flanges: Steel.

E. Hanger Rods: Galvanized, mild low carbon steel, fully threaded with two (2) nuts at each end for positioning rod and hanger and locking each in place.

F. Riser Clamps: Malleable iron or steel.

G. Rollers: Cast Iron.

H. Restraints, Anchors, and Supports for Grooved End Piping System: As recommended by the grooved end fitting manufacturer.

2.3 FASTENERS

A. Sleeve Anchors (Group II, Type 3, Class 3): Molly's Div./USM Corp. Parasleeve Series, Ramset's Dynabolt Series, or Red Head/Phillips AN1405, HN-1614, FS-1411 Series.

B. Wedge Anchors (Zinc Plated, Group II, Type 4, Class 1): Hilti's Kwik Bolt Series, Molly's Div./USM Corp. Parabolt PB Series, Ramset's Trubolt T Series, or Red Head/Phillips WS-3822.

C. Self-Drilling Anchors (Group III, Type 1): Ramset's RD Series, or Red Head/Phillips Series S-14.

D. Non-Drilling Anchors (Group VIII, Type 1): Ramset's Dynaset DS Series, Hilti's HDI Series, or Red Head/Phillips J Series.

E. Stud Anchors (Group VIII, Type 2): Red Head/Phillips JS-38 Series.

F. Threaded Type Concrete Insert: Galvanized ferrous castings, internally threaded to receive 3/4-inch diameter machine bolts.

G. Wedge Type Concrete Insert: Galvanized box-type ferrous castings, internally threaded to receive 3/4-inch bolts having special wedge-shaped heads.

H. Bolts, Nuts, Washers, Lags, and Screws: Medium carbon steel; size and type to suit application; galvanized for high humidity locations, and treated wood; plain finish for other interior locations. Except where shown otherwise on the Drawings, furnish type, size, and grade required for proper installation of the Work.

2.4 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A36/A36M, steel plates, shapes, and bars, black, and galvanized.

B. Bolts and Nuts: ASME B18.10 or ASTM A183, steel, hex-head, track bolts and nuts.

C. Washers: ASTM F844, steel, plain, flat washers.

D. Grout: ASTM C1107, Grade B, non-shrink, nonmetallic.
   1. Characteristics include post-hardening, volume-adjusting, dry, hydraulic-cement-type grout that is non-staining, noncorrosive, nongaseous and is recommended for both interior and exterior applications.
   2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
   3. Water: Potable.
   4. Packaging: Premixed and factory-packaged.

E. Pipe Alignment Guides: Factory fabricated of cast semi-steel or heavy fabricated steel consisting of bolted two-section outer cylinder and base with two-section guiding spider that bolts tightly to pipe.
   1. Length of guides: As recommended by manufacturer to allow indicated travel.

PART 3 – EXECUTION

3.1 INSTALLATION OF HANGERS AND SUPPORTS

A. General: Install hangers, supports, clamps and attachments to support piping properly from building structure; comply with MSS SP-58, SP-69 and SP-89. Arrange for grouping of parallel runs of horizontal piping supported together on field-fabricated, heavy-duty trapeze hangers where possible. Where piping of various sizes is supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe as specified above for individual pipe hangers.

B. Do not hang or support one pipe from another or from ductwork.

C. Support all insulated horizontal piping conveying refrigerants or other fluids below ambient temperature, by means of hangers or supports with insulation shields installed outside of the insulation.

D. Space hangers or supports for horizontal piping on maximum center distances as listed in the following hanger schedules, except as otherwise specified, or noted on the Drawings.

E.

PIPE MATERIAL	MAXIMUM HORIZONTAL SPACING (FEET)	MAXIMUM VERTICAL SPACING (FEET)
Copper or copper-alloy pipe	12	10
Copper or copper-alloy tubing, 1-1/4 inch diameter and smaller	6	10
Copper or copper-alloy tubing, 1-1/2 inch diameter and larger	10	10
Steel pipe	12	15
Chlorinated polyvinyl chloride (CPVC) pipe and tubing, 11/4 inches and larger	4	10
Chlorinated polyvinyl chloride (CPVC) pipe and tubing, 1 inch and smaller	3	10

PIPE MATERIAL	MAXIMUM HORIZONTAL SPACING (FEET)	MAXIMUM VERTICAL SPACING (FEET)
Polyvinyl chloride (PVC) pipe	4	10

F. For Cast Iron Soil Pipe: Space hangers or support pipe at each joint or on maximum centers of 5 feet. Support pipe in continuous 10-foot lengths or longer on maximum centers of 10 feet. Place hangers or supports as close as possible to joints and when hangers or supports do not come within 1 foot of a branch line fitting, install an additional hanger or support at the fittings.

G. For Hubless Cast Iron Pipe: Space hangers or supports at every other joint, except when the horizontal distance between hangers exceeds 4 feet, provide hangers, or supports at each joint. Place hanger or supports as close as possible to joints and when hangers or supports do not come within 1 foot of a branch line fitting install an additional hanger or support at the fitting. Where piping is suspended on centers in excess of 18 inches by means of non-rigid hangers, provide sway bracing to prevent horizontal pipe movement. Submit details of sway braces.

H. For Directional Changes: Install a hanger or support close to the point of change of direction of all pipe runs in either a horizontal or vertical plane.

I. For Concentrated Loads: Install additional hangers or supports, spaced as required and directed, at locations where concentrated loads such as in-line pumps, valves, fittings or accessories occur, to support the concentrated loads.

J. For Branch Piping Runs and Runouts over 5 Feet in Length: Install a minimum of one hanger and additional hangers if required by the hanger spacing schedules.

K. Parallel Piping Runs: Where several pipe lines run parallel in the same plane and in close proximity to each other, trapeze hangers may be submitted for approval. Base hanger spacing for trapeze type hangers on the smaller size of pipe being supported. Design the entire hanger assembly based on a safety factor of five (5), for the ultimate strength of the material being used.

L. Support floor drain traps from the overhead construction, with hangers of type and design as required and approved. Overhead supports are not required for floor drain traps installed directly below earth supported concrete floors.

M. Size hanger rods in accordance with the following:

PIPE OR TUBING SIZE (INCHES)	SINGLE ROD HANGER SIZE (INCHES)		DOUBLE ROD HANGER SIZE (INCHES)	
	PIPE	TUBING	PIPE	TUBING
Up to 2 inches	3/8	1/4	3/8	1/4
2-1/2 and 3	1/2	3/8	3/8	1/4
4 and 5	5/8	1/2	1/2	3/8

N. Size hanger rods, for piping over 12 inches in size and multiple line supports, based on a safety factor of five for the ultimate strength of the materials being used.

O. Secure hanger rods as follows: Install one nut under clevis, angle or steel member; one nut on top of clevis, angle or steel member; one nut inside insert or on top of upper hanger attachment and one nut and washer against insert or on lower side of upper hanger attachment. A total of four nuts are required for each road, two at upper hanger attachment and two at hanger.

P. Vertical Piping:

1. Support vertical risers of piping systems, by means of heavy duty hangers installed close to base of pipe risers, and by riser clamps with extension arms at intermediate floors, with the distance between clamps not to exceed 25 feet, unless otherwise specified. Support pipe risers in vertical shafts equivalent to the aforementioned. Install riser clamps above floor slabs, with the extension arms resting on floor slabs. Provide adequate clearances for risers that are subject to appreciable expansion and contraction, caused by operating temperature ranges.
2. Support extension arms of riser clamps, secured to risers to be insulated for cold service, 4 inches above floor slabs, to allow room for insulating and vapor sealing around riser clamps.
3. Install intermediate supports between riser clamps on a maximum 6-foot centers, for copper tubing risers 1-1/4 inches in size and smaller, installed in finished rooms or spaces other than mechanical equipment machine or steam service rooms, or penthouse mechanical equipment rooms.
4. Floor Supports: Install adjustable yoke rests with base flanges, for the support of piping, unless otherwise indicated on the Drawings. Install supports in a manner, which will not be detrimental to the building structure.

Q. Install building attachments within concrete or to structural steel. Space attachments within maximum piping span length indicated in MSS SP-58 and SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert to forms. Install reinforcing bars through openings at top of inserts.

R. Install hangers and supports to allow controlled movement of piping systems, permit freedom of movement between pipe anchors, and facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

S. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.

T. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so that maximum pipe deflections allowed by ASME B31.9 “Building Services Piping” is not exceeded.

3.2 UPPER HANGER ATTACHMENTS

A. General:

1. In all cases, secure upper hanger attachments to overhead structural steel, steel bar joists, or other suitable structural members.
2. Do not attach hangers to steel decks which are not to receive concrete fill.
3. Do not attach hangers to precast concrete plank decks less than 2-3/4 inches thick.
4. Do not use flat bars or bent rods as upper hanger attachments.

B. Attachment to Existing Cast-In-Place Concrete:

1. For piping up to a maximum of 4 inches in size, secure hangers to overhead construction with self-drilling type expansion shields and machine tools.
2. Secure hangers to wall or floor construction with single unit expansion shields or self-drilling type expansion shields and machine bolts.
3. Install powder-actuated drive-pin fasteners in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer’s operating manual. Do not use in lightweight concrete slabs or in concrete slabs less than 4 inches (100 mm) thick.

C. Attachment to Wood Construction: Secure hangers to the sides (only) of wood members, by means of malleable iron side beam connectors, or malleable iron or steel side beam brackets. Do not secure hanger attachments to nailing strips resting on top of steel beams.

1. Secure side beam connectors to wood members with two No. 18 by 1-1/2-inch long wood screws, or two No. 16 by 1-1/2-inch long drive screws. Do not support piping over 1-1/2 inches in size from side beam connectors. Do not hammer in wood screws.
2. Secure side beam brackets to wood members with steel bolts or lag screws. Do not use lag screws in wooden members having a nominal thickness (beam face) under 2 inches in size. Install bolts or lag screws, in the sides of timber or a joist, at the mid-point or above, not less than 2-1/2 inches from the lower edge when supporting branch lines and not less than 3 inches from the lower edge when supporting mains. Install heavy gage steel washers under all nuts.
3. Secure side beam brackets to wooden beams or joists, with lag screws or bolts of size as follows:

PIPE SIZE (INCHES)	LAG SCREW SIZE (INCHES)	BOLT DIAMETER (INCHES)
2 and under	3/8 diameter x 1-3/4	3/8
2-1/2 and 3	1/2 diameter x 2	1/2
4 and 5	Use bolt	5/8

a. Do not support piping larger than 3 inches with lag screws. Predrill holes for lag screws 1/8 inch in diameter less than the root diameter of the lag screw thread.

b. The minimum width of the lower face of wood beams or joints in which lag screws of size as specified may be used is as follows:

LAG SCREW DIAMETER (INCHES)	NOMINAL WIDTH OF BEAM FACE (INCHES)
3/8	2
1/2	3

3.3 TRAPEZES

A. Heavy-Duty Steel Trapezes: Field-fabricate from ASTM A36 steel shapes selected for loads being supported. Weld steel according to AWS D-1.1.

3.4 ANCHORS, RESTRAINTS, RIGID SUPPORTS, STAYS, AND SWAY BRACES

A. Install pipe anchors, restraints, and sway braces, at locations required. Design anchors so as to permit piping to expand and contract freely in opposite directions, away from anchor points. Install anchors independent of all hangers and supports, and in a manner which will not affect the structural integrity of the building.

1. Rigid support sway bracing shall be provided at changes in direction greater than 45 degrees for pipe sizes 4 inches and larger.
2. Anchorage shall be provided to restrain drainage piping from axial movement: For pipe sizes greater than 4 inches, restraints shall be provided for drain pipes at all changes in direction and at all changes in diameter greater than two pipe sizes. Braces, blocks, rodding and other suitable methods as specified by the coupling manufacturer shall be utilized.

3.5 COMBINATION CLEVIS HANGER, PIPE INSULATION SHIELD, AND VAPOR BARRIER JACKETED HIGH DENSITY INSULATING SADDLES

A. Install a combination clevis hanger, pipe insulation shield and vapor barrier jacketed high density insulating saddles, at all points of support for piping or tubing to be insulated for cold service. Furnish companion high density vapor barrier jacketed saddle pieces, of the same material, thickness and length, for installation over the top 180-degree surface of pipe or tubing, at each point of support where an insulated clevis hanger is utilized.

3.6 PIPE INSULATION SHIELDS

A. Install a pipe insulation shield, at all points of support, for piping insulated with cold service insulation. Center shields on all hangers and supports and install in such a manner so as not to cut, puncture or press into the insulation, or in any manner be detrimental to the vapor barrier.

3.7 INSTALLATION OF ANCHORS

A. Install anchors at proper locations to prevent stresses from exceeding those permitted by ASME B31.9 and to prevent transfer of loading and stresses to connected equipment.

B. Fabricate and install anchors by welding steel shapes, plates, and bars to piping and to structure. Comply with ASME B31.9 and with AWS Standards D1.1.

C. Where expansion compensators are indicated, install anchors in accordance with expansion unit manufacturer's written instructions to control movement to compensators.

D. Anchor Spacings: Where not otherwise indicated, install anchors at ends of principal pipe runs between expansion loops and bends. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.

3.8 EQUIPMENT SUPPORTS

A. Fabricate structural steel stands to suspend equipment from structure above or support equipment above floor.

B. Grouting: Place grout under supports for piping and equipment.

3.9 METAL FABRICATION

A. Cut, drill, and fit miscellaneous metal fabrications for pipe anchors and equipment supports. Install and align fabricated anchors in indicated locations.

B. Touch-Up Painting: Immediately after erection of anchors and supports, clean field welds and abraded areas of shop paint and paint exposed areas with same material as used for shop painting to comply with SSPC-PA-1 requirements for touch-up of field-painted surfaces.
   1. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

C. Ferrous Metals: Clean galvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with recommendations of the Steel Structure Painting Council.
   1. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by the paint manufacturer, and touch up with the same primer as the shop coat.

D. Galvanized Surfaces: Clean galvanized surfaces with non-petroleum based solvents so that the surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

E. Fit exposed connections together to form hairline joints. Field-weld connections that cannot be shop-welded because of shipping size limitations.

F. Field Welding: Comply with AWS D1.1 procedures for manual shielded metal-arc welding, appearance and quality of welds, methods used in correcting welding work, and the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. Finish welds at exposed connections so that no roughness shows after finishing, and so that contours of welded surfaces match adjacent contours.

3.10 ADJUSTING

A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

END OF SECTION

SECTION 220700 – PLUMBING INSULATION

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes pipe, duct, and equipment insulation.

1.2 DEFINITIONS

A. Hot Surfaces: Normal operating temperatures of 100 DegF or higher.

B. Dual-Temperature Surfaces: Normal operating temperatures that vary from hot to cold.

C. Cold Surfaces: Normal operating temperatures less than 75 DegF.

D. Thermal Resistivity: "r-values" represent the reciprocal of thermal conductivity (k-value). Thermal conductivity is the rate of heat flow through a homogenous material exactly 1 inch thick. Thermal resistivities are expressed by the temperature difference in degrees Fahrenheit between two exposed faces required to cause one Btu to flow through one square foot of material, in one hour, at a given mean temperature.

E. Density: Is expressed in lb/sq.ft.

1.3 SUBMITTALS

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

B. Product data for each type of mechanical insulation identifying k-value, thickness, and accessories.

C. Manufacturer's installation instructions.

D. Schedule of materials and thickness for each piece of equipment.

1.4 QUALITY ASSURANCE

A. Fire Performance Characteristics: Conform to the following characteristics for insulation including facings, cements, and adhesives, when tested according to ASTM E84, by UL or other testing or inspecting organization acceptable to the authority having jurisdiction. Label insulation with appropriate markings of testing laboratory.
   1. Interior Insulation: Flame spread rating of 25 or less and a smoke developed rating of 50 or less.
   2. Exterior Insulation: Flame spread rating of 75 or less and a smoke developed rating of 150 or less.

1.5 SEQUENCING AND SCHEDULING

A. Schedule insulation application after testing of piping systems.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Glass Fiber:
   a. CertainTeed Corporation.
   b. Knauf Fiberglass GmbH.
   c. Manville.
   d. Owens-Corning Fiberglas Corporation.
   e. USG Interiors, Inc. - Thermafiber Division.
2. Flexible Elastomeric Cellular:
   a. Armstrong World Industries, Inc.
   b. Halstead Industrial Products.
   c. IMCOA.
   d. Rubatex Corporation.
3. Open Weave Glass Cloth Membrane:
   a. Perma Glas-Mesh Corp.
4. Vinyl-Acrylic Mastic:
   a. Childers Products Co.

2.2 GLASS FIBER

A. Material: Inorganic glass fibers, bonded with a thermosetting resin.

B. Jacket: All-purpose, factory-applied, laminated glass-fiber-reinforced, flame-retardant Kraft paper and aluminum foil having self-sealing lap.

C. Preformed Pipe Insulation: ASTM C547, Class 1, rigid pipe insulation, jacketed.
1. Thermal Conductivity: 0.27 average maximum at 75 DegF mean temperature.
2. Density: 10 average maximum.

D. Adhesive: Produced under the UL Classification and Follow-up service.
1. Type: Non-flammable, solvent-based.
2. Service Temperature Range: Minus 20 to 180 DegF.

E. Vapor Barrier Coating: Waterproof coating recommended by insulation manufacturer for outside service.

2.3 FLEXIBLE ELASTOMERIC CELLULAR

A. Material: Flexible expanded closed-cell structure with smooth skin on both sides.
1. Tubular Materials: ASTM C534, Type I.
2. Sheet Materials: ASTM C534, Type II.

B. Thermal Conductivity: 0.27 average maximum at 75 DegF.

C. Coating: Water based latex enamel coating recommended by insulation manufacturer.

2.4 INSULATING CEMENTS

A. Mineral Fiber: ASTM C195.
   1. Thermal Conductivity: 1.0 average maximum at 500 DegF mean temperature.
   2. Compressive Strength: 10 psi at 5 percent deformation.

B. Expanded or Exfoliated Vermiculite: ASTM C196.
   1. Thermal Conductivity: 1.10 average maximum at 500 DegF mean temperature.
   2. Compressive Strength: 5 psi at 5 percent deformation.

C. Mineral Fiber, Hydraulic-Setting Insulating and Finishing Cement: ASTM C449.
   1. Thermal Conductivity: 1.2 average maximum at 400 DegF mean temperature.
   2. Compressive Strength: 100 psi at 5 percent deformation.

2.5 ADHESIVES

A. Flexible Elastomeric Cellular Insulation Adhesive: Solvent-based, contact adhesive recommended by insulation manufacturer.

B. Lagging Adhesive: MIL-A-3316C, non-flammable adhesive in the following Classes and Grades:
   1. Class 1, Grade A for bonding glass cloth and tape to unfaced glass fiber insulation, sealing edges of glass fiber insulation, and bonding lagging cloth to unfaced glass fiber insulation.
   2. Class 2, Grade A for bonding glass fiber insulation to metal surfaces.

2.6 JACKETS

A. General: ASTM C921, Type 1, except as otherwise indicated.

B. Foil and Paper Jacket: Laminated glass-fiber-reinforced, flame-retardant Kraft paper and aluminum foil.
   1. Water Vapor Permeance: 0.02 perm maximum, when tested according to ASTM E96.
   2. Puncture Resistance: 50 beach units minimum, when tested according to ASTM D781.

C. PVC Jacketing: High-impact, ultra-violet-resistant PVC, 20-mil-thick, roll stock ready for shop or field cutting and forming to indicated sizes.
   1. Adhesive: As recommended by insulation manufacturer.

D. PVC Fitting Covers: Factory-fabricated fitting covers manufactured from 20-mil-thick, high-impact, ultra-violet-resistant PVC.
   1. Adhesive: As recommended by insulation manufacturer.

2.7 ACCESSORIES AND ATTACHMENTS

A. Glass Cloth and Tape: Woven glass fiber fabrics, plain weave, presized a minimum of 8 ounces per square yard.
   1. Tape Width: 4 inches.
   2. Cloth Standard: MIL-C-20079H, Type I.
   3. Tape Standard: MIL-C-20079H, Type II.

B. Bands: 3/4-inch wide in one of the following materials compatible with jacket:
   1. Stainless Steel: Type 304, 0.020-inch thick.
   2. Galvanized Steel: 0.005-inch thick.
   3. Aluminum: 0.007-inch thick.
   4. Brass: 0.01-inch thick.
   5. Nickel-Copper Alloy: 0.005-inch thick.

C. Wire: 14-gage nickel copper alloy, 16-gage, soft-annealed stainless steel, or 16-gage, soft-annealed galvanized steel.

D. Corner Angles: 28-gage, 1-inch by 1-inch aluminum, adhered to 2-inch by 2-inch Kraft paper.

E. Anchor Pins: Capable of supporting 20 pounds each. Provide anchor pins and speed washers of sizes and diameters as recommended by the manufacturer for insulation type and thickness.

2.8 SEALING COMPOUNDS

A. Vapor Barrier Compound: Water-based, fire-resistive composition.
   1. Water Vapor Permeance: 0.08 perm maximum.
   2. Temperature Range: Minus 20 to 180 DegF.

B. Weatherproof Sealant: Flexible-elastomer-based, vapor-barrier sealant designed to seal metal joints.
   1. Water Vapor Permeance: 0.02 perm maximum.
   2. Temperature Range: Minus 50 to 250 DegF.
   3. Color: Aluminum.

PART 3 – EXECUTION

3.1 PREPARATION

A. Surface Preparation: Clean, dry, and remove foreign materials such as rust, scale, and dirt.

B. Mix insulating cements with clean potable water. Mix insulating cements contacting stainless-steel surfaces with demineralized water.
   1. Follow cement manufacturer's printed instructions for mixing and portions.

3.2 INSTALLATION, GENERAL

A. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each mechanical system.

B. Select accessories compatible with materials suitable for the service. Select accessories that do not corrode, soften, or otherwise attack the insulation or jacket in either the wet or dry state.

C. Install vapor barriers on insulated pipes and equipment having surface operating temperatures below 60 DegF.

D. Install insulation only after systems to be insulated have been tested and approved.

E. Apply insulation material, accessories, and finishes according to the manufacturer's printed instructions.

F. Install insulation with smooth, straight, and even surfaces.

G. Seal joints and seams to maintain vapor barrier on insulation requiring a vapor barrier.

H. Seal penetrations for hangers, supports, anchors, and other projections in insulation requiring a vapor barrier.

I. Seal Ends: Except for flexible elastomeric insulation, taper ends at 45-degree angle and seal with lagging adhesive. Cut ends of flexible elastomeric cellular insulation square and seal with adhesive.

J. Apply adhesives and coatings at manufacturer's recommended coverage-per-gallon rate.

K. Keep insulation materials dry during application and finishing.

L. Install board and block materials with a minimum dimension of 12 inches and a maximum dimension of 48 inches.

M. Items Not Insulated: Unless otherwise indicated do not apply insulation to the following systems, materials, and equipment:
   1. Flexible connectors for pipes.
   2. Vibration control devices.
   3. Testing laboratory labels and stamps.
   4. Nameplates and data plates.
   5. Access panels and doors in air distribution systems.
   6. Fire protection piping systems.
   7. Sanitary drainage and vent piping except for exposed sanitary on fixtures for the disabled.
   8. Drainage piping located in crawl spaces, unless indicated otherwise.
   9. Below grade piping.
   10. Chrome-plated pipes and fittings except for plumbing fixtures for the disabled.
   11. Piping specialties including air chambers, unions, strainers, check valves, plug valves, and flow regulators.

3.3 PIPE INSULATION INSTALLATION, GENERAL

A. Tightly butt longitudinal seams and end joints. Bond with adhesive.

B. Stagger joints on double layers of insulation.

C. Apply insulation continuously over fittings, valves, and specialties except as otherwise indicated.

D. Apply insulation with a minimum number of joints.

E. Apply insulation with integral jackets as follows:
   1. Pull jacket tight and smooth.
   2. Cover circumferential joints with butt strips, at least 3 inches wide and of same material as insulation jacket. Secure with adhesive along both edges of butt strip and space 4 inches on center.
   3. Longitudinal Seams: Overlap seams at least 1-1/2 inches. Apply insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap.
   4. Vapor Barrier Coatings: Where vapor barriers are indicated, apply on seams and joints and at ends butt to flanges, unions, valves, and fittings.

5. At penetrations in jackets for thermometers and pressure gages, fill and seal voids with vapor barrier coating.
6. Repair damaged insulation jackets, except metal jackets, by applying jacket material around damaged jacket. Adhere and seal. Extend patch at least 2 inches in both directions beyond damaged insulation jacket and around the entire circumference of the pipe.

F. Interior Walls and Partitions Penetrations: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions. Apply an aluminum jacket with factory-applied moisture barrier over insulation. Extend 2 inches from both surfaces of wall or partition. Secure aluminum jacket with metal bands at both ends. Seal ends of jacket with vapor barrier coating. Seal around penetration with joint sealer. Refer to Division 7.

G. Floor Penetrations: Terminate insulation underside of floor assembly and at floor support at top of floor.

H. Flanges, Fittings, and Valves - Interior Exposed and Concealed: Coat pipe insulation ends with vapor barrier coating. Apply premolded, precut, or field-fabricated segments of insulation around flanges, unions, valves, and fittings. Make joints tight. Bond with adhesive.
1. Use same material and thickness as adjacent pipe insulation.
2. Overlap nesting insulation by 2 inches or 1-pipe diameter, whichever is greater.
3. Apply materials with adhesive, fill voids with mineral fiber insulating cement. Secure with wire or tape.
4. Insulate elbows and tees smaller than 3-inch pipe size with premolded insulation.
5. Insulate elbows and tees 3 inches and larger with premolded insulation or insulation material segments. Use at least three (3) segments for each elbow.
6. Cover insulation, except for metal jacketed insulation, with PVC fitting covers and seal circumferential joints with butt strips.
7. Cover insulation, except for metal jacketed insulation, with two (2) layers of lagging adhesive to a minimum thickness of 1/16 inch. Install glass cloth between layers. Overlap adjacent insulation by 2 inches in both directions from joint with glass cloth and lagging adhesive.

I. Hangers and Anchors: Apply insulation continuously through hangers and around anchor attachments. Install saddles, shields, and inserts as specified in Section "Hangers, Supports and Anchors." For cold surface piping, extend insulation anchor legs a minimum of 12 inches and taper and seal insulation ends.
1. Inserts and Shields: Cover hanger inserts and shields with jacket material matching adjacent pipe insulation.
2. Special Treatment at Hanger Locations: At hanger locations on insulated piping 2 inches and larger, install high density rigid fiber glass pipe support blocks. On piping up to and including 5 inches, install one (1) block at each hanger, directly on the bottom of the pipe. For 6-, 8-, and 10-inch piping, install two (2) blocks at each hanger oriented 30 degrees from each side of the bottom. For piping 12 inches and larger, orientate blocks at both the 30 degrees positions and directly on the bottom. Install blocks inside cut out section of pipe insulation, being careful not to damage the vapor barrier jacketing. Any jacketing so damaged should be repaired with matching vapor barrier tape.

3.4 BELOW GROUND PIPE INSULATION INSTALLATION

A. General: The following are additional requirements for insulation applied to piping installed below ground.

B. Coat bore surfaces of insulation materials with insulating cement of type recommended by insulation manufacturer. Apply enough cement to fill surface cells. Do not use adhesives for this coating.

C. Secure insulation with a minimum of two (2) stainless-steel bands for each section of insulation.

D. Terminate insulation at anchor blocks.

E. Apply insulation continuously through sleeves and manholes, except as specified above for exterior wall penetrations.

F. Finishing: Apply three (3) coats of asphaltic mastic to a finish thickness of 3/16 inch over insulation materials. Apply 10 by 10 mesh glass cloth between coats. Overlap edges of glass cloth by 2 inches.

3.5 GLASS FIBER PIPE INSULATION INSTALLATION

A. Bond insulation to pipe with lagging adhesive.

B. Seal exposed ends with lagging adhesive.

C. Seal seams and joints with vapor barrier compound.

3.6 FLEXIBLE ELASTOMERIC CELLULAR PIPE INSULATION INSTALLATION

A. Slip insulation on the pipe before making connections wherever possible. Seal joints with adhesive. Where the slip-on technique is not possible, cut one side longitudinally and apply to the pipe. Seal seams and joints with adhesive.

B. Valves, Fittings, and Flanges: Cut insulation segments from pipe or sheet insulation. Bond to valve, fitting, and flange and seal joints with adhesive.
   1. Miter cut materials to cover soldered elbows and tees.
   2. Fabricate sleeve fitting covers from flexible elastomeric cellular insulation for screwed valves, fittings, and specialties. Miter cut materials. Overlap adjoining pipe insulation.

3.7 EQUIPMENT INSULATION INSTALLATION, GENERAL

A. Groove and score insulation materials as required to fit as closely as possible to the equipment and to fit contours of equipment. Stagger end joints.

B. Insulation Thicknesses Greater than 2 Inches: Install insulation in multiple layers with staggered joints.

C. Bevel insulation edges for cylindrical surfaces for tight joint.

D. Secure sections of insulation in place with wire or bands spaced at 9-inch centers except for flexible elastomeric cellular insulation.

E. Protect exposed corners with corner angles under wires and bands.

F. Manholes, Handholes, and Information Plates: Bevel and seal insulation ends around manholes, handholes, ASME stamps, and nameplates.

G. Removable Insulation: Install insulation on components that require periodic inspecting, cleaning, and repairing for easy removal and replacement without damage to adjacent insulation.

H. Pumps: Where insulation is indicated, fabricate galvanized steel boxes lined with insulation. Fit boxes around pumps and coincide joints in box with the splits in the pump casings. Fabricate joints with outward bolted flanges.

I. Finishing: Except for flexible elastomeric cellular insulation, apply two (2) coats of vapor barrier compound to a minimum thickness of 1/16 inch. Install a layer of glass cloth embedded between layers.

3.8 GLASS FIBER EQUIPMENT INSULATION INSTALLATION

A. Secure insulation with anchor pins and speed washers.

B. Space anchors at maximum intervals of 18 inches in both directions and not more than 3 inches from edges and joints.

C. Apply a smoothing coat of insulating and finishing cement to finished insulation.

3.9 FLEXIBLE ELASTOMERIC CELLULAR EQUIPMENT INSULATION INSTALLATION

A. Install sheets of the largest manageable size.

B. Apply full coverage of adhesive to the surfaces of the equipment and to the insulation.

C. Butt insulation joints firmly together and apply adhesive to insulation edges at joints.

3.10 JACKETS

A. Foil and Paper Jackets (FP): Install jackets drawn tight. Install lap or butt strips at joints with material same as jacket. Secure with adhesive. Install jackets with 1-1/2-inch laps at longitudinal joints and 3-inch-wide butt strips at end joints:
   1. Seal openings, punctures, and breaks in vapor barrier jackets and exposed insulation with vapor barrier compound.
   2. Provide PVC fitting covers.

B. Install the PVC jacket with 1-inch overlap at longitudinal and butt joints and seal with adhesive.

3.11 FINISHES

A. Paint finished insulation as specified in Division 9.

B. Flexible Elastomeric Cellular Insulation: After adhesive has fully cured, apply two (2) coats of protective coating to exposed insulation.

3.12 APPLICATIONS

A. General: Materials and thicknesses are specified in schedules at the end of this Section.

B. Interior Piping Systems: Unless otherwise indicated, insulate the following piping systems:
   1. Domestic cold water.
   2. Domestic hot water.
   3. Domestic recirculated hot water.
   4. Sanitary drains for fixtures accessible to the disabled.

C. Equipment: Unless otherwise indicated, insulate the following indoor equipment:
   1. Domestic cold water equipment, tanks, and pumps.
   2. Domestic hot water equipment, tanks, and water heaters unless factory insulated.
   3. Low temperature brine equipment, tanks, pumps, and heat exchangers, 0 DegF to 34 DegF.
   4. Refrigerated drinking water equipment, tanks, pumps, and heat exchangers.

3.13 PIPE INSULATION SCHEDULES

A. General: Abbreviations used in the following schedules include:
   1. Field-Applied Jackets:
      a. P – PVC.
      b. K - Foil and Paper.
      c. A – Aluminum.
      d. SS - Stainless Steel.
   2. Pipe Sizes: NPS - Nominal Pipe Size.

B. Domestic Cold Water, All Sizes (Interior): 1/2-inch-thick glass fiber insulation. Field-applied jacket is not required.

C. Interior Domestic Hot Water and Recirculated Hot Water:

PIPE SIZES (NPS)	MATERIALS	THICKNESS IN INCHES	VAPOR BARRIER REQUIRED	FIELD-APPLIED JACKET
1 and below	Glass Fiber	1	No	None
1-1/2 and above	Glass Fiber	1.5	No	None

D. Sanitary Drains and Traps Exposed at Fixtures for Disabled:

PIPE SIZES (NPS)	MATERIALS	THICKNESS IN INCHES	VAPOR BARRIER REQUIRED	FIELD-APPLIED JACKET
1 to 1-1/2	Glass Fiber	1	No	None

3.14 EQUIPMENT INSULATION SCHEDULES

A. General: Abbreviations used in the following schedules include:
   1. Field-Applied Jackets:
      a. P - PVC.
      b. K - Foil and Paper.
      c. A - Aluminum.
      d. SS - Stainless Steel.
   2. Pipe Sizes: NPS - Nominal Pipe Size.

3. Interior Exposed Domestic Cold Water Equipment, Tanks, and Pumps:

MATERIAL	FORM	THICKNESS IN INCHES	VAPOR BARRIER REQUIRED	FIELD-APPLIED JACKET
Glass Fiber	Block or Board	1	Yes	(P) (K) (A) (SS)
Flexible Elastomeric	Sheet	3/4	Yes	None

4. Interior Exposed Domestic Hot Water Equipment, Tanks, and Pumps:

MATERIAL	FORM	THICKNESS IN INCHES	VAPOR BARRIER REQUIRED	FIELD-APPLIED JACKET
Glass Fiber	Block	4	No	(A) (SS)
Flexible Elastomeric	Sheet	4	No	(A) (SS)

END OF SECTION

SECTION 221116 – WATER DISTRIBUTION PIPING

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes potable water distribution, including cold- and hot-water supply and hot-water recirculation to a point 5 feet outside the building.

1.2 SUBMITTALS

A. Product data for all products specified in this section.

B. Water samples, test results, and reports specified in "Field Quality Control" and "Cleaning" Articles.

C. Coordination drawings, drawn accurately to scale and coordinating penetrations.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide piping system with the following minimum working pressure ratings, except where indicated otherwise:
   1. Water Distribution Systems, Below Ground: 150 psig.
   2. Water Distribution Systems, Above Ground: 125 psig.

1.4 QUALITY ASSURANCE

A. Comply with the provisions of ASME B31.9 "Building Services Piping" for materials, products, and installation.

B. Provide listing/approval stamp, label, or other marking on piping made to specified standards.

PART 2 – PRODUCTS

2.1 GENERAL

A. All products specified in this section shall be manufactured in the USA and/or Canada.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Couplings for Grooved-End Copper Tube and Grooved-End Copper Fittings:
      a. Victaulic Co. of America.

2.2 PIPES AND TUBES

A. General: The application of the following pipe, tube, and fitting materials and joining methods required for plumbing piping systems are indicated in Part 3 Article "Pipe and Fittings Applications."

B. Hard Copper Tube: ASTM B88, Type L, water tube, drawn temper.

C. Soft Copper Tube: ASTM B88, Types K and L, water tube, annealed temper.

2.3 PIPE FITTINGS AND TUBE FITTINGS

A. Wrought-Copper, Solder-Joint Pressure Fittings: ASME B16.22.

B. Cast-Copper-Alloy, Solder-Joint Pressure Fittings: ASME B16.18.

C. Wrought-Copper and Bronze, Grooved-End Fittings: ASTM B75 Tube and ASTM B584 Bronze Castings.

D. Copper Tube, Grooved-End Mechanical Fittings: ASTM B75, copper tube and ASTM B584 bronze castings.

E. Bronze Flanges: ASME B16.24, Classes 150 and 300.

F. Copper Unions: ASME B16.18, cast-copper-alloy body, hexagonal stock, with ball-and-socket joint, metal-to-metal seating surfaces, and solder-joint, threaded, or solder-joint and threaded ends.
   1. Threaded Ends: Threads conforming to ASME B1.20.1.

2.4 JOINING MATERIALS

A. Solder, brazing, and welding filler metals are specified in other Sections.

B. Couplings for Grooved-End Copper Tube and Grooved-End Copper Fittings: ASTM A536 ductile-iron or ASTM A47 malleable-iron housing having copper-colored enamel finish, with synthetic-rubber gasket having central-cavity, pressure-responsive design and suitable for hot water, with ASTM A183 carbon-steel bolts and nuts.

2.5 VALVES

A. Refer to other Sections.

PART 3 – EXECUTION

3.1 EXCAVATION

A. Excavation, trenching, and backfilling are specified elsewhere.

3.2 PIPE AND FITTINGS APPLICATIONS

A. General: Use pipe, tube, fittings, and joining methods for piping systems according to the following applications.

B. Water Distribution Piping Above Ground: Use the following:
   1. 6 Inches and Smaller: Hard copper tube, Type L; wrought-copper or cast-copper-alloy pressure fittings; copper unions; bronze flanges; and solder joints with Alloy Sn95 solder.

3.3 VALVE APPLICATIONS

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
   1. Shutoff Duty: Use gate, ball, or butterfly valves.
   2. Throttling Duty: Use globe, ball, or butterfly valves.

3.4 PIPING INSTALLATION, GENERAL

A. Basic piping installation requirements are specified in other Sections.

3.5 WATER DISTRIBUTION PIPING INSTALLATION

A. Install piping with 1/32-inch-per-foot (1/4 percent) slope downward toward drain.

3.6 JOINT CONSTRUCTION

A. Basic piping joint construction is specified in other Sections.

B. Grooved Copper Tube and Grooved-Tube Fitting Joints: Assemble joints with coupling, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

3.7 INSTALLATION OF VALVES

A. Sectional Valves: Install sectional valves close to main on each branch and riser serving two (2) or more plumbing fixtures or equipment connections and where indicated.

B. Shutoff Valves: Install shutoff valves on inlet to each plumbing equipment item, on each supply to each plumbing fixture not having stops on supplies, and elsewhere as indicated.

C. Drain Valves: Install drain valves, specified in other Sections, on each plumbing equipment item located to drain equipment for service and repair. Install drain valve at base of each riser, at low points of horizontal runs, and where required to drain water distribution piping system.
   1. Install hose-end drain valves at low points in water mains, risers, and branches.
   2. Install stop and waste drain valves where indicated.

D. Check Valves: Install check valve on discharge side of each pump and elsewhere as indicated.

E. Balance Valves: Install valve in each hot-water circulating loop, discharge side of each pump, and elsewhere as indicated.

3.8 HANGERS AND SUPPORTS INSTALLATION

A. Hanger, support and anchor devices are specified in other Sections.

3.9 CONNECTIONS

A. Supply Runouts to Fixtures: Install hot- and cold-water supply piping runouts of sizes indicated, but not smaller than required by plumbing code to fixtures.

B. Mechanical Equipment Connections: Connect hot- and cold-water supply piping system to mechanical equipment as indicated. Provide shutoff valve and union for each connection. Use flanges instead of unions for connections 2-1/2 inches and larger.

3.10 FIELD QUALITY CONTROL

A. Inspect water distribution piping as follows:
   1. Do not enclose, cover, or put into operation water distribution piping system until it has been inspected and approved by the authority having jurisdiction.

2. During progress of the installation, notify the plumbing official having jurisdiction at least 24 hours prior to time inspection must be made. Perform tests specified below in presence of the plumbing official.
    a. Roughing-In Inspection: Arrange for inspection of piping system before concealed or closed-in after system roughing-in and prior to setting fixtures.
    b. Final Inspection: Arrange for final inspection by plumbing official to observe tests specified below and to ensure compliance with requirements of plumbing code.
3. Reinspections: When a plumbing official finds that piping system will not pass test or inspection, make required corrections and arrange for reinspection by the plumbing official.
4. Reports: Prepare inspection reports signed by plumbing official.

B. Test water distribution piping as follows:
1. Test for leaks and defects in new water distribution piping systems and parts of existing systems that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of system tested.
2. Leave uncovered and unconcealed in new, altered, extended, or replaced water distribution piping until it has been tested and approved. Expose work that has been covered or concealed before it has been tested and approved for testing.
3. Cap and subject the piping system to a static water pressure of 50 psig above the operating pressure without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for 4 hours. Leaks and loss in test pressure constitute defects that must be repaired.
4. Repair leaks and defects with new materials and retest system or portion thereof until satisfactory results are obtained.
5. Prepare reports for tests and required corrective action.

3.11 CLEANING

A. Clean and disinfect water distribution piping as follows:
1. Purge new potable water distribution piping systems and parts of existing potable water systems that have been altered, extended, or repaired prior to use.
2. Use purging and disinfecting procedure prescribed by authority having jurisdiction or, if a method is not prescribed by that authority, the procedure described in either AWWA C651 or AWWA C652 or as described below:
    a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    b. Fill system or part thereof with water/chlorine solution containing at least 50 parts per million of chlorine. Isolate (valve off) and allow to stand for 24 hours.
    c. Drain system or part thereof of previous solution and refill with water/chlorine solution containing at least 200 parts per million of chlorine. Isolate and allow to stand for 3 hours.
    d. Flush system with clean, potable water until the chlorine level matches the level in clean potable water source.
    e. Submit water samples in sterile bottles to authority having jurisdiction. Repeat procedure if biological examination made by the authority shows evidence of contamination.

B. Prepare and submit reports for purging and disinfecting activities.

C. Clean interior of piping system. Remove dirt and debris as work progresses.

3.12 COMMISSIONING

A. Fill water systems. Check compression tanks to determine that they are not air bound and that system is completely full of water.

B. Before operating systems, perform these steps:
   1. Close drain valves, hydrants, and hose bibbs.
   2. Open shutoff valves to full open position.
   3. Open throttling valves to proper setting.
   4. Remove plugs used during testing of piping systems and plugs used for temporary sealing of piping during installation.
   5. Remove, clean, and reinstall strainer screens. Replace damaged strainer screens. Close drain valves and replace drain plugs.
   6. Remove filter cartridges from housings and verify that cartridges are clean, and ready for use.

C. Check plumbing equipment and verify proper settings, adjustments, and operation. Do not operate water heaters before filling with water.

D. Check plumbing specialties and verify proper settings, adjustments, and operation.

E. Energize pumps and verify proper operation.

END OF SECTION

SECTION 221316 – DRAINAGE AND VENT SYSTEMS

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes drainage and vent piping systems to a point 5 feet outside the building. Systems include the following:
   1. Sanitary and storm drainage and vent systems.

1.2 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing piping systems with the following minimum working pressure ratings, except where indicated otherwise:
   1. Soil, Waste, and Vent Systems: 10-foot head of water.

1.3 SUBMITTALS

A. Coordination drawings, drawn accurately to scale and coordinating penetrations.

1.4 QUALITY ASSURANCE

A. Comply with the provisions of ASME B31.9 "Building Services Piping" for materials, products, and installation.

B. Provide listing/approval stamp, label, or other marking on piping made to specified standards.

PART 2 – PRODUCTS

2.1 PIPES AND TUBES

A. General: The application of the following pipe, tube, and fitting materials and joining methods required for plumbing piping systems are indicated in Part 3 Article "Pipe and Fittings Applications."

B. Hub and Spigot, Cast-Iron Soil Pipe: ASTM A74, Service Class.

C. Hubless, Cast-Iron Soil Pipe: CISPI 301.

D. Poly(Vinyl Chloride) (PVC) Plastic, DWV Pipe: ASTM D2665, Schedule 40, plain ends.

E. Poly(Vinyl Chloride) (PVC) Cellular Core, Non-pressure, Plastic Pipe: ASTM F891, Schedule 40, plain ends.

2.2 PIPE FITTINGS AND TUBE FITTINGS

A. Hub and Spigot, Cast-Iron Soil Pipe Fittings: ASTM A74, Service Class.

B. Hubless, Cast-Iron Soil Pipe Fittings: CISPI 301.

C. Poly(Vinyl Chloride) (PVC) Plastic, Threaded Pipe Fittings: ASTM D2464, Schedule 80.

D. Poly(Vinyl Chloride) (PVC) Plastic, Schedule 40, Socket-Type Pipe Fittings: ASTM D2466.

E. Poly(Vinyl Chloride) (PVC) Plastic, Schedule 80, Socket-Type Pipe Fittings: ASTM D2467.

2.3 JOINING MATERIALS

A. Solder, brazing, and welding filler metals are specified in other Sections.

B. Cast-Iron Soil Pipe and Fittings: ASTM C564 neoprene rubber gaskets and lubricant.

C. Ductile-Iron Pipe and Ductile-Iron or Cast-Iron Fittings: The following materials apply:
   1. Push-On Joints: AWWA C111 rubber gaskets and lubricant.
   2. Mechanical Joints: AWWA C111 ductile-iron or gray-iron glands, high-strength steel bolts and nuts, and rubber gaskets.
   3. Flanged Joints: AWWA C115 ductile-iron or gray-iron pipe flanges, rubber gaskets, and high-strength steel bolts and nuts.

D. CISPI Couplings for Hubless Cast-Iron Soil Pipe and Fittings: CISPI 310, having ASTM C564 neoprene sealing sleeve, with 300 Series stainless-steel corrugated shield-and-clamp assembly.

2.4 VALVES

A. Valves are specified in other Sections.

PART 3 – EXECUTION

3.1 EXCAVATION

A. Excavation, trenching, and backfilling are specified in other Sections.

3.2 PREPARATION OF FOUNDATION FOR BURIED PIPING

A. Grade trench bottom to provide smooth, firm, stable, and rock-free foundation throughout length of piping.

B. Remove unstable, soft, and unsuitable materials at surface on which piping is to be laid and backfill with clean sand or pea gravel to indicated level.

C. Shape bottom of trench to fit bottom of piping. Fill unevenness with tamped-sand backfill. Dig bell holes at each pipe joint to relieve bells of loads and to ensure continuous bearing of pipe barrel on foundation.

3.3 PIPE AND FITTINGS APPLICATIONS

A. General: Use pipe, tube, fittings, and joining methods for piping systems according to the following applications.

B. Soil, Waste, and Vent Piping Below Ground: Use the following:
   1. All: Hub-and-spigot cast-iron soil pipe, hub-and-spigot cast-iron soil pipe fittings, neoprene rubber gaskets, and compression joints.

C. Soil, Waste, and Vent Piping Above Ground: Use the following:
   1. All: Hubless cast-iron soil pipe, hubless cast-iron soil pipe fittings, CISPI-type couplings for hubless cast-iron soil pipe and fittings, and hubless joints.

2. Poly(vinyl chloride) (PVC) plastic DWV pipe; PVC socket-type drain, waste, and vent pipe pattern fittings in 5- and 6-inch sizes; PVC socket-type Schedule 40 fittings in 8-inch and larger sizes; and solvent-cemented joints.

3.4 VALVE APPLICATIONS

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
   1. Shutoff Duty: Use gate, ball, or butterfly valves.
   2. Throttling Duty: Use globe, ball, or butterfly valves.

3.5 PIPING INSTALLATION, GENERAL

A. Basic piping installation requirements are specified in other Sections.

3.6 DRAINAGE AND VENT PIPING INSTALLATION

A. Install cast-iron soil pipe and cast-iron soil pipe fittings according to CISPI 1990 revised and edited edition of "Cast Iron Soil Pipe and Fittings Handbook, Volume I," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

B. Make changes in direction for drainage and vent piping using appropriate Y branches, Y branches with 1/8 bends, and long-sweep 1/4, 1/5, 1/6, 1/8, and 1/16 bends. Sanitary tees and short-sweep quarter bends may be used on vertical stacks of drainage lines where change in direction of flow is from horizontal to vertical. Use long-turn double-Y-branch and 1/8-bend fittings where two (2) fixtures are installed back to back or side by side and have a common drain. Straight tees, elbows, and crosses may be used on vent lines. Make no change in direction of flow greater than 90 degrees. Where different sizes of drainage pipes and fittings are connected, use proper size standard increasers and reducers. Reduction of the size of drainage piping in the direction of flow is prohibited.

C. Lay buried building drains beginning at low point of each system, true to grades and alignment indicated, with unbroken continuity of invert. Place hub or bell ends of piping facing upstream. Install required gaskets according to manufacturer's recommendations for use of lubricants, cements, and other special installation requirements. Maintain swab or drag in piping and pull past each joint as completed.

D. Install drainage and vent piping at the following minimum slopes, except where another slope is indicated:
   1. Sanitary Building Drain: 1/4 inch per foot (2 percent) for piping 3 inches and smaller; 1/8 inch per foot (1 percent) for piping 4 inches and larger.
   2. Horizontal Sanitary Drainage Piping: 1/4 inch per foot (2 percent).
   3. Horizontal Storm Drainage Piping: 1/4 inch per foot (2 percent).
   4. Vent Piping: 1/8 inch per foot (1 percent).

E. Install underground plastic drainage piping according to ASTM D2321.

F. Sleeves are not required for cast-iron soil pipes passing through concrete slab, without membrane waterproofing, on grade.

G. Install PVC drainage pipe and fittings according to ASTM D2665.

3.7 JOINT CONSTRUCTION

A. Basic piping joint construction is specified in other Sections

B. Cast-Iron Soil Pipe and Cast-Iron Soil Pipe Fitting Joints: Make joints according to recommendations in CISPI 1990 revised and edited edition of "Cast Iron Soil Pipe and Fittings Handbook, Volume I," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
   1. Compression Joint: Make with neoprene gasket matching class of pipe and fittings.
   2. Hubless Joint: Make with neoprene gasket and sleeve or clamp.

C. PVC DWV Pipe: Join PVC drainage pipe and fittings according to ASTM D2665.

D. Handling of Solvent Cements, Primers, and Cleaners: Comply with procedures in ASTM F402 for safe handling during joining of plastic pipe and fittings with solvent cements.

3.8 INSTALLATION OF VALVES

A. Install valves for duty indicated, where indicated.

B. Shutoff Valves: For shutoff valves 2 inches and smaller, use gate or ball valves; for shutoff valves 2-1/2 inches and larger, use gate or butterfly valves.

C. Drain Valves: Install drain valves on each plumbing equipment item located to drain equipment for service and repair.

D. Check Valves: Install swing check valve on discharge side of each pump and elsewhere as indicated. Use MSS SP-80, Class 125, cast-bronze body for 2-inch and smaller piping and MSS SP-71, Class 125, cast-iron body for 2-1/2-inch and larger piping.

3.9 HANGERS AND SUPPORTS INSTALLATION

A. Hanger and support devices are specified in other Sections.

3.10 CONNECTIONS

A. Drainage Runouts to Fixtures: Provide drainage and vent piping runouts, with approved trap, of sizes indicated, but not smaller than required by plumbing code, to plumbing fixtures and drains.

B. Locate drainage piping runouts as close as possible to bottom of floor slab supporting fixtures or drains.

C. Mechanical Equipment Connections: Install drain valve and union on each equipment drain connection. Use flanges instead of unions for connections 2-1/2 inches and larger.

3.11 FIELD QUALITY CONTROL

A. Inspect drainage piping as follows:
   1. Do not enclose, cover, or put into operation drainage and vent piping system until it has been inspected and approved by the authority having jurisdiction.
   2. During progress of installation, notify the plumbing official having jurisdiction at least 24 hours prior to time such inspection must be made. Perform tests specified below in presence of the plumbing official.

a. Roughing-In Inspection: Arrange for inspection of piping system after system roughing-in, before concealing, and prior to setting fixtures.

b. Final Inspection: Arrange for final inspection by plumbing official to observe tests specified below and to ensure compliance with requirements of plumbing code.

3. Reinspections: Make required corrections and arrange for reinspection by plumbing official when piping system fails to pass test or inspection.

4. Reports: Prepare inspection reports signed by the plumbing official.

B. Drainage and Vent Piping System Tests: Test drainage and vent systems according to procedures of authority having jurisdiction or, in absence of published procedure, as follows:

1. Test for leaks and defects in new drainage and vent piping systems and parts of existing systems that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with a diagram of the portion of the system tested.

2. Leave uncovered and unconcealed in new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose for testing work that has been covered or concealed before it has been tested and approved.

3. Rough Plumbing Test Procedure: Except for outside leaders and perforated or open-jointed drain tile, test piping of plumbing drainage and venting systems on completion of roughing-in piping installation. Tightly close all openings in piping system and fill with water to point of overflow, but not less than 10 feet head of water. Water level shall not drop during the period from 15 minutes before inspection starts through completion of inspection. Inspect joints for leaks.

4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and their traps filled with water, test connections and prove gastight and watertight. Plug stack openings on roof and building drain where it leaves the building and introduce air into the system equal to pressure of 1-inch water column. Use a U tube or manometer inserted in the trap of a water closet to measure this pressure. Air pressure shall remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.

5. Repair leaks and defects using new materials and retest system or portion thereof until satisfactory results are obtained.

6. Prepare reports for tests and required corrective action.

3.12 CLEANING

A. Clean interior of piping system. Remove dirt and debris as work progresses.

3.13 COMMISSIONING

A. Check plumbing equipment and verify proper settings, adjustments, and operation.

B. Check plumbing specialties and verify proper settings, adjustments, and operation.

C. Energize pumps and verify proper operation.

3.14 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

B. Place plugs in ends of uncompleted piping at end of day or when work stops.

C. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two (2) coats of a water-based latex paint.

END OF SECTION

SECTION 223300 – ELECTRIC WATER HEATERS

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes electric water heaters and accessories.

1.2 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract.

B. Product Data including rated capacities of selected models, weights (shipping, installed, and operating), furnished specialties, and accessories. Indicate dimensions, finishes and coatings, required clearances, methods of assembly of components, and piping and wiring connections.

C. Shop Drawings showing layout of each unit, including tanks, pumps, controls, related accessories, and piping.

D. Setting Drawings with templates and directions for installing foundation bolts, anchor bolts, and other anchorages.

E. Wiring diagrams from manufacturers detailing electrical requirements for electrical power supply wiring to water heaters. Include ladder-type wiring diagrams for interlock and control wiring required for final installation of water heaters and controls. Differentiate between factory-installed and field-installed wiring.

F. Product certificates signed by manufacturers of water heaters certifying that their products comply with specified requirements.

G. Certificates of shop inspection and data report as required by provisions of ASME Boiler and Pressure Vessel Code, when ASME construction is indicated.

H. Field quality-control installation reports.

I. Maintenance data for water heaters to include in operation and maintenance. Include startup instructions.

1.3 QUALITY ASSURANCE

A. ASHRAE Standard: Comply with performance efficiencies prescribed in ASHRAE 90.1, “Energy Efficient Design of New Buildings Except Low-Rise Residential Buildings.”

B. ASHRAE Standard: Comply with performance efficiencies prescribed in ASHRAE 90.2, “Energy Efficient Design of New Low-Rise Residential Buildings.”

C. NFPA Standard: Comply with NFPA 70, “National Electrical Code,” for electrical components.

D. Listing and Labeling: Provide electrically operated water heaters, controls, and components specified in this Section that are listed and labeled.

1. The Terms “Listed” and “Labeled”: As defined in National Electrical Code, Article 100.

E. Product Options: Drawings indicate size, profiles, connections, dimensional requirements, and characteristics of water heaters and accessories and are based on specific types and models indicated. Other manufacturers' water heaters and accessories with equal performance characteristics may be considered.

1.4 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of Contract Documents.

B. Special Warranty: Submit a written warranty executed by manufacturer agreeing to repair or replace water heaters and accessories that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, tanks and elements. This warranty is in addition to, and not a limitation of, other rights Owner may have against Contractor under Contract Documents.

C. Warranty Period: Five (5) years after date of Substantial Completion.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Light-Commercial, Storage, Electric Water Heaters:
a. Bradford White Corp.
b. Lochinvar Corp.
c. Patterson-Kelley Co.
d. Rheem Mfg. Co.; Rheem Water Heater Div.
e. Rheem Mfg. Co.; Ruud Water Heater Div.
f. Smith: A.O. Smith Water Products Co.

2.2 WATER HEATERS, GENERAL

A. Specified manufacturer's standard components and features are acceptable where specific product requirements are not indicated.

B. Temperature Control: Adjustable thermostat, except for units where other arrangement is indicated or temperature is regulated by flow-control fitting.

C. Safety Control: Automatic, high-temperature-limit cutoff device or system on commercial units and where indicated. Include automatic low-water cutoff device or system on commercial units where indicated.

D. Interior Finish: Materials that comply with requirements of applicable NSF, AWWA, or FDA and EPA regulatory standards for tasteless and odorless, potable-water-tank linings.

E. Tappings: Factory fabricated of materials compatible with tank. Include tappings for piping connections, relief valves, pressure gage, thermometer, blow down, and controls as required and others as indicated. Attach tappings to tank before testing and labeling. Include tappings and connections as follows:

1. 2-Inch NPS (DN50) and Smaller: Threaded ends.
2. 2-1/2-Inch NPS (DN65) and Larger: Flanged ends.

F. Insulation: Fiberglass, polyurethane foam, or manufacturer's standard that is suitable for operating temperature and required insulating value. Include insulation material that surrounds entire tank except connections and controls.

G. Jacket: Steel, with baked-on enamel finish, except where otherwise specified.

H. Anode Rods: Factory installed, magnesium.

I. Combination Temperature and Pressure Relief Valve: ASME rated and stamped and complying with ASME PTC 25.3. Include relieving capacity at least as great as heat input and pressure setting less than water heater working-pressure rating. Select relief valve with sensing element that extends into tank.
1. Option: Separate temperature and pressure relief valves are acceptable instead of combination relief valve.
2. Exception: Omit relief valve for tankless water heater. Include pressure relief valve for installation in piping.

2.3 LIGHT-COMMERCIAL, STORAGE, ELECTRIC WATER HEATERS

A. Description: UL 174, but listed by manufacturer for commercial applications, or UL 1453, light-commercial, storage, electric water heater; with capacity more than 40 gallons (151 L), but not more than 120 gallons (454 L), and input not more than 12 kW.

B. Storage Tank Construction: Steel with 150-psig (1035-kPa) working-pressure rating.

C. Storage Tank Construction: ASME labeled, steel with 150-psig (1035-kPa) working-pressure rating.

D. Heating Elements: Two (2) electric, screw-in, immersion-type wired for simultaneous operation.

E. Special Requirements: NSF 5 construction.

F. Inlet and Outlet Manifolds: Fabricated by water heater manufacturer and capable of providing balanced flow through water heaters, for multiple-unit installation.

G. Vacuum Relief Valve: Comply with ASME PTC 25.3. Furnish for installation in piping.
1. Exception: Omit where water heater has integral vacuum relieving device.

PART 3 – EXECUTION

3.1 CONCRETE BASES

A. Install concrete bases of dimensions indicated for water heaters and accessories.

3.2 WATER HEATER INSTALLATION

A. General: Install water heaters on concrete bases. Set and connect units according to manufacturer's written instructions. Install units plumb, level, and firmly anchored in locations indicated. Maintain manufacturer's recommended clearances. Install so controls and devices are accessible for service.

B. Anchor water heaters and storage tanks to substrate.

C. Install seismic restraints as indicated.

D. Install electric booster heaters with thermometer, pressure gage, and pressure regulator on hot-water inlet; and thermometer, pressure gage, and shock absorber on boosted-temperature, hot-water outlet.

E. Install temperature and pressure relief valves in top portion of storage water heater tanks and hot-water storage tanks. Use relief valves with sensing elements that extend into tanks. Extend relief valve outlet with water piping in continuous downward pitch and discharge to closest floor drain.

F. Install pressure relief valves in hot-water-outlet piping for water heaters without storage. Extend relief valve outlet with water piping in continuous downward pitch and discharge to closest floor drain.

G. Install vacuum relief valves in cold-water-inlet piping.

H. Install vacuum relief valves in water heaters and hot-water storage tanks that have copper lining.

I. Install water heater drain piping as indirect waste to spill into open drains or over floor drains. Install hose-end drain valves at low points in water piping for water heaters that do not have tank drains.

J. Install thermometers on water heater inlet and outlet piping.

K. Install pressure gages on water heater piping when and as indicated.

L. Install inlet and outlet piping manifolds for multiple water heaters. Fabricate, modify, or arrange manifolds for balanced water flow through water heaters. Include throttling valves in outlet manifolds and thermometers in inlet and outlet manifolds.

M. Install piping adjacent to water heaters to allow service and maintenance.

N. Arrange for field-applied insulation on equipment and piping not furnished with factory-applied insulation.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties. The following are specific connection requirements:
   1. Connect hot- and cold-water piping to units with shutoff valves and unions. Connect hot-water circulating piping to unit with shutoff valve, check valve, and union.
   2. Make connections with dielectric fittings where piping is made of dissimilar metals. Dielectric fittings are specified in other Sections.

B. Electrical Connections: Power wiring and disconnect switches are specified in other Sections. Arrange wiring to allow unit servicing.

C. Grounding: Ground equipment. Tighten electrical connectors and terminals, including grounding connections, according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 COMMISSIONING

A. Startup Services: Engage a factory-authorized service representative to provide startup service and to demonstrate and train Owner's maintenance personnel as specified below.
   1. Test and adjust operating and safety controls. Replace damaged and malfunctioning controls and equipment.
   2. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance.
   3. Review data in the operation and maintenance manuals.
   4. Schedule training with Owner with at least 7 days of advance notice.

B. Perform the following final checks before startup:
   1. Fill water heaters with water.
   2. Check that piping system tests are complete.
   3. Check for piping connection leaks.
   4. Check for clear relief valve inlets, outlets, and drain piping.
   5. Check operation of pumps and circulators.
   6. Test operation of safety controls, relief valves, and devices.

C. Perform the following startup procedures:
   1. Energize electric circuits.
   2. Adjust operating controls.
   3. Adjust hot-water-outlet temperature settings.

END OF SECTION

SECTION 224000 – PLUMBING FIXTURES

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes plumbing fixtures and trim, fittings, and accessories, appliances, appurtenances, equipment, and supports associated with plumbing fixtures.

1.2 SUBMITTALS

A. Product data for each type of plumbing fixture specified, including fixture and trim, fittings, accessories, appliances, appurtenances, equipment, supports, construction details, dimensions of components, and finishes.

B. Wiring diagrams for field-installed wiring of electrically operated units.

C. Maintenance Data: For plumbing fixtures to include in maintenance manuals.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Useable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; about plumbing fixtures for people with disabilities.

B. Listing and Labeling: Provide electrically operated fixtures specified in this Section that are listed and labeled.

1. The terms "listed" and "labeled" shall be as defined in the National Electrical Code, Article 100.

C. Regulatory Requirements: Comply with requirements in U.S. Architectural & Transportation Barriers Compliance Board's "Uniform Federal Accessibility Standards (UFAS), 1985-494-187" about plumbing fixtures for people with disabilities.

D. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.

E. NSF Standard: Comply with NSF 61, "Drinking Water System Components – Health Effects," for fixture materials that will be in contact with potable water.

F. Design Concept: The drawings indicate types of plumbing fixtures and are based on the specific descriptions, manufacturers, models, and numbers indicated. Plumbing fixtures having equal performance characteristics by other manufacturers may be considered provided that deviations in dimensions, operation, color or finish, or other characteristics are minor and do not change the design concept or intended performance as judged by the Owner's Representative. Burden of proof for equality of plumbing fixtures is on the proposer.

1.4 DEFINITIONS

A. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.

B. Fitting: Device that controls flow of water into or out of plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, shower heads and tub spouts, drains and tailpieces, and traps and waste pipes. Piping and general-duty valves are included where indicated.

1.5 EXTRA MATERIALS

A. Deliver extra materials to Owner. Furnish extra materials described below matching products installed, packaged with protective covering for storage, and identified with labels clearly describing contents.

1. Faucet Washers and O-rings: Furnish quantity of identical units not less than 10 percent of amount of each installed.
2. Faucet Cartridges and O-rings: Furnish quantity of identical units not less than 5 percent of amount of each installed.
3. Faucet, Laminar-Flow Fittings: Furnish quantity of identical units not less than 10 percent of amount of each installed.
4. Faucet Stops: Furnish quantity of identical units not less than 10 percent of amount of each installed.
5. Supply Stops: Furnish quantity of identical units not less than 5 percent of amount of each installed.
6. Shower Stops: Furnish quantity of identical units not less than 5 percent of amount of each installed.
7. Flushometer Repair Kits: Furnish quantity of identical units not less than 10 percent of amount of each flushometer installed.
8. Provide a hinged-top wood or metal box, or individual metal boxes, having a separate compartment for each type and size of above extra materials.
9. Water Closet Tank Repair Kits: Furnish quantity of identical flush valve units not less than 5 percent of amount of each type installed.
10. Toilet Seats: Furnish quantity of identical units not less than 5 percent of amount of each type toilet seat installed.
11. Filter Cartridges: Furnish quantity of identical filter cartridges not less than 50 percent of amount of each type and size installed.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products in each category, by one of the following listed for that category:

1. Water Closets:
   a. American Standard, Inc.
   b. Eljer; A Household International Co.
   c. Kohler Co.
2. Lavatories:
   a. American Standard, Inc.
   b. Eljer; A Household International Co.
   c. Kohler Co.
3. Water Coolers:
   a. Elkay Manufacturing Co.
   b. Haws Drinking Faucet Co.

c. Sunroc Corp.
d. Western Drinking Fountains; Sunroc Corp.

4. Toilet Seats:
   a. Bemis Mfg. Co.
   b. Beneke Div.; Sanderson Plumbing Products, Inc.
   c. Church Seat Co.
   d. Olsonite Corp.
5. Flushometers:
   a. Coyne & Delany Co.
   b. Sloan Valve Co.
   c. Zurn Industries, Inc.; Flush Valve Operations.
6. Pressure Balance Bath/Shower Faucets:
   a. American Standard, Inc.
   b. Bradley Corp.
   c. Chicago Faucet Co.
   d. Crane Plumbing/Fiat Products.
   e. Delta Faucet Co.; Div. of Masco Corp.
   f. Eljer; A Household International Co.
   g. Elkay Manufacturing Co.
   h. Kohler Co.
   i. Leonard Valve Co.
   j. Moen Group; Stanadyne Corp.
   k. Powers Process Controls; A Unit of Mark Controls Corp.
   l. Price Pfister, Inc.
   m. Royal Brass Mfg. Co.
   n. Speakman Co.
   o. Symmons Industries, Inc.
7. Thermostatic Mixing Valve Bath/Shower Faucets:
   a. Bradley Corp.
   b. Lawler Manufacturing Co., Inc.
   c. Leonard Valve Co.
   d. Powers Process Controls; A Unit of Mark Controls Corp.
   e. Symmons Industries, Inc.
   f. T & S Brass and Bronze Works, Inc.
8. Miscellaneous Fittings (Except Faucets):
   a. Aquaflo Corp.
   b. Beaton & Corbin Mfg. Co.
   c. Brass Craft Subsidiary; Masco Co.
   d. Bridgeport Plumbing Products, Inc.
   e. Central Brass Manufacturing Co.
   f. Chicago Faucet Co.
   g. Connecticut Stamping & Bending Co.
   h. Crane Plumbing/Fiat Products.
   i. Eljer; A Household International Co.
   j. Kohler Co.
   k. McGuire Manufacturing Co., Inc.

l. Price Pfister, Inc.
m. Royal Brass Mfg. Co.
n. Sanitary-Dash Manufacturing Co., Inc.
o. T&S Brass and Bronze Works, Inc.
p. Teledyne Ansonia.

9. Supports:
a. Ancon, Inc.
b. Josam Co.
c. Smith (Jay R.) Mfg. Co.
d. Wade Div.; Tyler Pipe.
e. Zurn Industries, Inc.; Hydromechanics Div.

2.2 FAUCETS

A. Faucets General: Unless otherwise specified, provide faucets that are cast brass with polished chrome-plated finish.

B. Lavatory Faucets: ASME A112.18.1M.

C. Sink Faucet: ASME A112.18.1M.

D. Service Sink Faucet: ASME A112.18.1M, rough chrome finish, cast brass, with stops in shanks, and wall brace, integral vacuum breaker, pail hook, and garden hose thread on spout.

E. Mop Basin Faucet: ASME A112.18.1M, rough chrome finish, cast brass, with stops in shanks; wall brace, integral vacuum breaker, pail hook, and garden hose thread on spout; and hose and bracket.

F. Bathtub Faucet: ASME A112.18.1M.

G. Shower Faucet: ASME A112.18.1M, cast-brass combination single-lever, pressure-balancing mixing valve and escutcheon, and shower head, arm, and flange. Polished chrome-plated finish on all exposed metal.

H. Whirlpool Faucet: ASME A112.18.1M.

I. Bidet Faucets: ASME A112.18.1M.

2.3 FITTINGS, EXCEPT FAUCETS

A. Fittings General: Unless otherwise specified, provide fittings fabricated of brass, with a polished chrome plated finish.

B. Lavatory Supplies and Stops: Loose-key angle stop, having 3/8-inch NPS inlet with wall flange and 3/8-inch by 12-inch long flexible tubing riser outlet.

C. Lavatory Traps: Cast-brass, 1-1/4-inch NPS adjustable P-trap with cleanout, 17-gage tubular waste to wall, and wall flange.

D. Water Closet Supplies and Stops: Loose-key angle stop, having 1/2-inch NPS inlet with wall flange and 1/2-inch by 12-inch flexible tubing riser outlet with collar.

E. Fittings installed concealed inside a plumbing fixture or within wall construction may be without chrome plate finish.

F. Escutcheons: Wall flange with set screw.

G. Escutcheons: Polished chrome-plated, sheet steel wall flange with friction clips.

H. Deep Pattern Escutcheons: Wall flange with set screw or sheet steel wall flange with friction clips of depth adequate to conceal protruding roughing-in fittings.

2.4 FLUSHOMETERS

A. Provide flushometers compatible with fixtures, with features and of consumption indicated.

B. Construction: Cast-brass body, brass or copper pipe or tubing inlet with wall flange and tailpiece with spud, screwdriver check stop, vacuum breaker, and brass lever handle actuation except where other variations are specified. Type shall be diaphragm operation except where other type is specified.

C. Finish: Exposed metal parts shall be polished chrome-plated, except components installed in a concealed location may be rough brass or unfinished.

2.5 TOILET SEATS

A. General: Provide toilet seats compatible with water closets, and of type, color, and features indicated.

B. Toilet Seats: Extra heavy-duty, commercial/industrial type, elongated, open front, solid plastic with check hinge.

2.6 PLUMBING FIXTURE SUPPORTS

A. Supports: ASME A112.6.1M, categories and types as required for wall-hanging fixtures specified, and wall reinforcement.

B. Support categories are:
   1. Carriers: Supports for wall-hanging water closets and fixtures supported from wall construction. Water closet carriers shall have an additional faceplate and coupling when used for wide pipe spaces. Provide tiling frame or setting gage with carriers for wall-hanging water closets.
   2. Chair Carriers: Supports with steel pipe uprights for wall-hanging fixtures. Urinal chair carriers shall have bearing plates.
   3. Chair Carriers, Heavy Duty: Supports with rectangular steel uprights for wall-hanging fixtures.
   4. Reinforcement: 2-inch by 4-inch wood blocking between studs or 1/4-inch by 6-inch steel plates attached to studs, in wall construction, to secure floor-mounted and special fixtures to wall.

C. Support Types: Provide support of category specified, of type having features required to match fixture.

D. Provide supports specified as part of fixture description, in lieu of category and type requirements above.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for water soil and for waste piping systems and supports to verify actual locations and sizes of piping connections and that locations and types of supports match those indicated, before plumbing fixture installation. Use manufacturer's roughing-in data if roughing-in data are not indicated.

B. Examine walls, floors, and cabinets for suitable conditions where fixtures are to be installed.

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

3.2 APPLICATION

A. Install plumbing fixtures and specified components, in accordance with designations and locations indicated on Drawings.

B. Install supports for plumbing fixtures in accordance with categories indicated, and of type required:
   1. Carriers for following fixtures:
      a. Wall-hanging water closets.
      b. Wall-hanging fixtures supported from wall construction.
   2. Chair carriers for the following fixtures:
      a. Wall-hanging urinals.
      b. Wall-hanging lavatories.
      c. Wall-hanging drinking fountains and electric water coolers.
   3. Heavy-duty chair carriers for the following fixtures:
      a. Accessible lavatories.
      b. Fixtures where specified.
   4. Reinforcement for the following fixtures:
      a. Floor-mounted lavatories required to be secured to wall.
      b. Floor-mounted sinks required to be secured to wall.
      c. Recessed, box-mounted electric water coolers.

3.3 INSTALLATION OF PLUMBING FIXTURES

A. Install plumbing fixtures level and plumb, in accordance with fixture manufacturers' written installation instructions, roughing-in drawings, and referenced standards.

B. Install floor-mounted, floor-outlet water closets with closet flanges and gasket seals.

C. Install floor-mounted, back-outlet water closets with fittings and gasket seals.

D. Install wall-hanging, back-outlet water closets with support manufacturer's tiling frame or setting gage.

E. Install wall-hanging, back-outlet urinals with gasket seals.

F. Fasten wall-hanging plumbing fixtures securely to supports attached to building substrate when supports are specified, and to building wall construction where no support is indicated.

G. Fasten floor-mounted fixtures and special fixtures having holes for securing fixture to wall construction, to reinforcement built into walls.

H. Fasten wall-mounted fittings to reinforcement built into walls.

I. Fasten counter-mounting-type plumbing fixtures to casework.

J. Secure supplies behind wall or within wall pipe space, providing rigid installation.

K. Set shower receptors and mop basins in leveling bed of cement grout.

L. Install stop valve in an accessible location in each water supply to each fixture.

M. Install trap on fixture outlet except for fixtures having integral trap.

N. Install escutcheons at each wall, floor, and ceiling penetration in exposed finished locations and within cabinets and millwork. Use deep pattern escutcheons where required to conceal protruding pipe fittings.

O. Seal fixtures to walls, floors, and counters using a sanitary-type, one-part, mildew-resistant, silicone sealant in accordance with sealing requirements specified in other Sections. Match sealant color to fixture color.

3.4 CONNECTIONS

A. Piping installation requirements are specified in other Sections. The Drawings indicate general arrangement of piping, fittings, and specialties. The following are specific connection requirements:
   1. Install piping connections between plumbing fixtures and piping systems and plumbing equipment specified in other Sections.
   2. Install piping connections indicated between appliances and equipment specified in other sections, direct connected to plumbing piping systems.

3.5 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Test fixtures to demonstrate proper operation upon completion of installation and after units are water pressurized. Replace malfunctioning fixtures and components, then retest. Repeat procedure until all units operate properly.

3.6 ADJUSTING AND CLEANING

A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Operate and adjust disposers, hot water dispensers, and controls. Replace damaged and malfunctioning units and controls.

C. Adjust water pressure at drinking fountains, electric water coolers, and faucets, shower valves, and flushometers having controls, to provide proper flow and stream.

D. Replace washers of leaking and dripping faucets and stops.

E. Clean fixtures, fittings, and spout and drain strainers with manufacturers' recommended cleaning methods and materials.

F. Review the data in Operating and Maintenance Manuals.

3.7 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of fixtures for temporary facilities, except when approved in writing by the Owner.

END OF SECTION

SECTION 230000 – GENERAL REQUIREMENTS FOR HVAC SYSTEMS

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes general administrative and procedural requirements for all HVAC work. The administrative and procedural requirements included in this Section are to expand the requirements specified elsewhere.

1.2 SCOPE OF WORK

A. Provide all labor, material, equipment, and services necessary for and incidental to completion of all work as indicated on the Drawings and/or as specified herein. This includes all incidentals, equipment, appliances, services, hoisting, scaffolding, supports, sleeves, inserts, anchor bolts, tools, supervision, labor, consumable items, fees, licenses, etc., necessary to provide complete and workable systems.

1.3 DRAWING USE AND INTERPRETATION

A. Unless indicated by specific dimensions, drawings are meant to be diagrammatic. Exact equipment locations and routing of utilities shall be governed by field conditions and/or Owner's Representative's instructions.

B. All dimensions which relate to the building shall be taken as construction progresses. All errors incurred as result of the failure to check or verify dimensions, measurements, etc., shall be corrected.

C. The drawings show the general arrangement of utilities, equipment, and accessories. Drawings do not indicate all offsets, fittings, accessories, and changes in elevation, which may be necessary. Make all changes in equipment, locations, etc., to accommodate the work and to avoid obstacles at no increase in contract price. Provide offsets, fittings, and accessories as may be required to meet such conditions.

1.4 SPECIFICATION FORMAT AND CONTENT EXPLANATION

A. Specification Content: This Specification uses certain conventions regarding the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explained as follows:

1. Abbreviated Language: Language used in Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be interpolated as the sense requires. Singular words will be interpreted as plural and plural words interpreted as singular where applicable as the context of the Contract Documents indicates.
2. Streamlined Language: The Specifications generally use the imperative mood and streamlined language. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the Text, subjective language is used for clarity to describe responsibilities that must be fulfilled indirectly by the Contractor or by others when so noted.
   a. The words "shall be" are implied where a colon (:) is used within a sentence or phrase.

1.5 DEFINITIONS

A. General: Basic Contract definitions are included in the conditions of the Contract.

B. Indicated: The term "indicated" refers to graphic representations, notes or schedules on the Drawings, or other Paragraphs or Schedules in the Specifications, and similar requirements in the Contract Documents. Where terms such as "shown," "noted," "scheduled," and "specified" are used, it is to help the reader locate the reference; no limitation on location is intended.

C. Directed: Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean "directed by the Engineer," "requested by the Engineer," and similar phrases.

D. Approved: The term "approved," where used in conjunction with the Engineer's action on the Contractor's submittals, applications, and requests, is limited to the Engineer's duties and responsibilities as stated in the Conditions of the Contract.

E. Regulations: The term "Regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

F. Furnish: The term "furnish" is used to mean "supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations."

G. Install: The term "install" is used to describe operations at project site including the actual "unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations."

H. Provide: The term "provide" means "to furnish and install, complete and ready for the intended use."

I. Installer: An "installer" is the Contractor or an entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier for performance of a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.
   1. The term "experienced," when used with the term "installer," means having a minimum of five previous projects similar in size and scope to this Project, being familiar with the special requirements indicated, and having complied with requirements of the authority having jurisdiction.
   2. Trades: Use of titles such as "carpentry" is not intended to imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to trades persons of the corresponding generic name.
   3. Assignment of Specialists: Certain Sections of the Specifications require that specific construction activities shall be performed by specialists who are recognized experts in the operations to be performed. The specialists must be engaged for those activities, and assignments are requirements over which the Contractor has no choice or option. Nevertheless, the ultimate responsibility of fulfilling Contract requirement remains with the Contractor.
      a. This requirement shall not be interpreted to conflict with enforcement of building codes and similar regulations governing the Work. It is also not intended to interfere with local trade union jurisdictional settlements and similar conventions.

J. The term "concealed": embedded in masonry or other construction, installed behind wall furring, within partitions or hung ceilings (permanent or removable), in trenches, or in crawl spaces.

K. The term "exposed": not installed underground or concealed. Equipment in rooms with exposed construction (i.e., mechanical rooms, electrical rooms, janitor's closets, etc.) are classified as exposed.

L. The term "piping": piping fittings, flanges, valves, controls, hangers, traps, drains, insulation and items necessary or required in connection with or relating thereto.

M. The "Project Site" is the space available to the contractor for performance of construction activities, either exclusively or in conjunction with other performing other work as part of the Project.

N. Testing Laboratories: A "testing laboratory" is an independent entity engaged to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1.6 COMPLETE SYSTEMS

A. General: Provide all materials as required for complete systems, including all parts obviously or reasonably incidental to a complete installation, whether specifically indicated or not. All systems shall be completely assembled, tested, adjusted and demonstrated to be ready for operation prior to Owner's acceptance.

B. Systems: The systems specified and/or shown on the Drawings are for complete and workable systems. Any deviation from these systems due to a particular manufacturer's requirements shall be made at no additional cost to the Owner.

1.7 CODES AND REGULATIONS

A. General: Comply with all governing federal, state, and local laws, ordinances, codes, rules, and regulations. Where the Contract Documents exceed these requirements, the Contract Documents shall govern. In no case shall work be installed contrary to or below minimum legal standards.

B. Utilities: Comply with all applicable rules, restrictions, and requirements of the utility companies serving the project site/facilities. Contractor shall be required to contact state regulated "call before you dig" service prior to any excavation work.

C. Non-Compliance: Should any work be performed which is found not to comply with any of the above codes and regulations, provide all work and pay all costs necessary to correct the deficiencies.

1.8 REFERENCE STANDARDS

A. All published standards of the following associations/organizations, as mandated by specific state standards, shall be followed and applied as a minimum.
   1. AABC, Associated Air Balance Council
   2. ACI, American Concrete Institute
   3. AGA, American Gas Association.
   4. AIA, The American Institute of Architects
   5. AISC, American Institute of Steel Construction
   6. AMCA, Air Movement and Control Assoc.
   7. ANSI, American National Standards Institute
   8. API, American Petroleum Institute
   9. ARI, Air-Conditioning and Refrigeration Institute
   10. ASHRAE, American Society of Heating, Refrigerating and Air-Conditioning Engineers

11. ASME, American Society of Mechanical Engineers
12. ASPE, American Society of Plumbing Engineers
13. ASSE, American Society of Sanitary Engineering
14. ASTM, American Society for Testing and Materials
15. AWS, American Welding Society
16. AWWA, American Water Works Assoc.
17. CAGI, Compressed Air and Gas Institute
18. CGA, Compressed Gas Assoc.
19. CISPI, Cast Iron Soil Pipe Institute
20. DIPRA, Ductile Iron Pipe Research Assoc.
21. ETL, ETL SEMKO a Division of Intertek Group
22. FMG, Factory Mutual Global
23. GE-GAP, General Electric Global Assets Protection
24. HEI, Heat Exchange Institute
25. HI, Hydronics Institute
26. ISA, Instrument Society of America
27. MCAA, Mechanical Contractors Association of America
28. MSS, Manufacturers Standardization Society
29. NACE, National Association of Corrosion Engineers International
30. NADCA, National Air Duct Cleaners Association
31. NEC, National Electrical Code (from NFPA)
32. NECA, National Electrical Contractors Assoc.
33. NEMA, National Electrical Manufacturers Assoc.
34. NFPA, National Fire Protection Assoc.
35. NSF, National Sanitation Foundation
36. PDI, Plumbing and Drainage Institute
37. SMACNA, Sheet Metal and Air Conditioning Contractors
38. SSPMA, Sump and Sewage Pump Manufacturers Assoc.
39. STI, Steel Tank Institute
40. SWPA, Submersible Wastewater Pump Assoc.
41. UL, Underwriters Laboratories Inc.
42. WSC, Water Systems Council

B. Federal Government Agencies: Names and titles of federal government standard- or Specification-producing agencies are often abbreviated. The following acronyms or abbreviations referenced in the Contract Documents indicate names of standard- or Specification-producing agencies of the federal government. Names are subject to change and are believed, but are not assured, to be accurate and up-to-date as of the date of the Contract Documents.
1. CE, Corps of Engineers (U.S. Department of the Army).
2. EPA, Environmental Protection Agency.
3. UFC, United Facilities Criteria.
4. MIL, Military Standardization Documents (U.S. Department of Defense).
5. NIST, National Institute of Standards and Technology (U.S. Department of Commerce).
6. OSHA, Occupational Safety and Health Administration (U.S. Department of Labor).

C. Applicability of Standards: Except where the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or

copied directly into the Contract Documents. Such standards are made a part of the Contract Documents by reference.

D. Copies of Standards: Each entity engaged in construction on the project is required to be familiar with industry standards applicable to that entity's construction activity. Copies of applicable standards are not bound with the Contract Documents. Where copies of standards are needed for performance of a required construction activity, the contractor shall obtain copies directly from the publication source.

1.9 QUALITY ASSURANCE

A. Manufacturers' Qualifications: Not less than five years of experience in the actual production of the specified products.

B. Installers' Qualifications:
   1. Firm with not less than five years of experience in the installation of mechanical systems and equipment similar in scope and complexity to those required for this Project, and having successfully completed at least ten comparable scale projects.
   2. Painting, patching, carpentry, and the like related to or required for Division 23 work shall be performed by craftsman skilled in the appropriate trade.
   3. All welding shall be performed by ASME-certified welders.

1.10 INSPECTIONS

A. General: During and upon completion of the work, arrange and pay all associated costs for inspections of all work installed under this Contract, in accordance with the Conditions of the Contract.

B. Inspections Required: As per the laws and regulations of the local and/or state agencies having jurisdiction at the project site.

C. Inspection Agency: Approved by the local and/or state agencies having jurisdiction at the project site.

PART 2 – PRODUCTS

2.1 GENERAL

A. Where Specified: Materials and equipment shall be as specified in subsequent sections of the Project Manual and/or as indicated on the Drawings.

B. General: All materials and equipment to be new, clean, undamaged, and free of defects and corrosion.

C. Acceptable Products: The product will be acceptable only when that product complies with all requirements of the Contract Documents as determined by the Engineer.

D. Common Items: Where more than one of any specific item is required, all shall be of the same type and manufacturer.

E. Listing: All materials and equipment shall be Underwriters' Laboratories (UL) or ETL SEMKO (ETL) listed and labeled where UL or ETL standards and listings exist for the specified materials or equipment.

F. Special Tools: Provide all special tools needed for proper operation, adjustment, and maintenance of equipment.

PART 3 – EXECUTION

3.1 GENERAL

A. The installation of all mechanical work shall be in accordance with the letter and intent of the Contract Documents as determined by the Engineer.

B. Installation Requirements: All materials and equipment shall be installed as recommended by the respective manufacturers, by mechanics experienced and skilled in their particular trade, in a neat and workmanlike manner, in accordance with the standards of the trade, and so as not to void any warranty, UL, or ETL listing.

3.2 DELIVERY STORAGE AND HANDLING

A. Packing and Shipping: Deliver products in original, unopened packaging and properly identified with manufacturer's identification and compliance labels.

B. Storage and Protection: Comply with all manufacturer's written recommendations. Protect all equipment, materials, and work from the weather elements, paint, mortar, construction debris, and damage throughout duration of project.

C. Damaged Products: Do not install damaged products. Arrange for prompt replacement.

3.3 EXAMINATION

A. Conditions Verification: Examine the areas and conditions under which the work is to be performed. Identify and Report any conditions detrimental to the proper and timely completion of the work to the Owner's Representative.

3.4 DIMENSIONS

A. Building Dimensions: Exact locations of building elements shall be based on contractor's field measurements.

B. Limiting Dimensions: Where equipment dimension and clearances are indicated on the Drawings, do not provide equipment larger than equipment dimensions or clearances specified.

C. Verify all dimensions by field measurements.

3.5 ROUGH-IN

A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.

3.6 CUTTING AND PATCHING

A. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.

B. Perform cutting and patching of mechanical equipment and materials required to:
   1. Uncover Work to provide for installation of non-coordinated and/or improperly installed work.
   2. Remove and replace defective Work.
   3. Remove and replace Work not conforming to requirements of the Contract Documents.
   4. Remove samples of installed Work as specified for testing.
   5. Install equipment and materials in existing structures.
   6. Uncover and restore Work to provide for Engineer observation of concealed Work.

C. Cut, remove, and legally dispose of equipment, components, and materials as indicated. Removal shall include all ancillary items associated with items removed. Remove all items made obsolete by the new work.

D. Protect the structure, furnishings, finishes, and adjacent materials not indicated to be removed.

E. Provide and maintain temporary dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.

F. Patch surfaces and building components using new materials matching existing adjacent materials.

3.7 ADMINISTRATION AND SUPERVISION

A. The Contractor shall supervise the work and shall have at all times some competent person, approved by the Owner, following the work to receive instructions and to act with authority.

3.8 TESTING AND ADJUSTING

A. General: Provide testing equipment, materials, instruments, and personnel to perform all test procedures and adjustments required by the Contract Documents and/or deemed necessary by the Engineer to establish proper performance and installation of systems and equipment. All test instruments to be accurately calibrated and in good working order.

B. Scheduling: Schedule tests at least three days in advance and so as to allow Engineer and Owner representative(s) to witness the test, unless directed otherwise. Do not schedule tests until the system installation is complete and fully operational unless indicated or directed otherwise.

C. Correction/Replacement: After testing, correct any deficiencies and replace materials and equipment shown to be defective or unable to perform at design or rated capacity. Retest without additional cost to the Owner or Contract. Submit finalization report indicating corrective measures taken and satisfactory results of retest.

3.9 SYSTEMS DEMONSTRATION

A. Instruct the Owner's representative(s) in the startup, operation, and maintenance of all systems and equipment in accordance with the Contract Documents.

3.10 CLEANING

A. General: Remove from the project site all waste, rubbish, and construction debris weekly unless indicated otherwise. The premises shall be left clean and free of any debris and unused construction materials, prior to final acceptance.

B. Equipment: Remove all dust, dirt, debris, mortar, rust, and other foreign materials from the interior and exterior of all equipment and enclosures, and wipe down.

C. Utilities: Thoroughly clean all utilities just prior to final inspection.

3.11 TOUCH-UP PAINTING

A. Touch-Up Painting: Restore and refinish to original condition all surfaces of equipment scratched, marred, and/or dented during shipping, handling, or installation. Remove all rust prior to prime and paint as recommended by the manufacturer.

END OF SECTION

SECTION 230004 – COORDINATION WITH OTHER TRADES

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK

A. This section describes the coordination and procedural requirements for Contractors.

B. Definitions:
1. Owners Representative - Architect, Engineer, Construction Manager, General Contractor, Clerk of the works, or any stipulated Agent or Representative of the Owner.
2. GC - General Contractor.
3. MC - Mechanical Contractor/Subcontractor.
4. PC - Plumbing Contractor/Subcontractor.
5. EC - Electrical Contractor/Subcontractor.
6. SM - Sheet Metal Subcontractor.

1.2 COMPLIANCE

A. Cost incurred including those of other contractors and/or Owner due to non-compliance with this Section shall be the responsibility of the non-compliant contractor.

1.3 SUBMITTALS

A. Complete coordinated shop drawing shall be submitted in PDF and ACAD format to the Engineer for their record by the MC. Submitted coordinated shop drawing shall include all signatures required by sign off procedure.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION

3.1 COORDINATION

A. General: Sequence, coordinate, and integrate the installation of all materials and equipment for efficient flow of work in conjunction with the other trades. Review and become familiar with all of the Drawings and work of all the other trades. Report and resolve any discovered discrepancies and/or interferences prior to commencing work.

B. Cooperation: Cooperate with the other Contractors and individual disciplines for placement, anchorage and accomplishment of the work.

C. Chases, Slots, and Openings: Arrange for chases, slots, and openings during the progress of construction, as required to allow for installation of the work.

D. Supports and Sleeves: Coordinate the location installation of required supporting devices and sleeves to be set in concrete and other structural components, as they are constructed.

E. Right-Of-Way:

1. Adjust location of utilities, equipment, etc., to accommodate the work to prevent interferences – both anticipated and encountered.
2. Determine the exact route and location prior to fabrication.
3. Pitched piping has the right-of-way over utilities which do not pitch.
4. Furnish and install ancillary materials and equipment including but not limited to traps, air vents, drains, etc., as required to accommodate offsets, transitions, and changes in direction.

F. Headroom: Install systems, materials, and equipment to maximize headroom unless noted otherwise.

G. Utility Connections: Coordinate connection with underground and overhead utility services. Comply with requirements of governing regulations, utility providers, and controlling agencies. Provide required connection for each service.

3.2 COORDINATED SHOP DRAWINGS

A. The coordination shop drawing process shall occur in the following manner:

1. The MC shall create 3/8-inch scale AutoCAD (2002 or newer) base plans, which shall incorporate and coordinate with structural steel and ceiling system framing supports and show framing members on the shop drawings. This shall include existing building components not shown on Contract Documents.
2. The MC shall require the Sheet Metal Subcontractor to submit AutoCAD shop drawings, as expeditiously as possible, to the Engineer (through normal channels) for review and approval. The shop drawings shall incorporate all ductwork (including top and bottom of duct elevations at a maximum interval of 25 linear feet and at each elevation change), structural steel (building and miscellaneous support steel), equipment, and accessories as shown and/or specified in the contract documents.
3. All roof penetrations, wall, and floor openings shall be coordinated with the structural steel Subcontractor, Supplier, and/or Erector through the Owner's Representative. All conflicts with structural steel members shall be resolved through the Owner's Representative.
4. After review and final approval of the sheet metal shop drawing by the Engineer, the sheet metal Subcontractor shall incorporate all required corrections, additions, and modifications on the AutoCAD ductwork shop drawings.
5. The approved AutoCAD ductwork shop drawings shall be utilized for coordination with all other Contractors or Subcontractors whose involvement is mandated. The SM shall submit the AutoCAD ductwork shop drawings (hard copy and electronic files) to the MC to initiate the "coordination" process. The MC shall review the drawings for accuracy and completeness prior to distribution.
6. The MC shall forward with transmittal the ductwork shop drawings (hard copy and electronic files) to the PC for coordination of the plumbing work. The MC shall forward a copy of the transmittal to the Owner's Representative.
7. The PC shall (upon receipt of drawings from the MC) superimpose his scope of work on the AutoCAD ductwork shop drawings illustrating all plumbing equipment, piping, and hangers.
8. The PC shall include invert of pipes, elevations (top and bottom) and pipe sizes including insulation at a maximum of 25-foot intervals and at each elevation change.
9. Any conflicts between the plumbing and ductwork shall be clouded by the PC on the AutoCAD ductwork shop drawing file.
10. PC shall request coordination meeting to resolve the conflicts as clouded on the coordinated shop drawings. PC shall provide clouded shop drawing at the coordination meeting. All conflicts that arise between the plumbing and ductwork shall be resolved through and by the Owner's Representative.

11. The PC and/or the SM shall correct and shall complete the AutoCAD drawings depicting all resolutions.
12. When it is ascertained that no conflicts exist between the ductwork and plumbing work, the PC shall forward the final ductwork/plumbing coordinated drawings (hard copy and electronic files) to the MC with transmittal and provide the Owner's Representative with a copy of the transmittal.
13. The MC shall (upon receipt of drawings from the PC) superimpose all heating and air conditioning piping, equipment, hangers, and insulation including elevations (top and bottom) and pipe sizes (including insulation) on the AutoCAD drawings.
14. Any conflicts between the ductwork/plumbing/mechanical work shall be clouded by the MC on the AutoCAD shop drawing file.
15. MC shall request coordination meeting to resolve the conflicts as clouded on the coordinated shop drawings. MC shall provide clouded shop drawing at the coordination meeting. All conflicts that arise between the MC, SM, and PC shall be resolved through and by the Owner's Representative.
16. The MC, PC, and SM shall correct and complete the AutoCAD drawings depicting all resolutions.
17. When it is ascertained that no conflicts exist between the MC, SM, and PC, the MC shall forward the final ductwork/plumbing/mechanical coordinated drawings (hard copy and electronic files) to the EC with transmittal and provide the Owner's Representative with a copy of the transmittal.
18. The EC shall (upon receipt of drawings from the MC) superimpose all electrical equipment including but not limited to light fixtures, conduit, and hangers on the AutoCAD drawings.
19. The EC shall include elevations of light fixtures, electrical conduit, and conduit sizes.
20. Any conflicts with the ductwork/plumbing/mechanical/electrical work shall be clouded by the EC on the AutoCAD shop drawing file.
21. EC shall request coordination meeting to resolve any conflicts as clouded on the coordinated shop drawings. EC shall provide clouded coordinated shop drawing at the coordination meeting. All conflicts that arise between the EC, MC, PC, and SM shall be resolved through and by the Owner's Representative.
22. The EC and/or the SM, PC, and MC shall correct and complete the AutoCAD drawings depicting all resolutions.
23. When it is ascertained that no conflicts exist between the EC, MC, PC, and SM, the EC shall forward the final ductwork/plumbing/mechanical/electrical coordinated drawings (hard copy and electronic file) to the SC with transmittal and provide the Owner's Representative with a copy of the transmittal.
24. Sign Off:
    a. The MC shall provide the final coordinated shop drawing to the Engineer and the Owner's Representative. The final coordinated shop drawing shall contain signatures from SM, PC, MC, and EC on each sheet.
    b. Upon completion of the coordination process by all Contractors and Subcontractors as described above, they shall sign off on all drawings in ink indicating company, name, and date of sign-off and signature of company representative.
    c. Each contractor signature shall certify that each Contractor has shown their respective work on the drawings and have resolved all points of conflict and interference with other Contractors and Subcontractors.

3.3 COORDINATION MEETINGS

A. During the coordination process, separate meetings apart from project meetings concerning the progress and schedules may be called by the Owner's Representative when required or at the request of one or more of the coordinating Contractors.

1. The Owner's Representative shall contact the Contractors and make all required arrangements (e.g., time, place, etc.).
2. All Contractors shall place emphasis and importance on equipment purchases so as to not delay approvals, shop drawings, and the coordinated drawings.

3.4 SCHEDULE OF COORDINATED SHOP DRAWINGS

A. The MC and SM shall complete the ductwork shop drawings within 2 weeks after award of contract (or authorization to proceed).

B. Turn-around time for each Contractor shall be 2 weeks maximum.

3.5 "AS BUILT" DRAWINGS

A. At the completion of the project, "As Built" corrections shall be made to each AutoCAD drawing by each of the aforementioned Contractors and returned to the Owner's Representative for the Owner's permanent files and records. These "As Builts" do not remove the obligation of "As Builts" and record drawings as outlined under other sections of the specifications unless the Owner's Representative elects to do so.

END OF SECTION

SECTION 230500 – BASIC MECHANICAL MATERIALS AND METHODS

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes the following basic materials and methods to complement other Division 23 Sections.
   1. Identifying devices and labels.
   2. Installation requirements common to equipment specification sections.
   3. Touch-up painting.
   4. Removals.
   5. Repairs.

B. Pipe, pipe fittings and joining materials, and methods are specified in Division 23 piping system sections.

1.2 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:
   1. ABS: Acrylonitrile-butadiene-styrene plastic.
   2. CPVC: Chlorinated polyvinyl chloride plastic.
   3. NP: Nylon plastic.
   4. HDPE: High Density Polyethylene plastic.
   5. PVC: Polyvinyl chloride plastic.

G. Existing: Condition present prior to award of this contract.

1.3 SUBMITTALS

A. Product Data: For all materials specified within this section

B. Fire Rated Penetration Listing Details: Submit Underwriters Laboratory (UL) penetration listing details specific to the penetrations required by the project along with fire stopping material data.

C. Quality Control Submittals: Fire stopping certificates specified in Quality Assurance below.

1.4 QUALITY ASSURANCE

A. Fire Stopping: Fire stopping installer shall be certified by the fire stopping manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Protect piping, flanges, fittings, and piping specialties to prevent pipe end damage. Maintain end caps through shipping, storage, and handling.

B. Store plastic pipes in locations not subject to direct sunlight.

C. Protect all stored materials from moisture and dirt. Elevate above grade and support to prevent sagging and bending. Do not exceed structural capacity of floor if stored inside.

1.6 SEQUENCING AND SCHEDULING

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where identifying devices are to be applied.

B. Install identifying devices before concealment.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Identifying Devices:
      a. Craftsmark Identification Systems.
      b. Seton Identification Products.
      c. W.H. Brady Company.

2.2 SLEEVES

A. General: The following materials are for wall, floor, slab, and roof penetrations.

B. Ductwork
   1. All sleeves shall be per SMACNA.

2.3 IDENTIFYING DEVICES AND LABELS

A. Equipment Nameplates: Metal nameplate with operational data engraved or die-stamped; permanently fastened to equipment.
   1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data.

B. Stick-on Duct Markers: Manufacturer's standard preprinted, permanent adhesive, color-coded, pressure-sensitive vinyl complying with ASME A13.1.

C. Stick-on Flow Marker: Manufacturer's standard preprinted, permanent adhesive, color-coded, pressure-sensitive vinyl, 2-inch wide band, color coded complying with ASME A13.1.

D. Plastic Equipment Markers: ASME A13.1, color-coded, laminated plastic. Include lettering identifying name, equipment service, design capacity, pressure drop, entering and leaving conditions, and RPM indicated on the Contract Documents. Size shall be 2-1/2 by 4 inches (65 by 100 mm) for control devices, dampers, and valves; and 4-1/2 by 6 inches (115 by 150 mm) for equipment. Identifying names and/or abbreviations shall match those indicated on the Contract Documents.

PART 3 – EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

A. General Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install components with pressure and temperature ratings equal to or greater than system operating pressure and temperature.

C. In areas of exposed duct, install duct to maximize headroom. In areas with ceilings, install duct to maximize clearance between ceiling and duct. Allow sufficient space for ceiling panel removal.

3.2 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to provide maximum possible headroom if mounting heights are not indicated.

B. Install equipment level and plumb, parallel, and perpendicular to other building systems and components unless otherwise indicated.

C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting and without interference(s) to other installations.

D. Extend grease fittings to accessible locations.

3.3 LABELING AND IDENTIFYING

A. Install plastic equipment marker on all equipment provided under this contract.

B. Duct Systems: Identify air supply, return, exhaust, intake, and relief ducts with duct markers. Duct markers shall identify service and direction of flow. Locate markers at maximum intervals of 50 feet (15 m) near points where ducts enter and exit the space, and on ducts located behind all access doors.

C. Provide additional mechanical identification materials and devices to supplement field or factory supplied nameplates that have become visually blocked by work of this or other Divisions.

D. Clean faces of identification devices and glass frames of valve charts.

3.4 TOUCH-UP PAINTING

A. Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.5 REMOVALS

A. Disconnect and remove work where indicated on the Contract Documents in its entirety.

B. Removal: Remove indicated equipment, piping, ductwork, insulation, and associated components from Project site and dispose of in a legal manner. Provide Owner's right of first refusal for all equipment removed.

C. Where work is indicated to be abandoned in place, cut and remove pipe or ductwork a minimum of 2 inches (50 mm) beyond the wall, floor, ceiling, or roof. Patch surface to match existing finish of adjacent construction.

D. Temporary Disconnection: Remove, store, clean, reinstall, reconnect, and make operational equipment indicated for relocation.

3.6 REPAIRS

A. If existing or new work is damaged or disturbed, remove damaged sections and install new products of equal capacity and quality.

END OF SECTION

SECTION 233113 – METAL DUCTS

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes rectangular, round, and flat-oval metal ducts and plenums for heating, ventilating, and air-conditioning systems in pressure classes from minus 2- to plus 10-inch w.g. (minus 500 to plus 2490 Pa).

1.2 DEFINITIONS

A. Thermal Conductivity and Apparent Thermal Conductivity (k-Value): As defined in ASTM C168. In this Section, these values are the result of the formula Btu x in./h x sq. ft. x DegF or W/m x K at the temperature differences specified. Values are expressed as Btu or W.

1.3 SYSTEM DESCRIPTION

A. Duct system design, as indicated, has been used to select and size air-moving and -distribution equipment and other components of air system. Changes to layout or configuration of duct system must be specifically approved in writing by Engineer. Accompany requests for layout modifications with calculations showing that proposed layout will provide original design results without increasing system total pressure.

1.4 SUBMITTALS

A. Product Data: For duct liner and sealing materials.

B. Shop Drawings: Show details of the following:
   1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
   2. Duct layout indicating pressure classifications and sizes on plans.
   3. Fittings.
   4. Reinforcement and spacing.
   5. Seam and joint construction.
   6. Penetrations through fire-rated and other partitions.
   7. Terminal unit, coil, and humidifier installations.
   8. Hangers and supports, including methods for building attachment, vibration isolation, seismic restraints, and duct attachment.

C. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:
   1. Ceiling suspension assembly members.
   2. Other systems installed in same space as ducts.
   3. Ceiling- and wall-mounted access doors and panels required to provide access to dampers and other operating devices.
   4. Coordination with ceiling-mounted items, including lighting fixtures, diffusers, grilles, speakers, sprinkler heads, access panels, and special moldings.

D. Welding Certificates: Copies of certificates indicating welding procedures and personnel comply with requirements in "Quality Assurance" Article.

E. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

F. Record Drawings: Indicate actual routing, fitting details, reinforcement, support, and installed accessories and devices.

1.5 QUALITY ASSURANCE

A. Welding Standards: Qualify welding procedures and welding personnel to perform welding processes for this Project according to AWS D1.1, "Structural Welding Code--Steel," for hangers and supports; AWS D1.2, "Structural Welding Code--Aluminum," for aluminum supporting members; and AWS D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

B. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems" unless otherwise indicated.

C. Comply with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems" unless otherwise indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver sealant and firestopping materials to site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle sealant and firestopping materials according to manufacturer's written recommendations.

C. Deliver and store stainless-steel sheets with mill-applied adhesive protective paper maintained through fabrication and installation.

PART 2 – PRODUCTS

2.1 SHEET METAL MATERIALS

A. Galvanized, Sheet Steel: Lock-forming quality; ASTM A653/A653M, G90 (Z275) coating designation; mill-phosphatized finish for surfaces of ducts exposed to view.

B. Carbon-Steel Sheets: ASTM A366/A366M, cold-rolled sheets; commercial quality; with oiled, exposed matte finish.

C. Aluminum Sheets: ASTM B209 (ASTM 209M), Alloy 3003, Temper H14, sheet form with standard, one-side bright finish for ducts exposed to view and with mill finish for concealed ducts.

D. Reinforcement Shapes and Plates: Galvanized steel reinforcement where installed on galvanized, sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

E. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for 36-inch (900-mm) length or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.2 SEALANT MATERIALS

A. Joint and Seam Sealants, General: The term "sealant" is limited to materials of adhesive or mastic nature.

1. Joint and Seam Sealant: One-part, nonsag, solvent-release-curing, polymerized butyl sealant, formulated with a minimum of 66 percent solids.
2. Flanged Joint Mastics: One-part, acid-curing, silicone, elastomeric joint sealants, complying with ASTM C920, Type S, Grade NS, Class 25, Use O.

2.3 HANGERS AND SUPPORTS

A. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for building materials.
   1. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches (100 mm) thick.
   2. Exception: Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches (100 mm) thick.

B. Hanger Materials: Galvanized, sheet steel or round, threaded steel rod.
   1. Hangers Installed in Corrosive Atmospheres: Electrogalvanized, all-thread rod or galvanized rods with threads painted after installation.
   2. Straps and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for sheet steel width and thickness and for steel rod diameters.

C. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

D. Trapeze and Riser Supports: Steel shapes complying with ASTM A36/A36M.
   1. Supports for Galvanized-Steel Ducts: Galvanized steel shapes and plates.
   2. Supports for Stainless-Steel Ducts: Stainless-steel support materials.
   3. Supports for Aluminum Ducts: Aluminum support materials, unless materials are electrolytically separated from ductwork.

2.4 RECTANGULAR DUCT FABRICATION

A. General: Fabricate ducts, elbows, transitions, offsets, branch connections, and other construction with galvanized, sheet steel, according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible." Comply with requirements for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.
   1. Lengths: Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure classification.
   2. Materials: Free from visual imperfections such as pitting, seam marks, roller marks, stains, and discolorations.

B. Static-Pressure Classifications: Unless otherwise indicated, construct ducts to the following:
   1. Supply Ducts: 3-inch w.g. (750 Pa).
   2. Return Ducts: 2-inch w.g. (500 Pa), negative pressure.
   3. Exhaust Ducts: 2-inch w.g. (500 Pa), negative pressure.

C. Cross Breaking or Cross Beading: Cross break or cross bead duct sides 19 inches (480 mm) and larger and 0.0359-inch (0.9-mm) thick or less, with more than 10 square feet (0.93 sq. m) of unbraced panel area, unless ducts are lined.

PART 3 – EXECUTION

3.1 DUCT INSTALLATION, GENERAL

A. Drawings indicate general arrangement of ducts, fittings, and accessories. Provide all required fittings, accessories, and ancillaries as required for a complete system as determined by the Engineer.

B. Construct and install each duct system for the specific duct pressure classification indicated.

C. Install ducts with fewest possible joints.

D. Install fabricated fittings for changes in directions, changes in size and shape, and connections.

E. Install couplings tight to duct wall surface with a minimum of projections into duct.

F. Install ducts, unless otherwise indicated, vertically and horizontally, parallel and perpendicular to building lines; avoid diagonal runs.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch (25 mm) plus allowance for insulation thickness.

I. Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions, unless specifically indicated.

J. Coordinate layout with suspended ceiling, lighting layouts, and similar finished work.

K. Electrical Equipment Spaces: Route ductwork to avoid passing through transformer vaults and electrical equipment spaces and enclosures.

L. Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same metal thickness as duct. Overlap opening on four sides by at least 1-1/2 inches (38 mm).

3.2 SEAM AND JOINT SEALING

A. General: Seal duct seams and joints according to the duct pressure class indicated and as described in SMACNA's "HVAC Duct Construction Standards–Metal and Flexible."

B. Pressure Classification Less than 2-Inch w.g. (500 Pa): Transverse joints.

C. Seal externally insulated ducts before insulation installation.

3.3 HANGING AND SUPPORTING

A. Install rigid round, rectangular, and flat-oval metal duct with support systems indicated in SMACNA's "HVAC Duct Construction Standards–Metal and Flexible."

B. Support horizontal ducts within 24 inches (600 mm) of each elbow and within 48 inches (1200 mm) of each branch intersection.

C. Support vertical ducts at a maximum interval of 16 feet (5 m) and at each floor.

D. Install upper attachments to structures with an allowable load not exceeding one-fourth of failure (proof-test) load.

E. Install concrete inserts before placing concrete.

F. Install powder-actuated concrete fasteners after concrete is placed and completely cured.

3.4 CONNECTIONS

A. Connect equipment with flexible connectors according to other Sections.

B. For branch, outlet and inlet, and terminal unit connections, comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

3.5 FIELD QUALITY CONTROL

A. Disassemble, reassemble, and seal segments of systems as required to accommodate leakage testing and as required for compliance with test requirements.

B. Conduct tests, in presence of Architect, at static pressures equal to maximum design pressure of system or section being tested. If pressure classifications are not indicated, test entire system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure. Give seven days' advance notice for testing.

C. Determine leakage from entire system or section of system by relating leakage to surface area of test section.

D. Maximum Allowable Leakage: Comply with requirements for Leakage Classification 3 for round and flat-oval ducts, Leakage Classification 12 for rectangular ducts in pressure classifications less than and equal to 2-inch w.g. (500 Pa) (both positive and negative pressures), and Leakage Classification 6 for pressure classifications from 2- to 10-inch w.g. (500 to 2490 Pa).

E. Remake leaking joints and retest until leakage is less than maximum allowable.

F. Leakage Test: Perform tests according to SMACNA's "HVAC Air Duct Leakage Test Manual."

3.6 ADJUSTING

A. Adjust volume-control dampers in ducts, outlets, and inlets to achieve design airflow.

B. Detailed procedures for Testing, Adjusting, and Balancing are specified in other Sections.

3.7 CLEANING

A. After completing system installation, including outlet fittings and devices, inspect the system. Vacuum ducts before final acceptance to remove dust and debris.

END OF SECTION

SECTION 233300 – DUCT ACCESSORIES

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes the following:
1. Backdraft dampers.
2. Manual-volume dampers.
3. Duct-mounted access doors and panels.
4. Flexible connectors.
5. Duct accessory hardware.

1.2 SUBMITTALS

A. Product Data: For the following:
1. Backdraft dampers.
2. Manual-volume dampers.
3. Duct-mounted access doors and panels.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loadings, required clearances, method of field assembly, components, location, and size of each field connection. Detail the following:
1. Special fittings and manual- and automatic-volume-damper installations.
2. Fire- and smoke-damper installations, including sleeves and duct-mounted access doors and panels.

C. Product Certificates: Submit certified test data on dynamic insertion loss; self-noise power levels; and airflow performance data, static-pressure loss, dimensions, and weights.

1.3 QUALITY ASSURANCE

A. NFPA Compliance: Comply with the following NFPA standards:
1. NFPA 90A, "Installation of Air Conditioning and Ventilating Systems."
2. NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

PART 2 – PRODUCTS

2.1 SHEET METAL MATERIALS

A. Galvanized, Sheet Steel: Lock-forming quality; ASTM A653/A653M, G90 (Z275) coating designation; mill-phosphatized finish for surfaces of ducts exposed to view.

B. Carbon-Steel Sheets: ASTM A366/A366M, cold-rolled sheets, commercial quality, with oiled, exposed matte finish.

C. Aluminum Sheets: ASTM B209 (ASTM B209M), Alloy 3003, Temper H14, sheet form; with standard, one-side bright finish for ducts exposed to view and mill finish for concealed ducts.

D. Extruded Aluminum: ASTM B221 (ASTM B221M), Alloy 6063, Temper T6.

E. Reinforcement Shapes and Plates: Galvanized steel reinforcement where installed on galvanized, sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

F. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for 36-inch (900-mm) length or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.2 BACKDRAFT DAMPERS

A. Description: Suitable for horizontal or vertical installations.

B. Frame: 0.063-inch (1.6-mm) thick extruded aluminum with mounting flange.

C. Blades: 0.025-inch (0.6-mm) thick, roll-formed aluminum.

D. Blade Seals: Neoprene.

E. Blade Axles: Nonferrous.

F. Tie Bars and Brackets: Aluminum.

G. Return Spring: Adjustable tension.

2.3 MANUAL-VOLUME DAMPERS

A. General: Factory fabricated with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.

1. Pressure Classifications of 3-inch wg (750 Pa) or Higher: End bearings or other seals for ducts with axles full length of damper blades and bearings at both ends of operating shaft.

B. Standard Volume Dampers: Multiple- or single-blade, parallel- or opposed-blade design as indicated, standard leakage rating, and suitable for horizontal or vertical applications.

1. Aluminum Frames: Hat-shaped, 0.10-inch (2.5-mm) thick, aluminum sheet channels; frames with flanges where indicated for attaching to walls; and flangeless frames where indicated for installing in ducts.
2. Roll-Formed Aluminum Blades: 0.10-inch (2.5-mm) thick aluminum sheet.
3. Blade Axles: Nonferrous.
4. Tie Bars and Brackets: Aluminum.

C. Jackshaft: 1-inch (25-mm) diameter, galvanized steel pipe rotating within a pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.

1. Length and Number of Mountings: Appropriate to connect linkage of each damper of a multiple-damper assembly.

D. Damper Hardware: Zinc-plated, die-cast core with dial and handle made of 3/32-inch (2.4-mm) thick zinc-plated steel, and a 3/4-inch (19-mm) hexagon locking nut. Include center hole to suit damper operating-rod size. Include elevated platform for insulated duct mounting.

2.4 DUCT-MOUNTED ACCESS DOORS AND PANELS

A. General: Fabricate doors and panels airtight and suitable for duct pressure class.

B. Frame: Galvanized, sheet steel, with bend-over tabs and foam gaskets.

C. Door: Double-wall, galvanized, sheet metal construction with insulation fill and thickness, and number of hinges and locks as indicated for duct pressure class. Include vision panel where indicated. Include 1-by-1-inch (25-by-25-mm) butt or piano hinge and cam latches.

D. Seal around frame attachment to duct and door to frame with neoprene or foam rubber.

E. Insulation: 1-inch (25-mm) thick, fibrous-glass or polystyrene-foam board.

2.5 FLEXIBLE CONNECTORS

A. General: Flame-retarded or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.

1. Standard Metal-Edged Connectors: Factory fabricated with a strip of fabric 3-1/2 inches (89 mm) wide attached to two strips of 2-3/4-inch (70-mm) wide, 0.028-inch (0.7-mm) thick, galvanized, sheet steel or 0.032-inch (0.8-mm) aluminum sheets. Select metal compatible with connected ducts.

B. Conventional, Indoor System Flexible Connector Fabric: Glass fabric double coated with polychloroprene.

1. Minimum Weight: 26 oz./sq. yd. (880 g/sq. m).
2. Tensile Strength: 480 lbf/inch (84 N/mm) in the warp, and 360 lbf/inch (63 N/mm) in the filling.

2.6 ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments, and length to suit duct insulation thickness.

B. Splitter Damper Accessories: Zinc-plated damper blade bracket; 1/4-inch (6-mm), zinc-plated operating rod; and a duct-mounted, ball-joint bracket with flat rubber gasket and square-head set screw.

C. Flexible Duct Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action, in sizes 3 to 18 inches (75 to 450 mm) to suit duct size.

D. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details shown in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for metal ducts and NAIMA's "Fibrous Glass Duct Construction Standards" for fibrous-glass ducts.

B. Install volume dampers in lined duct; avoid damage to and erosion of duct liner.

C. Provide test holes at fan inlet and outlet and elsewhere as indicated.

D. Install duct access panels for access to both sides of duct coils. Install duct access panels downstream from volume dampers, fire dampers, turning vanes, and equipment.

1. Install duct access panels to allow access to interior of ducts for cleaning, inspecting, adjusting, and maintaining accessories and terminal units.
2. Install access panels on side of duct where adequate clearance is available.

E. Label access doors according to other Sections.

3.2 ADJUSTING

A. Adjust duct accessories for proper settings.

B. Final positioning of manual-volume dampers is specified in other Sections.

END OF SECTION

SECTION 233400 – FANS

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes the following type fans:
   1. Inline centrifugal fans.

1.2 SUBMITTALS

A. Product data for selected models, including specialties, accessories, and the following:
   1. Certified fan performance curves with system operating conditions indicated.
   2. Certified fan sound power ratings.
   3. Motor ratings and electrical characteristics plus motor and fan accessories.
   4. Materials gages and finishes including color charts.
   5. Dampers, including housings, linkages, and operators.

B. Shop drawings from manufacturer detailing equipment assemblies and indicating dimensions, weights, required clearances, components, and location and size of field connections.

C. Wiring diagrams that detail power, signal, and control wiring. Differentiate between manufacturer-installed wiring and field-installed wiring.

D. Maintenance data:

1.3 QUALITY ASSURANCE

A. UL Compliance: Fans and components shall be UL listed and labeled.

B. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.

C. Electrical Component Standard: Components and installation shall comply with NFPA 70 "National Electrical Code."

1.4 EXTRA MATERIALS

A. Furnish one additional complete set of belts for each belt-driven fan.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Inline Centrifugal Fans:
      a. Cook (Loren) Co.
      b. Greenheck Fan Corp.
      c. Jenn Industries Inc.

2.2 SOURCE QUALITY CONTROL

A. Testing Requirements: The following factory tests are required:
   1. Sound Power Level Ratings: Comply with AMCA Standard 301 "Method for Calculating Fan Sound Ratings from Laboratory Test Data." Test fans in accordance with AMCA Standard 300 "Test Code for Sound Rating." Fans shall be licensed to bear the AMCA Certified Sound Ratings Seal.
   2. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings in accordance with AMCA Standard 210/ASHRAE Standard 51, "Laboratory Methods of Testing Fans for Rating."

2.3 FANS, GENERAL

A. General: Provide fans that are factory fabricated and assembled, factory tested, and factory finished, with indicated capacities and characteristics.

B. Fans and Shafts: Statically and dynamically balanced and designed for continuous operation at the maximum rated fan speed and motor horsepower.
   1. Fan Shaft: Turned, ground, and polished steel designed to operate at no more than 70 percent of the first critical speed at the top of the speed range of the fan's class.

C. Belt Drives: Factory mounted, with final alignment and belt adjustment made after installation.
   1. Service Factor: 1.4.

D. Belts: Oil-resistant, non-sparking, and non-static.

E. Motor and Fan Wheel Pulleys: Adjustable pitch for use with motors. Select pulley so that pitch adjustment is at the middle of the adjustment range at fan design conditions.
   1. Belt Guards: Provide steel belt guards for motors mounted on the outside of the fan cabinet.

F. Shaft Bearings: Provide type indicated, having a median life "Rating Life" (AFBMA (L50)) of 200,000, calculated in accordance with AFBMA Standard 9 for ball bearings and AFBMA Standard 11 for roller bearings.

G. Factory Finish: The following finishes are required:
   1. Sheet Metal Parts: Prime coating prior to final assembly.
   2. Exterior Surfaces: Baked-enamel finish coat after assembly.

H. Motors:
   1. Refer to other Sections for motor equipment.

2.4 INLINE CENTRIFUGAL FANS

A. General Description: Inline, belt-driven, centrifugal fans consisting of housing, wheel, outlet guide vanes, fan shaft, bearings, drive assembly, motor and disconnect switch, mounting brackets, and accessories.

B. Housing: Split, spun-aluminum housing, with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.

C. Direct-Drive Units: Motor encased in housing out of air stream, factory-wired to disconnect located on outside of fan housing.

D. Belt-Drive Units: Motor mounted on adjustable base, with adjustable sheaves, enclosure around belts within fan housing, and lubricating tubes from fan bearings extended to outside of fan housing.

E. Wheel: Aluminum, airfoil blades welded to aluminum hub.

F. Accessories: The following accessories are required as indicated:
   1. Volume Control Damper: Manual operated with quadrant lock, located in fan outlet.
   2. Companion Flanges: For inlet and outlet duct connections.
   3. Fan Guards: Expanded metal in removable frame.
   4. Speed Control: Variable speed switch with on-off control and speed control for 100 to 50 percent of fan air delivery.

2.5 MOTORS

A. Torque Characteristics: Sufficient to accelerate the driven loads satisfactorily.

B. Motor Sizes: Minimum sizes and electrical characteristics as indicated. If not indicated, large enough so that the driven load will not require the motor to operate in the service factor range.

C. Temperature Rating: 50 DegC maximum temperature rise at 40 DegC ambient for continuous duty at full load (Class A Insulation).

D. Service Factor: 1.15 for polyphase motors and 1.35 for single-phase motors.

E. Motor Construction: NEMA Standard MG 1, general purpose, continuous duty, Design B. Provide permanent-split capacitor classification motors for shaft-mounted fans and capacitor start classification for belted fans.
   1. Bases: Adjustable.
   2. Bearings: The following features are required:
      a. Ball or roller bearings with inner and outer shaft seals.
      b. Grease lubricated.
      c. Designed to resist thrust loading where belt drives or other drives produce lateral or axial thrust in motor.
   3. Enclosure Type: The following features are required:
      a. Open dripproof motors where satisfactorily housed or remotely located during operation.
      b. Guarded dripproof motors where exposed to contact by employees or building occupants.
   4. Overload protection: Built-in, automatic reset, thermal overload protection.
   5. Noise rating: Quiet.
   6. Efficiency: Energy-efficient motors shall have a minimum efficiency as scheduled in accordance with IEEE Standard 112, Test Method B. If efficiency not specified, motors shall be “premium efficiency” motors in accordance with IEEE Standard 112, Test Method B.
   7. Nameplate: Indicate the full identification of manufacturer, ratings, characteristics, construction, and special features.

F. Starters, Electrical Devices, and Wiring: Electrical devices and connections are specified in other Sections.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances, housekeeping pads, and other conditions affecting performance of fans.

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

3.2 INSTALLATION, GENERAL

A. Install fans level and plumb, in accordance with manufacturer's written instructions. Support units as described below, using the vibration control devices indicated. Vibration control devices are specified in Section "Mechanical Vibration Controls and Seismic Restraints."
   1. Support floor-mounted units on concrete equipment bases using neoprene pads. Secure units to anchor bolts installed in concrete equipment base.
   2. Support floor-mounted units on concrete equipment bases using housed spring isolators. Secure units to anchor bolts installed in concrete equipment base.
   3. Secure roof-mounted fans to roof curbs with cadmium-plated hardware.
      a. Installation of roof curbs is specified in other Sections.
   4. Suspended Units: Suspend units from structural steel support frame using threaded steel rods and vibration isolation springs.

B. Arrange installation of units to provide access space around air- handling units for service and maintenance.

3.3 CONNECTIONS

A. Duct installations and connections are specified in other Sections. Make final duct connections with flexible connections.

B. Electrical Connections: The following requirements apply:
   1. Electrical power wiring is specified in other Divisions.
   2. Temperature control wiring and interlock wiring are specified in Division 23.
   3. Grounding: Connect unit components to ground in accordance with the National Electrical Code.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Inspection: Arrange and pay for a factory- authorized service representative to perform the following:
   1. Inspect the field assembly of components and installation of fans including ductwork and electrical connections.
   2. Prepare a written report on findings and recommended corrective actions.

3.5 ADJUSTING, CLEANING, AND PROTECTING

A. Adjust damper linkages for proper damper operation.

B. Clean unit cabinet interiors to remove foreign material and construction dirt and dust. Vacuum clean fan wheel and cabinet.

3.6 COMMISSIONING

A. Final Checks Before Start-Up: Perform the following operations and checks before start-up:
   1. Remove shipping blocking and bracing.
   2. Verify unit is secure on mountings and supporting devices and that connections for piping, ductwork, and electrical are complete. Verify proper thermal overload protection is installed in motors, starters, and disconnects.
   3. Perform cleaning and adjusting specified in this Section.
   4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearings operations. Reconnect fan drive system, align belts, and install belt guards.
   5. Lubricate bearings, pulleys, belts, and other moving parts with factory-recommended lubricants.
   6. Verify manual and automatic volume control and that fire and smoke dampers in connected ductwork systems are in the full-open position.
   7. Disable automatic temperature control operators.

B. Starting procedures for fans:
   1. Energize motor; verify proper operation of motor, drive system, and fan wheel. Adjust fan to indicated RPM.
      a. Replace fan and motor pulleys as required to achieve design conditions.
   2. Measure and record motor electrical values for voltage and amperage.

C. Shut unit down and reconnect automatic temperature control operators.

D. Refer to Division 23 Section “Testing, Adjusting, and Balancing” for procedures for air-handling-system testing, adjusting, and balancing.

3.7 DEMONSTRATION

A. Demonstration Services: Arrange and pay for a factory-authorized service representative to train Owner’s maintenance personnel on the following:
   1. Procedures and schedules related to start-up and shutdown, troubleshooting, servicing, preventative maintenance, and how to obtain replacement parts.
   2. Familiarization with contents of Operating and Maintenance Manuals.

B. Schedule training with at least 7 days’ advance notice.

END OF SECTION

SECTION 260001 – ELECTRICAL

PART 1 – GENERAL

1.1 SCOPE OF WORK

A. Provide all labor, material, tools, equipment, transportation, and services necessary for and incidental to completion of all electrical work as indicated on the Drawings and/or as specified herein.

1.2 DRAWING USE AND INTERPRETATION

A. The Drawings are diagrammatic and indicate the general arrangement of systems and equipment unless indicated otherwise by dimensions or details. Exact equipment locations and raceway routing, etc. shall be governed by actual field conditions and/or instructions of the Engineer and/or Owner's Representative.

1.3 COMPLETE SYSTEMS

A. General: Furnish and install all materials as required for complete systems, including all parts obviously or reasonably incidental to a complete installation, whether specifically indicated or not. All systems shall be completely assembled, tested, adjusted and demonstrated to be ready for operation prior to Owner's acceptance.

B. Wiring: The wiring specified and/or shown on the Drawings is for complete and workable systems. Any deviations from the wiring shown due to a particular manufacturer's or subcontractor's requirements shall be made at no cost to either the Contract or the Owner.

1.4 CODES AND REGULATIONS

A. General: Comply with the latest recognized edition of the National Electrical Code (NEC) and all governing federal, state, and local laws, ordinances, codes, rules, and regulations. Where the Contract Documents exceed these requirements, the Contract Documents shall govern. In no case shall work be installed contrary to or below minimum legal standards.

B. Utilities: Comply with all applicable rules, restrictions, and requirements of the utility companies serving the project site/facilities.

C. Non-Compliance: Should any work be performed which is found not to comply with any of the above codes and regulations, provide all work and pay all costs necessary to correct the deficiencies.

1.5 REFERENCE STANDARDS

A. All latest published standards of the following associations/organizations shall be followed and applied where applicable as minimum requirements:
   1. (ADA), Americans with Disabilities Act.
   2. (ANSI), American National Standards Institute.
   3. (ASTM), American Society for Testing and Materials.
   4. (CBM), Certified Ballast Manufacturer.
   5. (EPACT), National Energy Policy Act.
   6. (ETL), Electrical Testing Laboratory.
   7. (ICEA), Insulated Cable Engineers Association.

8. (IEEE), Institute of Electrical and Electronic Engineers.
9. (IESNA), Illuminating Engineering Society of North America.
10. (NBFU), National Board of Fire Underwriters.
11. (NEMA), National Electrical Manufacturers Association.
12. (NESC), National Electrical Safety Code.
13. (NFPA), National Fire Protection Association.
14. (UL), Underwriter's Laboratories.

1.6 PERMITS

A. General: Obtain and pay for any and all permits required by all applicable agencies, prior to commencing work.

1.7 SUBMITTALS

A. General: Prepare and submit for approval, per the procedures set forth in Division 1, all submittals required by Division 1, this section, and by all other Contract Documents.

B. Types: Required submittals may include: Schedule of Values; List of Subcontractors; Product Data; Shop Drawings; Samples; Test Reports; Certifications; Warranties; Maintenance Manuals; Record Drawings; and various administrative submittals.

C. Number of Copies: As indicated in Division 1, Division 26, or elsewhere in the Contract Documents. For quantities indicated in the Contract Documents or specification sections other than Division 26 sections, increase number of copies by one to allow for the Engineer's record copy. Minimum number of copies per submittal: three.

D. Product Data: Submit for all basic electrical equipment, devices, and materials to be used on the project. Product data to consist of manufacturer's standard catalog cuts, descriptive literature and/or diagrams, in 8-1/2-inch-by-11-inch format, and in sufficient detail so as to clearly indicate compliance with all specified requirements and standards. Mark each copy to clearly indicate proposed product, options, finishes, etc.

E. Shop Drawings: Submit for all custom equipment and systems (e.g., panelboards) to be used on the project. Shop Drawings to be newly prepared, specifically for this project, and shall include all information listed in the Shop Drawings submittal requirements in the respective specification section. Include all pertinent information such as equipment/system identification, manufacturer, dimensions, nameplate data, sizes, capacities, types, materials, performance data, features, accessories, wiring diagrams, etc., in sufficient detail so as to clearly indicate compliance with all specified requirements and standards. For control systems, provide computer generated control ladder diagrams specifically developed for this project (standard diagrams not acceptable).

F. Maintenance Manuals: Include operating and maintenance data in accordance with Division 1. Include all Product Data/Shop Drawing submittals as well as descriptions of function, normal operating characteristics and limitations, and manufacturer's printed operating maintenance, trouble shooting, repair, adjustment, and emergency instructions, and complete replacement parts listing.

G. Record Documents: Prepare and submit in accordance with Division 1. In addition to Division 1 requirements, indicate actual installed locations for all equipment and devices, routing of major interior raceways, locations of all concealed and underground equipment and raceways, and all approved modifications to the Contract Documents, and deviations necessitated by field conditions and change orders.

1.8 QUALITY ASSURANCE

A. Manufacturers' Qualifications: Not less than three years of experience in the actual production of the specified products.

B. Installers' Qualifications: Firm with not less than five years of experience in the installation of electrical systems and equipment similar in scope and complexity to those required for this Project, and having successfully completed at least ten comparable scale projects.

C. Incidental Work: Excavation, backfill, painting, patching, welding, carpentry, mechanical work, concrete pads and the like related to or required for Division 26 work shall be performed by craftsman skilled in the appropriate trade, but shall be provided for under Division 26.

1.9 INSPECTIONS

A. General: During and upon completion of the work, arrange and pay all associated costs for inspections of all electrical work installed under this contract, in accordance with the Conditions of the Contract.

B. Inspections Required: As per the laws and regulations of the local and/or state agencies having jurisdiction at the project site.

C. Inspection Agency: Approved by the local and/or state agencies having jurisdiction at the project site.

D. Certificates: Submit all required inspection certificates.

E. Coordination: Coordinate inspections with the local utility.

1.10 DELIVERY STORAGE AND HANDLING

A. Comply with Division 1 requirements.

B. Packing and Shipping: Deliver products in original, unopened packaging, properly identified with manufacturer's identification, and compliance labels.

C. Storage and Protection: Comply with all manufacturer's written recommendations. Store all products in a manner, which shall protect them from damage, weather, and entry of debris.

D. Damaged Products: Do not install damaged products. Arrange for prompt replacement.

PART 2 – PRODUCTS

2.1 GENERAL

A. Where Specified: Materials and equipment shall be as specified herein and/or as indicated on the Drawings.

B. General Requirements: All materials and equipment shall be in accordance with the Contract Documents, and to the extent possible, standard products of the various manufacturers, except where special construction or performance features are called for. All materials and equipment to be new, clean, undamaged, and free of defects and corrosion.

C. Acceptable Products: The product of a specified or approved manufacturer will be acceptable only when that product complies with or is modified as necessary to comply with all requirements of the Contract Documents.

D. Common Items: Where more than one of any specific item is required, all shall be of the same type and manufacturer.

E. UL Listing: All electrical materials and equipment shall be Underwriters' Laboratories (UL) listed and labeled where UL standards and listings exist for such materials or equipment.

2.2 PRODUCT OPTIONS AND SUBSTITUTIONS

A. Refer to the Conditions of the Contract and Division 1.

2.3 FIRESTOPPING MATERIALS

A. General: Firestop systems composed of firestop compounds and appropriate damming materials installed together with the penetrant (e.g., conduit) to form a complete firestop system, providing a fire resistant rating at least equal to the hourly fire resistance rating of the floor, wall or partition into which the firestop system is to be installed.

B. Test Standards: Firestopping materials shall be tested together as a system to the time/temperature requirements of ASTM E119 and shall be tested to UL 1479 (ASTM E814) and be UL classified for up to 3 hours.

C. Firestop Sealants: Non-hardening, conformable, intumescent putties, sealants or other compounds, containing no toxic solvents or asbestos, and exhibiting aggressive adhesion to all common building materials and penetrants, while allowing reasonable movement of the penetrants, without being displaced. Compounds shall be waterproof, non-toxic and smoke and gas tight.

D. Firestop Mortars: Light-weight, water-based, cementatious, fast drying, low density mortar, non-shrinking and non-cracking during its cure, and which forms a surface capable of being sanded, bored and painted.

E. Damming Materials: Mineral wool or ceramic fiber.

F. Multi-Cable Transits: Assemblies consisting of a frame, a compression mechanism, and grooved insert sealing modules sized for multiple penetrating elements of various sizes.

G. Acceptable Manufacturers: Hilti; Heavy Duty/Nelson; International Protective Coatings; Specified Technologies, Inc.

2.4 CONCRETE WORK

A. Concrete:
1. Minimum Strength: 3000 psi at 28 days.
2. Aggregate: 3/4 inch aggregate.
3. Cement: 588 #/cubic yard minimum, Type I or II.
4. Slump: 4 inches maximum.
5. Air: 5 to 7 percent.

B. Reinforcing: Grade 60 bars, sized as indicated, and 6 inches by 6 inches – W1.4 by W1.4 mesh and other reinforcing as indicated.

C. Forms: Wood, metal, or other approved materials constructed so as to withstand the forces of the newly placed concrete.

2.5 RACEWAY SYSTEMS

A. Raceway Sizing: As required by the NEC (minimum) with oversized raceways as indicated and where required for ease of pulling cable.
   1. Minimum conduit size: 3/4 inch, unless indicated otherwise.

B. Raceway Types: Rigid galvanized steel conduit, electrical metallic tubing (EMT), flexible steel conduit, and liquid-tight flexible steel conduit conforming to applicable ANSI, NEMA and UL standards.

C. Fittings: All raceway fittings (except for rigid non-metallic conduit) to be steel or malleable iron and UL-listed for the intended application. EMT fittings to be compression type.

D. Outlet Boxes (Concealed in Walls): Non-gangable, galvanized steel with square cornered tile (or masonry) type extension rings or cover.
   1. Minimum size: two-gang masonry box or 4-inch square box with single-gang adapter (plaster) ring. Depth of adapter ring to suit application.
   2. Minimum depth: 1-1/2 inches.
   3. Minimum capacity: 21 cubic inches.

E. Outlet Boxes (Surface Mounted): Cadmium plated cast or malleable iron.

F. Pull and Junction Boxes, and Wireways: Use as indicated and required. Junction and pull boxes for general indoor use (dry locations) to be of galvanized code gauge steel construction, minimum 4-inch square by 1-1/2 inches deep with screw-on covers. Wireways to be UL listed, sheet steel construction with screw-on covers. For exterior and damp or wet indoor locations, use boxes and wireways approved for such use.

G. Handholes: Light-weight and high-strength, constructed of fiberglass reinforced polymer concrete, gray color, suitable for use at temperatures down to -50 DegF, and resistant to sunlight, weathering, chemicals and freeze-thaw cycles, with bolt-on cover (with standard logo indicating type of service), and designed for in-grade use in areas with light vehicular traffic (5,000-pound load over a 10-inch by 10-inch area).
   1. Acceptable Manufacturers:
      a. Quazite “Composolite.”
      b. Styles “PC” or “PG.”

H. Pipe Sleeves: Rigid steel conduit or iron pipe.

I. Conduit Seals: For Cast-in-Place Concrete Applications:
   1. Acceptable Manufacturers:
      a. O-Z/Gedney Type “FSK.”
      b. Thunderline Corp. “Link Seal” with “Link Seal Wall Sleeve.”

J. For Core Drilled and Pre-Cast Opening Applications:
   1. Acceptable Manufacturers:
      a. O-Z/Gedney Type “CSML.”
      b. Thunderline Corp. “Link Seal.”

K. Pull Wires: No. 14 AWG zinc-coated steel monofilament plastic line with 200-pound tensile strength.

2.6 600 VOLT CLASS WIRE

A. General: All wire and cable shall be constructed in accordance with all applicable ICEA, NEMA and IEEE published standards, and shall be UL-listed and labeled. Single-conductor, 98 percent conductivity, annealed, uncoated copper conductors with 600-volt rated type "THHN/THWN" insulation.

B. Wire shall be annealed bare copper per ANSI/ASTM B3, UL 83, and Federal Specification JC-30A with 600 volt insulation, be stranded (except for #10 AWG and smaller may be solid), and be minimum size #12 AWG (except for control wiring and signal circuits).

C. Insulation: Provide THHN/THWN insulation for all conductors except XHHW insulation may be used for conductors #4 and larger.

D. Ampacity of conductors shall be rated for 75 DegC regardless of temperature of conductor insulation when combining circuits in one conduit. Derate conductors and increase size per NEC when installing multiple circuits in a raceway, utilizing 75 DegC ampacity table.

E. Connectors: Nylon shell insulated metallic screw-on connectors for #14-10 AWG and bolted pressure or compression type lugs and connectors with insulating covers for #8 AWG and larger.

2.7 WIRING DEVICES

A. Receptacles (General Use): 125 volt, 20 amp, NEMA 5-20R, duplex type.
   1. Acceptable Manufacturers:
      a. Leviton.
      b. Arrow-Hart.
      c. Hubbell.
      d. Pass and Seymour.

B. GFI Receptacles: Ground fault circuit interrupter, feed-through, duplex type, 125 volt, 20 amp, NEMA 5-20R, with solid-state ground-fault sensing and 5 mA trip level.
   1. Acceptable Manufacturers:
      a. Leviton.
      b. Arrow-Hart.
      c. Hubbell.
      d. Pass and Seymour.

C. Device Color: Brown, unless directed otherwise.

D. Coverplates (Interior Devices): For finished spaces, nylon coverplates to match wiring device. For unfinished spaces (e.g., mechanical room, electrical room, etc.), minimum .032-inch thick, Type 430 stainless steel with U.S. #32D satin finish.

E. Coverplates (Exterior Locations): Weatherproof cast aluminum or polycarbonate. Receptacles installed in damp or wet locations shall have an enclosure and cover that are weatherproof with the attachment plug inserted or removed per NEC 406.9.

2.8 EQUIPMENT CONNECTIONS

A. Materials as specified in this section, and as required.

2.9 HANGERS AND SUPPORTS

A. General: All hangers, supports, fasteners and hardware shall be zinc-coated or of equivalent corrosion resistance by treatment or inherent property, and shall be manufactured products designed for the application. Products for outdoor use shall be hot dip galvanized.

B. Types: Hangers, straps, riser supports, clamps, U-channel, threaded rods, etc., as indicated and/or required.

C. Seismic restraints and supports as indicated and/or required.

2.10 ELECTRICAL IDENTIFICATION

A. Nameplates: Three-layer laminated plastic with minimum 3/16-inch high white engraved characters on black background, and punched for mechanical fastening. Fasteners: self-tapping stainless-steel screws or number 10-32 stainless steel machine screws with nuts and flat and lock washers. Each nameplate on all panelboards and switchgear shall indicate the following:
   1. Panel Name.
   2. Voltage, Phase, Number of Wires.
   3. Source.

B. Underground Warning Tape: 6-inch wide polyethylene tape, permanently bright colored with continuous-printed legend indicating general type of underground line below and "CAUTION." Colors as follows:
   1. Red – Electric.
   2. Orange – Communications.

C. Marking Pens: Permanent, waterproof, quick drying black ink.
   1. Acceptable Manufacturers:
      a. Sanford Fine Point "Sharpie."
      b. Or equal.

D. Wire Tags: Vinyl or vinyl-cloth self-adhesive wraparound type indicating appropriate circuit number, etc.

E. Arc Flash Panelboard Stickers: Provide per NEC 110.16.

2.11 ELECTRIC SERVICE

A. Materials as specified elsewhere in this section and as required by the serving electric utility company.

2.12 SAFETY SWITCHES

A. General: Heavy duty, horsepower rated, fully enclosed, fusible (with rejection fuse clips) or non-fused as indicated, quick-make, quick-break switching mechanism interlocked with cover and NEMA-1 enclosure for dry locations and NEMA-3R enclosure for wet locations unless indicated

otherwise. Switches to be labeled as "Suitable for Use as Service Entrance Equipment" where so indicated or required.

B. Ratings: Provide switches with ratings as indicated. If ratings are not indicated, provide switch with ratings to suit the electrical system and load served.

C. Acceptable Manufacturers:
   1. General Electric.
   2. Square D.
   3. Cutler-Hammer.
   4. Siemens.

2.13 GROUNDING

A. Provide grounding installation per details on drawings.

B. General: Ground rods, conductors, clamps and connectors, etc., as required.

C. Ground Rods: Minimum 5/8-inch diameter by 10-foot long copper clad steel.

D. Welded Connectors: Exothermic process.

2.14

2.14 CIRCUIT BREAKERS

A. General: Molded case with thermal and magnetic trips unless indicated otherwise. Minimum 10,000 amps interrupting capacity for 208V and 240V, 14,000 amps interrupting capacity for 480V and higher ratings as indicated or required.

B. For Panelboard Mounting: Bolt-on type.

C. Breakers to be added to Existing Panelboards: Same manufacturer, type, and interrupting rating as for the existing breakers in same panelboard.

2.15 INDIVIDUAL MOTOR CONTROLLERS

A. Combination Magnetic Starters: Magnetic starters as specified above, with fusible or non-fused switch as indicated, sized as indicated, with defeatable cover interlock, quick-make, quick-break switching mechanism and padlockable indicating handle.

B. Enclosures: NEMA-1 for indoor application and NEMA-3R for outdoor application unless indicated otherwise, sized as required to house all components including any optional accessories.

C. Acceptable Manufacturers:
   1. Allen Bradley.
   2. General Electric.
   3. Square D.
   4. Cutler-Hammer.
   5. Siemens.

2.16 LIGHTING FIXTURES

A. General:

1. Provide fixture types as indicated on the Drawings. Lighting fixture manufacturers' series or catalog numbers listed indicate general quality, type, and style but may not cover all required design features and details. Provide lighting fixtures having all features, details, and accessories as noted in the fixture descriptions. Provide all fittings, hangers, clamps, brackets, yokes, flanges, and miscellaneous devices required for a complete installation.
2. Whenever possible, (based upon design requirements) provide lighting fixtures with ballasts provided integral to fixture and prewired.

B. Incandescent Lamps: General purpose, inside frosted, unless indicated otherwise.

PART 3 – EXECUTION

3.1 GENERAL

A. The installation of all electrical work shall be in accordance with the intent of the Contract Documents as determined by the Engineer.

B. Installation Requirements: All materials and equipment shall be installed as recommended by the respective manufacturers, by mechanics experienced and skilled in their particular trade, in a neat and workmanlike manner, in accordance with the standards of the trade, and so as not to void any warranty or UL listing.

C. Administration and Supervision: All electrical work shall be performed under the Contractor's direct supervision using sufficient and qualified personnel as necessary to complete the work in accordance with the progress schedule. The Contractor shall assign one or more competent supervisors who shall have authority to accept and execute orders and instructions, and who shall cooperate with the other Contractors and subcontractors, the Engineer, and Owner in all matters to resolve conflicts and avoid delays.

3.2 EXAMINATION

A. Conditions Verification: Examine the areas and conditions under which the work is to be performed, and identify any conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

3.3 COORDINATION

A. General: Sequence, coordinate and integrate the installation of all electrical materials and equipment for efficient flow of work, in conjunction with the other trades. Review to the Drawings for work of the other trades, and report and resolve any discovered discrepancies, prior to commencing work.

B. Cooperation: Cooperate with the other Contractors and individual disciplines for placement, anchorage, and accomplishment of the work. Resolve interferences between work of other disciplines or Contractors, prior to commencing installation.

C. Chases, Slots, and Openings: Arrange for chases, slots, and openings during the progress of construction as required to allow for installation of the electrical work.

D. Supports and Sleeves: Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components as they are constructed.

E. Obstacles and Interferences: When installing equipment and raceways, provide offsets, fittings, accessories, and changes in elevation or location as necessary to avoid obstacles and interferences, per actual field conditions.

F. Space Requirements: Electrical equipment sizes indicated on the Drawings are generally based on specified manufacturer. Verify that the proposed equipment will fit in the space indicated on the drawings. Maintain clearances required by NEC.

3.4 DIMENSIONS

A. Building Dimensions: For exact locations of building elements, refer to dimensioned drawings. However, field measurements take precedence over dimensioned drawings.

B. Site Dimensions: Field measurements take precedence over scaled electrical site plans.

C. Limiting Dimensions: Equipment outlines shown on detail drawings of 1/4" = 1'-0" scale or larger and dimensions indicated on the Drawings are limiting dimensions. Do not install equipment exceeding dimensions indicated by outlines on Drawings or equipment or arrangements that reduce indicated clearances.

D. Establish the exact location of electrical equipment based on the actual field verified dimensions of equipment furnished.

3.5 EQUIPMENT PROTECTION

A. Protect all electrical equipment, and materials and work from the weather elements, paint, mortar, construction debris and damage until project is substantially complete. Repair, replace, and clean all electrical work so affected.

3.6 ELECTRICAL INSTALLATION - GENERAL

A. Unfinished and Finished Areas: For the purposes of these electrical specifications, “unfinished” areas shall include mechanical, electrical and telephone equipment rooms. All other areas shall be considered “finished” spaces unless indicated or approved otherwise.

B. In Unfinished Areas: Raceways, equipment, and devices may be installed concealed or exposed unless indicated otherwise.

C. In Finished Areas: Conceal all raceway and flush mount all electrical boxes, equipment, and devices unless indicated or approved otherwise. The space above suspended ceilings or behind furred spaces is considered outside finished areas and electrical materials installed within these areas are considered concealed.

D. Minimum Mounting Height: Install exposed raceway and all other electrical equipment (e.g., lighting fixtures) with not less than 7 feet and 6 inches clear to finished floor unless indicated or approved otherwise, and excluding raceway and equipment mounted on walls.

E. Dimensions and Clearances: Field measure all dimensions and clearances affecting the installation of electrical work in relation to established datum, building openings and clearances, and work of other trades as construction progresses.

F. Rough-In Locations: Verify final locations for rough-ins with field measurements and requirements of actual equipment being installed.

G. Door Swings: Verify the swings of all doors before switch outlets or other electrical devices are installed. If necessary, relocate devices so they are not obstructed by doors when doors are open.

H. Ceiling Mounted Devices: The locations indicated on the architectural reflected ceiling plans take precedence over the electrical documents, in the event of conflict.

I. Install equipment according to manufacturer's written instructions.

J. Install equipment, conduit, cable tray, hangers, and supports to withstand seismic forces for the seismic zone of the installation.

3.7 LAYOUT

A. General: Install electrical systems, materials and equipment level and plumb, and parallel and perpendicular to other building systems and components, where installed exposed.

B. Serviceability: Install electrical equipment and raceways, etc., to readily facilitate servicing, maintenance, and repair or replacement of components and so as to minimize interference with other equipment and installations.

C. Clearances: Prior to commencing work, verify that all electrical equipment will adequately fit and conform to the indicated and code required clearances in the spaces indicated on the Drawings. If rearrangement is required, submit plan and elevation drawings or sketches indicating proposed rearrangement for the Engineer's approval. Do not rearrange without express written permission of the Engineer.

D. Right-Of-Way: When laying out electrical work, give priority in available space to steam and condensate lines, sanitary lines, drain lines, fire protection piping, and sheet metal duct work. Provide offsets as required to avoid conflicts. Resolve all conflicts before commencing installation.

3.8 MOUNTING HEIGHTS

A. General: Indicated heights are measured from the center of the device outlet box to finished floor or grade, unless indicated otherwise. Request instructions for mounting heights not indicated.

3.9 HOLES, SLEEVES, AND OPENINGS

A. General: Provide all holes, sleeves, and openings required for the completion of Division 26 work and restore all surfaces damaged to match surrounding surfaces. Maintain integrity of all fire and smoke rated barriers using approved firestopping systems. When cutting holes or openings, or installing sleeves, do not cut, damage, or disturb structural elements or reinforcing steel unless approved in writing by the Project Structural Engineer.

B. Conduit Penetrations: Size core drilled holes so that an annular space of not less than 1/4 inch and not more than 1 inch is left around the conduit. When openings are cut in lieu of core drilled, provide sleeve in rough opening. Size sleeves to provide and annular space of not less than 1/4 inch and not more than 1 inch around the conduit. Patch around sleeve to match surrounding surfaces.

3.10 FIRESTOPPING SYSTEMS

A. General: Install firestopping at all electrical raceway and cable penetrations through floor structures and interior walls or partitions, which are time-rated fire and/or smoke barriers.

B. Preparation: Prior to installation, verify that all penetrating elements and supporting devices are permanently installed and that surfaces which will be in contact with penetration seal materials are clean and free of dust, dirt, grease, oil, loose materials, rust or other substances.

C. Installation: Install firestop systems in accordance with UL approved design details and the manufacturer's instructions. Install sleeves, conduits, and cables with required clearance spaces, allowing installation of sealing materials. Do not exceed the outside diameter of the sleeve, conduit, or cable by more than 1 inch or by less than 1/4 inch when making openings for penetrations. Install firestop systems so as to completely seal openings to prevent passage of smoke and water.

3.11 CUTTING AND PATCHING

A. General: Provide all cutting, drilling, chasing, fitting, and patching necessary for accomplishing the work of Division 26, which includes any and all work necessary to: uncover work to provide for the installation of ill-timed work; remove and replace defective work and work not conforming to the requirements of the Contract Documents; and install equipment and materials in existing structures, in addition to that required during the normal course of construction.

B. Comply with the cutting and patching requirements of Division 1.

C. Building Structure: Do not endanger the integrity of the building structure by cutting, drilling, or otherwise modifying any structural member without specific approval. Do not proceed with any structural modifications without written permission of the Project Structural Engineer.

D. Repairs: Repair any and all damage to work of other trades caused by cutting and patching operations using skilled mechanics of the trades involved.

3.12 WELDING

A. General: Where welding is required, such welding shall be performed in a skilled manner by certified welders. Verify that welds are free from cracks, craters, undercuts, and strikes, weld spatter, and any other surface defects. Clean and re-weld any welds deemed unacceptable in size or configuration. Do not weld to structural steel without prior written permission from the Project Structural Engineer.

3.13 CONCRETE WORK

A. General: All concrete shall be prepared from approved materials and poured on clean, stable surfaces.

B. Exterior Base Surfaces: 12-inch layer of crushed stone over well-consolidated, stable, undisturbed soil. Where the underlying soil contains excess organic material, trash or voids, or fails to provide solid bearing for any other reason, excavate to the depth required for solid bearing and re-establish the required elevation with approved granular materials.

C. Finishing: Trowel all exposed surfaces smooth. Round-off or chamfer all exposed edges.

D. Curing: Beginning immediately after placement, protect concrete from premature drying, excessive hot or cold temperatures, and mechanical injury. Maintain minimal moisture loss at relatively constant temperature throughout period necessary for hydration of cement and hardening of concrete.

3.14 ELECTRICAL DEMOLITION

A. Refer to drawings for specific demolition work.

B. General: Provide electrical demolition work as indicated and as required for removal and/or abandonment of systems, equipment, devices, etc., made obsolete by this Project and as required for demolition and remodeling by the other trades.

C. Existing Conditions: In general, existing electrical systems, equipment, and devices are not shown on the Drawings unless pertinent to the demolition and/or remodeling work. Existing electrical conditions, where indicated, are based on casual field observations and must be verified. Report any discrepancies to the Engineer before disturbing the existing installation.

D. Examination: Prior to bidding, examine the site to determine all actual observable conditions. No additional compensation will be granted on account of extra work made necessary by the Contractor's failure to investigate such existing conditions.

E. Scheduling and Phasing: Coordinate demolition and changeover work with the other trades involved and with the Owner's Representative.

F. Protection of Adjacent Materials: During execution of demolition work, primary consideration shall be given to protecting from damage, the building structure, furnishings, finishes, and the like, which are not specifically indicated to be removed. Existing items or surfaces to remain, which are damaged as a result of this work, shall be refinished, repaired, or replaced to the satisfaction of the Owner at the Contractor's expense.

G. Patching: When electrical materials are removed, patch and finish walls, surfaces, etc., to match surrounding surfaces. Provide blank coverplates as required, etc. Materials used for patching shall be in conformance with the applicable sections of the Project Manual. Where materials are not specifically described, but required for proper completion of the Work, they shall be as selected by the Contractor subject to approval of the Engineer.

H. Inspection: Before commencing demolition work, carefully inspect the project site and become familiar with existing systems and conditions.

I. Items To Be Salvaged: Verify with the Owner, all systems, materials, and equipment which are to be salvaged and those which must be removed. The Owner reserves the right to salvage any or all existing electrical materials and equipment at the project site.

J. Disconnections: Disconnect all electrical devices and equipment as indicated and required. Disconnect electrical connections to mechanical and other equipment being removed by other trades.

K. Wiring Removals: Where existing electrical devices or equipment are indicated to be removed, remove all associated wiring. Remove all abandoned or dead wiring back to source.

L. Raceway Removals: Remove all abandoned raceways, boxes, supports, etc., where exposed and where they interfere with new work of any trade. Cut conduits flush with walls and floors, and cap.

M. Existing Electrical Work to Remain: Protect and maintain access to existing electrical work, which must remain. Reinstall existing electrical work disturbed.

N. Reconnections: Where electrical work in adjoining areas, or electrical work indicated to remain, becomes disconnected or affected by demolition work, reconnect circuits, etc., as required to restore original operation. Restoration work to comply with requirements for new work.

O. Existing Electrical Work to be Relocated: Disconnect, remove, reinstall and reconnect existing devices and equipment indicated to be relocated and where required to accommodate remodeling or new construction. Extend existing installations as required. Materials and methods used for relocations and extensions to conform to requirements for new work.

P. Shutdowns: All shutdowns to existing electrical services to be scheduled and approved, in writing, by the Owner's Representative.

3.15 RACEWAY SYSTEMS

A. Raceway Types: Unless indicated otherwise, use raceway types as follows:
   1. Indoors, Concealed in Walls or Above Ceilings: EMT.
   2. Indoors, Exposed: Use rigid galvanized steel conduit below 10 feet above finished floor. EMT may be used above 10 feet.
   3. Flexible Steel Conduit: Use (in dry locations only) for connections to transformers, vibrating equipment, and equipment requiring minor adjustments in positions for final connections to recessed lighting fixtures and between outlet boxes in metal stud partitions.
   4. Liquid-Tight Flexible Steel Conduit: Use where flexible steel conduit connections are required in damp, wet, or oily locations, and for final connections to all motors and similar equipment.

B. Raceway Routing: As required by job conditions unless specific routes or dimensioned positions are indicated on the Drawings. Install tight to slabs, beams, and joists wherever possible. Route exposed conduit, and conduit installed above ceilings, parallel or perpendicular to walls ceilings and structural members. Install to maintain minimum headroom and to present a neat appearance. Run parallel raceways together with bends made from same center line. Verify exact locations of all raceways, pull boxes, and junction boxes. Resolve any conflicts before installation.

C. Raceway Installation: Cut conduit ends square using saw or pipecutter and ream each cut end smooth. Carefully make all conduit bends and offsets so that the inside diameter of pipe is not reduced. Make bends so that legs are in the same plane. Make offsets so that legs are in the same plane and parallel. Protect stub-ups from damage, and carefully rebend when necessary.

D. Fittings: Make up all raceway fittings tight so that final installation of raceway, fittings and enclosures constitutes a firm mechanical assembly and a continuous electrical conductor. Where required, provide bonding jumpers to assure electrical continuity.

E. Protection: Protect all raceways, enclosures, and equipment during construction to prevent entry of concrete, debris and other foreign matter. Free clogged conduits of all obstructions, or replace, prior to pulling wire. Do not pull wire within buildings until buildings are completely enclosed.

F. Boxes: Install all outlet, pull, and junction boxes rigidly, plumb, and level. Support and secure boxes independently from conduits terminating at box. Install all boxes so as to be accessible and so that covers may be easily removed.

G. Conduit Seals: Install conduit seal for each conduit penetrating an exterior building wall below grade (unless penetration is below lowest building floor slab) and elsewhere as indicated, and so as to achieve a sealed watertight installation.

H. Pull Strings: Provide pull strings in all spare conduits.

3.16 CONDUCTORS - 600 VOLT AND BELOW

A. Minimum Conductor Size: All branch circuit wiring shall be minimum #12 AWG. All control circuit wiring shall be minimum #14 AWG unless indicated otherwise. Provide larger sizes as indicated or required.

B. Branch Circuit Conductor Sizes: Provide branch circuit conductor sizes as indicated on the panelboard schedules, plans, or elsewhere. Neutral conductor size to match phase conductors unless indicated otherwise. Provide branch circuit switch legs and travelers as required for the switching indicated.

C. Equipment Grounding Conductor Required: For each branch circuit and feeder run, provide an equipment grounding conductor for continuous length of run, sized per NEC 250-122 (minimum), larger if so indicated.

D. Feeders: Provide feeder conductor sizes and quantities as indicated.

E. In Raceway: Install all wiring in conduit or other specified raceway unless indicated otherwise.

F. Terminations: Furnish and install terminations including lugs (if necessary) to make all electrical connections indicated or required. Make connections and terminations for all stranded AWG conductors using crimp, clamp, or box-type connectors and terminators. Enclose all strands of stranded conductors in connectors, and lugs.

G. Color: Conductors #10 and smaller shall be factory color-coded by integral pigmentation with a separate color for each phase and neutral. #8 and larger shall have stripes, bands, hash marks, or color pressure-sensitive plastic tape. Color code all branch circuit and feeder conductors as follows:

1. 208/120 Volts:

PHASE	COLOR
A	Black
B	Red
C	Blue
Neutral	White

2. 480/277 Volts:

PHASE	COLOR
A	Brown
B	Orange
C	Yellow
Neutral	Gray

3. Equipment Grounding Conductors: Green

H. Phase Arrangement: Arrange phases in all electrical equipment as follows:
1. A, B, C: Front to Rear.
2. A, B, C: Top to Bottom.
3. A, B, C: Left to Right when facing established front of equipment.

I. Provide conductors with not less than 90 DegC rated insulation when branch circuit wiring is attached to high temperature light fixtures (e.g., fluorescent and HID), boilers, incinerators, ovens, ranges, kitchen exhaust fans, other heat-producing equipment, and “100 percent rated” overcurrent

protective devices. Use special higher temperature wire as required for connection to specialty equipment as required by equipment manufacturer.

3.17 EQUIPMENT CONNECTIONS

A. Connect complete, all equipment requiring electrical connections, furnished as part of this Contract or by others unless indicated otherwise.

B. Equipment Variations: Note that equipment sizes and capacities as shown on the Contract Documents are for bidding purposes and as such may not be the exact unit actually furnished. Contractor shall anticipate minor variations in equipment and shall include in his Bid all costs required to properly connect the equipment actually furnished.

C. Verification: Obtain and review shop drawings, product data, and manufacturer's instructions for equipment furnished by others. Examine actual equipment to verify proper connection locations and requirements.

D. Coordination: Sequence electrical rough-in and final connections to coordinate with installation and start-up schedule and work by other trades.

E. Rough-In: Provide all required conduit, boxes, fittings, wire, connectors, miscellaneous accessories, etc., as necessary to rough in and make final connections to all equipment requiring electrical connections. In general, motors and equipment shall be wired in conduit to a junction box (or safety switch) near the unit, and from there to the unit in flexible metal or liquid-tight flexible steel conduit.

F. Connections: Provide properly sized overload and short circuit protection for all equipment connected, whether furnished under this Contract or by others. Verify proper connections with manufacturer's published diagrams and comply with same. Verify that equipment is ready for electrical connections, wiring, and energization prior to performing same.

G. Control Wiring: Provide all control wiring to remote devices or equipment as indicated or required. Modify equipment control wiring, install or disconnect jumpers, etc., as required.

3.18 HANGERS AND SUPPORTS

A. General: Rigidly support and secure all electrical materials, raceway, and equipment to building structure using hangers, supports, and fasteners, suitable for the use, materials and loads encountered. Provide all necessary hardware.

B. Overhead Mounting: Attach overhead mounted equipment to structural framework or supporting metal framework. Do not make attachments to steel roofing, steel flooring, or ceiling mineral tile.

C. Wall Mounting: Support wall mounted equipment by masonry, concrete block, metal framing, or sub-framing.

D. Exterior Walls: Mount all electrical equipment located on the interior of exterior building walls at least 1 inch away from wall surface using suitable spacers.

E. Structural Members: Do not cut, drill, or weld any structural member.

F. Independent Support: Do not support electrical materials or equipment from other equipment, piping, ductwork, or supports for same.

G. Temporary Conditions: Do not attach to or support electrical work from removable or knockout panels or temporary walls or partitions.

H. Raceway Supports: Rigidly support all raceway with maximum spacings per NEC and so as to prevent distortion of alignment during pulling operation. Use approved hangers, clamps, and straps for individual runs. Do not use perforated straps or tie wires. Where multiple parallel raceways are run together, use trapeze type hanger arrangement made from U-channel and accessories, suspended by threaded rods, and allow at least 25 percent spare capacity for future installation of additional raceways. Rigidly anchor vertical conduits serving floor-mounted or "island" type equipment mounted away from walls with metal bracket or rigid steel conduit extension secured to floor.

I. Miscellaneous Supports: Provide any additional structural support steel brackets, angles, fasteners, and hardware as required to adequately support all electrical materials and equipment.

J. Seismic restraints and supports: Provide as indicated and/or as required per seismic zone indicated.

3.19 ELECTRICAL IDENTIFICATION

A. General: Locate nameplate, marking, or other identification means on outside of equipment or box front covers when above ceilings and when in mechanical or electrical equipment rooms or other unfinished areas, and on inside of front cover when in finished rooms/areas. Use Contract Document designations for identification unless indicated otherwise.

B. Nameplates: Provide nameplate engraved with equipment designation for each safety switch, panelboard, transformer, motor starter, and all other electrical cabinets, etc.

C. Underground Warning Tape: During trench backfilling for each underground electrical, telephone, signal, and communications line, provide a continuous underground warning tape located directly above line at 6 to 8 inches below finished grade.

D. Marking Pen Labeling: Mark each junction and pull box indicating source designation and circuit number(s) for the enclosed conductors.

E. Wire Tags: For power circuits, apply wire tag indicating appropriate circuit or feeder number to each conductor present in distribution panel and panelboard gutters, and to each conductor in pull and junction boxes where more than one feeder or multi-wire branch circuit is present. Where only a single feeder or multi-wire branch circuit is present, box cover labeling and conductor color coding is sufficient. For control, communications, and signal circuits, apply wire tag indicating circuit or termination number at all terminations and at all intermediate locations and boxes where more than one circuit is present.

F. Panelboard Circuit Directories: At completion of project, accurately complete each panelboard circuit directory card, identifying load served or "spare" or "space" for each circuit pole. When modifying, adding or deleting circuits at an existing panelboard, update the existing (or provide new) circuit directory card to accurately reflect final conditions.

G. Abandoned Equipment: Label all abandon equipment as "Abandon as of _____." For conduits and conductors, include opposite end location.

3.20 GROUNDING

A. General: Provide all system and equipment grounding as indicated and required by the NEC.

B. Equipment Grounding: Provide a green equipment grounding conductor, sized per NEC 250-122 (larger if so indicated), with each feeder and branch circuit run.

3.21 SAFETY SWITCHES

A. Mount securely at the location indicated on the Drawings.

B. Provide fuses as required.

3.22 INDIVIDUAL MOTOR CONTROLLERS

A. General: Make all connections to motors and control equipment complete, and verify that equipment is in proper operating order. Connect power to motors for correct direction of rotation. Verify nameplate ratings of all motors. Report any deviations or discrepancies.

B. Overcurrent and Overload Protection: Provide fuses (where indicated or required) and overload elements sized in accordance with the ambient temperature, the actual motor nameplate full load amperes, and service factor.

C. Power Wiring: Unless indicated otherwise, provide all required power wiring from indicated power source to each motor controller and from each motor controller to respective motor.

D. Control Wiring: Provide as indicated. Unless indicated otherwise, use No. 14 AWG wire for all control circuits. For circuits longer than 200 feet and for 120-volt motors, use No. 12 AWG wire.

3.23 LIGHTING FIXTURES

A. Install lighting fixtures per drawings.

3.24 CHECKOUT, TESTING, AND ADJUSTING

A. General: Provide testing equipment, materials, instruments, and personnel to perform all test procedures and adjustments required by the Contract Documents and/or deemed necessary by the Engineer to establish proper performance and installation of electrical systems and equipment. All test instruments to be accurately calibrated and in good working order.

B. Scheduling: Schedule tests at least three days in advance, and so as to allow Engineer and Owner representative(s) to witness the test, unless directed otherwise. Do not schedule tests until the system installation is complete and fully operational unless indicated or directed otherwise.

C. Manufacturer's Authorized Representatives: For all new and modified systems and equipment, arrange and pay for the services of the manufacturer's authorized representative(s) to be present at time of equipment or system start-up, to supervise the start-up, and to conduct and/or certify all required testing and adjusting.

D. Test Reports: Submit test reports neatly typewritten on 8-1/2-inch-by-11-inch sheets indicating system or equipment being tested, methodology of testing, date, and time of test, witnesses of test, and test results. Submit test reports in three (3) copies to the Engineer for review within five (5) days after test is performed, and include a copy with the appropriate operation and maintenance data.

E. Correction/Replacement: After testing, correct any deficiencies, and replace materials and equipment shown to be defective or unable to perform at design or rated capacity. Retest without additional cost to the Owner or Contract. Submit finalization report indicating corrective measures taken and satisfactory results of retest.

3.25 SYSTEMS DEMONSTRATION

A. Instruct the Owner's representative(s) in the start-up, operation, and maintenance of all electrical systems and equipment in accordance with Division 1 and as requested by the Owner's Representative.

3.26 CLEANING AND TOUCH-UP PAINTING

A. Perform cleaning required by Division 1.

B. General: Periodically remove from the project site, all waste, rubbish, and construction debris accumulated from construction operations, and maintain order. The premises shall be left clean and free of any debris and unused construction materials prior to final acceptance.

C. Electrical Equipment: Remove all dust, dirt, debris, mortar, wire scraps, rust, and other foreign materials from the interior and exterior of all electrical equipment and enclosures, and wipe down. Clean accessible current carrying elements and insulators prior to energizing.

D. Light Fixtures: Thoroughly clean all new or relocated light fixtures and lamps, just prior to final inspection. Fixture enclosures, reflectors, lenses, etc., shall be cleaned free of dust, dirt, fingerprints, etc., by an approved method.

E. Touch-Up Painting: Restore and refinish to original condition, all surfaces of electrical equipment scratched, marred, and/or dented during shipping, handling, or installation. Remove all rust, and prime and paint as recommended by the manufacturer.

END OF SECTION

SECTION 321115 – CONCRETE DECK REPAIR HIGH PERFORMANCE COATING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. This Section includes general administrative and procedural requirements for all work. The administrative and procedural requirements included in this Section are to expand the requirements specified in Division 1.

1.2 SUMMARY

A. Introduction: Contractor shall furnish all labor, materials, equipment and services necessary to complete the various pool deck repairs (see plans for details).

1. Exterior Substrates: Concrete spall and crack repairs.

1.3 RELATED SECTIONS

A. Division 02- Existing Conditions

B. Division 03- Concrete

C. Division 09 - Finishes

D. Division 13- Special Construction

1.4 REFERENCES

A. Meets or exceeds ASTM standards

B. ASTM E96 – Vapor Transmission

C. ASTM C321 – Bond Strength

D. ASTM C672 – Freeze/Thaw

E. ASTM D4541.02 – Pull Off Test

F. North Carolina Department of Health Public Swimming and Bathing Places

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Provide all products from a single manufacturer specializing in manufacture of high-performance epoxy coatings with a minimum of 10 years' experience.
1. Materials shall be standard products of a single manufacturer.
2. Secondary materials shall be specifically recommended by coating system manufacturer to ensure compatibility of systems.

B. Applicator Qualifications: A firm documented experienced applying paints and coatings similar in material, design, and extent to those indicated for this project, whose work has resulted in applications with a record of successful in-service performance.

C. Regulatory Requirements: Conform to all applicable codes and ordinances for flame, fuel, smoke and volatile organic compounds (VOC) ratings requirements for finishes at time of application.

D. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Located in areas designated by Architect.
   2. Prepare a surface preparation mock-up of each surface condition anticipated for the project.
   3. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.

E. Pre-Application Meeting:

   1. Convene a pre-application meeting two weeks before the start of application of coating system.

   2. Require attendance of parties directly affecting work of this section, including the Contractor, Architect, Owner's Representative, coating applicator, and a representative of coating material manufacturer.

   3. Topics to be discussed at meeting shall include:
      a. Review of Contract Documents and accepted shop drawings and deviations or differences resolved.
      b. Review environmental conditions, surface conditions, surface preparation, application procedures, and protection after application.
      c. Review the surface preparation, application, cleaning, protection and coordination with other work.
      d. Establish areas on-site available for use as storage areas and working area.
      e. Review project schedule, and the work that should be completed before coating application.

   4. Submit a written meeting report documenting the items discussed with copies to all parties attending within 3 days following the meeting.

1.6 SUBMITTALS

A. All submittals shall be made in accordance with the General Requirements of Division 1.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Application instructions.
   4. Manufacturer's Safety Data Sheets.

C. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

D. Verification Samples: For each finish product specified, two samples, minimum size 3 inches by 4 inches representing actual product, color, and patterns.

E. Manufacturer's Certificates: Certify products meet or exceed specified requirements and are suitable for intended application.

F. Closeout Submittals: Provide manufacturer's maintenance instructions that include recommendations for periodic cleaning and maintenance of coatings specified.

1.7 PRODUCT HANDLING

A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with manufacturer's labels clearly identifying product name and manufacturer and the following:
   1. Manufacturer and Coating or material name.
   2. Color name and number.
   3. Batch or lot number.
   4. Date of manufacture.
   5. Mixing and thinning instructions.

B. Store materials in accordance with the manufacturer's instructions.
   1. Store materials in dry, enclosed area with adequate protection from moisture.
   2. Keep containers sealed until ready for use.
   3. At all times, coatings shall be protected from freezing.

C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

D. Handling: Protect materials during handling and application to prevent damage or contamination

E. If necessary, remove damaged materials from site.

1.8 COORDINATION

A. Coordinate Work with other operations to avoid damage to installed materials.

B. The Contractor must establish with other Sub-Contractors, having related work in this Section that all work necessary to complete the pool renovations as shown on the drawings and in the specifications is included in the base bid to the City.

C. If in doubt regarding the responsibility for work covered in the Section and/or discovery of errors or omissions in the bidding documents, the Contractor shall notify the Architect through channels established by the specifications and request a clarification ten (10) days prior to the bid date.

1.9 WARRANTIES

A. Contractor / Installer shall provide a one (1) year warranty for the installation of the pool deck repairs. Any degradation of the deck repair that is deemed not typical 'wear and tear' will be replaced at no additional cost to the City. This shall include all necessary labor to repair or refinish the degraded material.

1.10 EXTRA MATERIALS

A. No extra materials required for this Section.

1.11 ENVIRONMENTAL 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. Provide ventilation during coating evaporation stage in confined or enclosed areas in accordance with manufacturer's instructions.

C. Schedule coating work to avoid excessive dust and airborne contaminants. Protect work areas from excessive dust and airborne contaminants during coating application and curing.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. BASECRETE TECHNOLOGIES LLC, 7969 Moyer Ave., Sarasota, FL 34240 (info@basecreteusa.com)

B. Or approved equal.

2.2 MATERIALS – GENERAL REQUIREMENTS

A. Interior Performance Requirements: All Interior Coatings: Supply certified test reports verifying product performance according to the following requirements:

1. Abrasion:
   a. Method: ASTM D 4060, CS-17 Wheel, 1,000 grams load.

2. Adhesion:
   a. Method: ASTM D 4541
   b. Method ASTM D 3359 (Method B, Crosshatch)

3. Fresh Water:
   a. Method: Coating system applied to SSPC-SP10 cleaned hot-rolled steel, cured 7 days prior to testing and immersed in aerated tap water at 77 degrees F.

4. Salt Spray:
   a. Method: ASTM B 117 applied to SSPC-SP10 cleaned hot-rolled steel

2.3 COATING SYSTEMS FOR CONCRETE AND MASONRY - INTERIOR

A. Moderate/Dry Conditions

1. System Type: shall be a waterproofing bondcoat with exceptional adhesive qualities. Waterproof polymer cement for use in concrete repairs. For use in swimming pools, roofs, terraces, foundations, cellars, decks, etc. Adheres directly to the substrate. No primer/bondcoat is required.

2. Surface Preparation:
   a. Concrete: SSPC-SP 13/NACE 6.

3. Adhesive Strength: Concrete 1372 psi/9.46 MPa

4. Flexural Strength: 2380 psi/16.41 MPa

5. Shear Bond: 720 psi/4.96 MPa

6. Tensile Strength: 732 psi/505 MPa

7. Impact Strength: 19lb/8.6kg

8. Compressive Strength: 7050 psi/48.61 MPa

9. Color: Tan (to match as closely as the existing pool deck).

10. Number of Coats: Two (2) coats shall be applied (if necessary).

PART 3 - EXECUTION

3.1 EXISTING CONDITIONS, INSPECTION AND PREPARATION

A. Carefully examine all the Contract Documents for requirements that affect the work of this Section. Prior to starting of work, notify the Owner of defects requiring correction. Do not begin work until conditions are satisfactory.

B. Verify that all work by others, related to this Section, has been completed. This includes all earthwork, concrete work, and mechanical, electrical, and plumbing connections.

C. Protect all materials and work completed by others from damage while completing the work in this Section.

3.2 PRE-WORK INSPECTION

A. Do not begin installation until substrates have been properly prepared.

B. Verify substrate surfaces are ready to receive work as instructed by coating manufacturer. Obtain and follow manufacturer's instructions for examination and testing of substrates.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.3 SURFACE PREPARATION

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

B. Surface Preparation of Concrete and Masonry
1. Prepare concrete surfaces in accordance with manufacturer's instructions, SSPC-SP 13/NACE 6, and ICRI 03732.
2. Ensure surfaces are clean, dry, and free of oil, grease, dirt, dust, and other contaminants.
3. Test concrete for moisture in accordance with ASTM D 4263 and F 1869.
4. Allow concrete and mortar to cure for a minimum of 28 days before coating.
5. Level protrusions and mortar spatter.

3.4 APPLICATION METHODS

A. TOOLS

1. Basecrete can be applied by trowel, Roller (3/4” nap), Brush, Squeegee or Spray.

2. Apply coating in accordance with manufacturer's instructions.

B. THICKNESS

1. Apply Basecrete in 2 layers, one vertical and one horizontal. Each layer should be 1/16” for a total of 1/8” thickness to achieve waterproof bondcoat. Second layer can be applied as soon as first layer passes thumbnail test.

C. APPLICATION

1. Basecrete can be built up in 2” increments and feathered edge.

2. Keep containers closed when not in use to avoid contamination.

3. Do not use mixed coatings beyond pot life limits.

4. Use application equipment, tools, pressure settings, and techniques in accordance with manufacturer's instructions.

5. Uniformly apply coatings at spreading rate required to achieve specified DFT.

6. Apply coatings to be free of film characteristics or defects that would adversely affect performance or appearance of coating systems.

7. Components for subsequent coats shall be mixed and applied in strict accordance with manufacturer's directions.

D. COVERAGE

1. Coverage is approximate for one coat. Slump can be adjusted to accomodate specific requirements by adjusting the liquid or the compound. DO NOT add water to mix.

2. Trowel: 1 Gal-1 50lb bag = 40-50 sq ft at 1/8” thickness

3. Roller: 5 Gal-3 50lb bags = 450-500 sq feet at 1/16”

4. Squeegee: 5 Gal-3 50lb bags =400 to 450 sq ft at 1/16“

5. Spray: 3 50lb bags = 400-500 sq ft at 1/16

6. For WATERPROOFING applications, apply (2) coats at 1/16 thickness (1/8 Total) to ensure the warranty.

3.5 PROTECTION

A. Protect installed products until completion of project.

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

C. Immediately remove coatings that fall on surrounding areas and surfaces not scheduled to be coated.

D. Protect installed products until completion of project.

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

F. Remove temporary coverings and protection of surrounding areas and surfaces.

3.6 REPAIR

A. Materials and Surfaces Not Scheduled to be Coated: Repair or replace damaged materials and surfaces not scheduled to be coated.

B. Damaged Coatings: Touch-up or repair of damaged coatings. Touch-up of minor damage shall be acceptable where result is not visibly different from adjacent surfaces. Recoat entire surface where touch-up result is visibly different, either in sheen, texture, or color.

C. Coating Defects: Repair in accordance with manufacturer's instructions coatings that exhibit film characteristics or defects that would adversely affect performance or appearance of coating systems.

3.7 INSPECTION

A. All work shall be inspected by the Architect, Engineer or Owner upon completion.

3.8 CLEAN-UP

A. Remove temporary coverings and protection of surrounding areas and surfaces.

END OF SECTION

SECTION 321216 – ASPHALT PAVMENT REPAIR & RESEAL

PART 1 – GENERAL

1.1 SUMMARY

A. This section includes provisions for existing asphalt surface repairs.

B. This section includes provisions for replacing pavement removed during the course of the work, or damaged resulting from Contractor's operations.

1.2 REFERENCES

A. "NCDOT - Standard Specification for Roads and Structures January 2018 or latest edition.

B. Standard Specifications for Highway Materials and Methods of Sampling and Testing, American Association of State Highway and Transportation Officials (AASHTO).

C. American Society for Testing and Materials (ASTM).

1.3 SUBMITTALS

A. Material Certificates signed by material producer and Contractor, certifying that each material item complies with or exceeds specified requirements.

B. Field Test Reports: Submit results of field testing directly to the Engineer.

1.4 SITE CONDITIONS

A. Weather Limitations: Per NCDOT Standard Specification for Roads and Structures, January 2018, or latest edition.

B. Grade Control: Establish and maintain required lines and elevations.

C. In no instance shall the materials and thicknesses of pavement and subbase courses replaced be less than that removed, unless approved by the Engineer.

1.5 SEQUENCING AND SCHEDULING

A. Coordinate the placement of asphalt concrete pavement with the completion of underground work by other trades.

PART 2 – PRODUCTS

2.1 MATERIALS

A. General: Asphalt concrete and all related items shall meet the requirements of NCDOT Standard Specification for Roads and Structures January 2018 or latest edition.

B. Contractor shall provide and install crack-sealing on the existing parking lot asphalt pavement identified in the project plans.

C. Contractor shall provide and install a new sealcoat finish on the existing parking lot asphalt pavement identified in the project plans

D. Contractor shall replace any sections of asphalt pavement that is damaged or destroyed during the course of construction.

PART 3 – EXECUTION

3.1 SURFACE PREPARATION

A. General: Remove loose material from compacted subbase surface immediately before commencing operations.

B. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.2 FIELD QUALITY CONTROL

A. General: Per NCDOT - Standard Specification for Roads and Structures, January 2018 or latest edition.

END OF SECTION

SECTION 321723 – PAVEMENT MARKING

PART 1 – GENERAL

1.1 SUMMARY

A. This section includes provisions for removal of existing pavement markings and for new pavement markings on finished surfaces.

1.2 REFERENCES

A. "Standard Specifications, Construction and Materials, per NCDOT Standard Specifications for Roads and Structures January 2018 or latest edition. .

B. Standard Specifications for Highway Materials and Methods of Sampling and Testing, American Association of State Highway and Transportation Officials (AASHTO).

C. "Manual of Uniform Traffic Control Devices"

D. Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities, US Department of Justice.

1.3 SUBMITTALS

A. Pavement marking plan indicating lane separations and defined parking spaces. Note dedicated handicapped spaces with international graphics symbol.

B. One (1) manufacturer's label including product analysis for each paint type and color.

1.4 QUALITY ASSURANCE

A. Conform to all requirements of regulatory agencies having jurisdiction.

1.5 SITE CONDITIONS

A. Perform the painting operations after working hours, on weekends or at such time so as not to interfere with the flow of traffic. Provide temporary barriers to prevent vehicles from driving over newly painted areas.

B. Apply paint on dry, clean pavement surface, when the air temperature is above 40°F.

C. All pavement markings require glass bead application, except parking stall markings.

1.6 SEQUENCING AND SCHEDULING

A. Coordinate pavement markings with regulatory authorities having jurisdiction.

B. Schedule pavement markings to follow the completion of paved surfaces.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Marking Paint: Per NCDOT Standard Specifications for Roads and Structures January 2018 or latest edition .
   1. Colors: White, yellow.

B. All paints and solvent shall conform to Federal, State and Local air pollution regulations, including those for the control (emission) of volatile organic compounds (VOC) as established by the US Environmental Protection Agency.

C. Epoxy Reflectorized Pavement Markings:
   1. Per NCDOT Standard Specifications for Roads and Structures January 2018 or latest edition.

PART 3 – EXECUTION

3.1 SURFACE PREPARATION

A. Remove dust, dirt, and other foreign material detrimental to paint adhesion.

B. Mark layout of pavement markings with chalk or paint prior to final application.

C. Painting out existing pavement markings will only be approved for short-term temporary use.

3.2 APPLICATION

A. Apply pavement markings in accordance with NCDOT Standard Specifications for Roads and Structures January 2018 or latest edition.

B. Use rollers and brushes for miscellaneous markings.

C. Use templates and guides to provide uniform patterns and straight edges.

END OF SECTION

SECTION 323113 – CHAIN LINK FENCE AND GATES

PART 1 – GENERAL

1.1 DESCRIPTION

A. The Contractor shall provide all labor, materials, equipment, and services necessary for, and incidental to, the installation of chain link fence and gates, as shown on the Drawings and as specified herein.

B. All chain link fence shall have a thermally-bonded and fused polymer color coating.

C. All gates and gate hardware shall be powder coated.

1.2 QUALITY ASSURANCE

A. Comply with standards of the Chain Link Fence Manufacturer's Institute.

B. Provide steel fence and related gates as a complete system produced by a single manufacturer, including necessary erection accessories, fittings and fastenings.

C. Comply with ASTM A53 for requirements of Schedule 40 piping.

D. Comply with ASTM F668 Specification for Polymer Coated Chain Link Fence Fabric.

E. Comply with ASTM F1043 Specification for Strength and Protective Coatings of Metal Industrial Fence Framework.

F. Height of fence shall be measured from the top of concrete footing to the top of post.

G. Manufacturer: Company shall be headquartered in the US having US manufacturing facility/facilities specializing in manufacturing chain link fence products with at least 5 years of experience.

H. Fence contractor: Company with demonstrated successful experience installing similar projects and products in accordance with ASTM F567.

I. Tolerances: Current published edition of ASTM specifications tolerances apply. ASTM specification tolerance supersede any conflicting tolerance.

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles and finishes for chain-link fences and gates.
   1. Fence and gate posts, rails and fittings
   2. Chain link fabric, reinforcements, and attachments.
   3. Gates and hardware.

B. Shop Drawings: Show locations of fences, gates, posts, rails, tension wires, details of extended posts, extension arms, gate swing, or other operation, hardware, and accessories. Indicate materials, dimensions, sizes, weights, and finishes of components. Include plans, gate elevations, sections details of post anchorages, attachment, bracing, and other required installation and operational clearances.

C. Samples for Verification: For each type of chain-link fence and gate indicated:
   1. Polymer coated steel wire (for fabric) in 6-inch (150-mm) lengths on shapes for posts, rails, wires and gate framing.
   2. Two-stage powder coat finish, in 6-inch (150-mm) lengths on shapes for gate framing.

D. Product Certificates: For each type of chain-link fence and gate, signed by product manufacturer:
   1. Strength test results for framing according to ASTM F1043.
   2. Material certifications, made in USA, Buy America Act or Buy America when required.

E. Qualification Data: For installer.

F. Field quality-control test reports.

G. Maintenance Data: For the following to include in maintenance manuals:
   1. Polymer finishes.
   2. Powder coat finishes.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed chain-link fences and gates similar in material, design and extent to those indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

PART 2 – PRODUCTS

2.1 STEEL FRAMEWORK

A. Unless noted otherwise on the Drawings, minimum Nominal Framework Sizes shall be the following:

FENCE HEIGHT	LINE POSTS	END, CORNER & PULL POSTS	RAILS & BRACES	GATE FRAMES	*GATE POSTS	CONCRETE FOUNDATION DIA.		DEPTH
						Diameters	Corner/ End	
						LINE POSTS	PULL & GATE POSTS	
3'	1-1/2"	2"	1-1/4"	1-1/2"	3"	12"	12"	4'
3'-6"	2"	3"	1-1/4"	1-1/2"	4"	12"	12"	4'
4'	2”	3"	1-1/4"	1-1/2"	4"	12"	12"	4'
4'-6"	2”	3"	1-1/4"	1-1/2"	4"	12"	12"	4'
5'	2”	3"	1-1/4"	1-1/2"	4"	12"	12"	4'
6'	2”	3"	1-1/4"	1-1/2"	4"	12"	18"	4'
8'	2”	3"	1-1/4"	1-1/2"	4"	12"	18"	4'
10'	3"	4"	1-1/4"	1-1/2"	4"	12"	18"	4'
12'	3"	4"	1-1/4"	1-1/2"	4"	12"	18"	5'

FENCE HEIGHT	LINE POSTS	END, CORNER & PULL POSTS	RAILS & BRACES	GATE FRAMES	*GATE POSTS	CONCRETE FOUNDATION DIA.		DEPTH
						Diameters	Corner/ End	
						LINE POSTS	PULL & GATE POSTS	
16'	3-1/2"	4"	1-1/4"	1-1/2"	4"	12"	18"	5'

SCHEDULE 40 STEEL PIPE TABLE		
NOMINAL SIZE (IN.)	ACTUAL OUTSIDE DIAMETER (IN.)	WEIGHT *(LB/FT)
1	1.315	1.67
1-1/4	1.660	2.27
1-1/2	1.900	2.71
2	2.375	3.65
2-1/2	2.875	5.79
3	3.500	7.58
3-1/2	4.000	9.11

50,000 PSI HOT DIPPED GALVANIZED STEEL TUBING		
NOMINAL SIZE (IN.)	ACTUAL OUTSIDE DIAMETER (IN.)	WEIGHT *(LB/FT)
1	1.315	
1-1/4	1.660	1.83
1-1/2	1.900	2.28
2	2.375	3.12
2-1/2	2.875	4.64
3	3.500	5.71
3-1/2	4.000	6.56

B. Pipe must comply with ASTM F1043 Group 1A or 1C.

C. Round Steel Pipe and Rail: Schedule 40 standard weight pipe, in accordance with ASTM F1043, materials design Group 1A minimum steel yield strength 30,000 psi. Type A, 1.8 oz/ft^2 hot dipped galvanized zinc exterior and 1.8 oz/ft^2 hot dipped galvanized zinc interior coating.

OR

D. Round Steel Pipe and Rail: Round steel pipe and rail to be cold-rolled electric resistance welded pipe in accordance with ASTM 1043 materials group 1C, minimum steel yield strength 50,000 psi. Type B external coating, hot dip galvanized zinc 1.0 oz/ft^2 with a clear polymeric overcoat, Type D interior 90% by weight zinc-rich coating having a minimum thickness of 0.30 mils.

E. Polymer Color Coated Pipe: Polymer coated pipe shall have a polyester or polyolefin coating fused and adhered to the exterior zinc coating of the galvanized pipe in accordance with ASTM F1043. The minimum thickness of the polymer coating shall be 3 mils.

1. Color: Black. To match fabric per ASTM F934.

F. Polymer Coated Color Fittings: In compliance with ASTM F626. Polymer coating minimum thickness to be 0.006 in. fused and adhered to the zinc coated fittings. Color to match fence system.

2.2 CHAIN LINK FABRIC

A. General: Height indicated on Drawings. Provide fabric in one-piece heights for fence heights up to 10 feet measured between top and bottom of outer edge of selvage knuckle or twist. Comply with ASTM A392, CLFMI CLF 2445, and requirements indicated below:
   1. Steel Chain Link Wire Fabric:
      a. Polymer Coated Steel Fabric: ASTM F668, the wire gauge specified for polymer coated wire is that of the metallic coated steel core wire.
         1) Class 2b fused and adhered
         2) Color: Black. In compliance with ASTM F934

B. Mesh Size:
   1. 2 inches for fences.
   2. 1-3/4 inches for tennis court fencing or end line fencing.

C. Selvages: Knuckled top and bottom.

2.3 SWING GATES

A. Assemble gate frames with fully coped welds as shown on the Drawings or on Shop Drawings approved by the Engineer.
   1. All ferrous metal components shall be blast cleaned to and SSPC-6 commercial blast clean.

B. Powder Coated Framework for Gates:
   1. Colored Powder Coated Framework:
      a. Powder for coating shall be a polyester-based thermal setting resin.
      b. Powder coat system shall meet or exceed the following test requirements:
         1) Direct Impact Resistance: ASTM D2794-93, up to 160 inches per pound.
         2) Flexibility: ASTM D522-93, Method B, equal to or less than a 1/4-inch mandrel.
         3) Pencil Hardness: ASTM D3363-93a, HB-2H.
         4) Crosshatch Adhesion: ASTM D3359-97, Method B, 5B.
         5) Salt Spray Resistance: ASTM B117 plus 1,000 hours.
         6) Humidity Resistance: ASTM D2247 plus 1,000 hours.
      c. Moveable parts such as hinges, latches and drop rods may be field coated using a liquid polymer touch up.
      d. Chain link fabric on gate same as finish same for fencing.
      e. Color: To match that of the fencing system.

2.4 GATE HARDWARE

A. Hinges: Non-lift-off type, offset to permit 180-degree swing, and of suitable size and weight to support gate. Provide 1-1/2 pair of hinges for each leaf over 6 feet high.

B. Latch: Provide plunger bar type complete with flush plate set in concrete for all double gates and single gates over 10 feet. Padlock eye shall be an integral part of latch construction.
   1. Provide plunger bar complete with flush plate set in concrete on each gate leaf
   2. Provide flush plate set in concrete for both the fully open position and full closed position

C. Keeper for Vehicle Gates: Provide keeper which automatically engages the gate leaf and holds it in open position until manually released.

2.5 MISCELLANEOUS MATERIALS AND ACCESSORIES

A. Vinyl Coated Post Tops: Steel, wrought iron, or malleable iron.

B. Stretcher Bars: One piece equal to full height of fabric, minimum cross-section 3/16 inch by 3/4 inch.

C. Metal Bands (for stretcher bars): Steel, wrought iron, or malleable iron, to secure stretcher bars to end, corner, pull and gate posts.

D. Vinyl Coated Wire Ties:
   1. For tying fabric to line posts, rails and braces: 9-gauge steel wire.

E. Truss Rods: 3/8-inch diameter.

F. Tension Wire (only if shown on plans):
   1. Polymer Coated Steel Tension Wire: 7 – gauge wire complying with ASTM F1664. Wire gauge specified is the core wire gauge (match coating to that of the chain link fabric).
      a. Class 2b, fused and adhered

G. Angle Beams, I Beams and Steel Shapes: ASTM A36.

H. Bolts and Nuts: ASTM A307, Grade A.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for a verified survey of property lines and legal boundaries, site clearing, earthwork, pavement work and other conditions affecting performance:
   1. Begin installation in general site areas or those not directly adjacent to the playing field only after final grading including topsoiling and paving is completed in that area or as otherwise permitted by Engineer.
   2. For installation directly adjacent to the playing field, coordinate footing installation timing with final installation of playing field materials so as not to contaminate, destroy or displace these playing field materials.
   3. If unsatisfactory conditions are present, proceed with installation only after they have been corrected.

3.2 PREPARATION

A. Coordinate fence and gate installation with completion of finished grading and installation of adjacent finish field materials.

B. Stake locations of fence lines, gates and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, irrigation system, underground structures, benchmarks and property monuments.

3.3 INSTALLATION

A. Space posts equidistant in the fence line with a maximum of 10 feet on center or as shown on Drawings.

B. Footings: Excavate holes as indicated for fence and gate posts. Excavate footings to depths and widths as noted in Specifications or on drawings. Install gravel drainage material in bottom of hole as shown on the drawings.

C. Setting Posts and Footings at Concrete Areas: Set posts in center of hole. Embed post so that bottom of post is flush with the bottom of concrete footing and in gravel drainage layer. Fill hole with concrete. Plumb and align posts. Vibrate or tamp concrete for consolidation. Finish elevation on top of footing to be coordinated with construction of concrete adjacent to posts or as shown on drawings. Do not attach fabric to posts until concrete has cured a minimum of 7 days.

OR

D. Setting Posts and Footings at Warning Track Areas: Set posts in center of hole. Embed post so that bottom of post is flush with the bottom of concrete footing and in gravel drainage layer. Fill hole with concrete. Plumb and align posts. Vibrate or tamp concrete for consolidation. Finish elevation on top of footing to be set below finish grade. Do not attach fabric to posts until concrete has cured a minimum of 7 days.

OR

E. Setting Posts and Footings in Grass Areas: Set posts in center of hole. Embed post so that bottom of post is flush the bottom of concrete footing and in gravel drainage layer. Fill hole with concrete. Plumb and align posts. Vibrate or tamp concrete for consolidation. Finish concrete in a dome shape above ground to shed water. Do not attach fabric to posts until concrete has cured a minimum of 7 days.

F. Locate corner posts at corners and at changes in direction. Use pull posts at all abrupt changes in grade and at intervals no greater than 500 feet. On runs over 500 feet, space pull posts evenly between corner or end posts. On long curves, space pull posts so that the strain of the fence will not bend the line posts.

G. Install top rail continuously through post caps or extension arms, bending to radius for curved runs. Install expansion couplings as recommended by fencing manufacturers.

H. Install intermediate rails in one piece between posts and flush with post on fabric side using special offset fittings where necessary.

I. Diagonally brace corner posts, pull posts, and terminal posts to adjacent line posts with truss rods and turnbuckles.

J. Attach fabric to security side of fence. Bottom of fabric to be set on finished grade of curb, track or playing field except when indicated otherwise. Thread stretcher bars through fabric using one bar for each gate and end post and two for each corner and pull post. Pull fabric tight so that the maximum deflection of fabric is 2 inches when a 30-pound pull is exerted perpendicular to the center of a panel. Maintain tension by securing stretcher bars to posts with metal bands spaced 15 inches on center. Fasten fabric to steel framework with wire ties spaced 12 inches on center for line posts and

24 inches on center for rails and braces. Bend back wire ends to prevent injury. Tighten stretcher bar bands, wire ties, and other fasteners securely.

OR

K. Attach fabric to security side of fence for lawn areas. Maintain a maximum 1 inch clearance above finished grade except when indicated otherwise. Thread stretcher bars through fabric using one bar for each gate and end post and two for each corner and pull post. Pull fabric tight so that the maximum deflection of fabric is 2 inches when a 30-pound pull is exerted perpendicular to the center of a panel. Maintain tension by securing stretcher bars to posts with metal bands spaced 15 inches on center. Fasten fabric to steel framework with wire ties spaced 12 inches on center for line posts and 24 inches on center for rails and braces. Bend back wire ends to prevent injury. Tighten stretcher bar bands, wire ties, and other fasteners securely.

L. Position bolts for securing metal bands and hardware so nuts are located opposite the fabric side of fence. Tighten nuts and score excess threads.

1. Secure post tops, extension arms, and caps with one-way cadmium plated steel screws.

M. Install gates plumb and level and adjust for full opening without interference. Install ground-set items in concrete for anchorage, as recommended by fence manufacturer. Adjust hardware for smooth operation and lubricate where necessary. Attach fabric as for fencing. Install ground-set items in concrete as shown on the drawings.

N. Touch Up: Small nicks or other blemishes shall be touched up with paint materials suitable for and matching the finish of the damaged material. Severely damaged fencing/gates deemed as unacceptable at the sole discretion of the Owner or its representatives shall be replaced at the contractor's expense.

END OF SECTION