STATE OF DELAWARE

DEPARTMENT OF NATURAL RESOURCES
AND ENVIRONMENTAL CONTROL

DIVISION OF PARKS AND RECREATION

LUMS POND STATE PARK
UTILITY IMPROVEMENTS
PHASE II

CONTRACT NO.: 2015-LP-100

AUGUST 26, 2015

LUMS POND STATE PARK
UTILITY IMPROVEMENTS – PHASE II

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LUMS POND STATE PARK
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SECTION 00010 - INVITATION TO BID

The Department of Natural Resources and Environmental Control, Division of Parks and Recreation, Office of Design and Development will receive sealed bids in the Auditorium, DNREC Building, 89 Kings Highway, Dover Delaware 19901, until XX:00 local time on Day, Month Date, Year, at which time they will be publicly opened and read aloud in the Auditorium. Bidder bears the risk of late delivery. Any bid received after the stated time will be returned unopened.

~~Project involves utility upgrades to the Lums Pond State Park Campground providing an installation of a complete electrical system, gravity sewer system and water system. In addition, rehabilitation to existing pre-cast manholes, the abandonment of existing pre-cast manholes and gravity sewer pipe, upgrades to existing lift stations and installation of a new pre-fabricated bath house at the campground.~~

A MANDATORY Pre-Bid Meeting will be held on Day, Month Date, Year, at Time. at location of meeting, Address, City, Delaware for the purpose of establishing the listing of subcontractors and to answer questions. Representatives of each party to any Joint Venture must attend this meeting. ATTENDANCE OF THIS MEETING IS A PREREQUISITE FOR BIDDING ON THIS CONTRACT.

Sealed bids shall be addressed to the following address. The outer envelope should clearly indicate "DNREC CONTRACT NO. **Insert contract number** SEALED BID – DO NOT OPEN".

Dept. of Natural Resources & Environmental Control
Division of Parks and Recreation
Office of Design and Development
89 Kings Highway, Dover DE 19901
Attn: Cindy A. Todd, RLA. Phone Number: 302-739-9210

Contract documents may be obtained at the office of the Division of Parks and Recreation upon receipt of $25.00 for each disc. This payment is non-refundable and the documents need not be returned. Checks are to be made payable to Division of Parks and Recreation.

Bidding documents will be available for review at the following locations: Division of Parks and Recreation; Delaware Contractors Association and Associated Builders and Contractors.

Bidders will not be subject to discrimination on the basis of race, creed, color, sex, sexual orientation, gender identity or national origin in consideration of this award, and Minority Business Enterprises, Disadvantaged Business Enterprises, Women-Owned Business Enterprises and Veteran-Owned Business Enterprises will be afforded full opportunity to submit bids on this contract. Each bid must be accompanied by a bid security equivalent to ten percent of the bid amount and all additive alternates. The successful bidder must post a performance bond and payment bond in a sum equal to 100 percent of the contract price upon execution of the contract. The Owner reserves the right to reject any or all bids and to waive any informalities therein. The Owner may extend the time and place for the opening of the bids from that described in the advertisement, with not less than two calendar days notice by certified delivery, facsimile machine or other electronic means to those bidders receiving plans.

David Small, Secretary

END OF SECTION

SECTION 00100 – INSTRUCTIONS TO BIDDERS

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2. BIDDER'S REPRESENTATION
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4. BIDDING PROCEDURES
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6. POST-BID INFORMATION
7. PERFORMANCE BOND AND PAYMENT BOND
8. FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

ARTICLE 1: GENERAL

1.1 DEFINITIONS

1.1.1 Whenever the following terms are used, their intent and meaning shall be interpreted as follows:

1.2 STATE: The State of Delaware.

1.3 AGENCY: Contracting State Agency as noted on cover sheet.

1.4 DESIGNATED OFFICIAL: The agent authorized to act for the Agency.

1.5 BIDDING DOCUMENTS: Bidding Documents include the Bidding Requirements and the proposed Contract Documents. The Bidding Requirements consist of the Advertisement for Bid, Invitation to Bid, Instructions to Bidders, Supplementary Instructions to Bidders (if any), General Conditions, Supplementary General Conditions, General Requirements, Special Provisions (if any), the Bid Form (including the Non-collusion Statement), and other sample bidding and contract forms. The proposed Contract Documents consist of the form of Agreement between the Owner and Contractor, as well as the Drawings, Specifications (Project Manual) and all Addenda issued prior to execution of the Contract.

1.6 CONTRACT DOCUMENTS: The Contract Documents consist of the, Instructions to Bidders, Supplementary Instructions to Bidders (if any), General Conditions, Supplementary General Conditions, General Requirements, Special Provisions (if any), the form of agreement between the Owner and the Contractor, Drawings (if any), Specifications (Project Manual), and all addenda.

1.7 AGREEMENT: The form of the Agreement shall be AIA Document A101, Standard Form of Agreement between Owner and Contractor where the basis of payment is a STIPULATED SUM. In the case of conflict between the instructions contained therein and the General Requirements herein, these General Requirements shall prevail.

1.8 GENERAL REQUIREMENTS (or CONDITIONS): General Requirements (or conditions) are instructions pertaining to the Bidding Documents and to contracts in general. They contain, in summary, requirements of laws of the State; policies of the Agency and instructions to bidders.

1.9 SPECIAL PROVISIONS: Special Provisions are specific conditions or requirements peculiar to the bidding documents and to the contract under consideration and are supplemental to the General Requirements. Should the Special Provisions conflict with the General Requirements, the Special Provisions shall prevail.

1.10 ADDENDA: Written or graphic instruments issued by the Owner/Architect prior to the execution of the contract which modify or interpret the Bidding Documents by additions, deletions, clarifications or corrections.

1.11 BIDDER OR VENDOR: A person or entity who formally submits a Bid for the material or Work contemplated, acting directly or through a duly authorized representative who meets the requirements set forth in the Bidding Documents.

1.12 SUB-BIDDER: A person or entity who submits a Bid to a Bidder for materials or labor, or both for a portion of the Work.

1.13 BID: A complete and properly executed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.

1.14 BASE BID: The sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents as the base, to which Work may be added or from which Work may be deleted for sums stated in Alternate Bids (if any are required to be stated in the bid).

1.15 ALTERNATE BID (or ALTERNATE): An amount stated in the Bid, where applicable, to be added to or deducted from the amount of the Base Bid if the corresponding change in the Work, as described in the Bidding Documents is accepted.

1.16 UNIT PRICE: An amount stated in the Bid, where applicable, as a price per unit of measurement for materials, equipment or services or a portion of the Work as described in the Bidding Documents.

1.17 SURETY: The corporate body which is bound with and for the Contract, or which is liable, and which engages to be responsible for the Contractor's payments of all debts pertaining to and for his acceptable performance of the Work for which he has contracted.

1.18 BIDDER'S DEPOSIT: The security designated in the Bid to be furnished by the Bidder as a guaranty of good faith to enter into a contract with the Agency if the Work to be performed or the material or equipment to be furnished is awarded to him.

1.19 CONTRACT: The written agreement covering the furnishing and delivery of material or work

to be performed.

1.20 CONTRACTOR: Any individual, firm or corporation with whom a contract is made by the Agency.

1.21 SUBCONTRACTOR: An individual, partnership or corporation which has a direct contract with a contractor to furnish labor and materials at the job site, or to perform construction labor and furnish material in connection with such labor at the job site.

1.22 CONTRACT BOND: The approved form of security furnished by the contractor and his surety as a guaranty of good faith on the part of the contractor to execute the work in accordance with the terms of the contract.

ARTICLE 2: BIDDER'S REPRESENTATIONS

2.1 PRE-BID MEETING

2.1.1 A pre-bid meeting for this project will be held at the time and place designated. Attendance at this meeting is a pre-requisite for submitting a Bid, unless this requirement is specifically waived elsewhere in the Bid Documents.

2.2 By submitting a Bid, the Bidder represents that:

2.2.1 The Bidder has read and understands the Bidding Documents and that the Bid is made in accordance therewith.

2.2.2 The Bidder has visited the site, become familiar with existing conditions under which the Work is to be performed, and has correlated the Bidder’s his personal observations with the requirements of the proposed Contract Documents.

2.2.3 The Bid is based upon the materials, equipment, and systems required by the Bidding Documents without exception.

2.3 JOINT VENTURE REQUIREMENTS

2.3.1 For Public Works Contracts, each Joint Venturer shall be qualified and capable to complete the Work with their own forces.

2.3.2 Included with the Bid submission, and as a requirement to bid, a copy of the executed Joint Venture Agreement shall be submitted and signed by all Joint Venturers involved.

2.3.3 All required Bid Bonds, Performance Bonds, Material and Labor Payment Bonds must be executed by both Joint Venturers and be placed in both of their names.

2.3.4 All required insurance certificates shall name both Joint Venturers.

2.3.5 Both Joint Venturers shall sign the Bid Form and shall submit a copy of a valid Delaware Business License with their Bid.

2.3.6 Both Joint Venturers shall include their Federal E.I. Number with the Bid.

2.3.7 In the event of a mandatory Pre-bid Meeting, each Joint Venturer shall have a representative in attendance.

2.3.8 Due to exceptional circumstances and for good cause shown, one or more of these provisions may be waived at the discretion of the State.

2.4 ASSIGNMENT OF ANTITRUST CLAIMS

2.4.1 As consideration for the award and execution by the Owner of this contract, the Contractor hereby grants, conveys, sells, assigns and transfers to the State of Delaware all of its right, title and interests in and to all known or unknown causes of action it presently has or may now or hereafter acquire under the antitrust laws of the United States and the State of Delaware, relating to the particular goods or services purchased or acquired by the Owner pursuant to this contract.

ARTICLE 3: BIDDING DOCUMENTS

3.1 COPIES OF BID DOCUMENTS

3.1.1 Bidders may obtain complete sets of the Bidding Documents from the Architectural/Engineering firm designated in the Advertisement or Invitation to Bid in the number and for the deposit sum, if any, stated therein.

3.1.2 Bidders shall use complete sets of Bidding Documents for preparation of Bids. The issuing Agency nor the Architect assumes no responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

3.1.3 Any errors, inconsistencies or omissions discovered shall be reported to the Architect immediately.

3.1.4 The Agency and Architect may make copies of the Bidding Documents available on the above terms for the purpose of obtaining Bids on the Work. No license or grant of use is conferred by issuance of copies of the Bidding Documents.

3.2 INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS

3.2.1 The Bidder shall carefully study and compare the Bidding Documents with each other, and with other work being bid concurrently or presently under construction to the extent that it relates to the Work for which the Bid is submitted, shall examine the site and local conditions, and shall report any errors, inconsistencies, or ambiguities

discovered to the Architect.

3.2.2 Bidders or Sub-bidders requiring clarification or interpretation of the Bidding Documents shall make a written request to the Architect at least seven days prior to the date for receipt of Bids. Interpretations, corrections and changes to the Bidding Documents will be made by written Addendum. Interpretations, corrections, or changes to the Bidding Documents made in any other manner shall not be binding.

3.2.3 The apparent silence of the specifications as to any detail, or the apparent omission from it of detailed description concerning any point, shall be regarded as meaning that only the best commercial practice is to prevail and only material and workmanship of the first quality are to be used. Proof of specification compliance will be the responsibility of the Bidder.

3.2.4 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for all permits, labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for the proper execution and completion of the Work.

3.2.5 The Owner will bear the costs for all impact and user fees associated with the project.

3.3 SUBSTITUTIONS

3.3.1 The materials, products and equipment described in the Bidding Documents establish a standard of quality, required function, dimension, and appearance to be met by any proposed substitution. The specification of a particular manufacturer or model number is not intended to be proprietary in any way. Substitutions of products for those named will be considered, providing that the Vendor certifies that the function, quality, and performance characteristics of the material offered is equal or superior to that specified. It shall be the Bidder's responsibility to assure that the proposed substitution will not affect the intent of the design, and to make any installation modifications required to accommodate the substitution.

3.3.2 Requests for substitutions shall be made in writing to the Architect at least ten days prior to the date of the Bid Opening. Such requests shall include a complete description of the proposed substitution, drawings, performance and test data, explanation of required installation modifications due the substitution, and any other information necessary for an evaluation. The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect’s decision of approval or disapproval shall be final. The Architect is to notify Owner prior to any approvals.

3.3.3 If the Architect approves a substitution prior to the receipt of Bids, such approval shall be set forth in an Addendum. Approvals made in any other manner shall not be binding.

3.3.4 The Architect shall have no obligation to consider any substitutions after the Contract

award.

3.4 ADDENDA

3.4.1 Addenda will be mailed or delivered to all who are known by the Architect to have received a complete set of the Bidding Documents.

3.4.2 Copies of Addenda will be made available for inspection wherever Bidding Documents are on file for that purpose.

3.4.3 No Addenda will be issued later than 4 days prior to the date for receipt of Bids except an Addendum withdrawing the request for Bids or one which extends the time or changes the location for the opening of bids.

3.4.4 Each bidder shall ascertain prior to submitting his Bid that they have received all Addenda issued, and shall acknowledge their receipt in their Bid in the appropriate space. Not acknowledging an issued Addenda could be grounds for determining a bid to be non-responsive.

ARTICLE 4: BIDDING PROCEDURES

4.1 PREPARATION OF BIDS

4.1.1 Submit the bids on the Bid Forms included with the Bidding Documents.

4.1.2 Submit the original Bid Form for each bid. Bid Forms may be removed from the project manual for this purpose.

4.1.3 Execute all blanks on the Bid Form in a non-erasable medium (typewriter or manually in ink).

4.1.4 Where so indicated by the makeup on the Bid Form, express sums in both words and figures, in case of discrepancy between the two, the written amount shall govern.

4.1.5 Interlineations, alterations or erasures must be initialed by the signer of the Bid.

4.1.6 BID ALL REQUESTED ALTERNATES AND UNIT PRICES, IF ANY. If there is no change in the Base Bid for an Alternate, enter “No Change”. The Contractor is responsible for verifying that they have received all addenda issued during the bidding period. Work required by Addenda shall automatically become part of the Contract.

4.1.7 Make no additional stipulations on the Bid Form and do not qualify the Bid in any other manner.

4.1.8 Each copy of the Bid shall include the legal name of the Bidder and a statement whether the Bidder is a sole proprietor, a partnership, a corporation, or any legal entity, and each copy shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further give the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current Power of Attorney attached, certifying agent's authority to bind the Bidder.

4.1.9 Bidder shall complete the Non-Collusion Statement form included with the Bid Forms and include it with their Bid.

4.1.10 In the construction of all Public Works projects for the State of Delaware or any agency thereof, preference in employment of laborers, workers or mechanics shall be given to bona fide legal citizens of the State who have established citizenship by residence of at least 90 days in the State.

4.1.11 Each bidder shall include in their bid a copy of a valid Delaware Business License.'

4.2 BID SECURITY

4.2.1 All bids shall be accompanied by a deposit of either a good and sufficient bond to the agency for the benefit of the agency, with corporate surety authorized to do business in this State, the form of the bond and the surety to be approved by the agency, or a security of the bidder assigned to the agency, for a sum equal to at least 10% of the bid plus all add alternates, or in lieu of the bid bond a security deposit in the form of a certified check, bank treasurer's check, cashier's check, money order, or other prior approved secured deposit assigned to the State. The bid bond need not be for a specific sum, but may be stated to be for a sum equal to 10% of the bid plus all add alternates to which it relates and not to exceed a certain stated sum, if said sum is equal to at least 10% of the bid. The Bid Bond form used shall be the standard OMB form (attached).

4.2.2 The Agency has the right to retain the bid security of Bidders to whom an award is being considered until either a formal contract has been executed and bonds have been furnished or the specified time has elapsed so the Bids may be withdrawn or all Bids have been rejected.

4.2.3 In the event of any successful Bidder refusing or neglecting to execute a formal contract and bond within 20 days of the awarding of the contract, the bid bond or security deposited by the successful bidder shall be forfeited.

4.3 SUBCONTRACTOR LIST

4.3.1 As required by Delaware Code, Title 29, section 6962(d)(10)b, each Bidder shall submit with their Bid a completed List of Sub-Contractors included with the Bid Form. NAME ONLY ONE SUBCONTRACTOR FOR EACH TRADE. A Bid will be considered non-responsive unless the completed list is included.

4.3.2 Provide the Name and Address for each listed subcontractor. Addresses by City, Town or Locality, plus State, will be acceptable.

4.3.3 It is the responsibility of the Contractor to ensure that their Subcontractors are in compliance with the provisions of this law. Also, if a Contractor elects to list themselves as a Subcontractor for any category, they must specifically name themselves on the Bid Form and be able to document their capability to act as Subcontractor in that category in accordance with this law.

4.4 EQUALITY OF EMPLOYMENT OPPORTUNITY ON PUBLIC WORKS

4.4.1 During the performance of this contract, the contractor agrees as follows:

A. The Contractor will not discriminate against any employee or applicant for employment because of race, creed, sex, color, sexual orientation, gender identity or national origin. The Contractor will take affirmative action to ensure the applicants are employed, and that employees are treated during employment, without regard to their race, creed, sex, color, sexual orientation, gender identity or national origin. Such action shall include, but not be limited to, the following: Employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places available to employees and applicants for employment notices to be provided by the contracting agency setting forth this nondiscrimination clause.

B. The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, creed, sex, color, sexual orientation, gender identity or national origin."

4.5 PREVAILING WAGE REQUIREMENT

4.5.1 Wage Provisions: In accordance with Delaware Code, Title 29, Section 6960, renovation projects whose total cost shall exceed $15,000, and $100,000 for new construction, the minimum wage rates for various classes of laborers and mechanics shall be as determined by the Department of Labor, Division of Industrial Affairs of the State of Delaware.

4.5.2 The prevailing wage shall be the wage paid to a majority of employees performing similar work as reported in the Department's annual prevailing wage survey or in the absence of a majority, the average paid to all employees reported.

4.5.3 The employer shall pay all mechanics and labors employed directly upon the site of work, unconditionally and not less often than once a week and without subsequent deduction or rebate on any account, the full amounts accrued at time of payment,

computed at wage rates not less than those stated in the specifications, regardless of any contractual relationship which may be alleged to exist between the employer and such laborers and mechanics.

4.5.4 The scale of the wages to be paid shall be posted by the employer in a prominent and easily accessible place at the site of the work.

4.5.5 Every contract based upon these specifications shall contain a stipulation that sworn payroll information, as required by the Department of Labor, be furnished weekly. The Department of Labor shall keep and maintain the sworn payroll information for a period of 6 months from the last day of the work week covered by the payroll.

4.6 SUBMISSION OF BIDS

4.6.1 Enclose the Bid, the Bid Security, and any other documents required to be submitted with the Bid in a sealed opaque envelope. Address the envelope to the party receiving the Bids. Identify with the project name, project number, and the Bidder's name and address. If the Bid is sent by mail, enclose the sealed envelope in a separate mailing envelope with the notation "BID ENCLOSED" on the face thereof. The State is not responsible for the opening of bids prior to bid opening date and time that are not properly marked.

4.6.2 Deposit Bids at the designated location prior to the time and date for receipt of bids indicated in the Advertisement for Bids. Bids received after the time and date for receipt of bids will be marked “LATE BID” and returned.

4.6.3 Bidder assumes full responsibility for timely delivery at location designated for receipt of bids.

4.6.4 Oral, telephonic or telegraphic bids are invalid and will not receive consideration.

4.6.5 Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids, provided that they are then fully in compliance with these Instructions to Bidders.

4.7 MODIFICATION OR WITHDRAW OF BIDS

4.7.1 Prior to the closing date for receipt of Bids, a Bidder may withdraw a Bid by personal request and by showing proper identification to the Architect. A request for withdraw by letter or fax, if the Architect is notified in writing prior to receipt of fax, is acceptable. A fax directing a modification in the bid price will render the Bid informal, causing it to be ineligible for consideration of award. Telephone directives for modification of the bid price shall not be permitted and will have no bearing on the submitted proposal in any manner.

4.7.2 Bidders submitting Bids that are late shall be notified as soon as practicable and the bid shall be returned.

4.7.3 A Bid may not be modified, withdrawn or canceled by the Bidder during a thirty (30) day period following the time and date designated for the receipt and opening of Bids, and Bidder so agrees in submitting their Bid. Bids shall be binding for 30 days after the date of the Bid opening.

ARTICLE 5: CONSIDERATION OF BIDS

5.1 OPENING/REJECTION OF BIDS

5.1.1 Unless otherwise stated, Bids received on time will be publicly opened and will be read aloud. An abstract of the Bids will be made available to Bidders.

5.1.2 The Agency shall have the right to reject any and all Bids. A Bid not accompanied by a required Bid Security or by other data required by the Bidding Documents, or a Bid which is in any way incomplete or irregular is subject to rejection.

5.1.3 If the Bids are rejected, it will be done within thirty (30) calendar day of the Bid opening.

5.2 COMPARISON OF BIDS

5.2.1 After the Bids have been opened and read, the bid prices will be compared and the result of such comparisons will be made available to the public. Comparisons of the Bids may be based on the Base Bid plus desired Alternates. The Agency shall have the right to accept Alternates in any order or combination.

5.2.2 The Agency reserves the right to waive technicalities, to reject any or all Bids, or any portion thereof, to advertise for new Bids, to proceed to do the Work otherwise, or to abandon the Work, if in the judgment of the Agency or its agent(s), it is in the best interest of the State.

5.2.3 An increase or decrease in the quantity for any item is not sufficient grounds for an increase or decrease in the Unit Price.

5.2.4 The prices quoted are to be those for which the material will be furnished F.O.B. Job Site and include all charges that may be imposed during the period of the Contract.

5.2.5 No qualifying letter or statements in or attached to the Bid, or separate discounts will be considered in determining the low Bid except as may be otherwise herein noted. Cash or separate discounts should be computed and incorporated into Unit Bid Price(s).

5.3 DISQUALIFICATION OF BIDDERS

5.3.1 An agency shall determine that each Bidder on any Public Works Contract is responsible before awarding the Contract. Factors to be considered in determining

the responsibility of a Bidder include:

A. The Bidder's financial, physical, personnel or other resources including Subcontracts;

B. The Bidder's record of performance on past public or private construction projects, including, but not limited to, defaults and/or final adjudication or admission of violations of the Prevailing Wage Laws in Delaware or any other state;

C. The Bidder's written safety plan;

D. Whether the Bidder is qualified legally to contract with the State;

E. Whether the Bidder supplied all necessary information concerning its responsibility; and,

F. Any other specific criteria for a particular procurement, which an agency may establish; provided however, that, the criteria be set forth in the Invitation to Bid and is otherwise in conformity with State and/or Federal law.

5.3.2 If an agency determines that a Bidder is nonresponsive and/or nonresponsible, the determination shall be in writing and set forth the basis for the determination. A copy of the determination shall be sent to the affected Bidder within five (5) working days of said determination.

5.3.3 In addition, any one or more of the following causes may be considered as sufficient for the disqualification of a Bidder and the rejection of their Bid or Bids.

1. More than one Bid for the same Contract from an individual, firm or corporation under the same or different names.
2. Evidence of collusion among Bidders.
3. Unsatisfactory performance record as evidenced by past experience.
4. If the Unit Prices are obviously unbalanced either in excess or below reasonable cost analysis values.
5. If there are any unauthorized additions, interlineation, conditional or alternate bids or irregularities of any kind which may tend to make the Bid incomplete, indefinite or ambiguous as to its meaning.
6. If the Bid is not accompanied by the required Bid Security and other data required by the Bidding Documents.
7. If any exceptions or qualifications of the Bid are noted on the Bid Form.

5.4 ACCEPTANCE OF BID AND AWARD OF CONTRACT

5.4.1 A formal Contract shall be executed with the successful Bidder within twenty (20) calendar days after the award of the Contract.

5.4.2 Per Section 6962(d)(13) a., Title 29, Delaware Code, "The contracting agency shall award any public works contract within thirty (30) days of the bid opening to the lowest responsive and responsible Bidder, unless the Agency elects to award on the basis of best value, in which case the election to award on the basis of best value shall be stated in the Invitation To Bid."

5.4.3 Each Bid on any Public Works Contract must be deemed responsive by the Agency to be considered for award. A responsive Bid shall conform in all material respects to the requirements and criteria set forth in the Contract Documents and specifications.

5.4.4 The Agency shall have the right to accept Alternates in any order or combination, and to determine the low Bidder on the basis of the sum of the Base Bid, plus accepted Alternates.

5.4.5 The successful Bidder shall execute a formal contract, submit the required Insurance Certificate, and furnish good and sufficient bonds, unless specifically waived in the General Requirements, in accordance with the General Requirement, within twenty (20) days of official notice of contract award. Bonds shall be for the benefit of the Agency with surety in the amount of 100% of the total contract award. Said Bonds shall be conditioned upon the faithful performance of the contract. Bonds shall remain in affect for period of one year after the date of substantial completion.

5.4.6 If the successful Bidder fails to execute the required Contract and Bond, as aforesaid, within twenty (20) calendar days after the date of official Notice of the Award of the Contract, their Bid guaranty shall immediately be taken and become the property of the State for the benefit of the Agency as liquidated damages, and not as a forfeiture or as a penalty. Award will then be made to the next lowest qualified Bidder of the Work or readvertised, as the Agency may decide.

5.4.7 Each bidder shall supply with its bid its taxpayer identification number (i.e., federal employer identification number or social security number) and a copy of its Delaware business license, and should the vendor be awarded a contract, such vendor shall provide to the agency the taxpayer identification license numbers of such subcontractors. Such numbers shall be provided on the later of the date on which such subcontractor is required to be identified or the time the contract is executed. The successful Bidder shall provide to the agency to which it is contracting, within 30 days of entering into such public works contract, copies of all Delaware Business licenses of subcontractors and/or independent contractors that will perform work for such public works contract. However, if a subcontractor or independent contractor is hired or contracted more than 20 days after the Bidder entered the public works contract the Delaware Business license of such subcontractor or independent contractor shall be provided to the agency within 10 days of being contracted or hired.

5.4.8 The Bid Security shall be returned to the successful Bidder upon the execution of the

formal contract. The Bid Securities of unsuccessful bidders shall be returned within thirty (30) calendar days after the opening of the Bids.

ARTICLE 6: POST-BID INFORMATION

6.1 CONTRACTOR'S QUALIFICATION STATEMENT

6.1.1 Bidders to whom award of a Contract is under consideration shall, if requested by the Agency, submit a properly executed AIA Document A305, Contractor's Qualification Statement, unless such a statement has been previously required and submitted.

6.2 BUSINESS DESIGNATION FORM

6.2.1 Successful bidder shall be required to accurately complete an Office of Management and Budget Business Designation Form for Subcontractors.

ARTICLE 7: PERFORMANCE BOND AND PAYMENT BOND

7.1 BOND REQUIREMENTS

7.1.1 The cost of furnishing the required Bonds, that are stipulated in the Bidding Documents, shall be included in the Bid.

7.1.2 If the Bidder is required by the Agency to secure a bond from other than the Bidder's usual sources, changes in cost will be adjusted as provide in the Contract Documents.

7.1.3 The Performance and Payment Bond forms used shall be the standard OMB forms (attached).

7.2 TIME OF DELIVERY AND FORM OF BONDS

7.2.1 The bonds shall be dated on or after the date of the Contract.

7.2.2 The Bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix a certified and current copy of the power of attorney.

ARTICLE 8: FORM OF AGREEMENT BETWEEN AGENCY AND CONTRACTOR

8.1 Unless otherwise required in the Bidding Documents, the Agreement for the Work will be written on AIA Document A101, Standard Form of Agreement Between Owner and Contractor Where the Basis of Payment is a Stipulated Sum.

END OF INSTRUCTIONS TO BIDDERS

BID FORM

BID FORM

For Bids Due: Date and Time
Control

To: Dept. of Natural Resources and Environmental

Division of Parks and Recreation
Office of Design and Development
89 Kings Highway, Dover DE 19901

Name of Bidder: _____

Delaware Business License No.:_____ **Taxpayer ID No.:** _____
(A copy of Bidder's Delaware Business License must be attached to this form.)

(Other License Nos.): _____

Phone Number: ( ) ____ _____ **Fax Number: ( ) ___ _____**

The basis of award will be the base bid plus the contingencies plus any selected alternatives. The undersigned, representing that he has read and understands the Bidding Documents and that this bid is made in accordance therewith, that he has visited the site and has familiarized himself with the local conditions under which the Work is to be performed, and that his bid is based upon the materials, systems and equipment described in the Bidding Documents without exception, hereby proposes and agrees to provide all labor, materials, plant, equipment, supplies, transport and other facilities required to execute the work described by the aforesaid documents for the lump sum itemized below:

$ _____

($)

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

Base Bid					
Item No.	**Description**	**Unit**	**Quantity**	**Unit Price**	**Total Price**
1	Mobilization (Max of 5% of the total of the Base and any Contingency Bid Items)	LS	1		
2	Traffic Control	LS	1		
3	Clearing	LS	1		
4	Restoration	LS	1		
5	Install 8" and 10" PVC Gravity Sewer Pipe	LF	4000		

BID FORM

6	New 6” PVC Gravity Sewer Lateral Connections	LF	3600		
7	Pre-Cast Manholes:				
	7A -- 4'-0" Diameter Manhole at 0'-0" to 8'-0" Deep	EA	14		
	7B – Remove and Replace Existing Manhole 0’-0” to 8’-0” Deep	EA	2		
	7C – 4’-0” Diameter Manhole per vertical foot greater than 8’-0” Deep	EA	6		
8	Grease Trap	LS	1		
9	Abandon Existing Manholes in Place	EA	3		
10	Abandon Existing Sewer Pipe in Place	CY	30		
12	PVC Water Main Pipe:				
	12A -- 2 1/2" PVC Water Main	LF	3800		
	12B -- 8" DIP Water Main	LF	200		
13	Water Service Installation:				
	13A -- 3/4" Water Service Connection from New PVC Pipe	EA	52		
	13B -- 3/4" Water Service Connection from New DIP Pipe	EA	2		
	13C -- 3/4" Water Service Connection from Existing AC Pipe	EA	14		
	13D -- 1-1/2” Water Service and Future Stub (adjacent to camp site 18)	EA	1		
	13E -- 2-1/2" Water Service Connection from new PVC Pipe	EA	1		
14	Gate Valves:				
	14A -- 2 1/2" Gate Valve	EA	6		
	14B -- 1 1/2" Gate Valve	EA	1		
	14C -- 3/4" Gate Valve	EA	1		
	14D -- 8" Gate Valve	EA	1		
15	Fire Hydrants	EA	1		
16	Water Connections to Existing Pipe				
	16A -- 8" Water Connection to Existing Pipe	EA	1		
	16B -- 2-1/2" Water Connection to Existing Pipe	EA	1		
17	Proposed Bathhouse Foundation, Stub-ups and Final Connections	LS	1		
18	Proposed Lift Station Modifications				
	18C -- Proposed Lift Station Modifications LS-3	LS	1		
19	Hot Mix Patching	SY	1100		

BID FORM

20	Cleaning and Television Inspection of Pipe	LF	4000		
23	Manhole / Precast Concrete Structure Rehabilitation:				
	23A -- Pressure grouting a brick base section	EA	1		
	23B -- Pressure grouting a precast concrete joint or pipe penetration	EA	1		
24	Grout	GAL	50	$10	$500.00
25	Replacement Manhole Frame and Cover:				
	25A -- Replace Manhole Frame and Cover out of Roadway	EA	1		
26	Driveway Construction	SY	8000		
29	Proposed Electrical System Improvements	LS	1		
31	Asbestos Abatement	LB			
				Subtotal Base Bid Total	
Contingent Bid Items					
11	Well Pointing	LF	800		
15	Fire Hydrants	EA	2		
21	Undercut Excavation and Backfill	CY	500		
22	Type C Borrow Backfill	CY	3000		
27	Milling	SY	13500		
28	Asphalt Paving	SY	13500		
				Subtotal Contingency Bid Items	

Total Bid (Base Bid + Contingency Bid)	

Alternate Bid Items					
Item No.	**Description**	**Unit**	**Quantity**	**Unit Price**	**Total Price**
18	Proposed Lift Station Modifications:				
	18A -- Proposed Lift station Modifications LS-1	LS	1		
18	Proposed Lift Station Modifications:				
	18B -- Proposed Lift Station Modifications LS-2	LS	1		
23	Manhole / Precast Concrete Structure Rehabilitation:				
	23A -- Pressure grouting a brick base section	EA	14		
	23B -- Pressure grouting a precast concrete joint or pipe penetration	EA	19		

BID FORM

24	Grout	GAL	470	$10	$4,700.00
25	Replacement Manhole Frame and Cover:				
	25A -- Replace Manhole Frame and Cover out of Roadway	EA	16		
	25B -- Manhole Chimney Reconstruction in excess of 12"	VF	5		
30	Wastewater Treatment Primary Feeder	LS	1		

BID FORM

BID FORM

I/We acknowledge Addendums numbered _____ and the price(s) submitted include any cost/schedule impact they may have.

This bid shall remain valid and cannot be withdrawn for thirty (30) days from the date of opening of bids, and the undersigned shall abide by the Bid Security forfeiture provisions. Bid Security is attached to this Bid.

The Owner shall have the right to reject any or all bids, and to waive any informality or irregularity in any bid received.

This bid is based upon work being accomplished by the Sub-Contractors named on the list attached to this bid.

Should I/We be awarded this contract, I/We pledge to achieve substantial completion of all the work within _____calendar days of the Notice to Proceed.

The undersigned represents and warrants that he has complied and shall comply with all requirements of local, state, and national laws; that no legal requirement has been or shall be violated in making or accepting this bid, in awarding the contract to him or in the prosecution of the work required; that the bid is legal and firm; that he has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken action in restraint of free competitive bidding.

Upon receipt of written notice of the acceptance of this Bid, the Bidder shall, within twenty (20) calendar days, execute the agreement in the required form and deliver the Contract Bonds, and Insurance Certificates, required by the Contract Documents.

BID FORM

I am / We are an Individual / a Partnership / a Corporation

By _____ Trading as _____
(Individual's/General Partner's /Corporate Name)

_____
(State of Corporation)

Business Address: _____
_____
_____

Witness: _____ By: _____
(Authorized Signature)

(Seal)

_____
(Title)

Date: _____

ATACHMENTS
Sub-Contractor List
Non-Collusion Statement
Bid Security
(Others as Required by Project Manual)

BID FORM

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 6962 (d)(10)b Delaware Code, the following sub-contractor listing must accompany the bid submittal. The name and address of the sub-contractor **must be listed for each category** where the bidder intends to use a sub-contractor to perform that category of work. In order to provide full disclosure and acceptance of the bid by the *Owner*, **it is required that bidders list themselves as being the sub-contractor for all categories where he/she is qualified and intends to perform such work.**

	Subcontractor Category	Subcontractor	Address (City & State)	Subcontractors tax payer ID # or Delaware Business license #
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				

UTILITY IMPROVEMENTS – PHASE II
LUMS POND STATE PARK
DIVISION OF PARKS AND RECREATION CONTRACT No. 2015-LP-100

BID FORM

NON-COLLUSION STATEMENT

This is to certify that the undersigned bidder has neither directly nor indirectly, entered into any agreement, participated in any collusion or otherwise taken any action in restraint of free competitive bidding in connection with this proposal submitted this date to the Office of Design and Development, Division of Parks and Recreation.

All the terms and conditions of the Lums Pond State Park Utility Improvements – Phase II have been thoroughly examined and are understood.

NAME OF BIDDER _____

AUTHORIZED REPRESENTATIVE (TYPED): _____

AUTHORIZED REPRESENTATIVE (SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

_____

_____

E-MAIL: _____

PHONE NUMBER: _____

Sworn to and Subscribed before me this _____ day of _____ of 20_____.

My commission expires _____. NOTARY PULIC _____

THIS PAGE MUST BE SIGNED AND NOTORIZED FOR YOUR BID TO BE CONSIDERED.

BID BOND

TO ACCOMPANY PROPOSAL
(Not necessary if security is used)

KNOW ALL MEN BY THESE PRESENTS That: _____ _____of _____ in the County of _____ _____and State of _____as **Principal**, and _____ _____ of _____ in the County of _____ and State of _____ as **Surety**, legally authorized to do business in the State of Delaware ("**State**"), are held and firmly unto the **State** in the sum of _____ _____ Dollars ($_____), or _____ percent not to exceed _____ _____ Dollars ($_____) of amount of bid on Contract No. _____, to be paid to the **State** for the use and benefit of the Department of Natural Resources and Environmental Control for which payment well and truly to be made, we do bind ourselves, our and each of our heirs, executors, administrators, and successors, jointly and severally for and in the whole firmly by these presents.

NOW THE CONDITION OF THIS OBLIGATION IS SUCH That if the above bounden **Principal** who has submitted to the Department of Natural Resources and Environmental Control a certain proposal to enter into this contract for the furnishing of certain material and/or services within the **State**, shall be awarded this Contract, and if said **Principal** shall well and truly enter into and execute this Contract as may be required by the terms of this Contract and approved by the Department of Natural Resources and Environmental Control this Contract to be entered into within twenty days after the date of official notice of the award thereof in accordance with the terms of said proposal, then this obligation shall be void or else to be and remain in full force and virtue.

Sealed with _____ seal and dated this _____day of _____ in the year of our Lord two thousand and _____ (20___).

SEALED, AND DELIVERED IN THE
Presence of

_____
Name of Bidder (Organization)

Corporate Seal

By: _____
Authorized Signature

Attest _____

_____
Title

_____
Name of Surety

Witness:_____

By: _____

_____
Title

SECTION 00500 – AGREEMENT FORM A101-2007

The following supplements modify the "Standard Form of Agreement Between Owner and Contractor," AIA Document A101-2007. Where a portion of the Standard Form of Agreement is modified or deleted by the following, the unaltered portions of the Standard Form of Agreement shall remain in effect.

ARTICLE 5: PAYMENTS

5.1 PROGRESS PAYMENTS

5.1.3 Delete paragraph 5.1.3 in its entirety and replace with the following:

"Provided that a valid Application for Payment is received by the Architect that meets all requirements of the Contract, payment shall be made by the Owner not later than 30 days after the Owner receives the valid Application for Payment."

ARTICLE 6: DISPUTE RESOLUTION

6.2 BINDING DISPUTE RESOLUTION

Check Other – and add the following sentence:

"Any remedies available in law or in equity."

ARTICLE 8: MISCELLANEOUS PROVISIONS

8.2 Insert the following:

"Payments are due 30 days after receipt of a valid Application for Payment. After that 30 day period, interest may be charged at the rate of 1% per month not to exceed 12% per annum."

Delete paragraph 8.5 in its entirety and replace with the following:

"The Contractor's representative shall not be changed without ten days written notice to the Owner."

END OF SUPPLEMENT TO AGREEMENT BETWEEN OWNER AND CONTRACTOR

END OF SECTION 00500

FORM OF PERFORMANCE BOND

Bond Number: _____

KNOW ALL PERSONS BY THESE PRESENTS, that we, _____, as principal ("Principal"), and _____, a _____ corporation, legally authorized to do business in the State of Delaware, as surety ("Surety"), are held and firmly bound unto the State of Delaware, Department of Natural Resources and Environmental Control, Division of Parks and Recreation ("Owner"), in the amount of _____ ($_____), to be paid to Owner, for which payment well and truly to be made, we do bind ourselves, our and each and every of our heirs, executors, administrations, successors and assigns, jointly and severally, for and in the whole, firmly by these presents.

Sealed with our seals and dated this _____ day of _____, 20__.

NOW THE CONDITION OF THIS OBLIGATION IS SUCH, that if Principal, who has been awarded by Owner that certain contract known as Contract No. _____ dated the _____ day of _____, 20__ (the "Contract"), which Contract is incorporated herein by reference, shall well and truly provide and furnish all materials, appliances and tools and perform all the work required under and pursuant to the terms and conditions of the Contract and the Contract Documents (as defined in the Contract) or any changes or modifications thereto made as therein provided, shall make good and reimburse Owner sufficient funds to pay the costs of completing the Contract that Owner may sustain by reason of any failure or default on the part of Principal, and shall also indemnify and save harmless Owner from all costs, damages and expenses arising out of or by reason of the performance of the Contract and for as long as provided by the Contract; then this obligation shall be void, otherwise to be and remain in full force and effect.

Surety, for value received, hereby stipulates and agrees, if requested to do so by Owner, to fully perform and complete the work to be performed under the Contract pursuant to the terms, conditions and covenants thereof, if for any cause Principal fails or neglects to so fully perform and complete such work.

Surety, for value received, for itself and its successors and assigns, hereby stipulates and agrees that the obligation of Surety and its bond shall be in no way impaired or affected by any extension of time, modification, omission, addition or change in or to the Contract or the work to be performed thereunder, or by any payment thereunder before the time required therein, or by any waiver of any provisions thereof, or by any assignment, subletting or other transfer thereof or of any work to be performed or any monies due or to become due thereunder; and Surety hereby waives notice of any and all such extensions, modifications, omissions, additions, changes, payments, waivers, assignments, subcontracts and transfers and hereby expressly stipulates and agrees that any and all things done and omitted to be done by and in relation to assignees, subcontractors, and other transferees shall have the same effect as to Surety as though done or omitted to be done by or in relation to Principal.

Surety hereby stipulates and agrees that no modifications, omissions or additions in or to the terms of the Contract shall in any way whatsoever affect the obligation of Surety and its bond.

Any proceeding, legal or equitable, under this Bond may be brought in any court of competent jurisdiction in the State of Delaware. Notices to Surety or Contractor may be mailed or delivered to them at their respective addresses shown below.

IN WITNESS WHEREOF, Principal and Surety have hereunto set their hand and seals, and such of them as are corporations have caused their corporate seal to be hereto affixed and these presents to be signed by their duly authorized officers, the day and year first above written.

PRINCIPAL

Name: _____

Witness or Attest: Address: _____

_____ By: _____(SEAL)
Name: Name:
Title:

(Corporate Seal)

SURETY

Name: _____

Witness or Attest: Address: _____

_____ By: _____ (SEAL)
Name: Name:
Title:

(Corporate Seal)

FORM OF PAYMENT BOND

Bond Number: _____

KNOW ALL PERSONS BY THESE PRESENTS, that we, _____, as principal ("Principal"), and _____, a _____ corporation, legally authorized to do business in the State of Delaware, as surety ("Surety"), are held and firmly bound unto the State of Delaware, Department of Natural Resources and Environmental Control, Division of Parks and Recreation ("Owner"), in the amount of _____ ($_____), to be paid to Owner, for which payment well and truly to be made, we do bind ourselves, our and each and every of our heirs, executors, administrations, successors and assigns, jointly and severally, for and in the whole firmly by these presents.

Sealed with our seals and dated this _____ day of_____, 20__.

NOW THE CONDITION OF THIS OBLIGATION IS SUCH, that if Principal, who has been awarded by Owner that certain contract known as Contract No. _____dated the _____ day of _____, 20__ (the "Contract"), which Contract is incorporated herein by reference, shall well and truly pay all and every person furnishing materials or performing labor or service in and about the performance of the work under the Contract, all and every sums of money due him, her, them or any of them, for all such materials, labor and service for which Principal is liable, shall make good and reimburse Owner sufficient funds to pay such costs in the completion of the Contract as Owner may sustain by reason of any failure or default on the part of Principal, and shall also indemnify and save harmless Owner from all costs, damages and expenses arising out of or by reason of the performance of the Contract and for as long as provided by the Contract; then this obligation shall be void, otherwise to be and remain in full force and effect.

Surety, for value received, for itself and its successors and assigns, hereby stipulates and agrees that the obligation of Surety and its bond shall be in no way impaired or affected by any extension of time, modification, omission, addition or change in or to the Contract or the work to be performed thereunder, or by any payment thereunder before the time required therein, or by any waiver of any provisions thereof, or by any assignment, subletting or other transfer thereof or of any work to be performed or any monies due or to become due thereunder; and Surety hereby waives notice of any and all such extensions, modifications, omissions, additions, changes, payments, waivers, things done and omitted to be done by and in relation to assignees, subcontractors, and other transferees shall have the same effect as to Surety as though done or omitted to be done by or in relation to Principal.

Surety hereby stipulates and agrees that no modifications, omission or additions in or to the terms of the Contract shall in any way whatsoever affect the obligation of Surety and its bond.

Any proceeding, legal or equitable, under this Bond may be brought in any court of competent jurisdiction in the State of Delaware. Notices to Surety or Contractor may be mailed or delivered to them at their respective addresses shown below.

IN WITNESS WHEREOF, Principal and Surety have hereunto set their hand and seals, and such of them as are corporations have caused their corporate seal to be hereto affixed and these presents to be signed by their duly authorized officers, the day and year first above written.

PRINCIPAL

Name: _____

Witness or Attest: Address: _____

_____ By: _____(SEAL)
Name: Name:
Title:

(Corporate Seal)

SURETY

Name: _____

Witness or Attest: Address: _____

_____ By: _____(SEAL)
Name: Name:
Title:

(Corporate Seal)

SECTION 00600 – BONDS, CERTIFICATES AND ADMINISTRATIVE FORMS

ARTICLE 1: Related Work Specified Elsewhere:

Section 00100 Instructions to Bidders
Section 00300 Bid Form
Section 00500 Agreement Form
Section 00700 General Conditions
Section 00800 Supplementary General Conditions

ARTICLE 2: Forms Submitted By Contractor:

2.1 Reference is made throughout this project manual to a number of standard forms which the contractor is required to submit to the owner prior to and during the execution of work of this project.

2.2 The contractor shall be responsible for obtaining and submitting the following forms to the owner when the forms are completed as specified.

2.3 Prior to commencing work, submit forms:

a. AIA Document G715 "Acord Certificate of Insurance" (Latest Edition).

b. “Form of Performance Bond” and “Form of Payment Bond" (Samples enclosed) Use of these forms is mandatory.

2.4 During the execution of the work, as appropriate, and prior to final payment:

a. Modified AIA Document G702 "Application and Certificate for Payment".

b. Modified AIA Document G703 "Continuation Sheet" for G702, "Application and Certificate for Payment".

c. AIA Document G706 "Contractor's Affidavit of Payment of Debts and Claims" (Latest Edition).

d. AIA Document G706A "Contractor's Affidavit of Release of Liens" (Latest Edition).

e. AIA Document G707 "Consent of Surety to Final Payment" (Latest Edition).

f. AIA Document G707A "Consent of Surety to Reduction in or Partial Release of Retainage" (Latest Edition).

g. Payroll Report (Sample Enclosed).

2.5 The forms specified above are available for examination in the owner's office by prospective bidders. Failure to examine the specified documents and to make allowances for them in his bid, shall not relieve the contractor from using the forms and complying with their requirements.

ARTICLE 3: Forms Prepared by Owner

3.1 The owner shall prepare the following standard forms, as appropriate:

a. AIA Document A101-1997 “Standard Form of Agreement Between Owner and Contractor - Stipulated Sum”.

b. AIA Document G701 "Change Order" (Latest Edition).

c. AIA Document G704 "Certificate of Substantial Completion" (Latest Edition).

d. AIA Document G714 "Construction Change Directive" (Latest Edition).

END OF SECTION 00600

AIA® Document G702™ – 1992

Application and Certificate for Payment

TO OWNER:	PROJECT:	BHH	APPLICATION NO: 001 PERIOD TO: CONTRACT FOR: General Construction	Distribution to: OWNER: ☐ ARCHITECT: ☐
FROM CONTRACTOR:	VIA ARCHITECT:	Bernardon Haber Holloway Architects PC Three Mill Road, Suite 211 Wilmington, Delaware 19806	CONTRACT DATE: PROJECT NOS: / /	CONTRACTOR: ☐ FIELD: ☐ OTHER: ☐

CONTRACTOR'S APPLICATION FOR PAYMENT

Application is made for payment, as shown below, in connection with the Contract.
Continuation Sheet, AIA Document G703, is attached.

1. **ORIGINAL CONTRACT SUM** ..... $ 0.00
2. **Net change by Change Orders** ..... $ 0.00
3. **CONTRACT SUM TO DATE** (Line 1 ± 2) ..... $ 0.00
4. **TOTAL COMPLETED & STORED TO DATE** (Column G on G703) ..... $ 0.00
5. **RETAINAGE:**
   a. 0 % of Completed Work (Column D + E on G703) $ 0.00
   b. 0 % of Stored Material (Column F on G703) $ 0.00
   Total Retainage (Lines 5a + 5b or Total in Column I of G703) ..... $ 0.00
6. **TOTAL EARNED LESS RETAINAGE** ..... $ 0.00
   (Line 4 Less Line 5 Total)
7. **LESS PREVIOUS CERTIFICATES FOR PAYMENT** ..... $ 0.00
   (Line 6 from prior Certificate)
8. **CURRENT PAYMENT DUE** ..... $ 0.00
9. **BALANCE TO FINISH, INCLUDING RETAINAGE**
   (Line 3 less Line 6) $ 0.00

CHANGE ORDER SUMMARY	ADDITIONS	DEDUCTIONS
Total changes approved in previous months by Owner	$ 0.00	$ 0.00
Total approved this Month	$ 0.00	$ 0.00
TOTALS	$ 0.00	$ 0.00
NET CHANGES by Change Order	$	0.00

The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work for which previous Certificates for Payment were issued and payments received from the Owner, and that current payment shown herein is now due.

CONTRACTOR:

By: _____ Date: _____

State of:

County of:

Subscribed and sworn to before me this day of

Notary Public:

My Commission expires:

ARCHITECT'S CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on on-site observations and the data comprising this application, the Architect certifies to the Owner that to the best of the Architect's knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the AMOUNT CERTIFIED.

AMOUNT CERTIFIED ..... $ 0.00

(Attach explanation if amount certified differs from the amount applied. Initial all figures on this Application and on the Continuation Sheet that are changed to conform with the amount certified.)

ARCHITECT:

By: _____ Date: _____

This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the Contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract

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Continuation Sheet

AIA Document G702, APPLICATION AND CERTIFICATION FOR PAYMENT, containing Contractor's signed certification is attached.
In tabulations below, amounts are stated to the nearest dollar.
Use Column I on Contracts where variable retainage for line items may apply.

APPLICATION NO: 001
APPLICATION DATE:
PERIOD TO:
ARCHITECT'S PROJECT NO:

A	B	C	D	E	F	G		H	I
			WORK COMPLETED						
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	FROM PREVIOUS APPLICATION (D + E)	THIS PERIOD	MATERIALS PRESENTLY STORED (NOT IN D OR E)	TOTAL COMPLETED AND STORED TO DATE (D+E+F)	% (G ÷ C)	BALANCE TO FINISH (C - G)	RETAINAGE (IF VARIABLE RATE)
	GRAND TOTAL	$ 0.00	$ 0.00	$ 0.00	$ 0.00	$ 0.00	0.00 %	$ 0.00	$ 0.00

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SECTION 00650 – REVOLVING LOAN FUND REQUIREMENTS

AIS Final Guidance March 20, 2014
Delaware Pollution Control Revolving Loan Fund Program Requirements
Davis-Bacon and Related Acts (DBRA) Provisions and Procedures
Compliance Statement
National Product Waiver for Pig Iron and Direct Reduced Iron for State Revolving Fund Projects
Short-term National Product Waiver for Stainless Steel Nuts and Bolts

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

MAR 20 2014

OFFICE OF WATER

MEMORANDUM

SUBJECT: Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014

FROM: For Andrew D. Sawyers, Director
Office of Wastewater Management (4201M)

Peter C. Grevatt, Director
Office of Ground Water and Drinking Water (4601M)

TO: Water Management Division Directors
Regions I - X

P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an "American Iron and Steel (AIS)" requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works if the project is funded through an assistance agreement executed beginning January 17, 2014 (enactment of the Act), through the end of Federal Fiscal Year 2014.

Section 436 also sets forth certain circumstances under which EPA may waive the AIS requirement. Furthermore, the Act specifically exempts projects where engineering plans and specifications were approved by a State agency prior to January 17, 2014.

The approach described below explains how EPA will implement the AIS requirement. The first section is in the form of questions and answers that address the types of projects that must comply with the AIS requirement, the types of products covered by the AIS requirement, and compliance. The second section is a step-by-step process for requesting waivers and the circumstances under which waivers may be granted.

Implementation

The Act states:

Sec. 436. (a)(1) None of the funds made available by a State water pollution control revolving fund as authorized by title VI of the Federal Water Pollution Control Act (33 U.S.C. 1381 et seq.) or made available by a drinking water treatment revolving loan fund as authorized by section 1452 of the Safe Drinking Water Act (42 U.S.C. 300j–12) shall be used for a project for the construction, alteration, maintenance, or repair of a public water system or treatment works unless all of the iron and steel products used in the project are produced in the United States.

(2) In this section, the term ''iron and steel products'' means the following products made primarily of iron or steel: lined or unlined pipes and fittings, manhole covers and other municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete, and construction materials.

(b) Subsection (a) shall not apply in any case or category of cases in which the Administrator of the Environmental Protection Agency (in this section referred to as the ''Administrator'') finds that—

(1) applying subsection (a) would be inconsistent with the public interest;

(2) iron and steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality; or

(3) inclusion of iron and steel products produced in the United States will increase the cost of the overall project by more than 25 percent.

(c) If the Administrator receives a request for a waiver under this section, the Administrator shall make available to the public on an informal basis a copy of the request and information available to the Administrator concerning the request, and shall allow for informal public input on the request for at least 15 days prior to making a finding based on the request. The Administrator shall make the request and accompanying information available by electronic means, including on the official public Internet Web site of the Environmental Protection Agency.

(d) This section shall be applied in a manner consistent with United States obligations under international agreements.

(e) The Administrator may retain up to 0.25 percent of the funds appropriated in this Act for the Clean and Drinking Water State Revolving Funds for carrying out

the provisions described in subsection (a)(1) for management and oversight of the requirements of this section.

(f) This section does not apply with respect to a project if a State agency approves the engineering plans and specifications for the project, in that agency's capacity to approve such plans and specifications prior to a project requesting bids, prior to the date of the enactment of this Act.

The following questions and answers provide guidance for implementing and complying with the AIS requirements:

Project Coverage

1) What classes of projects are covered by the AIS requirement?

All treatment works projects funded by a CWSRF assistance agreement, and all public water system projects funded by a DWSRF assistance agreement, from the date of enactment through the end of Federal Fiscal Year 2014, are covered. The AIS requirements apply to the entirety of the project, no matter when construction begins or ends. Additionally, the AIS requirements apply to all parts of the project, no matter the source of funding.

2) Does the AIS requirement apply to nonpoint source projects or national estuary projects?

No. Congress did not include an AIS requirement for nonpoint source and national estuary projects unless the project can also be classified as a 'treatment works' as defined by section 212 of the Clean Water Act.

3) Are any projects for the construction, alteration, maintenance, or repair of a public water system or treatment works excluded from the AIS requirement?

Any project, whether a treatment works project or a public water system project, for which engineering plans and specifications were approved by the responsible state agency prior to January 17, 2014, is excluded from the AIS requirements.

4) What if the project does not have approved engineering plans and specifications but has signed an assistance agreement with a CWSRF or DWSRF program prior to January 17, 2014?

The AIS requirements do not apply to any project for which an assistance agreement was signed prior to January 17, 2014.

5) What if the project does not have approved engineering plans and specifications, but bids were advertised prior to January 17, 2014 and an assistance agreement was signed after January 17, 2014?

If the project does not require approved engineering plans and specifications, the bid advertisement date will count in lieu of the approval date for purposes of the exemption in section 436(f).

6) What if the assistance agreement that was signed prior to January 17, 2014, only funded a part of the overall project, where the remainder of the project will be funded later with another SRF loan?

If the original assistance agreement funded any construction of the project, the date of the original assistance agreement counts for purposes of the exemption. If the original assistance agreement was only for planning and design, the date of that assistance agreement will count for purposes of the exemption only if there is a written commitment or expectation on the part of the assistance recipient to fund the remainder of the project with SRF funds.

7) What if the assistance agreement that was signed prior to January 17, 2014, funded the first phase of a multi-phase project, where the remaining phases will be funded by SRF assistance in the future?

In such a case, the phases of the project will be considered a single project if all construction necessary to complete the building or work, regardless of the number of contracts or assistance agreements involved, are closely related in purpose, time and place. However, there are many situations in which major construction activities are clearly undertaken in phases that are distinct in purpose, time, or place. In the case of distinct phases, projects with engineering plans and specifications approval or assistance agreements signed prior to January 17, 2014 would be excluded from AIS requirements while those approved/signed on January 17, 2014, or later would be covered by the AIS requirements.

8) What if a project has split funding from a non-SRF source?

Many States intend to fund projects with "split" funding, from the SRF program and from State or other programs. Based on the Act language in section 436, which requires that American iron and steel products be used in any project for the construction, alteration, maintenance, or repair of a public water system or treatment works receiving SRF funding between and including January 17, 2014 and September 30, 2014, any project that is funded in whole or in part with such funds must comply with the AIS requirement. A "project" consists of all construction necessary to complete the building or work regardless of the number of contracts or assistance agreements involved so long as all contracts and assistance agreements awarded are closely related in purpose, time and place. This precludes the intentional splitting of SRF projects into separate and smaller contracts or assistance agreements to avoid AIS coverage on some portion of a larger

project, particularly where the activities are integrally and proximately related to the whole. However, there are many situations in which major construction activities are clearly undertaken in separate phases that are distinct in purpose, time, or place, in which case, separate contracts or assistance agreement for SRF and State or other funding would carry separate requirements.

9) What about refinancing?

If a project began construction, financed from a non-SRF source, prior to January 17, 2014, but is refinanced through an SRF assistance agreement executed on or after January 17, 2014 and prior to October 1, 2014, AIS requirements will apply to all construction that occurs on or after January 17, 2014, through completion of construction, unless, as is likely, engineering plans and specifications were approved by a responsible state agency prior to January 17, 2014. There is no retroactive application of the AIS requirements where a refinancing occurs for a project that has completed construction prior to January 17, 2014.

10) Do the AIS requirements apply to any other EPA programs, besides the SRF program, such as the Tribal Set-aside grants or grants to the Territories and DC?

No, the AIS requirement only applies to funds made available by a State water pollution control revolving fund as authorized by title VI of the Federal Water Pollution Control Act (33 U.S.C. 1381 et seq.) or made available by a drinking water treatment revolving loan fund as authorized by section 1452 of the Safe Drinking Water Act (42 U.S.C. 300j–12)

<u>Covered Iron and Steel Products</u>

11) What is an iron or steel product?

For purposes of the CWSRF and DWSRF projects that must comply with the AIS requirement, an iron or steel product is one of the following made primarily of iron or steel that is permanently incorporated into the public water system or treatment works:

Lined or unlined pipes or fittings;
Manhole Covers;
Municipal Castings (defined in more detail below);
Hydrants;
Tanks;
Flanges;
Pipe clamps and restraints;
Valves;
Structural steel (defined in more detail below);
Reinforced precast concrete; and
Construction materials (defined in more detail below).

12) What does the term 'primarily iron or steel' mean?

'Primarily iron or steel' places constraints on the list of products above. For one of the listed products to be considered subject to the AIS requirements, it must be made of greater than 50% iron or steel, measured by cost. The cost should be based on the material costs.

13) Can you provide an example of how to perform a cost determination?

For example, the iron portion of a fire hydrant would likely be the bonnet, body and shoe, and the cost then would include the pouring and casting to create those components. The other material costs would include non-iron and steel internal workings of the fire hydrant (i.e., stem, coupling, valve, seals, etc). However, the assembly of the internal workings into the hydrant body would not be included in this cost calculation. If one of the listed products is not made primarily of iron or steel, United States (US) provenance is not required. An exception to this definition is reinforced precast concrete, which is addressed in a later question.

14) If a product is composed of more than 50% iron or steel, but is not listed in the above list of items, must the item be produced in the US? Alternatively, must the iron or steel in such a product be produced in the US?

The answer to both question is no. Only items on the above list must be produced in the US. Additionally, the iron or steel in a non-listed item can be sourced from outside the US.

15) What is the definition of steel?

Steel means an alloy that includes at least 50 percent iron, between .02 and 2 percent carbon, and may include other elements. Metallic elements such as chromium, nickel, molybdenum, manganese, and silicon may be added during the melting of steel for the purpose of enhancing properties such as corrosion resistance, hardness, or strength. The definition of steel covers carbon steel, alloy steel, stainless steel, tool steel and other specialty steels.

16) What does 'produced in the United States' mean?

Production in the United States of the iron or steel products used in the project requires that all manufacturing processes, including application of coatings, must take place in the United States, with the exception of metallurgical processes involving refinement of steel additives. All manufacturing processes includes processes such as melting, refining, forming, rolling, drawing, finishing, fabricating and coating. Further, if a domestic iron and steel product is taken out of the US for any part of the manufacturing process, it becomes foreign source material. However, raw materials such as iron ore, limestone and iron and steel scrap are not covered by the AIS requirement, and the

material(s), if any, being applied as a coating are similarly not covered. Non-iron or steel components of an iron and steel product may come from non-US sources. For example, for products such as valves and hydrants, the individual non-iron and steel components do not have to be of domestic origin.

17) Are the raw materials used in the production of iron or steel required to come from US sources?

No. Raw materials, such as iron ore, limestone, scrap iron, and scrap steel, can come from non-US sources.

18) If an above listed item is primarily made of iron or steel, but is only at the construction site temporarily, must such an item be produced in the US?

No. Only the above listed products made primarily of iron or steel, permanently incorporated into the project must be produced in the US. For example trench boxes, scaffolding or equipment, which are removed from the project site upon completion of the project, are not required to be made of U.S. Iron or Steel.

19) What is the definition of 'municipal castings'?

Municipal castings are cast iron or steel infrastructure products that are melted and cast. They typically provide access, protection, or housing for components incorporated into utility owned drinking water, storm water, wastewater, and surface infrastructure. They are typically made of grey or ductile iron, or steel. Examples of municipal castings are:

Access Hatches;
Ballast Screen;
Benches (Iron or Steel);
Bollards;
Cast Bases;
Cast Iron Hinged Hatches, Square and Rectangular;
Cast Iron Riser Rings;
Catch Basin Inlet;
Cleanout/Monument Boxes;
Construction Covers and Frames;
Curb and Corner Guards;
Curb Openings;
Detectable Warning Plates;
Downspout Shoes (Boot, Inlet);
Drainage Grates, Frames and Curb Inlets;
Inlets;
Junction Boxes;
Lampposts;
Manhole Covers, Rings and Frames, Risers;

Meter Boxes;
Service Boxes;
Steel Hinged Hatches, Square and Rectangular;
Steel Riser Rings;
Trash receptacles;
Tree Grates;
Tree Guards;
Trench Grates; and
Valve Boxes, Covers and Risers.

20) What is 'structural steel'?

Structural steel is rolled flanged shapes, having at least one dimension of their cross-section three inches or greater, which are used in the construction of bridges, buildings, ships, railroad rolling stock, and for numerous other constructional purposes. Such shapes are designated as wide-flange shapes, standard I-beams, channels, angles, tees and zees. Other shapes include H-piles, sheet piling, tie plates, cross ties, and those for other special purposes.

21) What is a 'construction material' for purposes of the AIS requirement?

Construction materials are those articles, materials, or supplies made primarily of iron and steel, that are permanently incorporated into the project, not including mechanical and/or electrical components, equipment and systems. Some of these products may overlap with what is also considered "structural steel". This includes, but is not limited to, the following products: wire rod, bar, angles, concrete reinforcing bar, wire, wire cloth, wire rope and cables, tubing, framing, joists, trusses, fasteners (i.e., nuts and bolts), welding rods, decking, grating, railings, stairs, access ramps, fire escapes, ladders, wall panels, dome structures, roofing, ductwork, surface drains, cable hanging systems, manhole steps, fencing and fence tubing, guardrails, doors, and stationary screens.

22) What is not considered a 'construction material' for purposes of the AIS requirement?

Mechanical and electrical components, equipment and systems are not considered construction materials. Mechanical equipment is typically that which has motorized parts and/or is powered by a motor. Electrical equipment is typically any machine powered by electricity and includes components that are part of the electrical distribution system.

The following examples (including their appurtenances necessary for their intended use and operation) are NOT considered construction materials: pumps, motors, gear reducers, drives (including variable frequency drives (VFDs)), electric/pneumatic/manual accessories used to operate valves (such as electric valve actuators), mixers, gates, motorized screens (such as traveling screens), blowers/aeration equipment, compressors, meters, sensors, controls and switches, supervisory control and

data acquisition (SCADA), membrane bioreactor systems, membrane filtration systems, filters, clarifiers and clarifier mechanisms, rakes, grinders, disinfection systems, presses (including belt presses), conveyors, cranes, HVAC (excluding ductwork), water heaters, heat exchangers, generators, cabinetry and housings (such as electrical boxes/enclosures), lighting fixtures, electrical conduit, emergency life systems, metal office furniture, shelving, laboratory equipment, analytical instrumentation, and dewatering equipment.

23) If the iron or steel is produced in the US, may other steps in the manufacturing process take place outside of the US, such as assembly?

No. Production in the US of the iron or steel used in a listed product requires that all manufacturing processes must take place in the United States, except metallurgical processes involving refinement of steel additives.

24) What processes must occur in the US to be compliant with the AIS requirement for reinforced precast concrete?

While reinforced precast concrete may not be at least 50% iron or steel, in this particular case, the reinforcing bar and wire must be produced in the US and meet the same standards as for any other iron or steel product. Additionally, the casting of the concrete product must take place in the US. The cement and other raw materials used in concrete production are not required to be of domestic origin.

If the reinforced concrete is cast at the construction site, the reinforcing bar and wire are considered to be a construction material and must be produced in the US.

Compliance

25) How should an assistance recipient document compliance with the AIS requirement?

In order to ensure compliance with the AIS requirement, specific AIS contract language must be included in each contract, starting with the assistance agreement, all the way down to the purchase agreements. Sample language for assistance agreements and contracts can be found in Appendix 3 and 4.

EPA recommends the use of a step certification process, similar to one used by the Federal Highway Administration. The step certification process is a method to ensure that producers adhere to the AIS requirement and assistance recipients can verify that products comply with the AIS requirement. The process also establishes accountability and better enables States to take enforcement actions against violators.

Step certification creates a paper trail which documents the location of the manufacturing process involved with the production of steel and iron materials. A step certification is a process under which each handler (supplier, fabricator, manufacturer,

processor, etc) of the iron and steel products certifies that their step in the process was domestically performed. Each time a step in the manufacturing process takes place, the manufacturer delivers its work along with a certification of its origin. A certification can be quite simple. Typically, it includes the name of the manufacturer, the location of the manufacturing facility where the product or process took place (not its headquarters), a description of the product or item being delivered, and a signature by a manufacturer's responsible party. Attached, as Appendix 5, are sample certifications. These certifications should be collected and maintained by assistance recipients.

Alternatively, the final manufacturer that delivers the iron or steel product to the worksite, vendor, or contractor, may provide a certification asserting that all manufacturing processes occurred in the US. While this type of certification may be acceptable, it may not provide the same degree of assurance. Additional documentation may be needed if the certification is lacking important information. Step certification is the best practice.

26) How should a State ensure assistance recipients are complying with the AIS requirement?

In order to ensure compliance with the AIS requirement, States SRF programs must include specific AIS contract language in the assistance agreement. Sample language for assistance agreements can be found in Appendix 3.

States should also, as a best practice, conduct site visits of projects during construction and review documentation demonstrating proof of compliance which the assistance recipient has gathered.

27) What happens if a State or EPA finds a non-compliant iron and/or steel product permanently incorporated in the project?

If a potentially non-compliant product is identified, the State should notify the assistance recipient of the apparent unauthorized use of the non-domestic component, including a proposed corrective action, and should be given the opportunity to reply. If unauthorized use is confirmed, the State can take one or more of the following actions: request a waiver where appropriate; require the removal of the non-domestic item; or withhold payment for all or part of the project. Only EPA can issue waivers to authorize the use of a non-domestic item. EPA may use remedies available to it under the Clean Water Act, the Safe Drinking Water Act, and 40 CFR part 31 grant regulations, in the event of a violation of a grant term and condition.

It is recommended that the State work collaboratively with EPA to determine the appropriate corrective action, especially in cases where the State is the one who identifies the item in noncompliance or there is a disagreement with the assistance recipient.

If fraud, waste, abuse, or any violation of the law is suspected, the Office of Inspector General (OIG) should be contacted immediately. The OIG can be reached at 1-

888-546-8740 or OIG_Hotline@epa.gov. More information can be found at this website: http://www.epa.gov/oig/hotline.htm.

28) How do international trade agreements affect the implementation of the AIS requirements?

The AIS provision applies in a manner consistent with United States obligations under international agreements. Typically, these obligations only apply to direct procurement by the entities that are signatories to such agreements. In general, SRF assistance recipients are not signatories to such agreements, so these agreements have no impact on this AIS provision. In the few instances where such an agreement applies to a municipality, that municipality is under the obligation to determine its applicability and requirements and document the actions taken to comply for the State.

Waiver Process

The statute permits EPA to issue waivers for a case or category of cases where EPA finds (1) that applying these requirements would be inconsistent with the public interest; (2) iron and steel products are not produced in the US in sufficient and reasonably available quantities and of a satisfactory quality; or (3) inclusion of iron and steel products produced in the US will increase the cost of the overall project by more than 25 percent.

In order to implement the AIS requirements, EPA has developed an approach to allow for effective and efficient implementation of the waiver process to allow projects to proceed in a timely manner. The framework described below will allow States, on behalf of the assistance recipients, to apply for waivers of the AIS requirement directly to EPA Headquarters. Only waiver requests received from states will be considered. Pursuant to the Act, EPA has the responsibility to make findings as to the issuance of waivers to the AIS requirements.

Definitions

The following terms are critical to the interpretation and implementation of the AIS requirements and apply to the process described in this memorandum:

Reasonably Available Quantity: The quantity of iron or steel products is available or will be available at the time needed and place needed, and in the proper form or specification as specified in the project plans and design.

Satisfactory Quality: The quality of iron or steel products, as specified in the project plans and designs.

Assistance Recipient: A borrower or grantee that receives funding from a State CWSRF or DWSRF program.

Step-By-Step Waiver Process

Application by Assistance Recipient

Each local entity that receives SRF water infrastructure financial assistance is required by section 436 of the Act to use American made iron and steel products in the construction of its project. However, the recipient may request a waiver. Until a waiver is granted by EPA, the AIS requirement stands, except as noted above with respect to municipalities covered by international agreements.

The waiver process begins with the SRF assistance recipient. In order to fulfill the AIS requirement, the assistance recipient must in good faith design the project (where applicable) and solicit bids for construction with American made iron and steel products. It is essential that the assistance recipient include the AIS terms in any request for proposals or solicitations for bids, and in all contracts (see Appendix 3 for sample construction contract language). The assistance recipient may receive a waiver at any point before, during, or after the bid process, if one or more of three conditions is met:

1. Applying the American Iron and Steel requirements of the Act would be inconsistent with the public interest;
2. Iron and steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality; or
3. Inclusion of iron and steel products produced in the United States will increase the cost of the overall project by more than 25 percent.

Proper and sufficient documentation must be provided by the assistance recipient. A checklist detailing the types of information required for a waiver to be processed is attached as Appendix 1.

Additionally, it is strongly encouraged that assistance recipients hold pre-bid conferences with potential bidders. A pre-bid conference can help to identify iron and steel products needed to complete the project as described in the plans and specifications that may not be available from domestic sources. It may also identify the need to seek a waiver prior to bid, and can help inform the recipient on compliance options.

In order to apply for a project waiver, the assistance recipient should email the request in the form of a Word document (.doc) to the State SRF program. It is strongly recommended that the State designate a single person for all AIS communications. The State SRF designee will review the application for the waiver and determine whether the necessary information has been included. Once the waiver application is complete, the State designee will forward the application to either of two email addresses. For CWSRF waiver requests, please send the application to: cwsrfwaiver@epa.gov. For DWSRF waiver requests, please send the application to: dwsrfwaiver@epa.gov.

Evaluation by EPA

After receiving an application for waiver of the AIS requirements, EPA Headquarters will publish the request on its website for 15 days and receive informal comment. EPA Headquarters will then use the checklist in Appendix 2 to determine whether the application properly and adequately documents and justifies the statutory basis cited for the waiver – that it is quantitatively and qualitatively sufficient – and to determine whether or not to grant the waiver.

In the event that EPA finds that adequate documentation and justification has been submitted, the Administrator may grant a waiver to the assistance recipient. EPA will notify the State designee that a waiver request has been approved or denied as soon as such a decision has been made. Granting such a waiver is a three-step process:

1. Posting – After receiving an application for a waiver, EPA is required to publish the application and all material submitted with the application on EPA's website for 15 days. During that period, the public will have the opportunity to review the request and provide informal comment to EPA. The website can be found at: http://water.epa.gov/grants_funding/aisrequirement.cfm

2. Evaluation – After receiving an application for waiver of the AIS requirements, EPA Headquarters will use the checklist in Appendix 2 to determine whether the application properly and adequately documents and justifies the statutory basis cited for the waiver – that it is quantitatively and qualitatively sufficient – and to determine whether or not to grant the waiver.

3. Signature of waiver approval by the Administrator or another agency official with delegated authority – As soon as the waiver is signed and dated, EPA will notify the State SRF program, and post the signed waiver on our website. The assistance recipient should keep a copy of the signed waiver in its project files.

Public Interest Waivers

EPA has the authority to issue public interest waivers. Evaluation of a public interest waiver request may be more complicated than that of other waiver requests so they may take more time than other waiver requests for a decision to be made. An example of a public interest waiver that might be issued could be for a community that has standardized on a particular type or manufacturer of a valve because of its performance to meet their specifications. Switching to an alternative valve may require staff to be trained on the new equipment and additional spare parts would need to be purchased and stocked, existing valves may need to be unnecessarily replaced, and portions of the system may need to be redesigned. Therefore, requiring the community to install an alternative valve would be inconsistent with public interest.

EPA also has the authority to issue a public interest waiver that covers categories of products that might apply to all projects.

EPA reserves the right to issue national waivers that may apply to particular classes of assistance recipients, particular classes of projects, or particular categories of iron or steel products. EPA may develop national or (US geographic) regional categorical waivers through the identification of similar circumstances in the detailed justifications presented to EPA in a waiver request or requests. EPA may issue a national waiver based on policy decisions regarding the public's interest or a determination that a particular item is not produced domestically in reasonably available quantities or of a sufficient quality. In such cases, EPA may determine it is necessary to issue a national waiver.

If you have any questions concerning the contents of this memorandum, you may contact us, or have your staff contact Jordan Dorfman, Attorney-Advisor, State Revolving Fund Branch, Municipal Support Division, at dorfman.jordan@epa.gov or (202) 564-0614 or Kiri Anderer, Environmental Engineer, Infrastructure Branch, Drinking Water Protection Division, at anderer.kirsten@epa.gov or (202) 564-3134.

Attachments

Appendix 1: Information Checklist for Waiver Request

The purpose of this checklist is to help ensure that all appropriate and necessary information is submitted to EPA. EPA recommends that States review this checklist carefully and provide all appropriate information to EPA. This checklist is for informational purposes only and does not need to be included as part of a waiver application.

Items	✓	Notes
General • Waiver request includes the following information: — Description of the foreign and domestic construction materials — Unit of measure — Quantity — Price — Time of delivery or availability — Location of the construction project — Name and address of the proposed supplier — A detailed justification for the use of foreign construction materials • Waiver request was submitted according to the instructions in the memorandum • Assistance recipient made a good faith effort to solicit bids for domestic iron and steel products, as demonstrated by language in requests for proposals, contracts, and communications with the prime contractor		
Cost Waiver Requests • Waiver request includes the following information: — Comparison of overall cost of project with domestic iron and steel products to overall cost of project with foreign iron and steel products — Relevant excerpts from the bid documents used by the contractors to complete the comparison — Supporting documentation indicating that the contractor made a reasonable survey of the market, such as a description of the process for identifying suppliers and a list of contacted suppliers		
Availability Waiver Requests • Waiver request includes the following supporting documentation necessary to demonstrate the availability, quantity, and/or quality of the materials for which the waiver is requested: — Supplier information or pricing information from a reasonable number of domestic suppliers indicating availability/delivery date for construction materials — Documentation of the assistance recipient's efforts to find available domestic sources, such as a description of the process for identifying suppliers and a list of contacted suppliers. — Project schedule — Relevant excerpts from project plans, specifications, and permits indicating the required quantity and quality of construction materials • Waiver request includes a statement from the prime contractor and/or supplier confirming the non-availability of the domestic construction materials for which the waiver is sought • Has the State received other waiver requests for the materials described in this waiver request, for comparable projects?		

Appendix 2: HQ Review Checklist for Waiver Request

Instructions: To be completed by EPA. Review all waiver requests using the questions in the checklist, and mark the appropriate box as Yes, No or N/A. Marks that fall inside the shaded boxes may be grounds for denying the waiver. If none of your review markings fall into a shaded box, the waiver is eligible for approval if it indicates that one or more of the following conditions applies to the domestic product for which the waiver is sought:

1. The iron and/or steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality.
2. The inclusion of iron and/or steel products produced in the United States will increase the cost of the overall project by more than 25 percent.

Review Items	Yes	No	N/A	Comments
Cost Waiver Requests • Does the waiver request include the following information? — Comparison of overall cost of project with domestic iron and steel products to overall cost of project with foreign iron and steel products				
— Relevant excerpts from the bid documents used by the contractors to complete the comparison				
— A sufficient number of bid documents or pricing information from domestic sources to constitute a reasonable survey of the market				
• Does the Total Domestic Project exceed the Total Foreign Project Cost by more than 25%?				
Availability Waiver Requests • Does the waiver request include supporting documentation sufficient to show the availability, quantity, and/or quality of the iron and/or steel product for which the waiver is requested? — Supplier information or other documentation indicating availability/delivery date for materials — Project schedule — Relevant excerpts from project plans, specifications, and permits indicating the required quantity and quality of materials				
• Does supporting documentation provide sufficient evidence that the contractors made a reasonable effort to locate domestic suppliers of materials, such as a description of the process for identifying suppliers and a list of contacted suppliers?				
• Based on the materials delivery/availability date indicated in the supporting documentation, will the materials be unavailable when they are needed according to the project schedule? (By item, list schedule date and domestic delivery quote date or other relevant information)				
• Is EPA aware of any other evidence indicating the non-availability of the materials for which the waiver is requested? Examples include: — Multiple waiver requests for the materials described in this waiver request, for comparable projects in the same State — Multiple waiver requests for the materials described in this waiver request, for comparable projects in other States — Correspondence with construction trade associations indicating the non-availability of the materials				
• Are the available domestic materials indicated in the bid documents of inadequate quality compared those required by the project plans, specifications, and/or permits?				

Appendix 3: Example Loan Agreement Language

ALL ASSISTANCE AGREEMENT MUST HAVE A CLAUSE REQUIRING COMPLIANCE WITH THE AIS REQUIREMENT. THIS IS AN EXAMPLE OF WHAT COULD BE INCLUDED IN SRF ASSISTANCE AGREEMENTS. EPA MAKES NO CLAIMS REGARDING THE LEGALITY OF THIS CLAUSE WITH RESPECT TO STATE LAW:

Comply with all federal requirements applicable to the Loan (including those imposed by the 2014 Appropriations Act and related SRF Policy Guidelines) which the Participant understands includes, among other, requirements that all of the iron and steel products used in the Project are to be produced in the United States ("American Iron and Steel Requirement") unless (i) the Participant has requested and obtained a waiver from the Agency pertaining to the Project or (ii) the Finance Authority has otherwise advised the Participant in writing that the American Iron and Steel Requirement is not applicable to the Project.

Comply with all record keeping and reporting requirements under the Clean Water Act/Safe Drinking Water Act, including any reports required by a Federal agency or the Finance Authority such as performance indicators of program deliverables, information on costs and project progress. The Participant understands that (i) each contract and subcontract related to the Project is subject to audit by appropriate federal and state entities and (ii) failure to comply with the Clean Water Act/Safe Drinking Water Act and this Agreement may be a default hereunder that results in a repayment of the Loan in advance of the maturity of the Bonds and/or other remedial actions.

Appendix 4: Sample Construction Contract Language

ALL CONTRACTS MUST HAVE A CLAUSE REQUIRING COMPLIANCE WITH THE AIS REQUIREMENT. THIS IS AN EXAMPLE OF WHAT COULD BE INCLUDED IN ALL CONTRACTS IN PROJECTS THAT USE SRF FUNDS. EPA MAKES NO CLAIMS REGARDING THE LEGALITY OF THIS CLAUSE WITH RESPECT TO STATE OR LOCAL LAW:

The Contractor acknowledges to and for the benefit of the City of _____ ("Purchaser") and the _____ (the "State") that it understands the goods and services under this Agreement are being funded with monies made available by the Clean Water State Revolving Fund and/or Drinking Water State Revolving Fund that have statutory requirements commonly known as "American Iron and Steel;" that requires all of the iron and steel products used in the project to be produced in the United States ("American Iron and Steel Requirement") including iron and steel products provided by the Contactor pursuant to this Agreement. The Contractor hereby represents and warrants to and for the benefit of the Purchaser and the State that (a) the Contractor has reviewed and understands the American Iron and Steel Requirement, (b) all of the iron and steel products used in the project will be and/or have been produced in the United States in a manner that complies with the American Iron and Steel Requirement, unless a waiver of the requirement is approved, and (c) the Contractor will provide any further verified information, certification or assurance of compliance with this paragraph, or information necessary to support a waiver of the American Iron and Steel Requirement, as may be requested by the Purchaser or the State. Notwithstanding any other provision of this Agreement, any failure to comply with this paragraph by the Contractor shall permit the Purchaser or State to recover as damages against the Contractor any loss, expense, or cost (including without limitation attorney's fees) incurred by the Purchaser or State resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the State or any damages owed to the State by the Purchaser). While the Contractor has no direct contractual privity with the State, as a lender to the Purchaser for the funding of its project, the Purchaser and the Contractor agree that the State is a third-party beneficiary and neither this paragraph (nor any other provision of this Agreement necessary to give this paragraph force or effect) shall be amended or waived without the prior written consent of the State.

Appendix 5: Sample Certifications

The following information is provided as a sample letter of **step** certification for AIS compliance. Documentation must be provided on company letterhead.

Date

Company Name

Company Address

City, State Zip

Subject: American Iron and Steel Step Certification for Project (XXXXXXXXXX)

I, (company representative), certify that the (melting, bending, coating, galvanizing, cutting, etc.) process for (manufacturing or fabricating) the following products and/or materials shipped or provided for the subject project is in full compliance with the American Iron and Steel requirement as mandated in EPA's State Revolving Fund Programs.

Item, Products and/or Materials:

1. Xxxx
2. Xxxx
3. Xxxx

Such process took place at the following location:

_____

If any of the above compliance statements change while providing material to this project we will immediately notify the prime contractor and the engineer.

Signed by company representative

The following information is provided as a sample letter of certification for AIS compliance. Documentation must be provided on company letterhead.

Date

Company Name

Company Address

City, State Zip

Subject: American Iron and Steel Certification for Project (XXXXXXXXXX)

I, (company representative), certify that the following products and/or materials shipped/provided to the subject project are in full compliance with the American Iron and Steel requirement as mandated in EPA's State Revolving Fund Programs.

Item, Products and/or Materials:

1. Xxxx
2. Xxxx
3. Xxxx

Such process took place at the following location:

_____

If any of the above compliance statements change while providing material to this project we will immediately notify the prime contractor and the engineer.

Signed by company representative

DELAWARE WATER POLLUTION CONTROL REVOLVING LOAN FUND

PROGRAM REQUIREMENTS

Department of Natural Resources and Environmental Control
Division of Water Resources
Financial Assistance Branch
89 Kings Highway
Dover, DE 19901

Last revision: February 2010

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SUBPART A
Delaware Prevailing Wage Regulations

The Project or Program to which the work covered by this contract pertains to is being assisted by the State of Delaware and the following provisions are included in this Contract pursuant to the provisions applicable to such Clean Water State Revolving Loan Fund (CWSRF) Program. Loan recipients or engineering representatives are to verify with the State of Delaware Department of Labor to the appropriate wage determination before they go out for competitive bidding.

Delaware Prevailing Wage Regulations, Worker Classifications, Current Prevailing Wage Rates and forms may be found at:

http://www.delawareworks.com/industrialaffairs/services/LaborLawEnforcementInfo.shtml#pw1

or by contacting:

State of Delaware
Department of Labor
Division of Industrial Affairs
225 Corporate Blvd. Suite 104
Newark, DE 19702
Telephone No. (302) 761-8200

Weekly sworn payroll forms are also to be submitted to the same address.

SUBPART B:
Equal Opportunity Clause (41 CFR 60-1.4)

A. Executive Order 11246 (Applicable to Contracts/subcontracts above $10,000).

1. During the performance of this contract the contractor and all subcontractors agree as follows:

   a. The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, or national origin, such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer, recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection of training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

   b. The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive considerations for employment without regard to race, color, religion, sex, or national origin.

   c. The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

   d. The contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

   e. The contractor will furnish all information and reports required by the Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

   f. In the event of the contractors' noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be cancelled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

g. The contractor will include the portion of the sentence immediately preceding Paragraph (1) and the provisions of Paragraphs (1) through (7) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance: *Provided, however,* that in the event a contractor becomes involved in, or is threatened with litigation with a subcontractor or vendor as a result of such direction by the administering agency the contractor may request the United States to enter into such litigation to protect the interests of the United States.

SUBPART C:
Certification of Non-segregated Facilities (41 CFR 60-1.8)

Bidders and offerers are cautioned as follows: By signing this bid or offer, the bidder or offerers will be deemed to have signed and agreed to the provisions of the "Certification of Nonsegregated Facilities" in this solicitation. The certification provides that the bidder or offerer does not maintain or provide for his employees facilities which are segregated on a basis of race, creed, color, or national origin, whether such facilities are segregated by directive or on a de facto basis. The certification also provides that he will not maintain such segregated facilities.

SUBPART D

Disadvantaged Business Enterprise Regulations for Loan Recipients, Prime Contractors and Subcontractors (CFR Title 40, Part 33)

A. Introduction

EPA's Disadvantaged Business Enterprise (DBE) rule applies to procurement actions funded in part by EPA assistance agreements awarded after May 27, 2008. Loan recipients, their prime contractors and DBE subcontractors are responsible for complying with these regulations during procurement of construction contracts, equipment purchase orders, service agreements (engineering, inspection, legal, etc) and supplies. A list of Fair Share Objectives, the Six Good Faith Efforts, responsibilities for loan recipients, prime contractors and DBE subcontractors and appendices A, B, C and D are as follows:

B. Fair Share Objectives

The DBE fair share objectives for the loan recipients and prime contractors of the Delaware State Revolving Fund Program (SRF) which includes Minority Business Enterprises (MBEs) and Women's Business Enterprises (WBEs) is as follows:

		MBE - %	WBE - %
1.	Construction	2.49	3.69
2.	Goods/Equipment Combined	11.69	12.62
3.	Services	4.85	3.62
4.	Supplies	2.41	2.41

The above goals are not a quota and apply to DBE participation only.

C. Six Good Faith Efforts:

1. Ensure DBEs are made aware of contracting opportunities to the fullest extent practicable through outreach and recruitment activities; including placing qualified DBEs on solicitation lists and soliciting them whenever they are potential sources.

2. Make information on forthcoming opportunities available to DBEs. Adjust time frames and delivery schedules to encourage participation by DBEs. Advertise for bids and proposals for at least 30 calendar days before bid closing date, unless circumstances require a shorter advertising period.

3. Divide total requirements of the project, when economically feasible, to permit maximum DBE participation.

4. Encourage contracting with a consortium of DBE's when a contract is too large for one of these firms to handle individually.

5. To obtain lists of DBE firms, use the services of the Delaware Department of Transportation (DelDOT), the United States Small Business Administration (SBA), and the Minority Business Development Agency (MDBA) of the U.S. Department of Commerce.

6. Require the prime contractor to follow steps 1 through 5, if prime contractor will be sub-contracting parts of the contract work.

D. **Loan Recipient's Responsibilities**

1. Adopt the fair share objectives of the State of Delaware revolving loan fund (SRF) or conduct an Availability Analysis of local DBE resources and negotiate fair share objectives with EPA Region III Office of Policy and Management. Loan recipients who receive a loan of $250,000 or less are exempt from adopting fair share objectives. This exemption from adopting fair share objectives does NOT exempt a loan recipient from the other DBE responsibilities.

2. Include a copy of Appendix A from the DBE regulations in each contract with prime contractor (for construction, engineering, equipment purchases, etc) which is fully or partially funded with a SRF loan subjective to DBE requirements.

3. Apply the six good faith efforts during procurement of construction, equipment, services, and supplies in each contract which is fully or partially funded with a SRF loan subjective to DBE requirements.

4. Require the prime contractor to complete all applicable items on the lists of Prime Contractor's Pre-award and Post-Award Responsibilities under section E of this subpart. In addition, the request for bids/proposal should define which items need to be included in the bid opening envelope and if necessary, a time frame for submitting additional forms to complete the bid package. State procurement laws and policies may define the bidding requirements that need to be followed by the recipient.

5. Report semiannually DBE participation achievements to the State of Delaware SRF using EPA form 5700-52A, even if the reports are negative reports. Reports are due no more than 30 days after March 31 and September 30. Report must be submitted until the final loan payment is made.

6. Maintain records documenting compliance achieved with the requirements of the DBE regulations, including documentation of the SRF loan recipient and its prime contractor's good faith efforts. Documents to be maintained include solicitation lists, evidence of contacts with DBEs (copies of letters, telephone memos, e-mails), explanations of decisions, EPA forms 6100-3 and EPA 6100-4, bidders list for designated SRF projects, copy of advertisements and copies of EPA forms 5700-52A.

7. Maintain a list of all firms (not just DBEs) that bid or provided a quote on prime contracts and subcontracts. The list must include:
   (a) Entity's name and point of contact;
   (b) Mailing address, telephone number, e-mail address;
   (c) The procurement on which the entity bid or quoted and when the bid or quote was provided:
   (d) Entity's status as a DBE or non-DBE

The list must be maintained until the end of the project period (e.g., construction period or as long as receiving funds from the SRF).

E. **Prime Contractor Pre-Award Responsibilities**

1. Apply the six good faith efforts, if the prime contractor awards subcontracts.

2. Continue to apply the six good faith efforts even if the prime contractor has achieved the fair share objectives.

3. Provide EPA form number 6100-2 *–DBE Program Subcontractor Participation Form* and EPA form number 6100-3 *–DBE Program Subcontractor Performance Form* to each DBE subcontractor selected. These forms are included in Appendix D of this subpart or may be downloaded from EPA's Office of Small Business Programs website: http://www.epa.gov/osbp/grants.htm. EPA form number 6100-3 must be completed by each selected DBE subcontractor and submitted back to the prime contractor so the form can be included in the bid package.

4. Complete EPA form number 6100-4 - DBE *Program Subcontractor Utilization Form*. This form is also included in Appendix D of this subpart or may be downloaded from EPA's Office of Small Business Programs website: http://www.epa.gov/osbp/grants.htm. EPA form number 6100-4 must be completed by the prime contractor and included in the bid package.

5. Submit EPA form 6100-3 and 6100-4 to SRF loan recipient with bid package or proposal.

F. **Prime Contractor Post-Award Responsibilities**

1. Pay subcontractors for satisfactory performance no more than 30 days from the prime contractor's receipt of payment from the SRF loan recipient.

2. Notify the SRF loan recipient in writing prior to termination for convenience of a DBE subcontractor.

3. Employ the six good faith efforts if soliciting a replacement subcontractor after a DBE subcontractor fails to complete work under the subcontract for any reason.

4. Semiannually (on March 31 and September 30) inform the SRF loan recipient of DBE participation achieved for the required reporting.

5. Maintain records documenting compliance with DBE regulations, including documentation of the contractors good faith efforts

G. **DBE Subcontractor's Responsibilities**

1. Obtain certification as a DBE. Self certification is NOT acceptable for EPAs DBE program. DBE firms may be certified by the Small Business Administration (SBA), the State of Delaware Department of Transportation (DelDOT), or by a State, locality or independent private organization provided their applicable criteria match SBA applicable Business Development Program regulations.

2. May submit EPA form 6100-2-*DBE Subcontractor Participation Form* to Ms. Romona McQueen, EPA region III DBE Coordinator. This form gives a DBE an opportunity to describe the work they received from the prime contractor, how they were paid and any other concerns they may have.

3. Must complete EPA form 6100-3-*DBE Program Subcontractor Performance Form*, and submit it to the prime contractor soliciting services from the subcontractor.

APPENDIX A:

DBE Rule Term and Condition

The following term and condition must be included in each procurement contract signed by an EPA loan recipient and their contractors:

The contractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 40 CFR part 33 in the award and administration of contracts awarded under EPA financial assistance agreements. Failure by the contractor to carry out these requirements is a material breach of this contract which may result in termination of this contract or other legally available remedies.

Contractor: _____

Authorized Representative: _____

Date: _____

APPENDIX B

Examples of Good Faith Efforts

A. Loan Recipient

1. **Effort 1**: Awareness covers a variety of activities, including direct solicitation through mailings, phone calls or e-mails, advertizing through publications (newspapers, journals or Dodge reports) and/or listing on websites. Loan recipients should maintain the solicitation list and a narrative statement which explains how the contacts were selected as part of their DBE documentation.

2. **Effort 2**: Soliciting (advertizing) should include a minimum 30-calender days advertizing period. A publisher's affidavit is typically used to document the 30-day advertizing period. If the recipient deviates from this minimum, they should document the reasons for a shorter solicitation period.

3. **Effort 3:** Dividing the total project into smaller tasks is an option that needs to be considered on a project by project basis. A $100 million waste water treatment plant project may have no economic advantage if it is broken down into smaller contracts whereas a $10 million sewer collection system project may easily be broken down into several contracts. Dividing a project based on contractors discipline such as electrical HVAC (Heating, Ventilation and Air Conditioning) would be a measure of compliance with this effort.

4. **Effort 4**: Encouraging contracting with DBE consortium could be as simple as stating this option in the bid advertisement (newspaper notice), solicitation letters to DBEs, and/or in the instruction to bidders section of the specifications.

5. **Effort 5**: Contacting the State of Delaware DOT (DelDOT) or any State of Delaware Certifying Office for a list of certified DBE firms would be appropriate.

6. **Effort 6**: This part may be complied with by incorporating the SPECIAL NOTICE – Appendix C into the bidding documents.

B. Prime Contractors, if Subcontracting

1. **Effort 1**: The prime contract will place DBE's on the solicitation list. A prime contractor may have a limited amount of time to solicit subcontractors because of the 30-day advertisement period for the prime contract. The new regulations require the prime contractor to submit EPA forms 6100-3 and 6100-4 with the bid package. These forms will be part of the contractor's Good Faith Effort documentation.

2. **Effort 2**: The prime contractor will determine the time frames and delivery schedules for the contract. The prime contractor may have less than 30-days to solicit subcontractors. Depending upon the type of work being subcontracted, the time frame and delivery schedules can determine the availability of DBEs.

3. **Effort 3**: The prime contractor has to determine if the total requirements can be divided to allow smaller DBE firms to compete for the work.

4. **Effort 4**: Encouraging contracting with a consortium of DBEs when a subcontract is too large for one DBE firm to handle.

5. **Effort 5**: Prime contractors should be in contact with the State of Delaware DOT (DelDOT), Small Business Administration (SBA) and other Certifying Offices to develop their solicitation lists.

6. **Effort 6**: Not applicable to prime contractors.

APPENDIX C:

SPECIAL NOTICE: Insert into the Instructions for Bidders

A. This is to advise bidders of the requirements of this program regarding the "Good Faith Efforts" necessary to be deemed a responsive and responsible bidder. The Federal Register Part 40 CFR 33.301 requires these Good Faith Efforts in procurement actions to assure that Disadvantaged Business Enterprises (DBE) are made aware of procurement opportunities in construction, equipment, services and supplies under EPA financial assistant agreements.

1. Ensure DBE's are made aware of contracting opportunities to the fullest extent practicable through outreach and recruitment activities by placing qualified DBE's on solicitation lists whenever they are potential sources.

2. Establish delivery schedules, where the requirement permits to encourage participation by DBE's. The loan recipient should allow a 30-day minimum advertising period for bidding.

3. Dividing total requirements, when economically feasible, into small tasks or quantities, to permit maximum participation of DBE's.

4. Encourage contracting with a consortium of DBE's when a contract is too large for one of these firms to handle individually.

5. Using the services and of the Delaware Department of Transportation (DelDOT), the United States Small Business Administration (SBA), and the Minority Business Development Agency (MDBA) of the U.S. Department of Commerce.

6. Require the prime contractor, if subcontracts are to be let, to take steps 1-5.

APPENDIX D: EPA FORMS

A. DBE Subcontractor Participation Form – **EPA FORM 6100-2**

B. DBE Subcontractor Performance Form- **EPA FORM 6100-3**

C. DBE Subcontractor Utilization Form- **EPA FORM 6100-4**

OMB Control No: 2090-0030
Approved: 05/01/2008
Approval Expires: 01/31/2011

Environmental
Protection Agency

Disadvantaged Business Enterprise Program
DBE Subcontractor Participation Form

NAME OF SUBCONTRACTOR[1]	**PROJECT NAME**
ADDRESS	**CONTRACT NO.**
TELEPHONE NO.	EMAIL ADDRESS
PRIME CONTRACTOR NAME	

Please use the space below to report any concerns regarding the above EPA-funded project (e.g., reason for termination by prime contractor, late payment, etc.).

_____
_____
_____
_____
_____

CONTRACT ITEM NO.	ITEM OF WORK OR DESCRIPTION OF SERVICES RECEIVED FROM THE PRIME CONTRACTOR	AMOUNT SUBCONTRACTOR WAS PAID BY PRIME CONTRACTOR

_____ _____
Subcontractor Signature Title/Date

[1]Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.

OMB Control No: 2090-0030
Approved: 05/01/2008
Approval Expires: 01/31/2011

Environmental
Protection Agency

Disadvantaged Business Enterprise Program
DBE Subcontractor Participation Form

The public reporting and recordkeeping burden for this collection of information is estimated to average fifteen (15) minutes. Burden means the total time, effort, or financial resources expended by persons to generate, maintain, retain, or disclose or provide information to or for a Federal agency. This includes the time needed to review instructions; develop, acquire, install, and utilize technology and systems for the purposes of collecting, validating, and verifying information, processing and maintaining information, and disclosing and providing information; adjust the existing ways to comply with any previously applicable instructions and requirements; train personnel to be able to respond to a collection of information; search data sources; complete and review the collection of information; and transmit or otherwise disclose the information. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number.

Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed EPA DBE Subcontractor Participation Form to this address.

OMB Control No: 2090-0030
Approved: 05/01/2008
Approval Expires: 01/31/2011

Environmental
Protection Agency

Disadvantaged Business Enterprise Program
DBE Subcontractor Performance Form

NAME OF SUBCONTRACTOR[1]	**PROJECT NAME**
ADDRESS	**BID/PROPOSAL NO.**
TELEPHONE NO.	**E-MAIL ADDRESS**
PRIME CONTRACTOR NAME	

CONTRACT ITEM NO.	**ITEM OF WORK OR DESCRIPTION OF SERVICES BID TO PRIME**	**PRICE OF WORK SUBMITTED TO PRIME CONTRACTOR**

Currently certified as an MBE or WBE under EPA's DBE Program? _____ Yes _____ No Signature of Prime Contractor Date Print Name Title _____
_____ Signature of Subcontractor Date
_____ _____ Print Name Title

[1]Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.

OMB Control No: 2090-0030
Approved: 05/01/2008
Approval Expires: 01/31/2011

Environmental
Protection Agency

Disadvantaged Business Enterprise Program
DBE Subcontractor Performance Form

The public reporting and recordkeeping burden for this collection of information is estimated to average fifteen (15) minutes. Burden means the total time, effort, or financial resources expended by persons to generate, maintain, retain, or disclose or provide information to or for a Federal agency. This includes the time needed to review instructions; develop, acquire, install, and utilize technology and systems for the purposes of collecting, validating, and verifying information, processing and maintaining information, and disclosing and providing information; adjust the existing ways to comply with any previously applicable instructions and requirements; train personnel to be able to respond to a collection of information; search data sources; complete and review the collection of information; and transmit or otherwise disclose the information. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number.

Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed EPA DBE Subcontractor Performance Form to this address.

OMB Control No: 2090-0030
Approved: 05/01/2008
Approval Expires: 01/31/2011

Environmental
Protection Agency

Disadvantaged Business Enterprise Program
DBE Subcontractor Utilization Form

BID/PROPOSAL NO.	**PROJECT NAME**
NAME OF PRIME BIDDER/PROPOSER	**E-MAIL ADDRESS**
ADDRESS	
TELEPHONE NO.	**FAX NO.**

The following subcontractors[1] will be used on this project:

COMPANY NAME, ADDRESS, PHONE NUMBER, AND E-MAIL ADDRESS	TYPE OF WORK TO BE PERFORMED	ESTIMATED DOLLAR AMOUNT	CURRENTLY CERTIFIED AS AN MBE OR WBE?

I certify under penalty of perjury that the forgoing statements are true and correct. In the event of a replacement of a subcontractor, I will adhere to the replacement requirements set forth in 40 CFR Part 33 Section 33.302(c).

Signature of Prime Contractor _____ Date _____

Print Name _____ Title _____

[1]Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.

OMB Control No: 2090-0030
Approved: 05/01/2008
Approval Expires: 01/31/2011

Environmental
Protection Agency

Disadvantaged Business Enterprise Program
DBE Subcontractor Utilization Form

The public reporting and recordkeeping burden for this collection of information is estimated to average fifteen (15) minutes. Burden means the total time, effort, or financial resources expended by persons to generate, maintain, retain, or disclose or provide information to or for a Federal agency. This includes the time needed to review instructions; develop, acquire, install, and utilize technology and systems for the purposes of collecting, validating, and verifying information, processing and maintaining information, and disclosing and providing information; adjust the existing ways to comply with any previously applicable instructions and requirements; train personnel to be able to respond to a collection of information; search data sources; complete and review the collection of information; and transmit or otherwise disclose the information. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number.

Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed EPA DBE Subcontractor Utilization Form to this address.

SUBPART E

Civil Rights Act of 1964

The contractor and any subcontractors shall not, on the grounds of race, color, or national origin, or sex, exclude from participation in, deny the benefits of, or subject to discrimination any person under any program or activity receiving Federal financial assistance.

SUBPART F
Section 13 of PL 92-500; Under the Federal Water Pollution Control Act; Rehabilitation Act of 1973; PL 93-112; and Age Discrimination Act of 1975

The contractor and any subcontractors shall not on the ground of race, color, national origin, or sex, exclude from participation in, deny the benefits of, or subject to discrimination any person or activity funded in whole or in part with Federal funds. Any prohibition against discrimination on the basis of age under the Age Discrimination Act of 1975, or with respect to any otherwise qualified handicapped individual as provided in Section 504 of the Rehabilitation Act of 1973 shall also apply to any such program of activity.

SUBPART G
Required Provisions of 40 CFR Part 31 Subpart C

A. **Contracts awarded in excess of $10,000**

1. Equal Employment Opportunity Clause
    a. The contractor agrees to comply with Executive Order 11246, entitled Equal Employment Opportunity, "as amended by Executive Order 11375, and as supplemented in Department of Labor regulations (41 CFR Part 60).

B. **Contracts awarded in Excess of $100,000**

1. Violating Facilities Clause
    a. The contractor agrees to comply with all applicable standards, orders or requirements issued under section 306 of the Clean Air Act (42 U.S.C 1857 (h), section 508 of the Clean Water Act (33 U.S.C. 1368), Executive Order 11738, and EPA regulations (40 CFR Part 15) which prohibits the award of this contract to facilities included on the EPA List of Violating Facilities. The contractor shall report violations to EPA.

SUBPART H
Suspension and Debarment and Other Responsibility Matters

The Project or Program to which the work covered by this contract pertains to is being assisted by the State of Delaware and the following provision is included in this Contract pursuant to the provisions applicable to such SRF Program. Loan Recipients or engineering representatives are to refer to the "List of parties excluded from Federal Procurement and Nonprocurement Programs" to insure that the contractor or subcontracts are not on this list. A copy of the list may be obtained from the World Wide Web at www.epls.gov or by calling (202) 512-1800 or by writing to this address:

Superintendent of Documents
U.S. Government Printing Office
Washington, DC
20402

ACCESS TO PROJECT SITE

The Contractor shall allow representatives of U.S. EPA and the State of Delaware DNREC access to the project site.

PROJECT SIGN

The contractor shall provide and erect a sign at a prominent location at each construction site. The sign and location shall be approved by the Engineer. The sign shall be prepared in accordance with the attached detailed instructions. It shall be the responsibility of the Contractor to maintain the sign in good condition throughout the life of the project.

The sign wording shown on Figure 1 is an example only and must be adapted to suit each project. The Contractor shall be responsible for obtaining the appropriate wording from the Engineer.

WORKING FOR YOU TO PROVIDE CLEAN WATER
FOR TODAY & TOMORROW

NAME OF PROJECT

PROJECT NO. xxxx-xx
Name of Engineering Firm

FUNDING PROVIDED BY: **DIVISION OF WATER RESOURCES**

Funding Source	**$xx,xxx,xxx**
Funding Source	**$xx,xxx,xxx**
Funding Source	**$xx,xxx,xxx**
Total Project Costs	**$xx,xxx,xxx**

CONSTRUCTION SITE SIGN REQUIREMENTS

Sign Dimensions: 1200 x 2400 x 19 mm (4’ x 8’ x ¾”) Exterior Plywood (A-B Grade).
1st four lines are 4 inches in height; remaining lines are 2 inches in height.
DNREC Logo is to be the standard colors – decal to be provided by the Financial Assistance Branch.
Black letters on white background with 3 inch border around the perimeter in dark blue. Place bottom of sign 36 inches to 48 inches above grade to permit public viewing.
Provide adequate support for sign.

EXAMPLE
Figure 1

Davis-Bacon and Related Acts (DBRA) Provisions and Procedures for EPA Funded Projects Executed Between October 30, 2009 and September 30, 2010 or required under Continuing Resolution

A Supplement to the CWSRF Program Requirements

January 28, 2010
Updated April 5, 2011

I. Introduction

The Davis Bacon Act requires that all contractors and subcontractors performing construction, alteration and repair work under federal contracts in excess of $2,000 pay their laborers and mechanics not less than the prevailing wage and fringe benefits. Projects executed between October 30, 2009 and September 30, 2010 (or projects subject to Davis-Bacon under Continuing Resolution) are subject to the Davis-Bacon provisions through completion of construction and must comply with the following:

A. This contract clause pertains to minimum wages for any contract in excess of $2,000 which is entered into for the actual construction, alteration and/or repair**,** including painting and decorating, of a public building or public work, or building or work financed in whole, or in part, from federal funds or in accordance with guarantees of a federal agency or financed from funds obtained by pledge of any contract of a federal agency to make a loan, grant or annual contribution.

1. **Minimum wages**. All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account, the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor at the following web site www.wdol.gov/dba.aspx, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics. A "wage determination" is the listing of wage and fringe benefit for each classification of laborers and mechanics which the Administrator of the Wage and Hour Division of the U.S. Department of Labor has determined to be prevailing in a given area for a particular type of construction (e.g., building, heavy, highway, or residential). The wage determination (including any additional classification and wage rates) and the Davis-Bacon poster (WH–1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers. The poster may be downloaded from: http://www.dol.gov/esa/whd/regs/compliance/posters/fedprojc.pdf

2. **Withholding**. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the regulations, the loan or grant recipient may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

3. **Payrolls and basic records**. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of **three years** thereafter for all laborers and mechanics working at the site

of the work. The contractor shall submit weekly for each week in which any contract work is performed, a copy of all payrolls to the recipient, sponsor, or owner. The required weekly payroll information may be submitted in any form desired. A contractor may use Form WH–347 which is available from the Wage and Hour Division web site at: http://www.dol.gov/esa/whd/forms/wh347.pdf .

4. **Subcontracts.** The prime contractor is responsible for the compliance by any subcontractor or lower tier subcontractor with the requirements above, the requirements identified in the Davis Bacon Terms and Conditions of the EPA assistance agreement, and the contract clauses in 29 CFR 5.5, which can be found at http://ecfr.gpoaccess.gov/

B. **Contract Work Hours and Safety Standards Act**. In any contract in an amount in excess of $100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act, the following clauses shall apply:

1. **Overtime requirements**. No contractor or subcontractor for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek. The overtime rate of time and one half does not apply to fringe payments. For work in excess of forty hours, fringe payments should continue to be paid on a per hour worked basis.

2. **Violation; liability for unpaid wages; liquidated damages**. In the event of any violation of the clause set forth in paragraph (B) (1) of this section the contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States government, for liquidated damages.

3. **Withholding for unpaid wages and liquidated damages**. The recipient shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (B) (2) of this section.

4. **Subcontracts.** The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (B) (1) through (4) of this section.

C) In any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes cited in 29 CFR 5.1, the contractor or subcontractor shall

maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years.

II. Davis Bacon Compliance Procedures

A. **Before Contract Award** - Once it is determined that Davis Bacon wage rates will apply to a construction contract, the recipient's contracting organization must state in the solicitation that Davis Bacon Prevailing wage rates are applicable, and bid packages must include the current Davis Bacon general wage determination for the area where construction will occur**.** To select the prevailing wage rate determination for a specific locality:

(i) Go to website http://www.wdol.gov/
(ii) Select "DBA WDs"
(iii) Input the State and County where the construction site is located.
(iv) Input the type of construction for the project as Building, Heavy, Highway or Residential.

B. **Before Bid Opening-** The wage determination website should be continually monitored by the contracting organization for modifications. Generally, the most current published wage determination at the time of contract award must be incorporated into the contract. A wage determination update issued less than 10 days before bid opening shall be in effect unless there is not a reasonable time to notify all prospective bidders. In these cases the relevant facts should be documented in the contract file

A convenient way to monitor potential wage determination modifications is to sign up for the alert service as shown on the website http://www.wdol.gov/

C. **After Contract Award** - After solicitation, bid opening and contractor selection by the recipient contracting organization, the prevailing wage determination shall be included in the final construction contract between the recipient, sub recipient or borrower and its contractor.

In the event the construction contract is not awarded within 90 days of the bid opening date, any modification to the prevailing wage determination published prior to award of the contract shall be effective and should be included in the award documents, or by modification to the contract documents.

III. Applicability of the Davis-Bacon and Related Acts to EPA programs

EPA capitalization grants to states, which provides loans to municipalities and other eligible entities for eligible projects, including wastewater water infrastructure projects, estuary projects, and non-point source projects.

COMPLIANCE STATEMENT

This statement relates to a proposed contract with _____

_____

(Name of borrower or grantee)

who expects to finance the contract with assistance from either the Delaware Water Pollution Control Revolving Fund or Delaware 21st Century Fund (whether by a loan, grant, loan insurance, guarantee, or other form of financial assistance). I am the undersigned bidder or prospective contractor, I represent that:

1. ☐I have, ☐ have not, participated in a previous contract or subcontract subject to Executive Order 11246 (regarding equal employment opportunity) or a preceding similar Executive Order.

2. If I have participated in such a contract or subcontract, ☐ I have, ☐ have not, filed all compliance reports that have been required to file in connection with the contract or subcontract.

If the proposed contract is for $50,000 or more and I have 50 or more employees, I also represent that:

3. ☐I have, ☐ have not previously had contracts subject to the written affirmative action programs requirements of the Secretary of Labor.

4. If I have participated in such a contract or subcontract, ☐ I have, ☐ have not developed and placed on file at each establishment affirmative action programs as required by the rules and regulations of the Secretary of Labor.

I understand that if I have failed to file any compliance reports that have been required of me, I am not eligible and will not be eligible to have my bid considered or to enter into the proposed contract unless and until I make an arrangement regarding such reports that is satisfactory to either the DNREC, or to the office where the reports are required to be filed.

I also certify that I do not maintain or provide for my employees any segregated facilities at any of my establishments, and that I do not permit my employees to perform their services at any location, under my control, where segregated facilities are maintained. I certify further that I will not maintain or provide for my employees any segregated facilities at any of my establishments, and that I will not permit my employees to perform their services at any location, under my control, where segregated facilities are maintained. I agree that a breach of this certification is a violation of the Equal Opportunity clause in my contract. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, restrooms and wash rooms, restaurants and other eating areas time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, creed, color, or national origin, because of habit, local custom, or otherwise. I further agree that (except where I have obtained identical certifications for proposed subcontractors for specific time periods) I will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity clause; that I will retain such certifications in my files; and that I will forward the following notice to such proposed subcontractors (except where the proposed subcontractors have submitted identical certifications for specific time periods):

NOTICE TO PROSPECTIVE SUBCONTRACTORS OF REQUIREMENTS FOR CERTIFICATIONS OF NON-SEGREGATED FACILITIES

A certification of Nonsegregated Facilities, as required by the May 9, 1967, order (32F.R. 7439, may 19, 1967) on Elimination of Segregated Facilities, by the Secretary of Labor, must be submitted prior to the award of a subcontract exceeding $ 10,000 which is not exempt from the provisions of the Equal Opportunity clause. The certification may be submitted either for each subcontract or for all subcontracts during a period (i.e., quarterly, semiannually, or annually).

NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

_____

(Signature) (Date)

_____

(Name and Title of Signer – Please Type)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

FEB 18 2015

OFFICE OF WATER

DECISION MEMORANDUM

SUBJECT: National Product Waiver for Pig Iron and Direct Reduced Iron for State Revolving Fund Projects

FROM: Ellen Gilinsky for Kenneth J. Kopocis
Deputy Assistant Administrator

The U.S. Environmental Protection Agency is hereby granting a national product waiver pursuant to the "American Iron and Steel" provisions of the Clean Water Act and Public Law 113-235, the "Consolidated and Further Continuing Appropriations Act, 2015," for certain intermediate goods used in the manufacture of iron and steel products.[1] This waiver permits the use of pig iron and direct reduced iron manufactured outside of the United States in domestic manufacturing processes for iron and steel products used in projects funded by a Clean Water or Drinking Water State Revolving Fund that may otherwise be prohibited absent this waiver. The waiver is retroactive and thus also applies to the use of non-domestic pig iron and direct reduced iron before the signature date.

Background: Pig iron and direct reduced iron are intermediate products of iron and steel manufacturing used as material feed sources in iron and steel foundries and steel mills. Pig iron is a product of iron ore smelting in a blast furnace. It is made from molten iron, which has been cast in the shape of "pigs" as it comes from the blast furnace. Direct reduced iron ore is produced from iron ore, pellets or fines, which are reduced in a solid state using natural gas. Hot briquetted iron, or HBI, is a compacted form of direct reduced iron with enhanced physical characteristics for shipment and storage.

Coverage: This waiver permits the use of iron and steel products that were manufactured using non-domestic pig iron and direct reduced iron in projects that receive funds from either the CWSRF or DWSRF. Any project that received or will receive funds from the CWSRF or DWSRF beginning with the enactment of P.L. 113-76, the "Consolidated Appropriations Act, 2014," may use this waiver for iron and steel that use these intermediate goods.

Rationale: The AIS provisions require CWSRF and DWSRF assistance recipients to use specific domestic iron and steel products that are produced in the United States if the project is funded

[1]Absent a waiver, all treatment works and drinking water facilities that are constructed, in whole or in part, with funds from the CWSRF or the DWSRF, must use American made iron and steel. EPA is allowed under certain circumstances to provide waivers of this requirement.

through an SRF assistance agreement unless the Agency determines that it is necessary to waive this requirement. EPA has authority to issue waivers in accordance with Section 608(c)(2) of the Clean Water Act and the AIS provisions extended by P.L. 113-235, the "Consolidated and Further Continuing Appropriations Act, 2015," under the authority of Section 424(b)(2). The provision states in part: "[the requirements] shall not apply in any case or category of cases in which the Administrator of the Environmental Protection Agency…finds that – iron and steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality."

Product manufacturers and suppliers informed EPA of concerns about the sufficient availability of domestically produced pig iron and direct reduced iron. The iron and steel products produced at steel mills and foundries that use non-domestic intermediate goods are not compliant with the AIS requirements. AIS compliant products used at water and wastewater projects could be in extremely short supply should a waiver of the intermediate goods not be available.

EPA conducted extensive market research on the supply of pig iron and direct reduced iron and found that domestic supplies of these goods sold on the open market are generally not available. There are three major types of facilities that manufacture iron and steel finished products: basic oxygen furnace steel mills (BOF), electric arc furnace steel mills (EAF) and foundries. BOF steel mills undertake both iron making and steel making, as molten iron from the blast furnace is the required feedstock for BOF steel production. EAF steel mills and foundries, on the other hand, use iron and steel scrap as their principal feedstock, which must be supplemented with the use of pig iron and/or direct reduced iron in their manufacturing processes to achieve required steel qualities.

EPA market research has shown that BOF steel mills are able to produce adequate amounts of pig iron to meet their own demands, but these mills use the bulk of this production for their own processes and do not sell pig iron on the open market in sufficient quantities. At this time, there is only one producer of direct reduced iron operating in the U.S. and the company uses the output internally for EAF steel production. Therefore, EAF steel mills and foundries must import pig iron and direct reduced iron to meet their iron needs.

At least 60 percent of the nation's steel production comes from the EAF steel mills that use non-domestic pig iron and direct reduced iron in their manufacturing processes. Consequently, the majority of steel used in water and wastewater projects would not be compliant with the AIS requirements absent this waiver. Similarly, most, if not all, of the iron foundries in the United States use non-domestic pig iron and direct reduced iron to produce cast and ductile iron products used by water and wastewater projects. Therefore, the majority of iron used in water and wastewater projects would not be compliant with the AIS requirements absent this waiver. Hence, EPA is hereby providing a nationwide waiver pursuant to AIS requirements to cover the non-domestic intermediate iron goods used in the manufacture of iron and/or steel components and products for water and wastewater projects.

Public Comments: EPA requested comments on the draft national waiver and a majority of the comments received were supportive of a national waiver. The commenters in support of the waiver agreed with the Agency's conclusion that pig iron and direct reduced iron are not

produced in the United States in sufficient and reasonably available quantities to meet the needs of many domestic foundries and steel mills. These commenters believe that the waiver will ensure that pig iron and direct reduced iron are treated similarly to raw material inputs in iron and steel manufacturing and by doing so the EPA will preserve the viability of the AIS requirement. These commenters also state that the waiver would treat pig iron and direct reduced iron in a manner consistent with the implementation of other similar federal laws such as the Federal Highway Administration's Buy America requirement. The FHWA issued a similar nationwide waiver of the Buy America requirements in 1995 for pig iron and processed, pelletized and reduced iron ore.

A few commenters challenged the Agency's issuance of a nationwide waiver of the AIS requirements for pig iron and direct reduced iron. These commenters disagreed with the Agency's interpretation of the AIS requirements and stated that raw materials used in iron and steel production must also be produced in the United States. In addition, the commenters questioned whether the Agency could exempt iron and steel products that are composed of non-domestic materials.

The statutory language lists the categories of products that are considered "iron and steel products." The statutory requirements include provisions that allow the EPA to issue waivers under defined conditions, including the case where iron and steel products are not produced in the United States in sufficient and reasonably available quantities. The Agency's market research, supported by comments from manufacturers, has shown that pig iron and direct reduced iron are not produced in the United States in sufficient and reasonably available quantities. Therefore the Agency is authorized to issue a waiver for iron and steel products composed of non-domestic pig iron and direct reduced iron.

Legal Authority: Legal authority for the AIS requirements for CWSRF projects is included under Sec. 608(c)(2) of the Clean Water Act and previously under P.L. 113-76, the "Consolidated Appropriations Act, 2014," under the authority of Section 436(b)(2). Legal authority for the AIS requirements for DWSRF projects is included under P.L. 113-235, the "Consolidated and Further Continuing Appropriations Act, 2015," under the authority of Section 424(b)(2) and also previously under P.L. 113-76. This waiver will continue in force for DWSRF projects under any continuing resolutions or statutes that use similar language as in Section 424 of the "Consolidated and Further Continuing Appropriations Act, 2015."

If you have questions concerning the contents of this memorandum, please contact Timothy Connor, Chemical Engineer, Municipal Support Division, at connor.timothy@epa.gov or (202) 566-1059 or Kiri Anderer, Environmental Engineer, Drinking Water Protection Division, at anderer.kirsten@epa.gov or (202) 564-3134.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

FEB 18 2015

OFFICE OF WATER

DECISION MEMORANDUM

SUBJECT: Short-Term National Product Waiver for Stainless Steel Nuts and Bolts used in Pipe Couplings, Restraints, Joints, Flanges, and Saddles for State Revolving Fund Projects

FROM: Kenneth J. Kopocis
Deputy Assistant Administrator

The U.S. Environmental Protection Agency is hereby granting a national product waiver pursuant to the "American Iron and Steel" provisions of the Clean Water Act and Public Law 113-235, the "Consolidated and Further Continuing Appropriations Act, 2015."[1] The waiver permits the use of non-domestically produced stainless steel nuts and bolts in bolting-type pipe couplings, restraints, joints, flanges and repair saddles in iron and steel products for projects funded by a Clean Water or Drinking Water State Revolving Fund that may otherwise be prohibited absent this waiver. This national product waiver is short-term, applying to the covered products if those products are purchased up until one year after the waiver's signature date. The waiver is retroactive and also applies to products purchased before the signature date. Covered products purchased prior to the waiver's signature date or within the one-year period may be used subsequent to the waiver expiration date.

Coverage: The specific product categories covered by this waiver include bolted expansion joints, bolted dismantling joints, bolted pipe couplings, bolted pipe restraints, bolted pipe flanges, bolted flange adapters, bolted pipe repair or service saddles, bolted mechanical joints, and pipe hangers and supports. Non-domestic stainless steel nuts and bolts may be incorporated into these specific products; however, all other iron and steel components in these products, unless subject to a waiver, must still meet the AIS requirements. In other words, this waiver does not exempt the whole product, or any of the main iron or steel components such as the ring, sleeve, body, flange spool or mechanical joint, from the AIS requirements just because stainless steel nuts and bolts are used. Any project that receives funds from the CWSRF or DWSRF since the enactment of P.L. 113-76, the "Consolidated Appropriations Act, 2014," is required to comply with the AIS provisions.

[1] Absent a waiver, all treatment works and drinking water facilities that are constructed, in whole or in part, with funds from the CWSRF or the DWSRF, must use American made iron and steel. EPA is allowed under certain circumstances to provide waivers of this requirement.

Rationale: The AIS provisions require CWSRF and DWSRF assistance recipients to use specific domestic iron and steel products that are produced in the United States if the project is funded through an SRF assistance agreement unless the Agency determines that it is necessary to waive this requirement. EPA has authority to issue waivers in accordance with Section 608(c)(2) of the Clean Water Act and the AIS provisions extended by P.L. 113-235, the "Consolidated and Further Continuing Appropriations Act, 2015," under the authority of Section 424(b)(2). The provision states in part: "[the requirements] shall not apply in any case or category of cases in which the Administrator of the Environmental Protection Agency…finds that – iron and steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality."

Product manufacturers and suppliers informed EPA of concerns about insufficient availability of appropriate domestically produced stainless steel nuts and bolts for use in their bolting-type products. They noted concerns about both delivery (up to six-month delays) and pricing (as much as ten-fold increases per fastener piece).

EPA conducted extensive research and outreach into the market supply of the required parts and determined that, at the time of this waiver, the current manufacturers and suppliers of domestic stainless steel nuts and bolts used in the products identified above are not able to deliver sufficient and reasonably available quantities and sizes of stainless steel nuts and bolts for the products needed. Although special-order stainless steel nuts and bolts might be obtainable for select requests, the lag-time for delivery of these products does not meet the requirements of most projects or suppliers. However, one supplier informed EPA that it is in the process of increasing its supply of domestic nuts and bolts and expects to be providing increased supply within several months. Hence, EPA is providing a national product waiver for one year. Prior to the expiration of the waiver, EPA intends to reassess the market and supply for stainless steel nuts and bolts for the products of interest and will reassess the need for reissuing this waiver.

Public Comments: EPA received comments generally in favor of issuing a waiver. Several commenters requested that EPA include additional types of stainless steel bolts and rods within purview of this waiver, as follows: threaded U-bolts used as a part of a pipe saddle; the restraint rod in bolted pipe restraints; joint harness tie bolts; threaded hook rods in adjustable beam clamps; and pipe hanger rods. EPA is declining to include these products in this waiver. The pipe hanger rods and threaded hook rods are not integral to the coupling products covered by this waiver. Additionally, market research shows that the requested additional rods/U-bolts/harness tie bolts integrated within the couplings covered by this waiver are all domestically available. Their availability is in sufficient quantity to differentiate them from the covered stainless steel bolts and nuts covered herein.

Some commenters requested that EPA make the waiver a permanent action. EPA has decided to issue the waiver for a one-year term. Prior to the expiration of the waiver, EPA will reassess the product market for any changes in domestic availability. As noted above, EPA learned that at least one domestic manufacturer has expressed interest in producing AIS compliant products that would meet the need addressed by this waiver. Hence, EPA has determined that it will not issue a permanent waiver at this time.

Other commenters requested that EPA clarify the coverage of this waiver for past and future products, in other words explain whether products purchased prior to enactment of this waiver would be covered. As noted above, the waiver is retroactive. Recipients thus may use products covered by this waiver that were purchased prior to the signature date.

Finally, one commenter suggested that all fasteners (regardless of whether or not they are stainless steel) be excluded from the AIS requirement. EPA declines to act on this recommendation. While EPA understands that for some manufacturers there is significant burden to track, obtain, store and manage separate stocks of domestic and foreign fasteners within their product lines, it does not consider this waiver to be the appropriate means to address this issue. EPA understands that domestic fastener manufacturers can provide most of the types and sizes of non-stainless steel fasteners needed for covered projects and therefore EPA will not include all fasteners.

Legal Authority: Legal authority for the AIS requirements for CWSRF projects is included under Sec. 608(c)(2) of the Clean Water Act and previously under P.L. 113-76, the "Consolidated Appropriations Act, 2014," under the authority of Section 436(b)(2). Legal authority for the AIS requirements for DWSRF projects is included under P.L. 113-235, the "Consolidated and Further Continuing Appropriations Act, 2015," under the authority of Section 424(b)(2) and also previously under P.L. 113-76. This waiver will continue in force for DWSRF projects under any continuing resolutions or statutes that use similar language as in Section 424 of the "Consolidated and Further Continuing Appropriations Act, 2015."

If you have questions concerning the contents of this memorandum, please contact Timothy Connor, Chemical Engineer, Municipal Support Division, at connor.timothy@epa.gov or (202) 566-1059 or Kiri Anderer, Environmental Engineer, Drinking Water Protection Division, at anderer.kirsten@epa.gov or (202) 564-3134.

SECTION 00700 – GENERAL CONDITIONS

Part 1 - General:

General Conditions:

The General Conditions of this Contract are as stated in The American Institute of Architects' AIA Document A201 (2007 Edition) entitled General Conditions of the Contract for Construction and is part of this Project Manual as if herein written in full.

Copies of the Document are available through the Owner.

END OF SECTION

SECTION 00710 - GENERAL REQUIREMENTS

The following GENERAL REQUIREMENTS supplement AIA Document A201 (2007 Edition). In the event of conflict or discrepancies among the Contract Documents, the Documents prepared by the State of Delaware, Division of Parks and Recreation shall take precedence over all other documents.

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ARTICLE 1: GENERAL PROVISIONS

1.1 CONTRACT DOCUMENTS

1.1.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary and what is required by one shall be as binding as if required by all. Performance by the Contractor shall be required to an extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the intended results.

1.1.2 Work including material purchases shall not begin until the Contractor is in receipt of a bonafide State of Delaware Purchase Order. Any work performed or material purchases prior to the issuance of the Purchase Order is done at the Contractor’s own risk and cost.

1.2 EQUALITY OF EMPLOYMENT OPPORTUNITY ON PUBLIC WORKS

1.2.1 For Public Works Projects financed in whole or in part by State appropriation, the Contractor agrees that during the performance of this Contract:

.1 The Contractor will not discriminate against any employee or applicant for employment because of race, creed, color, sex or national origin. The Contractor will take positive steps to ensure that applicants are employed and that employees are treated during employment without regard to their race, creed, color, sex or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the contracting Agency setting forth this nondiscrimination clause.

.2 The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that "all qualified applicants will receive consideration for employment without regard to race, creed, color, sex or national origin."

ARTICLE 2: OWNER

(NO ADDITIONAL GENERAL REQUIREMENTS – SEE SECTION 00800, SUPPLEMENTARY GENERAL CONDITIONS)

ARTICLE 3: CONTRACTOR

3.1 Schedule of Values: The successful Bidder shall within twenty (20) days after receiving notice to proceed with the Work, furnish to the Owner a complete schedule of values on the various items comprising the Work.

3.2 Subcontracts: Upon approval of Subcontractors, the Contractor shall award their Subcontracts as soon as possible after the signing of their own Contract and see that all material, their own and those of their Subcontractors, are promptly ordered so that the Work will not be delayed by failure of materials to arrive on time.

3.3 Before commencing any work or construction, the General Contractor is to consult with the Owner as to matters in connection with access to the site and the allocation of Ground Areas for the various features of hauling, storage, etc.

3.4 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences and procedures and for

coordinating all portions of the Work under the Contract, unless the Contract Documents give other specific instructions.

3.5 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Contract. The Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them.

3.6 The Contractor warrants to the Owner that materials and equipment furnished will be new and of good quality, unless otherwise permitted, and that the Work will be free from defects and in conformance with the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved, may be considered defective. If required by the Owner, the Contractor shall furnish evidence as to the kind and quality of materials and equipment provided.

3.7 Unless otherwise provided, the Contractor shall pay all sales, consumer, use and other similar taxes, and shall secure and pay for required permits, fees, licenses, and inspections necessary for proper execution of the Work.

3.8 The Contractor shall comply with and give notices required by laws, ordinances, rules, regulations, and lawful orders of public authorities bearing on performance of the Work. The Contractor shall promptly notify the Owner if the Drawings and Specifications are observed to be at variance therewith.

3.9 The Contractor shall be responsible to the Owner for the acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons performing portions of the Work under contract with the Contractor.

3.10 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work the Contractor shall remove from and about the Project all waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus materials. The Contractor shall be responsible for returning all damaged areas to their original conditions.

3.11 STATE LICENSE AND TAX REQUIREMENTS

3.11.1 In conformance with Chapter 25, Title 30, Section 2502, any person desiring to engage in business in the State of Delaware shall obtain a license upon making application to the Division of Revenue. This license must be obtained and proof of license compliance must be made prior to, or in conjunction with, the execution of a contract to such person. In the case of contracts in excess of $50,000 which are competitively bid, such person shall have initiated the license application procedure required by this subsection with the Division of Revenue prior to, or in conjunction with, the submission of a

bid on a contract, or, in the case of a Subcontractor, prior to the submission of a bid by the General Contractor.

3.11.2 Each Contractor and Subcontractor shall be licensed to do business in the State of Delaware and shall pay all fees and taxes due under State laws. In conformance with Section 2503, Chapter 25, Title 30, Delaware Code, the Contractor "shall furnish the Department of Finance within 10 days after entering into any contract with a contractor or subcontractor not a resident of this State, a statement of the total value of such contract or contracts together with the names and addresses of the contracting parties."

3.11.3 The Contractor shall comply with all requirements set forth in Section 6962, Chapter 69, Title 29 of the Delaware Code.

ARTICLE 4: ADMINISTRATION OF THE CONTRACT

4.1 CONTRACT SURETY

4.1.1 PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND

4.1.2 All bonds will be required as follows unless specifically waived elsewhere in the Bidding Documents.

4.1.3 Contents of Performance Bonds – The bond shall be in the form approved by the Office of Management and Budget. The bond shall be conditioned upon the faithful compliance and performance by the successful Bidder of each and every term and condition of the Contract and the proposal, Plans, Specifications, and Bid Documents thereof. Each term and condition shall be met at the time and in the manner prescribed by the Contract, Bid Documents and the Specifications, including the payment in full to every person furnishing materiel or performing labor in the performance of the Contract, of all sums of money due the person for such labor and materiel. (The bond shall also contain the successful bidder's guarantee to indemnify and save harmless the State and the Agency from all costs, damages and expenses growing out of or by reason of the Contract in accordance with the Contract.)

4.1.4 Invoking a Performance Bond – The Agency may, when it considers that the interest of the State so requires, cause judgment to be confessed upon the bond.

4.1.5 Within twenty (20) days after the date of notice of award of Contract, the Bidder to whom the award is made shall furnish a Performance Bond and Labor and Material Payment Bond, each equal to the full amount of the Contract price to guarantee the faithful performance of all terms, covenants

and conditions of the same. The bonds are to be issued by an acceptable Bonding Company licensed to do business in the State of Delaware and shall be issued in duplicate. In the event a change order is issued which affects total contract price issued, the Contractor shall notify the Surety of the change in contract price and shall show proof of approval to the Agency.

4.1.6 Performance and Payment Bonds shall be maintained in full force (warranty bond) for a period of two (2) years after the date of the Certificate for Final Payment. The Performance Bond shall guarantee the satisfactory completion of the Project and that the Contractor will make good any faults or defects in his Work which may develop during the period of said guarantees as a result of improper or defective workmanship, material or apparatus, whether furnished by themselves or their Sub-Contractors. The Payment Bond shall guarantee that the Contractor shall pay in full all persons, firms or corporations who furnish labor or material or both labor and material for, or on account of, the work included herein. The bonds shall be paid for by this Contractor. The Owner shall have the right to demand proof that the parties signing the bonds are duly authorized to do so.

4.2 FAILURE TO COMPLY WITH CONTRACT

4.2.1 If any firm entering into a contract with the State, or Agency neglects or refuses to perform or fails to comply with the terms thereof, the Agency which signed the Contract may terminate the Contract and proceed to award a new contract in accordance with Chapter 69, Title 29 of the Delaware Code or may require the Surety on the Performance Bond to complete the Contract in accordance with the terms of the Performance Bond. Nothing herein shall preclude the Agency from pursuing additional remedies as otherwise provided by law.

4.3 CONTRACT INSURANCE AND CONTRACT LIABILITY

4.3.1 In addition to the bond requirements stated in the Bid Documents, each successful Bidder shall purchase adequate insurance for the performance of the Contract and, by submission of a Bid, agrees to indemnify and save harmless and to defend all legal or equitable actions brought against the State, any Agency, officer and/or employee of the State, for and from all claims of liability which is or may be the result of the successful Bidder’s actions during the performance of the Contract.

4.3.2 The purchase or nonpurchase of such insurance or the involvement of the successful Bidder in any legal or equitable defense of any action brought against the successful Bidder based upon work performed pursuant to the Contract will not waive any defense which the State, its agencies and their respective officers, employees and agents might otherwise have against such

claims, specifically including the defense of sovereign immunity, where applicable, and by the terms of this section, the State and all agencies, officers and employees thereof shall not be financially responsible for the consequences of work performed, pursuant to said contract.

4.4 RIGHT TO AUDIT RECORDS

4.4.1 The Owner shall have the right to audit the books and records of a Contractor or any Subcontractor under any Contract or Subcontract to the extent that the books and records relate to the performance of the Contract or Subcontract.

4.4.2 Said books and records shall be maintained by the Contractor for a period of seven (7) years from the date of final payment under the Prime Contract and by the Subcontractor for a period of seven (7) years from the date of final payment under the Subcontract.

ARTICLE 5: SUBCONTRACTORS

5.1 SUBCONTRACTING REQUIREMENTS

5.1.1 All contracts for the construction, reconstruction, alteration or repair of any public building (not a road, street or highway) shall be subject to the following provisions:

.1 A contract shall be awarded only to a Bidder whose Bid is accompanied by a statement containing, for each Subcontractor category, the name and address (city or town and State only – street number and P.O. Box addresses not required) of the Subcontractor whose services the Bidder intends to use in performing the Work and providing the material for such Subcontractor category.

.2 A Bid will not be accepted nor will an award of any Contract be made to any Bidder which, as the Prime Contractor, has listed itself as the Subcontractor for any Subcontractor unless:

.1 It has been established to the satisfaction of the awarding Agency that the Bidder has customarily performed the specialty work of such Subcontractor category by artisans regularly employed by the Bidder’s firm;

.2 That the Bidder is duly licensed by the State to engage in such specialty work, if the State requires licenses; and

.3 That the Bidder is recognized in the industry as a bona fide Subcontractor or Contractor in such specialty work and Subcontractor category.

5.1.2 The decision of the awarding Agency as to whether a Bidder who lists itself as the Subcontractor for a Subcontractor category shall be final and binding upon all Bidders, and no action of any nature shall lie against any awarding Agency or its employees or officers because of its decision in this regard.

5.1.3 After such a Contract has been awarded, the successful Bidder shall not substitute another Subcontractor for any Subcontractor whose name was set forth in the statement which accompanied the Bid without the written consent of the awarding Agency.

5.1.4 No Agency shall consent to any substitution of Subcontractors unless the Agency is satisfied that the Subcontractor whose name is on the Bidders accompanying statement:

.1 Is unqualified to perform the work required;

.2 Has failed to execute a timely reasonable Subcontract;

.3 Has defaulted in the performance on the portion of the work covered by the Subcontract; or

.4 Is no longer engaged in such business.

5.2 PENALTY FOR SUBSTITUTION OF SUBCONTRACTORS

5.2.1 Should the Contractor fail to utilize any or all of the Subcontractors in the Contractor's Bid statement in the performance of the Work on the public bidding, the Contractor shall be penalized in the amount of (project specific amount*). The Agency may determine to deduct payments of the penalty from the Contractor or have the amount paid directly to the Agency. Any penalty amount assessed against the Contractor may be remitted or refunded, in whole or in part, by the Agency awarding the Contract, only if it is established to the satisfaction of the Agency that the Subcontractor in question has defaulted or is no longer engaged in such business. No claim for the remission or refund of any penalty shall be granted unless an application is filed within one year after the liability of the successful Bidder accrues. All penalty amounts assessed and not refunded or remitted to the Contractor shall be reverted to the State.

*one (1) percent of contract amount not to exceed $10,000

5.3 ASBESTOS ABATEMENT

5.3.1 The selection of any Contractor to perform asbestos abatement for State-funded projects shall be approved by the Office of Management and Budget, Division of Facilities Management pursuant to Chapter 78 of Title 16.

5.4 STANDARDS OF CONSTRUCTION FOR THE PROTECTION OF THE PHYSICALLY HANDICAPPED

5.4.1 All Contracts shall conform with the standard established by the Delaware Architectural Accessibility Board unless otherwise exempted by the Board.

5.5 CONTRACT PERFORMANCE

5.5.1 If any firm entering into a Public Works Contract neglects or refuses to perform or fails to comply with its terms, the Agency may terminate the Contract and proceed to award a new Contract or may require the Surety on the Performance Bond to complete the Contract in accordance with the terms of the Performance Bond.

ARTICLE 6: CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

6.1 The Owner reserves the right to simultaneously perform other construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other projects at the same site.

6.2 The Contractor shall afford the Owner and other Contractors reasonable opportunity for access and storage of materials and equipment, and for the performance of their activities, and shall connect and coordinate their activities with other forces as required by the Contract Documents.

ARTICLE 7: CHANGES IN THE WORK

7.1 The Owner, without invalidating the Contract, may order changes in the Work consisting of Additions, Deletions, Modifications or Substitutions, with the Contract Sum and Contract completion date being adjusted accordingly. Such changes in the Work shall be authorized by written Change Order signed by the Architect, as the duly authorized agent, the Contractor and the Owner.

7.2 The Contract Sum and Contract Completion Date shall be adjusted only by a fully executed Change Order.

7.3 The additional cost, or credit to the Owner resulting from a change in the Work shall be by mutual agreement of the Owner, Contractor and the Architect. In all cases, this

cost or credit shall be based on the 'DPE' wages required and the "invoice price" of the materials/equipment needed.

7.3.1 "DPE" shall be defined to mean "direct personnel expense". Direct payroll expense includes direct salary plus customary fringe benefits (prevailing wage rates) and documented statutory costs such as workman's compensation insurance, Social Security/Medicare, and unemployment insurance (a maximum multiplier of 1.35 times DPE).

7.3.2 "Invoice price" of materials/equipment shall be defined to mean the actual cost of materials and/or equipment that is paid by the Contractor, (or subcontractor), to a material distributor, direct factory vendor, store, material provider, or equipment leasing entity. Rates for equipment that is leased and/or owned by the Contractor or subcontractor(s) shall not exceed those listed in the latest version of the "Means Building Construction Cost Data" publication.

7.3.3 In addition to the above, the General Contractor is allowed a fifteen percent (15%) markup for overhead and profit for additional work performed by the General Contractor's own forces. For additional subcontractor work, the Subcontractor is allowed a fifteen (15) percent overhead and profit on Change Order work above and beyond the direct costs stated previously. To this amount, the General Contractor will be allowed a mark-up not exceeding seven and one half percent (7.5%) on the subcontractors work. These mark-ups shall include all costs including, but not limited to: overhead, profit, bonds, insurance, supervision, etc. No markup is permitted on the work of the subcontractor's subcontractor. No additional costs shall be allowed for changes related to the Contractor's onsite superintendent/staff, or project manager, unless a change in the work changes the project duration and is identified by the CPM schedule. There will be no other costs associated with the Change Order.

7.3.4 Additional work performed by the Contractor without authorization of a Change Order will not entitle him to an increase in the Contract Price or an extension of the Contract Time, except for emergencies as outlined in AIA Document A201, Paragraph 10.4 EMERGENCIES.

ARTICLE 8: TIME

8.1 Time limits, if any, are as stated in the Project Manual. By executing the Agreement, the Contractor confirms that the stipulated limits are reasonable, and that the Work will be completed within the anticipated time frame.

8.2 If progress of the Work is delayed at any time by changes ordered by the Owner, by labor disputes, fire, unusual delay in deliveries, abnormal adverse weather

conditions, unavoidable casualties or other causes beyond the Contractor's control, the Contract Time shall be extended for such reasonable time as the Owner may determine.

8.3 Any extension of time beyond the date fixed for completion of the construction and acceptance of any part of the Work called for by the Contract, or the occupancy of the building by the Owner, in whole or in part, previous to the completion shall not be deemed a waiver by the Owner of his right to annul or terminate the Contract for abandonment or delay in the matter provided for, nor relieve the Contractor of full responsibility.

8.4 SUSPENSION AND DEBARMENT

8.4.1 Per Section 6962(d)(14), Title 29, Delaware Code, “Any Contractor who fails to perform a Public Works Contract or complete a Public Works Project within the time schedule established by the Agency in the invitation to bid, may be subject to Suspension or Debarment for one or more of the following reasons: a) failure to supply the adequate labor supply ratio for the project; b) inadequate financial resources; or, c) poor performance on the Project.”

8.4.2 Upon such failure for any of the above stated reasons, the Agency that contracted for the Public Works Project may petition the Director of the Office of Management and Budget for Suspension or Debarment of the Contractor. The Agency shall send a copy of the petition to the Contractor within three (3) working days of filing with the Director. If the Director concludes that the petition has merit, the Director shall schedule and hold a hearing to determine whether to suspend the Contractor, debar the Contractor or deny the petition. The Agency shall have the burden of proving, by a preponderance of the evidence, that the Contractor failed to perform or complete the Public Works Project within the time schedule established by the Agency and failed to do so for one or more of the following reasons: a) failure to supply the adequate labor supply ratio for the project; b) inadequate financial resources; or, c) poor performance on the project. Upon a finding in favor of the Agency, the Director may suspend a Contractor from Bidding on any project funded, in whole or in part, with public funds for up to 1 year for a first offense, up to 3 years for a second offense and permanently debar the Contractor for a third offense. The Director shall issue a written decision and shall send a copy to the Contractor and the Agency. Such decision may be appealed to the Superior Court within thirty (30) days for a review on the record.

8.5 RETAINAGE

8.5.1 Per Section 6962(d)(5), Title 29, Delaware Code: The Agency may at the beginning of each Public Works Project establish a time schedule for the

completion of the project. If the project is delayed beyond the completion date due to the Contractor's failure to meet their responsibilities, the Agency may hold permanently, at its discretion, all or part of the Contractor's retainage.

8.5.2 This forfeiture of retainage also applies to the timely completion of the punchlist. A punchlist will only be prepared upon the mutual agreement of the Owner, Architect and Contractor. Once the punchlist is prepared, all three parties will by mutual agreement, establish a schedule for its completion. Should completion of the punchlist be delayed beyond the established date due to the Contractor's failure to meet their responsibilities, the Agency may hold permanently, at its discretion, all or part of the Contractor's retainage.

ARTICLE 9: PAYMENTS AND COMPLETION

9.1 APPLICATION FOR PAYMENT

9.1.1 Applications for payment shall be made upon AIA Document G702.

9.1.2 A date will be fixed for the taking of the monthly account of work done. Upon receipt of Contractor's itemized application for payment, such application will be audited, modified, if found necessary, and approved for the amount. Statement shall be submitted to the Owner.

9.1.3 Section 6516, Title 29 of the Delaware Code annualized interest is not to exceed 12% per annum beginning thirty (30) days after the "presentment" (as opposed to the date) of the invoice.

9.2 PARTIAL PAYMENTS

9.2.1 Any Public Works Contract executed by any Agency may provide for partial payments at the option of the Owner with respect to materials placed along or upon the sites or stored at secured locations, which are suitable for use in the performance of the Contract.

9.2.2 When approved by the Agency, partial payment may include the values of tested and acceptable materials of a nonperishable or noncontaminative nature which have been produced or furnished for incorporation as a permanent part of the Work yet to be completed, provided acceptable provisions have been made for storage.

.1 Any allowance made for materials on hand will not exceed the delivered cost of the materials as verified by invoices furnished by the Contractor, nor will it exceed the contract bid price for the material complete in place.

9.2.3 If requested by the Agency, receipted bills from all Contractors, Subcontractors, and materialmen, etc., for the previous payment must accompany each application for payment. Following such a request, no payment will be made until these receipted bills have been received by the Owner.

9.3 SUBSTANTIAL COMPLETION

9.3.1 When the building has been made suitable for occupancy, but still requires small items of miscellaneous work, the Owner will determine the date when the Project has been Substantially Completed.

9.3.2 If, after the Work has been Substantially Completed, full completion thereof is materially delayed through no fault of the Contractor, and without terminating the Contract, the Owner may make payment of the balance due for the portion of the Work fully completed and accepted. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

9.3.3 On projects where commissioning is included, the commissioning work as defined in the specifications must be complete prior to the issuance of Substantial Completion.

9.4 FINAL PAYMENT

9.4.1 Final payment, including the retainage if determined appropriate, shall be made within thirty (30) days after the Work is fully completed and the Contract fully performed and provided that the Contractor has submitted the following closeout documentation (in addition to any other documentation required elsewhere in the Contract Documents):

.1 Evidence satisfactory to the Owner that all payrolls, material bills, and other indebtedness connected with the Work have been paid,

.2 An acceptable RELEASE OF LIENS,

.3 Copies of all applicable warranties,

.4 As-built drawings,

.5 Operations and Maintenance Manuals,

.6 Instruction Manuals,

.7 Consent of Surety to final payment.

.8 The Owner reserves the right to retain payments, or parts thereof, for its protection until the foregoing conditions have been complied with, defective work corrected and all unsatisfactory conditions remedied.

ARTICLE 10: PROTECTION OF PERSONS AND PROPERTY

10.1 The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract. The Contractor shall take all reasonable precautions to prevent damage, injury or loss to: workers, persons nearby who may be affected, the Work, materials and equipment to be incorporated, and existing property at the site or adjacent thereto. The Contractor shall give notices and comply with applicable laws, ordinances, rules, regulations, and lawful orders of public authorities bearing on the safety of persons and property and their protection from injury, damage, or loss. The Contractor shall promptly remedy damage and loss to property at the site caused in whole or in part by the Contractor, a Subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable.

10.2 The Contractor shall notify the Owner in the event any existing hazardous material such as lead, PCBs, asbestos, etc. is encountered on the project. The Owner will arrange with a qualified specialist for the identification, testing, removal, handling and protection against exposure or environmental pollution, to comply with applicable regulation laws and ordinances. The Contractor and Architect will not be required to participate in or to perform this operation. Upon completion of this work, the Owner will notify the Contractor and Architect in writing the area has been cleared and approved by the authorities in order for the work to proceed. The Contractor shall attach documentation from the authorities of said approval.

10.3 As required in the Hazardous Chemical Information Act of June 1984, all vendors supplying any materials that may be defined as hazardous, must provide Material Safety Data Sheets for those products. Any chemical product should be considered hazardous if it has a warning caution on the label relating to a potential physical or health hazard, if it is known to be present in the work place, and if employees may be exposed under normal conditions or in any foreseeable emergency situation. Material Safety Data Sheets must be provided directly to the Owner along with the shipping slips that include those products.

10.4 The Contractor shall certify to the Owner that materials incorporated into the Work are free of all asbestos. This certification may be in the form of Material Safety Data Sheet (MSDS) provided by the product manufacturer for the materials used in construction, as specified or as provided by the Contractor.

ARTICLE 11: INSURANCE AND BONDS

11.1 The Contractor shall carry all insurance required by law, such as Unemployment Insurance, etc. The Contractor shall carry such insurance coverage as they desire on their own property such as a field office, storage sheds or other structures erected upon the project site that belong to them and for their own use. The Subcontractors involved with this project shall carry whatever insurance protection they consider necessary to cover the loss of any of their personal property, etc.

11.2 Upon being awarded the Contract, the Contractor shall obtain a minimum of two (2) copies of all required insurance certificates called for herein, and submit one (1) copy of each certificate, to the Owner, within 20 days of contract award.

11.3 Bodily Injury Liability and Property Damage Liability Insurance shall, in addition to the coverage included herein, include coverage for injury to or destruction of any property arising out of the collapse of or structural injury to any building or structure due to demolition work and evidence of these coverages shall be filed with and approved by the Owner.

11.4 The Contractor's Property Damage Liability Insurance shall, in addition to the coverage noted herein, include coverage on all real and personal property in their care, custody and control damaged in any way by the Contractor or their Subcontractors during the entire construction period on this Project.

11.5 Builders Risk (including Standard Extended Coverage Insurance) on the existing building during the entire construction period, shall not be provided by the Contractor under this Contract. The Owner shall insure the existing building and all of its contents and all this new alteration work under this Contract during entire construction period for the full insurable value of the entire work at the site. Note, however, that the Contractor and their Subcontractors shall be responsible for insuring building materials (installed and stored) and their tools and equipment whenever in use on the project, against fire damage, theft, vandalism, etc.

11.6 Certificates of the insurance company or companies stating the amount and type of coverage, terms of policies, etc., shall be furnished to the Owner, within 20 days of contract award.

11.7 The Contractor shall, at their own expense, (in addition to the above) carry the following forms of insurance:

11.7.1 Contractor's Contractual Liability Insurance

Minimum coverage to be:

Bodily Injury	$ 500,000	for each person
	$1,000,000	for each occurrence

	$1,000,000	aggregate
Property Damage	$ 500,000	for each occurrence
	$1,000,000	aggregate

11.7.2 Contractor's Protective Liability Insurance

Minimum coverage to be:

Bodily Injury	$ 500,000	for each person
	$1,000,000	for each occurrence
	$1,000,000	aggregate
Property Damage	$ 500,000	for each occurrence
	$ 500,000	aggregate

11.7.3 Automobile Liability Insurance

Minimum coverage to be:

Bodily Injury	$1,000,000	for each person
	$1,000,000	for each occurrence
Property Damage	$ 500,000	per accident

11.7.4 Prime Contractor's and Subcontractors' policies shall include contingent and contractual liability coverage in the same minimum amounts as 11.7.1 above.

11.7.5 Workmen's Compensation (including Employer's Liability):

.1 Minimum Limit on employer's liability to be as required by law.

.2 Minimum Limit for all employees working at one site.

11.7.6 Certificates of Insurance must be filed with the Owner guaranteeing fifteen (15) days prior notice of cancellation, non-renewal, or any change in coverages and limits of liability shown as included on certificates.

11.7.7 Social Security Liability

.1 With respect to all persons at any time employed by or on the payroll of the Contractor or performing any work for or on their behalf, or in connection with or arising out of the Contractor’s business, the Contractor shall accept full and exclusive liability for the payment of any and all contributions or taxes or unemployment insurance, or old age retirement benefits, pensions or annuities now or hereafter imposed by

the Government of the United States and the State or political subdivision thereof, whether the same be measured by wages, salaries or other remuneration paid to such persons or otherwise.

.2 Upon request, the Contractor shall furnish Owner such information on payrolls or employment records as may be necessary to enable it to fully comply with the law imposing the aforesaid contributions or taxes.

.3 If the Owner is required by law to and does pay any and/or all of the aforesaid contributions or taxes, the Contractor shall forthwith reimburse the Owner for the entire amount so paid by the Owner.

ARTICLE 12: UNCOVERING AND CORRECTION OF WORK

12.1 The Contractor shall promptly correct Work rejected by the Owner or failing to conform to the requirements of the Contract Documents, whether observed before or after Substantial Completion and whether or not fabricated, installed or completed, and shall correct any Work found to be not in accordance with the requirements of the Contract Documents within a period of two years from the date of Substantial Completion, or by terms of an applicable special warranty required by the Contract Documents. The provisions of this Article apply to work done by Subcontractors as well as to Work done by direct employees of the Contractor.

12.2 At any time during the progress of the Work, or in any case where the nature of the defects shall be such that it is not expedient to have them corrected, the Owner, at their option, shall have the right to deduct such sum, or sums, of money from the amount of the Contract as they consider justified to adjust the difference in value between the defective work and that required under Contract including any damage to the structure.

ARTICLE 13: MISCELLANEOUS PROVISIONS

13.1 CUTTING AND PATCHING

13.1.1 The Contractor shall be responsible for all cutting and patching. The Contractor shall coordinate the work of the various trades involved.

13.2 DIMENSIONS

13.2.1 All dimensions shown shall be verified by the Contractor by actual measurements at the Project site. Any discrepancies between the Drawings and Specifications and the existing conditions shall be referred to the Owner for adjustment before any work affected thereby has been performed.

13.3 LABORATORY TESTS

13.3.1 Any specified laboratory tests of material and finished articles to be incorporated in the Work shall be made by bureaus, laboratories or agencies approved by the Owner and reports of such tests shall be submitted to the Owner. The cost of the testing shall be paid for by the Contractor.

13.3.2 The Contractor shall furnish all sample materials required for these tests and shall deliver same without charge to the testing laboratory or other designated agency when and where directed by the Owner.

13.4 ARCHAEOLOGICAL EVIDENCE

13.4.1 Whenever in the course of construction any archaeological evidence is encountered on the surface or below the surface of the ground, the Contractor shall notify the Owner and the authorities of the State Historic Preservation Office and suspend work in the immediate area for a reasonable time to permit those authorities or persons designated by the Owner, to ascertain its historic and cultural significance and to determine the need for compliance with the relevant State and Federal law and policies.

13.5 GLASS REPLACEMENT AND CLEANING

13.5.1 The General Contractor shall replace without expense to the Owner all glass broken during the construction of the project. If job conditions warrant, at completion of the job the General Contractor shall have all glass cleaned and polished.

13.6 WARRANTY

13.6.1 For a period of two (2) years from the date of Substantial Completion, as evidenced by the date of final acceptance of the work, the Contractor warrants that work performed under this Contract conforms to the Contract requirements and is free of any defect of equipment, material or workmanship performed by the Contractor or any of his subcontractors or suppliers. However, manufacturer's warranties and guarantees, if for a period longer than two (2) years, shall take precedence over the above warranties. The Contractor shall remedy, at his own expense, any such failure to conform or any such defect. The protection of this warranty shall be included in the Contractor's Performance Bond.

ARTICLE 14: TERMINATION OR SUSPENSION OF THE CONTRACT

14.1 If the Contractor defaults or persistently fails or neglects to carry out the Work in accordance with the Contract Documents or fails to perform a provision of the Contract, the Owner, after seven days written notice to the Contractor, may make

good such deficiencies and may deduct the cost thereof from the payment then or thereafter due the Contractor. Alternatively, at the Owner's option, and the Owner may terminate the Contract and take possession of the site and of all materials, equipment, tools, and machinery thereon owned by the Contractor and may finish the Work by whatever method the Owner may deem expedient. If the costs of finishing the Work exceed any unpaid compensation due the Contractor, the Contractor shall pay the difference to the Owner.

14.2 If the continuation of this Agreement is contingent upon the appropriation of adequate State, or federal funds, this Agreement may be terminated on the date beginning on the first fiscal year for which funds are not appropriated or at the exhaustion of the appropriation. The Owner may terminate this Agreement by providing written notice to the parties of such non-appropriation. All payment obligations of the Owner will cease upon the date of termination. Notwithstanding the foregoing, the Owner agrees that it will use its best efforts to obtain approval of necessary funds to continue the Agreement by taking appropriate action to request adequate funds to continue the Agreement.

END OF SECTION

SECTION 00800 – SUPPLEMENTARY CONDITIONS

The following supplements modify the "General Conditions of the Contract for Construction," AIA Document A201-2007. Where a portion of the General Conditions is modified or deleted by the Supplementary General Conditions, the unaltered portions of the General Conditions shall remain in effect.

TABLE OF ARTICLES

1. GENERAL PROVISIONS
2. OWNER
3. CONTRACTOR
4. ADMINISTRATION OF THE CONTRACT
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13. MISCELLANEOUS PROVISIONS
14. TERMINATION OR SUSPENSION OF THE CONTRACT
15. CLAIMS AND DISPUTES

ARTICLE 1: GENERAL PROVISIONS

1.1 BASIC DEFINITIONS

1.1.1 THE CONTRACT DOCUMENTS

Delete the last sentence in its entirety and replace with the following:

"The Contract Documents also include Advertisement for Bid, Instructions to Bidders, sample forms, the Bid Form, the Contractor's completed Bid and the Award Letter."

Add the following clause:

1.1.1.1 In the event of conflict or discrepancies among the Contract Documents, the Documents prepared by the State of Delaware, Division of Parks and Recreation shall take precedence over all other documents.

1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

Add the following subparagraphs:

1.2.4 In the case of an inconsistency between the Drawings and the Specifications, or within either document not clarified by Addendum, the better quality or greater quantity of work shall be provided in accordance with the Architect's interpretation.

1.2.5 The word "PROVIDE" as used in the Contract Documents shall mean "FURNISH AND INSTALL" and shall include, without limitation, all labor, materials, equipment, transportation, services and other items required to complete the Work.

1.2.6 The word "PRODUCT" as used in the Contract Documents means all materials, systems and equipment.

1.5 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS AND OTHER INSTRUMENTS OF SERVICE

Delete subparagraph 1.5.1 in its entirety and replace with the following:

"All pre-design studies, drawings, specifications and other documents, including those in electronic form, prepared by the Architect under this Agreement are, and shall remain, the property of the Owner whether the Project for which they are made is executed or not. Such documents may be used by the Owner to construct one or more like Projects without the approval of, or additional compensation to, the Architect. The Contractor, Subcontractors, Sub-subcontractors and Material or Equipment Suppliers are authorized to use and reproduce applicable portions of the Drawings, Specifications and other documents prepared by the Architect and the Architect's consultants appropriate to and for use in the execution of their Work under the Contract Documents. They are not to be used by the Contractor or any Subcontractor, Sub-subcontractor or Material and Equipment Supplier on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect and Architect's consultants.

The Architect shall not be liable for injury or damage resulting from the re use of drawings and specifications if the Architect is not involved in the re use project. Prior to re-use of construction documents for a project in which the Architect is not also involved, the Owner will remove from such documents all identification of the original Architect, including name, address and professional seal or stamp."

Delete subparagraph 1.5.2 in its entirety.

ARTICLE 2: OWNER

2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

To subparagraph 2.2.3 – Add the following sentence:

"The Contractor, at their expense shall bear the costs to accurately identify the location of all underground utilities in the area of their excavation and shall bear all cost for any repairs required, out of failure to accurately identify said utilities."

Delete subparagraph 2.2.5 in its entirety and substitute the following:

2.2.5 The Contractor will be furnished, free of charge, a specified number of copies of Drawings and Project Manuals. Refer to Section 01005, ADMINISTRATIVE PROVISIONS. Additional sets will be furnished at the cost of reproduction, postage and handling.

ARTICLE 3: CONTRACTOR

3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

Amend subparagraph 3.2.2 to state that any errors, inconsistencies or omissions discovered shall be reported to the Architect and Owner immediately.

Delete the third sentence in subparagraph 3.2.4.

3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

Add the following clause to subparagraph 3.3.2:

3.3.2.1 The Contractor shall immediately remove from the Work, whenever requested to do so by the Owner, any person who is considered by the Owner or Architect to be incompetent or disposed to be so disorderly, or who for any reason is not satisfactory to the Owner, and that person shall not again be employed on the Work without the consent of the Owner or the Architect.

Add the following subparagraphs:

3.3.4 The Contractor must provide suitable storage facilities at the Site for the proper protection and safe storage of their materials. Consult the Owner and the Architect before storing any materials.

3.3.5 When any room is used as a shop, storeroom, office, etc., by the Contractor or Subcontractor(s) during the construction of the Work, the Contractor making use of these areas will be held responsible for any repairs, patching or cleaning arising from such use.

3.4 LABOR AND MATERIALS

Add the following subparagraphs:

3.4.4 Before starting the Work, each Contractor, or Subcontractor, shall carefully examine all preparatory Work that has been executed to receive their Work. Check carefully, by whatever means are required, to insure that its Work and adjacent, related Work, will finish to proper contours, planes and levels. Promptly notify the General Contractor/Construction Manager of any defects or imperfections in preparatory Work which will in any way affect satisfactory completion of its Work. Absence of such notification will be construed as an acceptance of preparatory Work and later claims of defects will not be recognized.

3.4.5 Under no circumstances shall the Contractor's Work proceed prior to preparatory Work having been completely cured, dried and/or otherwise made satisfactory to receive this Work. Responsibility for timely installation of all materials rests solely with the Contractor responsible for that Work, who shall maintain coordination at all times.

3.5 WARRANTY

Add the following subparagraphs:

3.5.1 The Contractor will guarantee all materials and workmanship against original defects, except injury from proper and usual wear when used for the purpose intended, for two years after Acceptance by the Owner, and will maintain all items in perfect condition during the period of guarantee.

3.5.2 Defects appearing during the period of guarantee will be made good by the Contractor at his expense upon demand of the Owner, it being required that all Work will be in perfect condition when the period of guarantee will have elapsed.

3.5.3 In addition to the General Guarantee there are other guarantees required for certain items for different periods of time than the two years as above, and are particularly so stated in that part of the specifications referring to same. The said guarantees will commence at the same time as the General Guarantee.

3.5.4 If the Contractor fails to remedy any failure, defect or damage within a reasonable time after receipt of notice, the Owner will have the right to replace, repair, or otherwise remedy the failure, defect or damage at the expense of the Contractor and/or his surety.

3.11 DOCUMENTS AND SAMPLES AT THE SITE

Add the following subparagraphs:

3.11.1 During the course of the Work, the Contractor shall maintain a record set of drawings on which the Contractor shall mark the actual physical

location of all piping, valves, equipment, conduit, outlets, access panels, controls, actuators, including all appurtenances that will be concealed once construction is complete, etc., including all invert elevations.

3.11.2 At the completion of the Project, the Contractor shall obtain a set of reproducible drawings from the Architect, and neatly transfer all information outlined in 3.11.1 to provide a complete record of the as-built conditions.

3.11.3 The Contractor shall provide two (2) prints of the as-built conditions, along with the reproducible drawings themselves, to the Owner and one (1) set to the Architect. In addition, attach one complete set to each of the Operating and Maintenance Instructions/Manuals.

3.13 USE OF SITE

Add the following new subparagraphs:

3.13.1 The Contractor will not load nor permit any part of the structure to be loaded with weight that will endanger the structure.

3.13.2 Storage areas will be defined for the storage of the Contractor's materials and equipment and he shall confine his materials, equipment, and operations of his workmen to such limits as indicated by the Owner. Unless otherwise indicated in the Specifications, the storage areas will be outdoors, and the contractor shall provide whatever shelter is necessary for his storage and fabricating needs. No workmen shall trespass within areas or buildings of the Owner other than those related to the Work of the Contract. The Contractor shall rigidly enforce this regulation. Any materials, equipment or temporary structures belonging to the Contractor shall be moved when so directed by the Owner to permit the execution of the work of others in connection with the Project.

3.17 ROYALTIES, PATENTS AND COPYRIGHTS

In the second sentence of the paragraph, insert “indemnify and” between “shall” and “hold”.

ARTICLE 4: ADMINISTRATION OF THE CONTRACT

4.2 ADMINISTRATION OF THE CONTRACT

Delete the first sentence of subparagraph 4.2.7 and replace with the following:

The Architect will review and approve or take other appropriate action upon the Contractor’s submittals such as Shop Drawings, Product Data and Samples for the

purpose of checking for conformance with the Contract Documents.

Delete the second sentence of subparagraph 4.2.7 and replace with the following:

The Architect's action will be taken with such reasonable promptness as to cause no delay in the Work or in the activities of the Owner, Contractor or separate Contractors, while allowing sufficient time in the Owner's professional judgment to permit adequate review.

Add the following clause to subparagraph 4.2.10:

4.2.10.1 There will be no full-time project representative provided by the Owner or Architect on this project.

Add to subparagraph 4.2.13 "and in compliance with all local requirements." to the end of the sentence.

ARTICLE 5: SUBCONTRACTORS

5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

Delete subparagraph 5.2.3 in its entirety and replace with the following:

5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection, subject to the statutory requirements of 29 Delaware Code § 6962(d)(10)b.3 and 4.

ARTICLE 6: CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

6.1 OWNER'S RIGHT TO PERFORM CONSTRUCTION AND TO AWARD SEPARATE CONTRACTS

Delete Paragraph 6.1.4 in its entirety.

6.2 MUTUAL RESPONSIBILITY

6.2.3 In the second sentence, strike the word "shall" and insert the word "may".

Add the following Paragraph to Article 6:

6.4 DEPARTMENT FURNISHED MATERIALS AND EQUIPMENT

6.4.1 If any materials or equipment are to be furnished by the Owner for the Work, they will be so specified in the Contract Documents. Unless otherwise specified, it shall be the Contractor's responsibility to locate,

receive, handle and store, if necessary, any item of Owner furnished material or equipment which he is required by the Contract to install, erect or handle in any way, from the time it is received by the Contractor at the jobsite or other Owner approved location until completion of the Work in accordance with the Contract Documents. Damaged or lost Owner furnished items shall be repaired or replaced by the Contractor without additional cost to the Owner. See Section 01005, ADMINISTRATIVE PROVISIONS for list of Owner furnished materials and equipment.

ARTICLE 7: CHANGES IN THE WORK

(SEE ARTICLE 7: CHANGES IN WORK IN THE GENERAL REQUIREMENTS)

ARTICLE 8: TIME

8.2 PROGRESS AND COMPLETION

Add the following clause to subparagraph 8.2.1:

8.2.1.1 Refer to Specification Section 01005, ADMINISTRATIVE PROVISIONS for Contract time requirements.

Add the following new subparagraph:

8.2.4 If the Work falls behind the Progress Schedule as submitted by the Contractor, the Contractor shall employ additional labor and/or equipment necessary to bring the Work into compliance with the Progress Schedule at no additional cost to the Owner.

8.3 DELAYS AND EXTENSIONS OF TIME

8.3.1 Strike “arbitration” and insert “remedies at law or in equity”.

Add the following clause to subparagraph 8.3.2:

8.3.2.1 The Contractor shall update the status of the suspension, delay, or interruption of the Work with each Application for Payment. (The Contractor shall report the termination of such cause immediately upon the termination thereof.) Failure to comply with this procedure shall constitute a waiver for any claim for adjustment of time or price based upon said cause.

Delete subparagraph 8.3.3 in its entirety and replace with the following:

8.3.3 Except in the case of a suspension of the Work directed by the Owner, an extension of time under the provisions of Paragraph 8.3.1 shall be the Contractor’s sole remedy in the progress of the Work and there shall be no

payment or compensation to the Contractor for any expense or damage resulting from the delay.

Add the following subparagraph:

8.3.4 By permitting the Contractor to work after the expired time for completion of the Project, the Owner does not waive their rights under the Contract.

ARTICLE 9: PAYMENTS AND COMPLETION

9.2 SCHEDULE OF VALUES

Add the following subparagraphs:

9.2.1 The Schedule of Values shall be submitted using AIA Document G703, Continuation Sheet to G702.

9.2.2 The Schedule of Values is to include a line item for Project Closeout Document Submittal. The value of this item is to be no less than 1% of the initial contract amount.

9.3 APPLICATIONS FOR PAYMENT

Add the following clause to subparagraph 9.3.1:

9.3.1.3 Application for Payment shall be submitted on AIA Document G702 “Application and Certificate for Payment”, supported by AIA Document G703 “Continuation Sheet”. Said Applications shall be fully executed and notarized.

Add the following subparagraphs:

9.3.4 Until the Work is 90% complete, the owner will pay 95% of the value of completed Work, based on the Contract prices of labor and materials incorporated in the Work and of materials suitably stored at the site thereof up to the last day of the preceding month as estimated by the Architect, less the aggregate of previous payments. At the time the Work is 90% complete, if the manner of completion of the Work and its progress are and remain satisfactory to the Architect, and in the absence of other good and sufficient reasons, as provided in GENERAL REQUIREMENTS 8.5 RETAINAGE, the Architect shall, on presentation by the Contractor of Consent of Surety, certify for payment to the Contractor half the funds being held as retainage by the Owner. Thereafter, the Owner will pay 97.5% of the amount due the Contractor on account of remaining progress payments.

9.3.5 The Contractor shall provide a current and updated Progress Schedule to

the Architect with each Application for Payment. Failure to provide Schedule will be just cause for rejection of Application for Payment.

9.5 DECISIONS TO WITHHOLD CERTIFICATION

Add the following clauses to subparagraph 9.5.1:

.8 failure to provide a current Progress Schedule;
.9 a lien or attachment is filed;
.10 failure to comply with mandatory requirements for maintaining Record Documents.

9.6 PROGRESS PAYMENTS

Delete subparagraph 9.6.1 in its entirety and replace with the following:

9.6.1 After the Architect has approved and issued a Certificate for Payment, payment shall be made by the Owner within 30 days after Owner's receipt of the Certificate for Payment.

9.7 FAILURE OF PAYMENT

In first sentence, strike "seven" and insert "thirty (30)". Also strike "binding dispute resolution" and insert "remedies at law or in equity".

9.8 SUBSTANTIAL COMPLETION

Add the following sentence to Subparagraph 9.8.3:

"If the Architect is required to make more than 2 inspections of the same portion of Work, the Contractor shall be responsible for all costs associated with subsequent inspections including but not limited to any Architect's fees."

9.8.5 In the second sentence, strike "shall" and insert "may".

ARTICLE 10: PROTECTION OF PERSONS AND PROPERTY

10.1 SAFETY PRECAUTIONS AND PROGRAMS

Add the following subparagraphs:

10.1.1 Each Contractor shall develop a Safety Program in accordance with the Occupational Safety and Health Act of 1970. A copy of said plan shall be furnished to the Owner and Architect prior to the commencement of that Contractor's Work.

10.1.2 Each Contractor shall appoint a Safety Representative. Safety

Representatives shall be someone who is on site on a full time basis. If deemed necessary by the Owner or Architect, Contractor Safety Meetings will be scheduled. The attendance of all Safety Representatives will be required. Minutes will be recorded of said meetings by the Contractor and will be distributed to all parties as well as posted in all job offices/trailers etc.

10.3 HAZARDOUS MATERIALS

Delete subparagraph 10.3.3 in its entirety.

Delete subparagraph 10.3.6 in its entirety.

ARTICLE 11: INSURANCE AND BONDS

11.1 CONTRACTOR'S LIABILITY INSURANCE

11.1.4 Strike "the Owner" immediately following "(1)" and strike "and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's completed operations."

11.2 OWNER'S LIABILITY INSURANCE

Delete Paragraph 11.2 in its entirety.

11.3 PROPERTY INSURANCE

Delete Paragraph 11.3 in its entirety and replace with the following:

11.3 The State will not provide Builder's All Risk Insurance for the Project. The Contractor and all Subcontractors shall provide property coverage for their tools and equipment, as necessary. Any mandatory deductible required by the Contractor's Insurance shall be the responsibility of the Contractor.

11.4 PERFORMANCE BOND AND PAYMENT BOND

Add the following sentence to subparagraph 11.4.1:

"The bonds will conform to those forms approved by the Office of Management and Budget."

ARTICLE 12: UNCOVERING AND CORRECTION OF WORK

12.2.2 AFTER SUBSTANTIAL COMPLETION

Add the following Paragraph:

12.2.2.1.1 At any time during the progress of the Work, or in any case where the nature of the defects will be such that it is not expedient to have corrected, the Owner, at its option, will have the right to deduct such sum, or sums, of money from the amount of the Contract as it considers justified to adjust the difference in value between the defective work and that required under contract including any damage to the structure.

12.2.2.1 Strike “one” and insert “two”.

12.2.2.2 Strike “one” and insert “two”.

12.2.2.3 Strike “one” and insert “two”.

12.2.5 In second sentence, strike “one” and insert “two”.

ARTICLE 13: MISCELLANEOUS PROVISIONS

13.1 GOVERNING LAW

Strike “except that, if the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.”

13.6 INTEREST

Strike “the date payment is due at such rate as the parties may agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.” Insert “30 days of presentment of the authorized Certificate of Payment at the annual rate of 12% or 1% per month.

13.7 TIME LIMITS ON CLAIMS

Strike the last sentence.

Add the following Paragraph:

13.8 CONFLICTS WITH FEDERAL STATUTES OR REGULATIONS

13.8.1 If any provision, specifications or requirement of the Contract Documents conflict or is inconsistent with any statute, law or regulation of the government of the United State of America, the Contractor shall notify the Architect and Owner immediately upon discovery.

ARTICLE 14: TERMINATION OR SUSPENSION OF THE CONTRACT

14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

Delete subparagraph 14.4.3 in its entirety and replace with the following:

14.4.3 In case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment for Work executed, and cost incurred by reason of such termination along with reasonable overhead.

ARTICLE 15: CLAIMS AND DISPUTES

15.1 CLAIMS

15.1.2 Throughout the Paragraph strike "21" and insert "45".

Delete subparagraph 15.1.6 in its entirety.

15.2 INITIAL DECISION

Delete subparagraph 15.2.5 in its entirety and replace with the following:

15.2.5 The Architect will approve or reject Claims by written decision, which shall state the reasons therefore and shall notify the parties of any change in the Contract Sum or Contract Time or both. The approval or rejection of a Claim by the Architect shall be subject to mediation and other remedies at law or in equity.

Delete subparagraph 15.2.6 and its clauses in their entirety.

15.3 MEDIATION

15.3.1 Strike "binding dispute resolution" and insert "any or all remedies at law or in equity".

15.3.2 In the first sentence, delete "administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement," Strike "binding dispute resolution" and insert "remedies at law and in equity".

15.4 ARBITRATION

Delete subparagraph 15.4 and its subparagraphs in their entirety.

END OF SECTION 00800

STATE OF DELAWARE
DEPARTMENT OF LABOR
DIVISION OF INDUSTRIAL AFFAIRS
OFFICE OF LABOR LAW ENFORCEMENT
PHONE: (302) 451-3423

Mailing Address:
225 CORPORATE BOULEVARD
SUITE 104
NEWARK, DE 19702

Located at:
225 CORPORATE BOULEVARD
SUITE 104
NEWARK, DE 19702

PREVAILING WAGES FOR **HEAVY CONSTRUCTION**
EFFECTIVE MARCH 13, 2015 - AMENDED JULY 15, 2015

CLASSIFICATION	NEW CASTLE	KENT	SUSSEX
ASBESTOS WORKERS	21.14	18.60	40.43
BOILERMAKERS	73.62	30.73	56.37
BRICKLAYERS	44.98	22.19	23.83
CARPENTERS	51.86	51.86	41.22
CEMENT FINISHERS	43.00	23.30	16.00
ELECTRICAL LINE WORKERS	62.75	26.30	62.75
ELECTRICIANS	63.60	63.60	63.60
GLAZIERS	19.54	16.96	11.48
INSULATORS	53.38	53.38	53.38
IRON WORKERS	60.12	60.12	55.78
LABORERS	40.95	40.95	40.95
MILLWRIGHTS	65.23	65.23	51.80
PAINTERS	75.26	75.26	75.26
PILEDRIVERS	71.17	37.64	29.30
PLASTERERS	18.40	15.97	10.80
PLUMBERS/PIPEFITTERS/STEAMFITTERS	76.78	76.78	17.12
POWER EQUIPMENT OPERATORS	59.81	59.81	59.81
SHEET METAL WORKERS	29.40	18.23	17.13
SPRINKLER FITTERS	31.68	11.99	9.93
TRUCK DRIVERS	28.34	19.72	21.40

CERTIFIED : 7/29/15

BY: _____
ADMINISTRATOR, OFFICE OF LABOR LAW ENFORCEMENT

NOTE: THESE RATES ARE PROMULGATED AND ENFORCED PURSUANT TO THE PREVAILING WAGE REGULATIONS ADOPTED BY THE DEPARTMENT OF LABOR ON APRIL 3, 1992.

CLASSIFICATIONS OF WORKERS ARE DETERMINED BY THE DEPARTMENT OF LABOR. FOR ASSISTANCE IN CLASSIFYING WORKERS, OR FOR A COPY OF THE REGULATIONS OR CLASSIFICATIONS, PHONE (302) 451-3423.

NON- REGISTERED APPRENTICES MUST BE PAID THE MECHANICS RATE.

THESE RATES ARE BRING PROVIDED IN ACCORDANCE WITH DELAWARE'S FREEDOM OF INFORMATION ACT.

Re: Contract # 2015-LP-100 Lums Pond Utility Improvements - Phase II, New Castle County, DE

LUMS POND STATE PARK UTILITY IMPROVEMENTS – PHASE II

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ES-04	CONSTRUCTION SWM PLAN-LIFT STATIONS
ES-05	E&S NOTES AND DETAILS 1
ES-06	E&S NOTES AND DETAILS 2
ES-07	E&S NOTES AND DETAILS 3
ES-08	POST CONSTRUCTION SWM PLAN
ES-09	POST CONSTRUCTION SWM PLAN: SHEET FLOW TO CONSERVED TRUF OPEN SPACE
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C-04	CAMPGROUND UTILITY PLAN
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LUMS POND STATE PARK UTILITY IMPROVEMENTS – PHASE II

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E-09	LIFT STATION LS-2 – ELECTRICAL PLANS
E-10	LIFT STATION LS-2 – ELECTRICAL DETAILS
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END OF SECTION

SECTION 01005 – ADMINISTRATIVE PROVISIONS

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13. Field Engineering
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ARTICLE 1: WORK COVERED BY CONTRACT DOCUMENTS

1.1 The work includes, but is not necessarily limited to, the installation of gravity sewer, water and electric service at the campground to provide sixty-eight (68) recreational vehicle (RV) campsites with full utility hook-ups including power, modifications to the existing pump stations, new grease trap, rehabilitation and/or replacement of manholes throughout Park, abandonment of limited amounts of gravity sewer, replacement of fire hydrants and water valves, replacement of existing transformers, and associated work required to complete the project in accordance with the drawings and specifications.

ARTICLE 2: CONTRACT METHOD

2.1 Construct the work under a Unit Price Contract.

2.2 Items noted "NIC" (Not in Contract), will be furnished and installed by others.

ARTICLE 3: WORK SEQUENCE

3.1 Construct work in stages to accommodate owner's occupancy requirements during the construction period; coordinate construction schedule and operations.

3.2 Begin work within seven (7) days after issuance of a State purchase order and Notice to Proceed and be substantially completed within 180 calendar days.

ARTICLE 4: CONTRACTOR USE OF PREMISES

4.1 Limit use of premises for work and for construction operations to allow for owner occupancy.

4.2 Coordinate use of premises under direction of owner.

ARTICLE 5: OWNER OCCUPANCY

5.1 Owner will occupy premises during entire period of construction for the conduct of his normal operations. Cooperate with owner to minimize conflict, and to facilitate owner's operations.

ARTICLE 6: OWNER-FURNISHED PRODUCTS

6.1 Owner is responsible for the purchase of the pre-fabricated bathhouse including the crane and placement of the units. The Contractor will be responsible for coordinating the installation of the units as well as all utility connections to and within the bathhouse. The Contractor will also prepare the foundation.

ARTICLE 7: SCHEDULE OF ALLOWANCES

7.1 None.

ARTICLE 8: ALTERNATES

8.1 Alternates quoted on bid forms will be exercised as owner option. Accepted alternates will be listed in owner-contractor agreement

8.2 Coordinate related work and modify surrounding work affected by accepted Alternates as required to complete the work.

8.3 Schedule of Alternates: (Refer to Bid Form and Section 01030 - Alternates)

ARTICLE 9: UNIT PRICES

9.1 Unit Prices quoted on bid forms will be exercised as owner option.

9.2 Coordinate related work and modify surrounding work affected by accepted unit prices as required to complete the work.

9.3 Schedule of Unit Prices: (Refer to Bid Form, Section 01025 – Measurement and Payment, and Section 01026 – Unit Prices)

ARTICLE 10: APPLICATIONS FOR PAYMENT

10.1 Submit 3 copies of each application under procedures of Section 00800.

10.3 Content and Format: Use table of contents of Project Manual.

ARTICLE 11: OWNER SUPPLIED CONSTRUCTION DOCUMENTS

11.1 The contractor will be furnished, free of charge, ten (10) copies of drawings and project manuals (or less if requested). Additional sets will be furnished at the cost of reproduction, postage and handling.

ARTICLE 12: COORDINATION

12.1 Coordinate work of the various sections of specifications to assure efficient and orderly sequence of installation of construction elements, with provisions for accommodating items installed later.

12.2 Verify characteristics of elements of interrelated operating equipment are compatible; coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

12.3 Coordinate space requirements and installation of mechanical, electrical and plumbing work which are indicated diagrammatically on drawings. Follow routing shown for pipes, ducts, and conduits, as closely as practicable; make runs parallel with lines of building. Utilize spaces

efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

12.4 In finished areas (except as otherwise shown,) conceal pipes, ducts, and wiring in the construction. Coordinate locations of fixtures and outlets with finish elements.

12.5 Execute cutting and patching to integrate elements of work, uncover, ill-timed, defective, and non-conforming work, provide openings for penetrations of existing surfaces, and provide samples for testing. Seal penetrations through floors, walls, and ceilings.

ARTICLE 13: FIELD ENGINEERING

13.1 Provide field engineering services; establish grades, lines, and levels, by use of recognized engineering survey practices.

13.2 Control datum for survey is that shown on drawings. Locate and protect control and reference points.

ARTICLE 14: REFERENCE STANDARDS

14.1 For products specified by association or trade standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

12.2 The date of the standard is that in effect as of the bid date, except when a specific date is specified.

12.3 Obtain copies of standards when required by contract documents. Maintain copy at job site during progress of the specific work.

END OF SECTION 01005-ADMINISTRATIVE PROVISIONS

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SECTION 01010 – SUMMARY OF WORK

TABLE OF ARTICLES

1. PROJECT DESCRIPTION
2. WORK SEQUENCE
3. CONTRACTOR USE OF PREMISES

ARTICLE 1: PROJECT DESCRIPTION

1.1 General Requirements

A. The Contractor for this project shall furnish all labor, materials, equipment and services necessary for and reasonably incidental to fully perform all the work indicated as their responsibility and as shown on the drawings and specified in the specifications. See attachment for manhole rehabilitation scope of work.

B. Comply with federal, state, and local rules and regulations.

C. Notify proper federal, state, and local agencies of the nature and timing of work on-site.

D. Protect and maintain site structures against damage. Repair damage.

E. Protect utility lines and appurtenances that are to remain.
   i. Utility locations have been shown based on historical facility information and have not been field verified.
   ii. Locate and verify existing utilities.
   iii. Contact the national construction alert system for utilities at 811.
   iv. Apply appropriate surface geophysical methods to locate subsurface utilities.
   v. Repair damage except when utility is to be abandoned in place.

F. Store and use materials and equipment in a safe manner and meet requirements of applicable codes.

1.2 The work shall include the following: Lums Pond State Park Utility Improvements Phase II as shown on the drawings and as specified in the specification manual, including, but not necessarily limited to the following:

A. Installation of a complete electrical system consisting of primary distribution, switchgear, power, control, secondary electrical services, pad mounted service transformers, equipment enclosures, enclosed circuit breaker, panelboards, park power pedestals, conduit and wiring.
B. Installation of a complete gravity sewer system consisting of 4000 LF of 8” gravity sewer piping, sewer laterals supplying sixty-eight (68) recreational vehicle (RV) campsites, eighteen (18) proposed manholes and replacement of one existing pre-cast manhole.
C. Installation of a complete water system including 3800 LF of 2.5” water main, services to sixty-eight (68) RV campsites and miscellaneous valving.
D. Replacement of two existing pre-cast manholes (S-18 and S-17) and the rehabilitation of one (1) existing pre-cast manhole south of the Pond (S-16). Non-mechanical modifications to lift station 3.
E. Replacement of one fire hydrant and valves and associated piping at campground.
F. Installation of a new bathhouse at the campground.
G. The abandonment of three (3) existing pre-cast manholes (S-19, S-20 and S-21) as well as the abandonment of an existing dump station and 1300 LF of AC pipe.
H. The installation of a new dump station with a 1000-gallon grease trap to follow.
I. Alternate Bid Items

i. Refer to Section 01030 – Alternates for a detailed explanation of all alternate bid items included in this contract.

ARTICLE 2: WORK SEQUENCE

2.1 The Work will be conducted in one phase to provide the least possible interference to the activities of the Owner's personnel and to permit an orderly transfer of personnel and equipment to the new facilities.

2.2 Begin work within 7 days after issuance of a State purchase order and Notice to Proceed and be substantially completed within 180 calendar days.

ARTICLE 3: CONTRACTOR USE OF PREMISES

3.1 General: Limit use of the premises to construction activities in areas indicated.

END OF SECTION 1010 – SUMMARY OF WORK

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SECTION 01020 - ALLOWANCES

TABLE OF ARTICLES

1. RELATED DOCUMENTS
2. SUMMARY
3. EXAMINATION
4. PREPARATION
5. SCHEDULE OF ALLOWANCES

ARTICLE 1: RELATED DOCUMENTS

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

ARTICLE 2: SUMMARY

2.1 This Section specifies administrative and procedural requirements for Allowances.

2.2 Selected materials and equipment are specified in the Contract Documents by Allowances. In some cases, these Allowances include installation. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation. If necessary, additional requirements will be issued by Change Order.

2.3 Types of Allowances may include the following (Refer to "Schedule of Allowances" included at the end of this Section):

.1 Lump-sum Allowances.

.2 Unit-cost Allowances.

.3 Contingency Allowances.

2.4 Selection and Purchase:

.1 At the earliest practical date after award of the Contract, advise the Owner of the date when the final selection and purchase of each product or system described by an Allowance must be completed to avoid delaying the Work.

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

.3 Purchase products and systems specifically selected (in writing) by the Owner.

2.5 Submittals:

.1 Submit proposals and recommendations for purchase of products or systems included in Allowances, in form required for Change Order.

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

2.6 Coordinate Allowance Work with related work to ensure that each selection is completely integrated and interfaced with related work.

2.7 Lump-Sum Allowances and Unit-Cost Allowances:

.1 These Allowances shall cover the cost to the Contractor, less any applicable trade discount, of the materials and equipment required by the Allowance delivered at the site, and all applicable taxes.

.2 The Contractor's costs for unloading and handling on the site, labor, installation costs, overhead, profit and other expenses contemplated for the original Allowance shall be included separately in the Contract Sum and not in the Allowance.

.3 Whenever the cost is more than or less than the Allowance, the Contract Sum shall be adjusted accordingly by Change Order:

.1 Change Order Mark-up: The amount of each change order resulting from final selection of products and systems covered by an Allowance shall be the difference between the Contractor’s purchase price amount and the Allowance, and shall not include Contractor's mark-up (or subcontractor's mark-up) except to the extent clearly demonstrated (by Contractor) that either scope of installation or nature of work required was changed from that which could have been foreseen from description of Allowance and other information in Contract Documents. No mark-up is permitted for selection of higher or lower priced materials or systems, of same scope and nature as originally indicated.

.2 Change Order Data: Where applicable, include in each Change Order proposal both the quantities of products being purchased and unit costs, along with total amount of purchase to be made. Where requested,

furnish survey-of-requirements data to substantiate quantities. Indicate applicable taxes, delivery charges, and amounts of applicable trade discounts.

2.8 Contingency Allowances:

.1 Use the Contingency Allowance only as directed for the Owner's purposes and only by Change Orders that indicate amounts to be charged to the Allowance.

.2 Change Orders authorizing use of funds from the Contingency Allowance, for purchase of products and equipment, will include Contractor's related costs and reasonable overhead and profit margins. These related costs include delivery, installation, taxes, insurance, equipment rental, and similar costs.

.3 At Project Closeout, credit unused amounts remaining in the Contingency Allowance to the Owner by Change Order.

2.9 Unused Materials:

.1 Return unused materials to the manufacturer or supplier for credit to the Owner, after installation has been completed and accepted.

.2 When requested by the Owner, prepare unused material for storage by Owner where it is not economically practical to return the material for credit. When directed by the Owner, deliver unused material to the Owner's storage space. Otherwise, disposal of unused material is the Contractor's responsibility.

ARTICLE 3: EXAMINATION

3.1 Examine products covered by an Allowance promptly upon delivery for damage or defects.

ARTICLE 4: PREPARATION

4.1 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.

ARTICLE 5: SCHEDULE OF ALLOWANCES

5.1 Allowance No. 1: Include, in the Bid, the Lump Sum of $5,000 for the purchase of Bid Item No. 2 - Traffic Control as indicated on the Bid Form and as specified in Division 1, Section 01025.

END OF SECTION 01020 – ALLOWANCES

SECTION 01025- MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.01 GENERAL

A. Payment for the work completed under this Contract will be made at the lump sum and unit prices bid, which shall include the furnishing of all labor, tools, equipment and materials, and performance of all work required to complete the project as indicated and specified in accordance with all requirements of the Contract Documents and to the entire satisfaction of the Owner's Engineer.

B. All incidental and miscellaneous items, work, and materials for which no specific bid item is shown and which are necessary to complete the project in accordance with the contract documents and to maintain and/or repair the work are incidental to the bid items listed below and shall be done and furnished by the Contractor without extra charge.

1.02 AUTHORITY

A. The Contractor shall provide the services of a Delaware registered surveyor to take all measurements and compute quantities. The Engineer will verify measurements and quantities.

1.03 UNIT QUANTITIES SPECIFIED

A. Quantities and measurements indicated in the Bid Tab are for bidding and contract purposes only. Quantities and measurements supplied or placed in the Work and verified by the Engineer shall determine payment. The State of Delaware is not liable to the Contractor for any additional compensation based on any variance between the estimated quantities and the actual quantities installed during the course of the Project. The Contractor shall be paid solely for the actual quantities of items installed at the bid price.

B. If the actual Work requires more or fewer quantities than those quantities indicated, provide the required quantities at the unit sum/prices contracted.

1.04 MEASUREMENT OF QUANTITIES

A. Lineal Foot

1. Measurement of lineal feet to be paid under this section shall be the actual number of lineal feet of material installed in accordance with these specifications, measured as described further in this section, complete, in place and accepted.

2. The cost of any connections of couplings shall be included in the price bid per linear foot for this item.

B. Square Yards

1. Measurement of square yards of material to be paid under this section shall be the actual number of square yards of material installed in accordance with these specifications, measured from end to end, complete, in place and accepted.

C. Cubic Yards

1. Measurement of cubic yards of material to be paid under this section shall be the actual volume of cubic yards of material installed in accordance with these specifications, measured from end to end, complete, in place and accepted.

2. The maximum payment width for pipe trenches shall be as shown on the drawings.

D. Each

1. The number of each item installed shall be measured on the actual number of each unit installed in accordance with the plans and specifications, complete, in place and accepted.

2. The cost of any incidentals shall be included in the price bid for this item.

E. Lump Sum

1. This item will not be measured.

F. Tonnage

1. The quantity of tonnage to be measured will be the actual number of tons provided, as documented by certified weight slips, complete, in place and accepted.

1.05 PAYMENT

A. Payment includes: Full compensation for all required labor, Products, tools, equipment, plant, transportation, services and incidentals, erection, application or installation of an item of the Work; overhead and profit.

B. Final payment for work governed by unit prices will be made on the basis of the actual measurements and quantities accepted by the engineer multiplied by the unit price for work which is incorporated in or made necessary by the work.

C. Lineal Foot

1. The number of lineal feet as determined above shall be paid for at the contract unit price per lineal foot bid for this item.

D. Square Yards

1. The square yards of material as measured above shall be paid at the contract unit price bid for the item.

E. Cubic Yards

1. The cubic yards of material as measured above shall be paid at the contract unit price bid for the item.

F. Each

1. The number of each item as determined above shall be paid for at the contract unit price bid for the item.

G. Lump Sum

1. The contract lump sum price will be made under this item in proportion to the amount of work done as determined by the Engineer.

H. Tonnage

1. Tonnage will be paid at the contract unit bid price for this item upon receipt of certified weight slips.

1.06 Bid Items

A. Bid Item 1- Mobilization

1. Measurement - The Lump Sum payment for this item will be full compensation for providing initial services and facilities required to mobilize for and commence the work of this project as shown, specified and required to provide a complete project.

2. Payment: The payment for mobilization will be made at 50 % on the first payment requested with the remainder paid in even monthly increments spread out over the Contract Time. Costs to be included under this item shall include such items as bonds, insurance, shop drawings, submittals, temporary facilities and controls, permits, progress schedules, notifications along with other costs and incidentals associated with initiating the work. The maximum amount bid for this item shall not exceed 5% of the sum of the Base and any Contingency Bid Items.

B. Bid Item 2 - Traffic Control

1. Measurement – This item will not be measured. The lump sum payment for this item is for the control of traffic throughout the course of the project in accordance with the latest edition of the Delaware Manual on Uniform Traffic Control Devises.

2. Payment – Payment will be based upon completion of the work in accordance with the DE MUTCD, Plans and Specifications. The price bid shall include, but not be limited to furnishing, transporting and setting up all lights, signs, flags, equipment, materials and labor including flagmen when required to complete the work in accordance with the latest edition of the Delaware Manual on Uniform Traffic Control Devises.

C. Bid Item 3 - Clearing

1. Measurement – The lump sum payment for this item will be full compensation for all work related to the Site Clearing required to complete the work in accordance with the plans and specifications.

2. Payment - The contract lump sum price to be paid will be paid under this item in proportion to the amount of work completed by the Contractor as determined by the Engineer and shall include, but not be limited to notifications, E&S controls and the demolition, removal and legal disposal of all items necessary to complete the work including trees, shrubs, surface debris, existing sidewalks, curb and gutter designated to be replaced, pipes, water spigots to be abandoned, inlets, signs, etc. along with protection of items designated to remain. The lump sum price for this item shall also include the proper and legal disposal of the materials removed to complete the work of this Contract.

D. Bid Item 4 – Restoration

1. Measurement - The Lump Sum payment for this item will be full compensation for all work related to provide the temporary and permanent restoration of the project work area (not including asphalt paving restoration) in accordance with the contract documents, complete, in place and accepted. Payment will be based upon percentage of Restoration completed in accordance with the Plans and Specifications as determined by the Engineer.

2. Payment - The contract lump sum price will be paid under this item in proportion to the amount of work done as determined by the Engineer. The price bid shall include, but not limited to: furnishing and setting up all equipment, labor, and materials necessary to restore the project site in accordance with the requirements of the contract documents including notifications, coordination, environmental protection, the restoration of incidental obstructions to original or better conditions including concrete curb and sidewalk, temporary seeding, permanent seeding, trees, shrubs, signs, removal of E&S Controls, storage facilities, clean up, restoration of staging areas, removal and proper disposal of surplus materials, restoration, construction facilities and temporary controls and all other work necessary to restore areas disturbed by construction.

   The restoration of the concrete walk at the existing bathhouse is included in this bid item.

E. Bid Item 5 – Install 8” and 10” PVC Gravity Sewer Pipe

1. Measurement - Measurement of lineal feet to be paid under this section shall be the actual number of lineal feet of 8” and 10” SDR 35 PVC gravity sewer pipe installed in accordance with the plans and specifications, measured along the centerline of installed pipe from center of manhole to center of manhole.

2. Payment – The number of lineal feet as determined above shall be paid for at the contract unit price bid per lineal foot for 8” to 10” SDR 35 PVC gravity sewer pipe installed and tested per the requirements of the Contract Documents. The unit price bid for these items will be full compensation for providing all labor, material, equipment, tools and incidentals necessary to furnish and install the pipe including notifications, test pits to locate utilities, saw cutting and removal of existing bituminous and/or concrete roadway surface and base pavement, sidewalk, curb, E&S controls, bypass pumping wastewater, excavation, shoring, soil, dewatering, the placement of AASHTO # 57 stone bedding around main and lateral pipes, placing backfill full depth of main pipe and lateral pipes, compaction, testing of backfill, placement of GABC, temporary paving, and all other items of work necessary to furnish and install the gravity piping per the plans and specifications.

F. Bid Item 6 – New 6” PVC Gravity Sewer Lateral Connections

1. Measurement – Measurement of lineal feet to be paid under this section shall be the actual number of lineal feet of SDR 35 PVC gravity lateral pipe installed in accordance with the plans and specifications, measured along the centerline of installed pipe from center of sewer main to center of proposed clean out to be installed at camper locations.

2. Payment – The number of lineal feet as determined above shall be paid for at the contract unit price bid per lineal foot for 4” and 6” SDR 35 PVC gravity sewer lateral pipe installed and tested per the requirements of the Contract Documents. The price bid to install and connect the 4” and 6” PVC lateral pipes shall include

but not be limited saw cutting and removal of existing bituminous and/or concrete roadway pavement, sidewalk, curb, test pits to locate existing utilities, E&S controls, excavation, shoring, dewatering, the installation of new 4” and 6” PVC lateral piping, AASHTO #57 stone bedding and initial backfill, the installation of new clean outs and clean out boxes furnish, place and compact backfill the full depth of pipe, GABC, disposal of existing material, temporary paving, testing and all other items incidental and necessary to complete the work as specified and shown in the contract documents.

G. Bid Item 7 – Pre Cast Concrete Manholes

1. Measurement – Measurement will be based on the actual number of new manholes 0’-0” to 8’-0” deep installed per the requirements of the contract documents plus the additional vertical footage of manholes over 8’-0” deep measured from interior downstream invert to top of precast manhole structure.

2. Payment – Payment will be based on the contract unit price bid for each new manhole installed plus the additional vertical footage for manholes greater than 8’-0” deep as measured above. The price bid to install manholes includes all work necessary to furnish and install the new manhole per the requirements of the Contract Documents including a physical survey of manholes to be placed to determine configuration of flow channel and coordination with precast supplier to provide the correct configuration, notifications, test pits to locate existing utilities, saw cutting and removal of existing bituminous and/or concrete roadway pavement, sidewalk, curb, E&S controls, excavation, shoring, dewatering, removal and disposal of existing manhole and soil material, furnishing and placement of manhole, bedding, place and compact backfill the full depth around structures, testing, GABC, manhole grade adjustment, manhole frame and cover, temporary paving, permanent paving and all other items incidental and necessary to complete the work as specified and shown in the contract documents.

   Bid Item 7A – 4’-0” Diameter Manhole at 0’-0” to 8’-0” Deep.
   Bid Item 7B – Replace Existing Manhole 0’-0” to 8’-0” Deep
   Bid Item 7C – 4’-0” Diameter Manhole per vertical foot greater than 8’-0” Deep.

H. Bid Item 8 – Grease Trap

1. Measurement – This item will not be measured. The Lump Sum payment for this item will be full compensation for providing all labor, equipment and material required to install a the Grease Trap and related piping complete in place and in accordance with the Contract Documents.

2. Payment – The lump sum payment for this item will be full compensation for all work related to the installation of the grease trap shown on the plans and related piping including but not limited to environmental protection, notifications, coordination with Park personnel, clearing and removal of incidental obstructions, excavation, dewatering, test pits to locate utilities, E&S controls, furnish and install grease pit, furnish and install inlet piping, RV Sewer and Dump Station and connection to existing piping, furnish and install outlet piping to the downstream manhole, backfill, testing, temporary seeding, permanent seeding, and all other items incidental and necessary to complete the work in accordance with the Contract Documents. Payment will be based upon percentage of work completed in accordance with the Plans and Specifications as determined by the Engineer.

I. Bid Item 9 – Abandon Existing Manholes in Place

The abandonment shall be accomplished by saw cutting the paved surface around the manhole, removing asphalt and / or concrete base material, removing the existing cone section or at least 4'-0" off the top of the manhole if constructed of brick, filling the remainder of the MH with Type C Borrow material, compacted and tested in accordance with the requirements of the Contract Documents.

1. Measurement - Measurement will be based on the actual number of existing manholes abandoned in place and accepted.

2. Payment - The number of each item as determined above shall be paid for at the contract unit price bid for this item. The unit price bid for this item will be full compensation for providing all labor, Products, material, equipment, tools and incidentals necessary to abandon existing manholes as specified including but not limited to notification to affected property owners, saw cutting and removal of existing bituminous and/or concrete roadway pavement, sidewalk, curb, base course, concrete collar, brick, cone section and existing manhole frame and cover, and disposal of all material including soil generated during the demolition. Also included in this item shall be costs to plug all pip penetrations with non-shrink grout, furnish and place Type C Borrow backfill, compaction, temporary paving, permanent paving, tack coat, any necessary surface preparation, curb and sidewalk replacement (where applicable), topsoiling, fertilizing, seeding, mulching, and anything else necessary for or incidental to complete this work in accordance with the plans and specifications.

J. Bid Item 10 – Abandon Existing Sewer Pipe in Place

1. Measurement - Measurement will be based on the actual number of cubic yards of flowable fill placed to properly abandon pipe and manholes.

2. Payment – Payment will be based on the unit bid price per cubic yard to properly fill pipes to be abandoned per the requirements of the Contract Documents. All work required to gain access to the abandoned pipe, construct appropriate bulkheads and vents, place/pump the flowable fill, and restore the work area and to satisfy these Specifications shall be incidental to this Bid Item and shall not be measured and paid separately.

K. Bid Item 11 - Well Pointing (Contingent Bid Item)

Dewatering is considered incidental to all Bid Items described above, however "Well Pointing" may be required to properly dewater excavations. Dewatering by well pointing involves installing a series of small PVC or steel wells (well points) into the ground about 1.5 inches in diameter. Each well point is connected to a common header pipe. The header pipe is then connected to a pump with a large amount of vacuum power. The vacuum power produced by the pump sucks the ground water up through thin slits cut into the walls of the well points. The water then travels to the header pipe, through the pump and is discharged through an outfall line away from the site. The Contractor shall assume the well points are driven about 3 feet apart to the depth required to dewater a 10'-0" deep trench with a static groundwater table depth of 3'-0" below existing grade.

1. Measurement – Well Pointing shall be paid on a linear foot basis. The linear footage for this item shall equal to the linear footage of sewer pipe being installed for which well pointing is required, regardless of the actual footage of well pointing installed to achieve the necessary dewatering. Well pointing for manholes, or other items will be included in the footage for the pipe therefore, no additional

footage will be calculated for these items. Well pointing for laterals will only be paid if additional well point piping is required and installed specifically for lateral excavation.

2. Payment - The number of linear feet of well pointing measured as described above shall be paid at the contract price for this item which price and payment shall constitute full compensation for all labor, equipment, materials, tools, coordination with DNREC, permit preparation and application to DNREC for withdrawal and discharge permits, well point and header piping, sound attenuated vacuum pump/pumps, notifications, noise control, restoration to areas disturbed by well pointing equipment and discharge piping and incidentals required to keep the excavation dry for the entire period needed to complete the work described in the Contract Documents. The price shall include all items identified in the above description of work without regard to the time needed to achieve the necessary dewatering. The duration of the well point operation will not, therefore, be factored into the payment for this item.

L. Bid Item 12 – PVC Water Main Pipe

1. Measurement - Measurement of lineal feet to be paid under this section shall be the actual number of lineal feet of PVC and DIP Water Main Pipe installed in accordance with the plans and specifications, measured along the centerline from end to end.

2. Payment - The number of lineal feet as determined above shall be paid for at the contract unit price per lineal foot bid for each size of water main pipe. The unit price bid for this item will be full compensation for providing all labor, material, equipment, tools and incidentals necessary to install the pipe in accordance with the plans and specifications including notifications and coordination with DNREC, coordination of water shutdowns, excavation, test pits to locate existing facilities, dewatering, transportation, furnish and place new water main pipe, blow offs, couplings, fittings, connections to existing water pipe, disinfection, backfill, testing, concrete thrust blocks, restoration, traffic control and all other items incidental and necessary to complete the work as specified and shown in the Contract Documents.

   Bid Item 12A – 2-1/2” PVC Water Main
   Bid Item 12B – 8” DIP Water Main

M. Bid Item 13 – Water Service Installation

1. Measurement – Measurement will be based on the actual number of water services installed in accordance with the plans and specifications, complete, in place and accepted.

2. Payment – Payment will be based on the number of water services installed at the contract unit price bid for each service. The price bid to install a water service shall include but not be limited to all work necessary to complete the work including survey and layout, notifications, excavation, test pits to locate existing utilities, dewatering, installation of tapped tee or wet tap to existing main, furnishing and placement of service pipe, fittings, corporation stop, curb stop, valve boxes, construction of yard hydrant per the details on the plans, E&S controls, testing, disinfection, backfill, compaction, and all other items incidental and necessary to complete the work as specified and shown in the contract documents.

   Bid Item 13A – ¾” Water Service Connection from New PVC Pipe

Bid Item 13B – ¾" Water Service Connection from New DIP Pipe
Bid Item 13C – ¾" Water Service Connection from Existing AC Pipe
Bid Item 13D – 1-1/2" Water Service and Future Stub (adjacent to camp site 18)
Bid Item 13E – 2-1/2" Water Service Connection from New PVC Pipe

N. Bid Item 14 – Gate Valves

1. Measurement – Measurement will be based on the actual number of each size of gate valve installed in accordance with the plans and specifications complete, in place and accepted.

3. Payment – Payment will be based on the number of each size of gate valve installed at the contract unit price bid for each installation. The price bid to install the gate valves shall include but not be limited to furnishing of all labor, equipment and materials necessary to complete the work including survey and layout, notifications, coordination of water shut downs, test pits to locate existing facilities, dewatering, excavation, installation of new valve with pipe and couplings, disinfection, valve box, restoration, backfill, compaction, traffic control and all other items necessary to complete the work as specified and shown in the contract documents.

The gate valves required at connections to the existing piping are incidental to the pay item for "Connections to Existing Water Pipe" and are not included in this Bid Item.

The 6" gate valves to be installed at fire hydrants are incidental to the pay item for "Fire Hydrants" and are not included in this Bid Item.

Bid Item 14A – 2-1/2" Gate Valve
Bid Item 14B – 1- 1/2" Gate Valve
Bid Item 14C – 3/4" Gate Valve
Bid Item 14D – 8" Gate Valve

O. Bid Item 15—Fire Hydrants

1. Measurement – Measurement will be based on the actual number of fire hydrants installed in accordance with the plans and specifications complete, in place and accepted.

3. Payment – Payment will be based on the number of fire hydrant installed at the contract unit price bid for each installation. The price bid to install the new hydrants shall include but not be limited to furnishing of all labor, equipment and materials necessary to complete the work including survey and layout, notifications, coordination of water shut downs, test pits to locate existing facilities, E&S controls, dewatering, excavation, removal and abandonment of existing fire hydrants and piping, installation of new hydrant with pipe, hydrant tee, 6" gate valve, valve box, thrust restraint, disinfection, concrete, restoration, backfill, compaction, traffic and all other items necessary to complete the work as specified and shown in the contract documents.

P. Bid Item 16 – Water Connections to Existing Pipe

1. Measurement – Measurement will be based on the actual number of water connections to existing pipe completed in accordance with the plans and specifications complete, in place and accepted.

2. Payment – Payment will be based on the number of water connections to existing pipe completed at the contract unit price bid for each installation. The price bid to complete the connections shall include but not be limited to furnishing of all labor, equipment and materials necessary to complete the work including survey and layout, notifications, coordination of water shut downs, test pits to locate existing facilities, E&S controls, dewatering, excavation, pipe fittings required to make the connections, physical connection to existing pipe, gate valves, valve boxes, thrust restraint, disinfection, concrete, restoration, backfill, compaction, traffic control and all other items necessary to complete the work as specified and shown in the contract documents.

   Bid Item 16A – 8" Water Connection to Existing Pipe
   Bid Item 16B – 2-1/2" Water Connection to Existing Pipe

Q. Bid Item 17 –Bathhouse Foundation, Stub-ups and Final Connections

1. Measurement – This item will not be measured. The Lump Sum payment for this item will be full compensation for providing all labor, equipment and material required to furnish and install the proposed bathhouse complete, in place and in accordance with the requirements of the Contract Documents.

2. Payment – The lump sum payment for this item will be full compensation for all work related to the site preparation for the proposed bathhouse shown on the plans including but not limited to environmental protection, notifications, coordination with Park personnel, clearing and removal of incidental obstructions, excavation, dewatering, test pits to locate utilities, E&S controls, building permit, installation of 90 feet of six inch diameter PVC main building sewer including one clean out on either side of the building, installation of 100 feet of two inch waste pipe to approximately 16 floor drains stubbed 12" above finished floor including trap primer piping and connections, installation of two inch vent pipe stubbed 12 inch above finished floor, 50 feet of 2-1/2" PVC water main stubbed 12 inch above finished floor, power supply, test plugs, traps, fittings, placement and compaction of stone foundation, sidewalk surrounding building, testing and testing equipment, final building piping connections after building is set, final cleaning, temporary seeding, permanent seeding, and all other items incidental and necessary to complete the work in accordance with the Contract Documents. Payment will be based upon percentage of work completed in accordance with the Plans and Specifications as determined by the Engineer.

R. Bid Item 18 – Proposed Lift Station Modifications

1. Measurement – This item will not be measured. The Lump Sum payment for this item will be full compensation for providing all labor, equipment and material required to complete the modifications to the lift stations at the site complete, in place and in accordance with the requirements of the Contract Documents.

2. Payment – The lump sum payment for this item will be full compensation for all work related to the modifications of the lift stations shown on the plans including but not limited to environmental protection, notifications, coordination with Park personnel, clearing and removal of incidental obstructions, excavation, dewatering, test pits to locate utilities, E&S controls, bypass pumping wastewater around the work for the duration of the work at each pump station including temporary piping/connections to existing pipe, demolition, concrete rehabilitation, core drilling existing valve vault, furnish and install new pre-cast concrete valve vault, furnish and installation of new equipment, furnish and installation of new force main (if required), modifications to the existing structure, fencing, proposed piping and valving, concrete thrust blocks, proposed grading including furnish and

place borrow fill material if required to achieve final grades, all mechanical and electrical work, start up, testing, final cleaning, temporary seeding, permanent seeding, final restoration and all other items incidental and necessary to complete the work in accordance with the Contract Documents. Payment will be based upon percentage of work completed in accordance with the Plans and Specifications as determined by the Engineer.

Bid Item 18A – Proposed Lift Station Modifications LS-1 (Alternate Bid Item)
Bid Item 18B – Proposed Lift Station Modifications LS-2 (Alternate Bid Item)
Bid Item 18C – Proposed Lift Station Modifications LS-3

S. Bid Item 19 - Hot Mix Patching

1. Measurement - Measurement of square yards of material to be paid under this section shall be the actual number of square yards of material installed in accordance with these specifications, measured from end to end complete, in place and accepted.

2. Payment - The square yards of Hot Mix Patching as measured above shall be paid at the contract unit price bid for the item. Price shall include full compensation for saw cutting existing pavement, pavement removal, removing pavement sub base material, placement of filter fabric, replacing pavement sub base (GABC) base, the installation of hot mix asphalt to the depths shown on the Contract Plans and application of bituminous joint sealant in accordance with DelDOT Standard Construction Specifications, striping and other incidentals required to complete the work per the requirements of the Contract Documents.

   It is the intent of this pay item to reimburse the Contractor for hot mix asphalt restoration at proposed roadway utility crossings (maximum payment width of 7'-0") and to reconstruct asphalt driveways per the details on the plans. The pay item is not intended for asphalt restoration to for asphalt damaged as a result of general construction traffic, etc. The cost for asphalt restoration beyond the scope required for roadway utility crossings and driveway construction shall be considered incidental to other items of work included in the project.

T. Bid Item 20 – Cleaning and Television Inspection of Pipe

The 8" and 10" sanitary sewer pipe installed as a part of this Project shall be cleaned and televised by the Contractor per the requirements of the Contract Documents.

1. Measurement - Measurement of lineal feet to be paid under this section shall be the actual number of lineal feet of pipe cleaned and televised in accordance with these specifications, measured along the pipe line from center of MH to center of MH.

2. Payment - The number of lineal feet as determined above shall be paid for at the contract unit price per lineal foot bid for this item measured from center of manhole to center of manhole horizontally along the center line of the pipe. Payment includes full compensation for all required labor, Products, tools, equipment, transportation, notifications, services, construction facilities and temporary controls, water and incidentals required to complete the televising and cleaning of sewers in accordance with the specifications including the removal and legal disposal of material removed from the pipe as a result of cleaning.

U. Bid Item No. 21 – Undercut Excavation and Backfill (Contingent Bid Item)

Undercut Excavation shall consist of all materials, labor, and equipment necessary to remove material below planned sub grade determined by the Engineer to be unsuitable and replacement of excavated material with AASHTO # 57 stone or Crusher Run borrow material as directed by the Engineer. The limits of Undercutting Excavation and Backfill shall be approved in advance by the Engineer.

Any Undercut Excavation and Backfill performed by the Contractor without prior approval of the Engineer, and/or any Undercut Excavation and Backfill performed outside the approved limits shall not be a pay item.

Undercut Excavation and Backfill required to correct unstable sub grade caused by the Contractor's methods, as determined by the Engineer, will not be measured and paid separately. It is the intent of the Contract Documents that Undercut Excavation and Backfill is for the correction of existing, in place unstable sub grade material not meeting the requirements of the specification and it is not intended as payment to reimburse the Contractor for the removal and replacement of unstable sub grade that results from poor construction practices including improper dewatering of excavations.

1. Measurement of cubic yards of material to be paid under this section shall be the actual volume of cubic yards of material removed and replaced in accordance with these specifications, measured from end to end, complete, in place and accepted.

2. Payment - The cubic yards of material as measured above shall be paid at the contract unit price bid for the item. The unit price per cubic yard for "Undercut Excavation and Backfill" shall be full compensation for performing all work and providing all material, labor and equipment necessary for excavation, backfill (including importing approved material from off-site), removal and proper disposal of excavation spoil and all incidental items.

V. Bid Item 22 – Type C Borrow Backfill (Contingent Bid Item)

It is the intent of the Contract Documents that the Contractor properly dewater excavations and re-use existing excavated material to backfill excavations per the requirements of the Contract Documents. In cases where an excavation has been properly dewatered and the existing excavated material does not meet the requirements of Type C Borrow, the Contractor, as directed by the Engineer, shall import borrow material meeting the requirements of Type C Borrow as defined by DelDOT and place and compact the Borrow backfill material per the requirements of the Contract Documents.

1. Measurement - Measurement of cubic yards of material to be paid under this section shall be the actual number of cubic yards of material installed in accordance with these specifications, measured from end to end for a maximum trench payment width of 4'-0" regardless of the actual amount of borrow material placed complete, in place and accepted.

   Those areas removed or disturbed outside of the maximum payment width requiring the installation of Borrow backfill shall be replaced at no additional cost to the Owner.

2. Payment - The cubic yards of Type C Borrow Backfill as measured above shall be paid at the contract unit price bid for the item. Price shall include full compensation for the removal and disposal of existing excavated material, the furnishing and placement of imported Type C Borrow material, compaction of

borrow, testing of backfill and other incidentals required to complete the work per the requirements of the Contract Documents.

W. Bid Item 23 – Manhole / Precast Concrete Structure Rehabilitation - Pipe Penetration, Wall, Base Section Grouting

1. Measurement - Measurement will be based on the actual number of joints, base sections, pipe penetrations grouted to stop infiltration into the structures per the requirements of the contract documents and accepted.

2. Payment - The number of each item as determined above shall be paid for at the contract unit price bid for this item. The unit price bid for this item will be full compensation for providing all labor, products, material (except grout), equipment, tools and incidentals necessary to pressure grout and chemically seal manhole base sections, walls and pipe penetrations. The bid item also includes clean up, removal of excess grout from the mainline sewer, disposal of debris and record keeping. The gallons of grout used will be paid separately under another bid item.

Bit Item 23A – Pressure grouting a precast brick base section. A base section includes all pipe penetrations at the bottom of the manhole, the flow channel and the joint at the wall / bench interface.

Bid Item 23B – Pressure grouting a precast joint or pipe penetration (above the base section)

X. Bid Item 24 – Grout

1. Measurement – The quantity of grout will be measured by the actual number of gallons of grout used to stop active infiltration into the existing manholes to be pressure grouted under this project.

2. Payment – The unit price for this item has been fixed by the Engineer at $10.00 per gallon of grout which will be full compensation for providing all labor, material, equipment, tools, construction facilities and temporary controls and incidentals necessary to furnish the grout to seal points of suspected or active infiltration into pipe and structures.

Y. Bid Item 25 – Replace Manhole Frame and Cover

1. Measurement - Measurement will be based on the actual number of manhole frames and covers replaced complete, in place and accepted.

2. Payment - The number of each item as determined above shall be paid for at the contract unit price bid for this item. The unit price bid for this item will be full compensation for providing all labor, Products, material, equipment, tools and incidentals necessary to replace the manhole frames and covers as specified including but not limited to notification of Park personnel, E&S controls, saw cutting and removal of existing bituminous and/or concrete roadway pavement, sidewalk, curb, base course, concrete collar, loose brick and mortar, existing manhole frame and cover, grade rings to top of precast (if precast manhole) and disposal of all material including soil generated during the demolition. Also included in this item shall be costs to furnish and install new manhole frames and covers, up to 12” of concrete grade adjustment rings, concrete collars, stainless steel hardware, Infra-Risers, Flex Coat Chimney Seal, Type C Borrow backfill, compaction, temporary paving, permanent paving, tack coat, any necessary surface preparation, curb and sidewalk replacement (where applicable), topsoiling, fertilizing, seeding, mulching, and anything else necessary for or

incidental to complete this work in accordance with the plans and specifications. The unit price bid for this item also includes the placement of additional concrete grade rings during the process described above to raise the top elevation of manholes (0" to 12") if necessary and as directed by the Engineer to provide positive drainage away from the manholes.

Bid Item 25A - Replace Manhole Frame and Cover out of Roadway. In cases where the existing manhole chimney sections are in excess of 12" measured from the top of the existing precast concrete manhole to the bottom of the existing fame and cover, a per vertical foot bid item has been included to complete the additional manhole demolition, furnish and install additional grade rings, add to the depth of the concrete collar to encompass grade rings, furnish and place additional Type C Borrow material and furnish and apply additional flex coat chimney seal to completely cover all grade rings.

Bid Item 25B – Manhole Chimney Reconstruction in excess of 12".

Z. Bid Item 26 – Driveway Construction

1. Measurement - Measurement of square yards of material to be paid under this section shall be the actual number of square yards of material installed in accordance with these specifications, measured from end to end complete, in place and accepted.

2. Payment - The square yards of Hot Mix Patching as measured above shall be paid at the contract unit price bid for the item. Price shall include full compensation for E&S controls, excavating to sub grade depth, placing of filter fabric, placing of pavement sub base (GABC) base, the installation of hot mix asphalt to the depths shown on the Contract Plans and grading of surrounding area and other incidentals required to complete the work per the requirements of the Contract Documents in accordance with DelDOT Standard Construction Specifications.

AA. Bid Item 27 - Milling (Contingent Bid Item)

1. Measurement - Measurement of square yards of milling to be paid under this section shall be the actual number of square yards of pavement milling completed to the specified depth of 2" in accordance with the plans and specifications, measured from end to end, complete, in place and accepted.

2. Payment - The square yards of material as measured above shall be paid at the contract unit price bid per square yard of pavement milling at 2" deep and shall be full compensation for providing all labor, material, equipment, tools and incidentals necessary to complete the work in accordance with the Contract Documents and DELDOT requirements.

AB. Bid Item 28 – Asphalt Paving (Contingent Bid Item)

1. Measurement - Measurement of square yards of material to be paid under this section shall be the actual number of square yards of 2" Type C Hot Mix paving placed in accordance with DELDOT requirements, measured from end to end, complete, in place and accepted.

Separate measurement for payment will not be made for incidentals including but not limited to, preparation for paving, tack coat, temporary signs, detours, lane shut downs and the like, the re striping of roadways or replacement of traffic signal wiring that is damaged as part of the work.

2. Payment - The square yards of material as measured above shall be paid at the contract unit price bid of 2" of Type C Hot Mix paving placed and shall be full compensation for providing all labor, material, equipment, tools and incidentals necessary to complete the work including but not limited to adjustment of existing utility covers, notifications and coordination with Residents, tack coat application, Independent Testing and Observation of the paving work, protection of installed work, striping, replacement of traffic signal wiring by an approved DelDOT Contractor, the furnishing and placement of asphalt paving and all other incidental items required to complete the work as required by the plans and specifications and DELDOT requirements.

   The Contractor will furnish the Engineer one copy of all delivery tickets for paving material delivered and placed at the site.

AC. Bid Item 29 – Proposed Electrical Systems Improvements

1. Measurement – This item will not be measured. The Lump Sum payment for this item will be full compensation for providing all labor, equipment and material required to complete the modifications to the campgrounds electrical system in accordance with the requirements of the Contract Documents.

2. Payment – The lump sum payment for this item will be full compensation for all work related to the replacement of the existing primary and secondary electrical system thru out the Park's campground with new primary and secondary distribution equipment, camp site power pedestals, power supply to new bath house, associated feeders, but not limited to coordination, clearing and removal of incidental obstructions, trenching, backfilling, locating existing utilities, demolition of existing electrical work becoming inactive, concrete equipment pads, testing, conduit sleeves under paved areas, final cleaning, temporary seeding, permanent seeding, final restoration and all other items incidental and necessary to complete the work in accordance with the Contract Documents. Payment will be based upon percentage of work completed in accordance with the Plans and Specifications as determined by the Engineer.

AD. Bid Item 30 – Wastewater Treatment Primary Feeder

1. Measurement – This item will not be measured. The Lump Sum payment for this item will be full compensation for providing all labor, equipment and material required to replace the existing wastewater treatment plant's utility service with a new primary supply from the campground's primary distribution system in accordance with the requirements of the Contract Documents.

2. Payment – The lump sum payment for this item will be full compensation for all work related to the installing an underground primary cable from Transformer T-2 to existing Transformer T-1 at the wastewater treatment plant, disconnect and removal of the existing Utility Primary Service existing primary pond feeder switchgear and pad, existing sectionalizing cabinet and pad with the existing primary cable cut back and abandoned in place. Works shall include, but not limited to coordination, clearing and removal of incidental obstructions, trenching, backfilling, locating existing utilities, demolition of existing electrical work becoming inactive, concrete equipment pads, terminations, testing, final cleaning,

temporary seeding, permanent seeding, final restoration and all other items incidental and necessary to complete the work in accordance with the Contract Documents. Payment will be based upon percentage of work completed in accordance with the Plans and Specifications as determined by the Engineer.

AE. Bid Item 31 – Asbestos Abatement

1. Measurement – Measurement of weight of material to be paid under this section shall be the actual pounds of material disposed of at landfill approved for disposal of asbestos containing material as determined by weigh tickets provided by the Contractor.

2. Payment – The lump sum payment for this item will be full compensation for all work related to the proper removal and disposal of asbestos containing material identified on the site by a certified Contractor in accordance with the Contract Documents and the State of Delaware rules and regulations including, but not limited to coordination, paperwork, clearing and removal of incidental obstructions, locating existing utilities, saw cutting of pipe, removal from trench, bagging, onsite storage, hauling and offsite disposal and all other items incidental and necessary to complete the work in accordance with the Contract Documents. There are Payment will be based upon percentage of work completed in accordance with the Plans and Specifications as determined by the Engineer.

   The Contractor will furnish the Engineer one copy of all weight tickets for disposal of ACM at the landfill within 24 hours of disposal.

PART 2 PRODUCTS

Not Required

PART 3 EXECUTION

Not Required

END OF SECTION 01025 – MEASUREMENT AND PAYMENT

SECTION 01026 - UNIT PRICES

TABLE OF ARTICLES

1. RELATED DOCUMENTS
2. SUMMARY
3. UNIT PRICE SCHEDULE

ARTICLE 1:RELATED DOCUMENTS

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

ARTICLE2: SUMMARY

2.1 This Section specifies administrative and procedural requirements for unit prices.

A. A unit price is an amount proposed by Bidders and stated on the Bid Form as a price per unit of measurement for materials or services that will be added to or deducted from the Contract Sum by Change Order in the event the estimated quantities of Work required by the Contract Documents are increased or decreased.

B. Unit prices include all necessary material, labor, overhead, profit and applicable taxes.

C. Refer to individual Specification Sections for construction activities requiring the establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.

2.2 Schedule: A "Unit Price Schedule" is included at the end of this Section. Specification Sections referenced in the Schedule contain requirements for materials and methods described under each unit price.

A. The Contractor shall provide the services of Delaware licensed Professional Land Surveyor to take all measurements and compute quantities. The Engineer will verify measurements and quantities.

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

ARTICLE 3: UNIT PRICE SCHEDULE

Refer to Section 00300 – Bid Form and Section 01025 – Measurement and Payment.

END OF SECTION 01026 – UNIT PRICES

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SECTION 01030 – ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 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.

1.4 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 No. 1: Replace Fire Hydrants

1. State the amount to be added/deducted from the Base Bid to install proposed fire hydrants with associated valves and piping, as described on the Construction Drawings, in the technical specifications, and elsewhere in this project manual.
2. Alternate Bid includes all elements necessary for the complete execution of the work described including civil/site, structural, mechanical, electrical and restoration elements.

B. Alternate No. 2: Modifications to Lift Station 1 and 2

1. State the amount to be added/deducted from the Base Bid to complete modifications to lift station 1 and 2, as described on the Construction Drawings, in the technical specifications, and elsewhere in this project manual.
2. Alternate Bid includes all elements necessary for the complete execution of the work described including civil/site, structural, mechanical, electrical and restoration elements.

C. Alternate No. 3: Rehabilitation of Existing Pre-Cast Manholes

1. State the amount to be added/deducted from the Base Bid to rehabilitate sixteen (16) manholes at Lums Pond including all pressure grouting and frame and cover replacement, as described in the Bid Form, on the Construction Drawings, technical specifications, and elsewhere in this project manual.
2. Alternate Bid includes all elements necessary for the complete execution of the work described.

D. Alternate No. 4: Wastewater Treatment Primary Feeder

1. State the amount to be added/deducted from the Base Bid to provide the power feed from the proposed distribution in the campground to the existing wastewater treatment plant, as described on the Construction Drawings, in the technical specifications, and elsewhere in this project manual.
2. Alternate Bid includes all elements necessary for the complete execution of the work.

END OF SECTION 01030 – ALTERNATES

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SECTION 01040 – PROJECT COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General project coordination procedures.
2. Administrative and supervisory personnel.
3. Project meetings.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Construction Progress Documentation" for preparing and submitting the Contractor's Construction Schedule.
2. Division 1 Section "Closeout Procedures" for coordinating Contract closeout.

1.3 COORDINATION

A. Coordination: Coordinate construction operations included in various Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components with subcontractors to ensure maximum accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. If necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner if coordination of their Work is required.

C. 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. Preinstallation conferences.
7. Project closeout activities.

1.4 SUBMITTALS

A. Staff Names: Within 15 days of notice to proceed, 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.

1.5 PROJECT MEETINGS

A. General: The Architect will 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.
2. Minutes: The Architect will record significant discussions and agreements achieved. The minutes will be distributed to everyone concerned, including Owner, within 7 days of the meeting.

B. Preconstruction Conference: A preconstruction conference will be scheduled before the start of construction, at a time convenient to the Owner and Contractor, but no later than 15 days after execution of the Agreement. The conference will be held at the Project. The meeting will be conducted to review responsibilities and personnel assignments.

1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Items of significance that could affect progress will be discussed, including the following:

   a. Tentative construction schedule.
   b. Designation of responsible personnel.
   c. Procedures for processing field decisions and Change Orders.
   d. Procedures for processing Applications for Payment.
   e. Submittal procedures.
   f. Preparation of Record Documents.
   g. Use of the premises.
   h. Responsibility for temporary facilities and controls.
   i. Parking availability.
   j. Storage areas.
   k. Equipment deliveries and priorities.
   l. Progress cleaning.
   m. Working hours.

C. Progress Meetings: Progress meetings will be conducted every two weeks. Coordinate dates of meetings with preparation of payment requests.

1. Attendees: In addition to representatives of Owner and Architect, 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 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) Deliveries.
      2) Off-site fabrication.
      3) Access.
      4) Site utilization.
      5) Temporary facilities and controls.
      6) Work hours.
      7) Progress cleaning.
      8) Quality and work standards.

3. Reporting: The Architect will distribute minutes of the meeting to each party present and to parties who should have been present. A brief summary, in narrative form, of progress since the previous meeting and report will be included.

   a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. The revised schedule will be issued concurrently with the report of each meeting.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION 01040 – PROJECT COORDINATION

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SECTION 01050 – FIELD ENGINEERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative provisions and procedural requirements for Field Engineering services, including, but not necessarily limited to the following:

1. Land Survey Work.
2. Engineering services.

1.3 SUBMITTALS

A. Certificates: Submit a certificate signed by the Land Surveyor certifying that the location and elevation of improvements comply with the Contract Documents.

B. Project Record Documents: Submit a record of Work performed and record survey data as required under provisions of Sections "Submittals" and "Project Closeout".

1.4 QUALITY ASSURANCE

A. Surveyor: Engage a Professional Land Surveyor, licensed in the State of Delaware, to perform required surveying services to ensure that grades, lines, levels, and locations of the Work are in compliance with the Contract Documents.

B. Engineer: Engage a Professional Engineer of the discipline required, registered in the State of Delaware, to perform required engineering services.

1.5 EXAMINATION

A. The Owner will identify existing control points and property line corner stakes.

B. Verify layout information shown on the Drawings, in relation to the property survey and existing benchmarks before proceeding to layout the Work. Locate and protect existing benchmarks and control points. Preserve permanent reference points during construction.

1. Do not change or relocate benchmarks or control points without prior written approval. Promptly report lost or destroyed reference points, or requirements to relocate reference points because of necessary changes in grades or locations.
2. Promptly replace lost or destroyed Project control points. Base replacements on the original survey control points.

C. Establish and maintain a minimum of two permanent benchmarks on the site, referenced to data established by survey control points.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

D. Existing utilities and equipment: 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.

1.6 PERFORMANCE

A. Working from lines and levels established by the property survey, establish benchmarks and markers to set lines and levels at each story of construction and elsewhere as needed to properly locate each element of the Project. Calculate and measure required dimensions within indicated or recognized tolerances. Do not scale Drawings to determine dimensions.

1. Advise entities engaged in construction activities, of marked lines and levels provided for their use.
2. As construction proceeds, check every major element for line, level and plumb.

B. Surveyor's Log: Maintain a surveyor's log of control and other survey Work. Make this log available for reference.

1. Record deviations from required lines and levels, and advise the Architect when deviations that exceed indicated or recognized tolerances are detected. On Project Record Drawings, record deviations that are accepted and not corrected.
2. On completion of foundation walls, major site improvements, and other Work requiring field engineering services, prepare a certified survey showing dimensions, locations, angles and elevations of construction and sitework.

C. Site Improvements: Locate and lay out site improvements, including pavements, stakes for grading, fill and topsoil placement, utility slopes and invert elevations by instrumentation and similar appropriate means.

D. Building Lines and Levels: Locate and lay out batter boards for structures, building foundations, column grids and locations, floor levels and control lines and levels required for mechanical and electrical work.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION 01050 – FIELD ENGINEERING

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SECTION 01090 – DEFINITIONS AND STANDARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 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 to other paragraphs or schedules in the 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. Location is not limited.

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

D. "Approved": The term "approved," when used in conjunction with the Architect's action on the Contractor's submittals, applications, and requests, is limited to the Architect'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" means to supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": The term "install" describes operations at the Project site including the actual 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 activity, including installation, erection, application, or 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 successfully completed 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 authorities having jurisdiction.
2. 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 tradespersons of the corresponding generic name.

3. Assigning Specialists: Certain Sections of the Specifications require that specific construction activities shall be performed by specialists who are recognized experts in those operations. The specialists must be engaged for those activities, and their assignments are requirements over which the Contractor has no option. However, the ultimate responsibility for fulfilling contract requirements remains with the Contractor.

    a. This requirement shall not be interpreted to conflict with enforcing 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. "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 the Project. The extent of the Project site is shown on the Drawings and may or may not be identical with the description of the land on which the Project is to be built.

K. "Testing Agencies": A testing agency 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.

1.3 SPECIFICATION FORMAT AND CONTENT EXPLANATION

A. Specification Format: These Specifications are organized into Divisions and Sections based on the CSI/CSC's "MasterFormat" numbering system.

B. Specification Content: These 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 interpolated as the sense requires. Singular words shall be interpreted as plural and plural words 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 the Contractor. At certain locations in the Section 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," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

1.4 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.

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 the Architect 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. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements. Refer uncertainties to the Architect for a decision before proceeding.

D. Copies of Standards: Each entity engaged in construction on the 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: Trade association names and titles of general standards are frequently abbreviated. Where abbreviations and acronyms are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards-producing organization, authorities having jurisdiction, or other entity applicable to the context of the text provision. 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.

1.5 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, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

Not Applicable

END OF SECTION 01090 – DEFINITIONS

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SECTION 01200 – PROJECT MEETINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for project meetings including but not limited to:

1. Pre-Construction Conference.
2. Pre-Installation Conferences.
3. Coordination Meetings.
4. Progress Meetings.

B. Construction schedules are specified in another Division-1 Section.

1.3 PRE-CONSTRUCTION CONFERENCE

A. Schedule a pre-construction conference and organizational meeting at the Project site or other convenient location no later than 15 days after execution of the Agreement and prior to commencement of construction activities. Conduct the meeting to review responsibilities and personnel assignments.

B. Attendees: The Owner, Engineer and their consultants, the Contractor and their superintendent, major subcontractors, manufacturers, suppliers and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the work.

C. Agenda: Discuss items of significance that could affect progress including such topics as:

1. Tentative construction schedule.
2. Critical Work sequencing.
3. Designation of responsible personnel.
4. Procedures for processing field decisions and Change Orders.
5. Procedures for processing Applications for Payment.
6. Distribution of Contract Documents.
7. Submittal of Shop Drawings, Product Data and Samples.
8. Preparation of record documents.
9. Use of the premises.
10. Office, Work and storage areas.
11. Equipment deliveries and priorities.
12. Safety procedures.
13. First aid.
14. Security.
15. Housekeeping.
16. Working hours.

1.4 PRE-INSTALLATION CONFERENCES

A. Conduct a pre-installation conference at the site before each construction activity that requires

coordination with other construction. The 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.

1. Review the progress of other construction activities and preparations for the particular activity under consideration at each pre-installation conference, including requirements for:

    a. Contract Documents.
    b. Options.
    c. Related Change Orders.
    d. Purchases
    e. Deliveries.
    f. Shop Drawings, Product Data and quality control Samples.
    g. Possible conflicts.
    h. Compatibility problems.
    I. Time schedules.
    j. Weather limitations.
    k. Manufacturer's recommendations.
    l. Compatibility of materials.
    m. Acceptability of substrates.
    n. Temporary facilities.
    o. Space and access limitations.
    p. Governing regulations.
    q. Safety.
    r. Inspection and testing requirements.
    s. Required performance results.
    t. Recording requirements.
    u. Protection.

2. Record significant discussions and agreements and disagreements of each conference, along with the approved schedule. Distribute the record of the meeting to everyone concerned, promptly, including the Owner and Engineer.

3. Do not proceed if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of Work and reconvene the conference at the earliest feasible date.

1.5 COORDINATION MEETINGS

A. Conduct Project coordination meetings at regularly scheduled times convenient for all parties involved. Project coordination meetings are in addition to specific meetings held for other purposes, such as regular progress meetings and special pre-installation meetings.

B. Request representation at each meeting by every party currently involved in coordination or planning for the construction activities involved.

C. Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.6 PROGRESS MEETINGS

A. Conduct progress meetings at the Project site at regularly scheduled intervals. Notify the Owner and Engineer of scheduled meeting dates. Coordinate dates of meetings with preparation of the payment request.

B. Attendees: In addition to representatives of the Owner and Engineer, each subcontractor, supplier or other entity concerned with current progress or involved in planning, coordination or performance of future activities shall be represented at these meetings by persons familiar with the Project and authorized to conclude matters relating to progress.

C. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the current status of the Project.

1. Contractor's Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time or ahead or behind 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.

2. Review the present and future needs of each entity present, including such items as:

a. Interface requirements.
b. Time.
c. Sequences.
d. Deliveries.
e. Off-site fabrication problems.
f. Access.
g. Site utilization.
h. Temporary facilities and services.
I. Hours of Work.
j. Hazards and risks.
k. Housekeeping.
l. Quality and Work standards.
m. Change Orders.
n. Documentation of information for payment requests.
o. Submittals and other items affecting progress of work.

D. Reporting: No later than 5 days after each progress meeting date, the Owner will distribute copies of minutes of the meeting to each party present and to other parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.

1. Schedule Updating: Revise the 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.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

Not Applicable

END OF SECTION 01200 – PROJECT MEETINGS

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SECTION 01300 – SUBMITTALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

B. Related Sections include the following:

1. Division 1 Section "Project Coordination" for submitting and distributing meeting and conference minutes and for submitting Coordination Drawings.
2. Division 1 Section "Quality Control" for submitting test and inspection reports and for mockup requirements.
3. Division 1 Section "Contract Closeout" for submitting warranties.
4. Division 1 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
5. Division 1 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.

1.3 DEFINITIONS

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

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

1.4 SUBMITTAL PROCEDURES

A. General: Electronic copies of CAD Drawings of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals. The Contractor will be responsible for field verifying existing conditions.

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

C. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect'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. Architect 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 Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.

D. Identification: Place a permanent label or title block on each submittal 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 (150 by 200 mm) on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Include the following information on label for processing and recording action taken:

a. Project name.
b. Date.
c. Name and address of Architect.
d. Name and address of Contractor.
e. Name and address of subcontractor.
f. Name and address of supplier.
g. Name of manufacturer.
h. 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., 06100.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 06100.01.A).

i. Number and title of appropriate Specification Section.
j. Drawing number and detail references, as appropriate.
k. Location(s) where product is to be installed, as appropriate.
l. Other necessary identification.

E. Deviations: Highlight or otherwise specifically identify deviations from the Contract Documents on submittals.

F. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

1. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.
2. Additional copies submitted for maintenance manuals will be marked with action taken and will be returned.

G. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review, received from sources other than Contractor.

1. Transmittal Form: Provide locations on form for the following information:

a. Project name.
b. Date.
c. Destination (To:).
d. Source (From:).
e. Names of subcontractor, manufacturer, and supplier.
f. Category and type of submittal.
g. Submittal purpose and description.
h. Specification Section number and title.
i. Drawing number and detail references, as appropriate.
j. Submittal and transmittal distribution record.
k. Remarks.
l. Signature of transmitter.

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

H. 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 "Furnish as Submitted".

I. 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.

J. Use for Construction: Use only final submittals with mark indicating "Furnish as Submitted" or “Revise as Noted & Furnish” taken by Architect.

1.5 CONTRACTOR'S USE OF ARCHITECT'S CAD FILES

A. General: At Contractor's written request, copies of Architect's CAD files will be provided to Contractor for Contractor's use in connection with Project, subject to the following conditions:

1. CADD files are limited to those that have been generated for this Project.
2. CADD files for the floor plans and roof plans shall be provided. Files for details, etc. will not be provided.
3. Contractor will be asked to sign Architects waiver of release form before files will be delivered to the contractor.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

A. General: Prepare and submit Action Submittals required by individual Specification Sections.

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 printed 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 written recommendations.
    b. Manufacturer's product specifications.
    c. Manufacturer's installation instructions.
    d. Standard color charts.
    e. Manufacturer's catalog cuts.
    f. Wiring diagrams showing factory-installed wiring.
    g. Printed performance curves.
    h. Operational range diagrams.
    i. Mill reports.
    j. Standard product operation and maintenance manuals.
    k. Compliance with specified referenced standards.
    l. Testing by recognized testing agency.
    m. Application of testing agency labels and seals.
    n. Notation of coordination requirements.

4. Submit Product Data before or concurrent with Samples.
5. Number of Copies: Submit six (6) copies of Product Data, unless otherwise indicated. Architect will return three copies. Mark up and retain one returned copy as a Project Record Document.

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. Dimensions.
    b. Identification of products.
    c. Fabrication and installation drawings.
    d. Roughing-in and setting diagrams.
    e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
    f. Shopwork manufacturing instructions.
    g. Templates and patterns.
    h. Schedules.
    i. Design calculations.
    j. Compliance with specified standards.
    k. Notation of coordination requirements.
    l. Notation of dimensions established by field measurement.
    m. Relationship to adjoining construction clearly indicated.
    n. Seal and signature of professional engineer if specified.
    o. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.

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 (215 by 280 mm) but no larger than 30 by 40 inches (750 by 1000 mm).
3. Number of Copies: Submit six (6) opaque copies of each submittal, unless copies are required for operation and maintenance manuals. Submit five copies where copies are required for operation and maintenance manuals. Architect will retain three copies; 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 appropriate Specification Section.

3. 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.

4. 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 one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.

5. 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 four sets of Samples. Architect will retain three Sample sets; remainder will be returned.

      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 four sets of paired units that show approximate limits of variations.

E. Product Schedule or List: 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.
2. Number and name of room or space.
3. Location within room or space.

4. Number of Copies: Submit three copies of product schedule or list, unless otherwise indicated. Architect will return two copies.

    a. Mark up and retain one returned copy as a Project Record Document.

F. Contractor's Construction Schedule: Comply with requirements specified in Division 1 Section "Construction Progress Documentation" for Construction Manager's action.

G. Submittals Schedule: Comply with requirements specified in Division 1 Section "Construction Progress Documentation."

H. Application for Payment: Comply with requirements specified in Division 1 Section "Payment Procedures."

I. Schedule of Values: Comply with requirements specified in Division 1 Section "Payment Procedures."

J. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.
4. Number of Copies: Submit three copies of subcontractor list, unless otherwise indicated. Architect will return two copies.

    a. Mark up and retain one returned copy as a Project Record Document.

2.2 INFORMATIONAL SUBMITTALS

A. General: Prepare and submit Informational Submittals required by other Specification Sections.

1. Number of Copies: Submit three copies of each submittal, unless otherwise indicated. Architect will not return copies.
2. Certificates and Certifications: Provide a notarized 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.
3. Test and Inspection Reports: Comply with requirements specified in Division 1 Section "Quality Requirements."

B. Coordination Drawings: Comply with requirements specified in Division 1 Section "Project Management and Coordination."

C. Contractor's Construction Schedule: Comply with requirements specified in Division 1 Section "Construction Progress Documentation."

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

E. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification

(WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

F. Installer Certificates: Prepare 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.

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

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

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

J. Material Test Reports: Prepare 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.

K. Product Test Reports: Prepare written reports indicating 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.

L. Research/Evaluation Reports: Prepare 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.

M. Schedule of Tests and Inspections: Comply with requirements specified in Division 1 Section "Quality Requirements."

N. Preconstruction Test Reports: Prepare 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.

O. Compatibility Test Reports: Prepare 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.

P. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, 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.

Q. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Division 1 Section "Operation and Maintenance Data."

R. Design Data: Prepare 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.

S. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:

1. Preparation of substrates.
2. Required substrate tolerances.
3. Sequence of installation or erection.
4. Required installation tolerances.
5. Required adjustments.
6. Recommendations for cleaning and protection.

T. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

U. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.

V. Material Safety Data Sheets (MSDSs): Submit information directly to Owner; do not submit to Architect.

1. Architect will not review submittals that include MSDSs and will return the entire submittal for resubmittal.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

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 ARCHITECT'S ACTION

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

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

1. Furnish as Submitted.
2. Revise as Noted & Furnish.
3. Revise as Noted & Furnish. Submit Revised Copy for Record.
4. Revise & Resubmit.

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

D. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

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

END OF SECTION 01300 – SUBMITTALS

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SECTION 01400 – QUALITY CONTROL

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. General Quality Control.
B. Workmanship.
C. Manufacturer's Instructions.
D. Manufacturer's Certificates.
E. Mock-ups.
F. Manufacturers' Field Services.
G. Testing Laboratory Services.

1.02 RELATED REQUIREMENTS

A. Section 00700 - General Conditions and Section 00710 – General Requirements: Inspection and testing required by governing authorities.

1.03 QUALITY CONTROL, GENERAL

A. Maintain quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

1.04 WORKMANSHIP

A. Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.

B. Perform work by persons qualified to produce workmanship of specified quality.

C. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking.

1.05 MANUFACTURER'S INSTRUCTIONS

A. Comply with instructions in full detail, including each step in sequence. Should instructions conflict with contract documents, request clarification from architect before proceeding.

1.06 MANUFACTURERS' CERTIFICATES

A. When required by individual specifications section, submit manufacturer's certificate, in duplicate, that products meet or exceed specified requirements.

1.07 MOCK-UPS

A. When required by individual specifications section, erect complete, full-scale mockup of assembly at project site.

1.08 MANUFACTURERS' FIELD SERVICES

A. When specified in respective specification sections, require manufacturer to provide qualified personnel to observe field conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to make appropriate recommendations.

B. Representative shall submit written report to owner listing observations and recommendations.

C. Provide eight hours of operations and maintenance instruction to Owner's personnel on pumps and controls at proposed station.

1.09 TESTING LABORATORY SERVICES

A. Contractor shall employ and pay for services of an Independent Testing Laboratory to perform inspections, tests, and other services required by various specification sections.

B. Services will be performed in accordance with requirements of governing authorities and with specified standards.

C. Reports will be submitted to owner in triplicate giving observations and results of tests, indicating compliance or noncompliance with specified standards and with contract documents.

D. Contractor shall cooperate with Testing Laboratory personnel; furnish tools, samples of materials, design mix, equipment, storage and assistance as requested.

1. Notify owner and Testing Laboratory 24 hours prior to expected time for operations requiring testing services.

2. Make arrangements with Testing Laboratory and pay for additional samples and tests for contractor's convenience.

E. Any item found unsatisfactory by the testing agency shall be removed, replaced and retested at no additional cost to the Owner.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION 01400 – QUALITY CONTROL

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SECTION 01500 – CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 GENERAL

1.01 GENERAL PROVISIONS

A. The general provisions of the contract, including the conditions of the contract (General, Supplementary and other Conditions, if any) and Division 1 as appropriate, apply to the work specified in this section.

1.02 REQUIREMENTS INCLUDED

A. Temporary Electricity and Lighting
B. Temporary Telephone Service
C. Temporary Water
D. Temporary Sanitary Facilities
E. Construction Aids
F. Barriers
G. Temporary Heat and Ventilation
H. Temporary Enclosures
I. Protection of Installed Work
J. Water Control
K. Cleaning During Construction
L. Project Identification
M. Field Offices and Sheds
N. Removal of Construction Facilities and Restoration of Site
O. Security
P. Access Roads and Parking Areas
Q. Temporary Controls
R. Traffic Regulation

1.03 GENERAL

A. Comply with National Electric Code.
B. Comply with Federal, State and local codes and regulations and with utility company requirements.
C. Coordinate work with owner's requirements.

1.04 MATERIALS

A. Materials must be new and must be adequate in capacity for the required usage, must not create unsafe conditions, and must not violate requirements of applicable codes and standards.

1.05 TEMPORARY ELECTRICITY AND LIGHTING

A. Provide temporary electric power and power distribution system if/as needed to perform the work.

B. The Contractor may use the Owner’s electric service at certain metered locations as directed by the Owner.

C. Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements

without operating entire system.
2. Install lighting for Project identification sign.

1.06 TEMPORARY TELEPHONE SERVICE

A. Provide temporary telephone service in common-use facilities for use by all construction personnel. Install one telephone line(s) for each field office.

B. Provide additional telephone lines for the following:

1. Provide a dedicated telephone line for each facsimile machine in each field office.

C. At each telephone, post a list of important telephone numbers.
1. Police and fire departments.
2. Ambulance service.
3. Contractor's home office.
4. Contractor's emergency after-hours telephone number.
5. Architect's office.
6. Engineers' offices.
7. Owner's office.
8. Principal subcontractors' field and home offices.

D. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

1.07 TEMPORARY WATER

A. Provide potable water for drinking and construction purposes.

B. The Contractor shall make all necessary arrangements for temporary water service for construction purposes, and furnish at his own expense all piping and accessories required.

C. Take positive measures to preclude cross-connections and backflow.

D. The contractor will assume the cost of water consumed for other purposes if responsible care and restraint are not exercised by the Contractor in its use.

1.08 TEMPORARY SANITARY FACILITIES

A. Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

B. Service, clean and maintain facilities and enclosures.

1.09 CONSTRUCTION AIDS

A. Each subcontractor shall provide construction aids and equipment required by his personnel and to facilitate execution of his work. Examples are scaffolds, staging, ladders, stairs, ramps, runways, platforms, railings, hoists, cranes, chutes and other such facilities and equipment.

B. Mutual use may be arranged by the contractor where applicable.

1.10 BARRIERS

A. Materials at contractor's option, as appropriate to serve required purpose.

1.11 HEAT VENTILATION

A. 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 that will not have a harmful effect on completed installations or elements being installed

B. 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 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.

1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.

1.12 ENCLOSURES

A. 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 incomplete, insulate temporary enclosures.

1.13 PROTECTION OF INSTALLED WORK

A. Provide temporary protection for installed products. Control traffic in immediate area to minimize damage.

B. Prohibit traffic and storage on waterproofed and roofed surfaces, on lawn and landscaped areas.

1.14 WATER CONTROL

A. Maintain excavations free of water. Provide and operate pumping equipment. Grade site to drain.

1.15 CLEANING DURING CONSTRUCTION

A. Control accumulation of waste materials and rubbish; periodically dispose of legally off site.

B. Clean interior areas prior to start of finish work, maintain areas free of dust and other contaminants during finishing operations.

1.16 PROJECT IDENTIFICATION

Not Used.

1.17 FIELD OFFICES AND SHEDS

A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect/Engineer and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:

1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service, internet access and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot- (1.2-m-) square tack and marker boards.
3. Drinking water and private toilet.
4. Coffee machine and supplies.
5. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F (20 to 22 deg C).
6. Lighting fixtures capable of maintaining average illumination of 20 fc (215 lx) at desk height.

C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
1. Store combustible materials apart from building.

1.18 REMOVAL OF CONSTRUCTION FACILITIES AND RESTORATION OF SITE

A. 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 property of Contractor. Owner reserves right to take possession of Project identification signs.
2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. 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, repair, renovate, and clean permanent facilities used during construction period.

B. Clean and repair damage caused by installation or use of temporary facilities. Remove underground installations to a depth of two (2) feet; grade site as indicated.

1.19 SECURITY

A. Security of persons and property in areas under control of the contractor shall be the contractor's exclusive responsibility.

B. The contractor, at this own expense, shall initiate whatever programs that are necessary to execute his responsibility.

C. Control of access to the areas under his control shall be maintained. Visitors shall be required to report immediately to the Contractor's Superintendent and to produce full identification which will be recorded in the Contractor's Daily Log, along with the purpose of the visit.

1.20 ACCESS ROADS AND PARKING AREAS

A. Provide and maintain uninterrupted vehicular access to site and within it:

1. To temporary construction facilities, storage and work areas.

2. For use by persons and equipment involved in construction of project.

B. Maintain traffic areas free as possible of excavated materials, construction equipment, products, snow, ice and debris.

C. Keep fire hydrants and water control valves free from obstruction and accessible for use.

D. Designated areas of existing parking facilities may be used for parking of construction personnel's private vehicles and of contractor's light-weight vehicles.

1.21 TEMPORARY CONTROLS

A. Provide the following Temporary Controls:

1. Control of noise.
2. Control of dust, both on site and within building.
3. Control of surface water to prevent damage to the project, the site or adjacent properties.
4. Control of pests and rodents to prevent infestation of construction or storage areas.
5. Control of debris.
6. Control of pollution of soil, water or atmosphere in accordance with applicable laws.
7. Control of erosion in accordance with applicable laws.
8. Control of mud and snow, including removal where necessary to construction operations. Remove any mud tracked from site onto public roads or streets.

1.22 TRAFFIC REGULATION

A. Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants and control valves.
3. Provide and maintain uninterrupted vehicular access to site and within to temporary construction facilities and work areas for persons and equipment involved in the construction of Project.
4. Maintain traffic areas free of excavated materials, construction equipment, products, snow, ice and debris.

B. Obtain all temporary permits for access to, and use of public roads and streets for construction and hauling purposes. Comply with traffic control regulations applying to permit issuance.

C. Provide all markers, signs, lights and barriers on, and near the site to safely control construction traffic and public access.

D. Parking: Use designated areas of Owner's existing parking areas for construction personnel's private vehicles and of Contractor's light-weight vehicles.

END OF SECTION 01500 – CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

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SECTION 015639 - TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes general protection and pruning of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction.

B. Related Sections:

1. Section 01500 "Construction Facilities and Temporary Controls" for temporary site fencing.
2. Section 02110 "Site Clearing" for removing existing trees and shrubs.

1.3 DEFINITIONS

A. Caliper: Diameter of a trunk measured by a diameter tape at 6 inches (150 mm) above the ground for trees up to, and including, 4-inch (100-mm) size; and 12 inches (300 mm) above the ground for trees larger than 4-inch (100-mm) size.

B. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, and indicated on Drawings.

C. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and defined by a circle concentric with each tree with a radius 1.5 times the diameter of the drip line unless otherwise indicated.

D. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 ACTION SUBMITTALS

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

B. Samples for Verification: For each type of the following:

1. Organic Mulch: 1-pint (0.5-L) volume of organic mulch; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch.
2. Protection-Zone Fencing: Assembled Samples of manufacturer's standard size made from full-size components.
3. Protection-Zone Signage: Full-size Samples of each size and text, ready for installation.

C. Tree Pruning Schedule: Written schedule detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.

1. Species and size of tree.
2. Location on site plan. Include unique identifier for each.
3. Reason for pruning.
4. Description of pruning to be performed.
5. Description of maintenance following pruning.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified arborist and tree service firm.

B. Certification: From arborist, certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.

C. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work.

D. Existing Conditions: Documentation of existing trees and plantings indicated to remain, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.

1. Use sufficiently detailed photographs or videotape.
2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.

1.6 QUALITY ASSURANCE

A. Arborist Qualifications: Certified Arborist as certified by ISA.

B. Tree Service Firm Qualifications: An experienced tree service firm that has successfully completed temporary tree and plant protection work similar to that required for this Project and that will assign an experienced, qualified arborist to Project site during execution of the Work.

C. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to temporary tree and plant protection including, but not limited to, the following:

    a. Construction schedule. Verify availability of materials, personnel, and equipment needed to make progress and avoid delays.
    b. Enforcing requirements for protection zones.
    c. Arborist's responsibilities.
    d. Field quality control.

1.7 PROJECT CONDITIONS

A. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.

5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

B. Do not direct vehicle or equipment exhaust toward protection zones.

C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Topsoil: Natural or cultivated top layer of the soil profile or manufactured topsoil; containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 1 inch (25 mm) in diameter; and free of weeds, roots, and toxic and other nonsoil materials.

1. Obtain topsoil only from well-drained sites where topsoil is 4 inches (100 mm) deep or more; do not obtain from bogs or marshes.

B. Organic Mulch: Free from deleterious materials and suitable as a top dressing for trees and shrubs, consisting of one of the following:

1. Type: Shredded hardwood.
2. Size Range: 3 inches (76 mm) maximum, 1/2 inch (13 mm) minimum.
3. Color: Natural.

C. Protection-Zone Fencing: Fencing fixed in position and meeting one of the following requirements.

1. Chain-Link Protection-Zone Fencing: Galvanized-steel fencing fabricated from minimum 2-inch (50-mm) opening, 0.148-inch- (3.76-mm-) diameter wire chain-link fabric; with pipe posts, minimum 2-3/8-inch- (60-mm-) OD line posts, and 2-7/8-inch- (73-mm-) OD corner and pull posts; with 1-5/8-inch- (42-mm-) OD top rails; with 0.177-inch- (4.5-mm-) diameter top tension wire and 0.177-inch- (4.5-mm-) diameter bottom tension wire; with tie wires, hog ring ties, and other accessories for a complete fence system.

   a. Height: 4 feet (1.2 m).

2. Plastic Protection-Zone Fencing: Plastic construction fencing constructed of high-density extruded and stretched polyethylene fabric with 2-inch (50-mm) maximum opening in pattern and weighing a minimum of 0.4 lb/ft. (0.6 kg/m); remaining flexible from minus 60 to plus 200 deg F (minus 16 to plus 93 deg C); inert to most chemicals and acids; minimum tensile yield strength of 2000 psi (13.8 MPa) and ultimate tensile strength of 2680 psi (18.5 MPa); secured with plastic bands or galvanized-steel or stainless-steel wire ties; and supported by tubular or T-shape galvanized-steel posts spaced not more than 8 feet (2.4 m) apart.

   a. Height: 4 feet (1.2 m).
   b. Color: High-visibility orange, nonfading.

D. Protection-Zone Signage: Shop-fabricated, rigid plastic or metal sheet with attachment holes prepunched and reinforced; legibly printed with nonfading lettering and as follows:

1. Size and Text: DO NOT ENTER. TREE PROTECTION ZONE.
2. Lettering: 3-inch- (75-mm-) high minimum, white characters on red background.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Erosion and Sedimentation Control: Examine the site to verify that temporary erosion- and sedimentation-control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

B. For the record, prepare written report, endorsed by arborist, listing conditions detrimental to tree and plant protection.

3.2 PREPARATION

A. Locate and clearly identify trees, shrubs, and other vegetation to remain. Flag each tree trunk at 54 inches (1372 mm) above the ground.

B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.

C. Tree-Protection Zones: Mulch areas inside tree-protection zones and other areas indicated.

1. Apply 4-inch (100-mm) average thickness of organic mulch. Do not place mulch within 6 inches (150 mm) of tree trunks.

3.3 TREE- AND PLANT-PROTECTION ZONES

A. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones before materials or equipment are brought on the site and construction operations begin in a manner that will prevent people from easily entering protected area except by entrance gates. Construct fencing so as not to obstruct safe passage or visibility at vehicle intersections where fencing is located adjacent to pedestrian walkways or in close proximity to street intersections, drives, or other vehicular circulation.

1. Chain-Link Fencing: Install to comply with ASTM F 567 and with manufacturer's written instructions.
2. Posts: Set or drive posts into ground one-third the total height of the fence without concrete footings. Where a post is located on existing paving or concrete to remain, provide appropriate means of post support acceptable to Architect.

B. Protection-Zone Signage: Install protection-zone signage in visibly prominent locations in a manner approved by Architect. Install one sign spaced approximately every 20 feet (6 m) on protection-zone fencing, but no fewer than one sign with each facing a different direction.

C. Maintain protection zones free of weeds and trash.

D. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.

E. Maintain protection-zone fencing and signage in good condition as acceptable to Architect and remove when construction operations are complete and equipment has been removed from the site.

1. Do not remove protection-zone fencing, even temporarily, to allow deliveries or equipment access through the protection zone.
2. Temporary access is permitted subject to preapproval in writing by arborist if a root buffer effective against soil compaction is constructed as directed by arborist. Maintain root buffer so long as access is permitted.

3.4 EXCAVATION

A. General: Excavate at edge of protection zones and for trenches indicated within protection zones according to requirements in Section 02222 "Excavation."

B. Trenching near Trees: Where utility trenches are required within protection zones, hand excavate under or around tree roots or tunnel under the roots by drilling, auger boring, or pipe jacking. Do not cut main lateral tree roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots as required for root pruning.

C. Redirect roots in backfill areas where possible. If encountering large, main lateral roots, expose roots beyond excavation limits as required to bend and redirect them without breaking. If encountered immediately adjacent to location of new construction and redirection is not practical, cut roots approximately 3 inches (75 mm) back from new construction and as required for root pruning.

D. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

3.5 ROOT PRUNING

A. Prune roots that are affected by temporary and permanent construction. Prune as follows:

1. Cut roots manually by digging a trench and cutting exposed roots with sharp pruning instruments; do not break, tear, chop, or slant the cuts. Do not use a backhoe or other equipment that rips, tears, or pulls roots.
2. Cut Ends: Coat cut ends of roots more than 1-1/2 inches (38 mm) in diameter with an emulsified asphalt or other coating formulated for use on damaged plant tissues and that is acceptable to arborist.
3. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
4. Cover exposed roots with burlap and water regularly.
5. Backfill as soon as possible according to requirements in Section 02222 "Excavation."

B. Root Pruning at Edge of Protection Zone: Prune roots 6 inches (150 mm) inside of the protection zone, by cleanly cutting all roots to the depth of the required excavation.

C. Root Pruning within Protection Zone: Clear and excavate by hand to the depth of the required excavation to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.

3.6 CROWN PRUNING

A. Prune branches that are affected by temporary and permanent construction. Prune branches as follows:

1. Prune trees to remain to compensate for root loss caused by damaging or cutting root system. Provide subsequent maintenance during Contract period as recommended by arborist.
2. Pruning Standards: Prune trees according to ANSI A300 (Part 1) and the following:

   a. Type of Pruning: Cleaning.

3. Cut branches with sharp pruning instruments; do not break or chop.
4. Do not apply pruning paint to wounds.

B. Chip removed branches and spread over areas identified by Architect.

3.7 REGRADING

A. Lowering Grade: Where new finish grade is indicated below existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

B. Lowering Grade within Protection Zone: Where new finish grade is indicated below existing grade around trees, slope grade away from trees as recommended by arborist unless otherwise indicated.

1. Root Pruning: Prune tree roots exposed by lowering the grade. Do not cut main lateral roots or taproots; cut only smaller roots. Cut roots as required for root pruning.

C. Raising Grade: Where new finish grade is indicated above existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

D. Minor Fill within Protection Zone: Where existing grade is 2 inches (50 mm) or less below elevation of finish grade, fill with topsoil. Place topsoil in a single uncompacted layer and hand grade to required finish elevations.

3.8 FIELD QUALITY CONTROL

A. Inspections: Engage a qualified arborist to direct plant-protection measures in the vicinity of trees, shrubs, and other vegetation indicated to remain and to prepare inspection reports.

3.9 REPAIR AND REPLACEMENT

A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.

1. Submit details of proposed root cutting and tree and shrub repairs.

2. Have arborist perform the root cutting, branch pruning, and damage repair of trees and shrubs.
3. Treat damaged trunks, limbs, and roots according to arborist's written instructions.
4. Perform repairs within 24 hours.
5. Replace vegetation that cannot be repaired and restored to full-growth status, as determined by Architect.

B. Trees: Remove and replace trees indicated to remain that are more than 25 percent dead or in an unhealthy condition before the end of the corrections period or are damaged during construction operations that Architect determines are incapable of restoring to normal growth pattern.

1. Provide new trees of same size and species as those being replaced for each tree that measures 6 inches (150 mm) or smaller in caliper size.

a. Species: Match existing tree to be replaced.

C. Soil Aeration: Where directed by Architect, aerate surface soil compacted during construction. Aerate 10 feet (3 m) beyond drip line and no closer than 36 inches (900 mm) to tree trunk. Drill 2-inch- (50-mm-) diameter holes a minimum of 12 inches (300 mm) deep at 24 inches (600 mm) o.c. Backfill holes with an equal mix of augered soil and sand.

3.10 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove excess excavated material, displaced trees, trash and debris, and legally dispose of them off Owner's property.

END OF SECTION 015639 – TEMPORARY TREE AND PLANT PROTECTION

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SECTION 01600 – MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

B. Related Sections include but are not limited to the following:Division 1 Section "References" for applicable industry standards for products specified.List below only products and procedures that the reader might expect to find in this Section but are specified elsewhere.
   1. Division 1 Section "Contract Closeout" for submitting warranties for Contract closeout.
   2. Other included Sections for specific requirements for warranties on products and installations specified to be warranted.

1.3 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, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. 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.

1.4 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.
2. 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.

3. Initial Submittal: Within 30 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.

4. Completed List: Within 60 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.
5. Architect's Action: Architect will respond in writing to Contractor within 15 days of receipt of completed product list. Architect's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Architect's response, or lack of response, does not constitute a waiver of requirement to comply with the Contract Documents.

B. Substitution Requests: Submit three 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. Substitution Request Form: Use CSI Form 13.1A at the end of this section.

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 architects 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. Architect's/Engineer’s Action: If necessary, Architect/Engineer will request additional information or documentation for evaluation within 7 days of receipt of a request for substitution. Architect/Engineer will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.

   a. Form of Acceptance: Change Order.
   b. Use product specified if Architect/Engineer cannot make a decision on use of a proposed substitution within time allocated.

C. Comparable Product Requests: Submit three 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. Architect's Action: If necessary, Architect/Engineer will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect/Engineer will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.

a. Form of Approval: As specified in Division 1 Section "Submittals."
b. Use product specified if Architect cannot make a decision on use of a comparable product request within time allocated.

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

1.5 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, Architect/Engineer will determine which products shall be used.

1.6 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.

B. Delivery and Handling:

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.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Store cementitious products and materials on elevated platforms.
5. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.
8. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 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.

1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. 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.

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: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.
3. Refer to Divisions 2 through 33 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 1 Section "Contract Closeout."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

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," Architect will make selection.
5. Where products are accompanied by the term "match sample," sample to be matched is Architect'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 Part 2 "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:

1. Product: Where Specifications name a single product and manufacturer, provide the named product that complies with requirements.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.
3. Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
4. Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
5. Available Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.
6. Available Manufacturers: Where Specifications include a list of manufacturers, provide a product by one of the manufacturers listed, or an unnamed manufacturer, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.
7. Product Options: Where Specifications indicate that sizes, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide the specified product or system. Comply with provisions in Part 2 "Product Substitutions" Article for consideration of an unnamed product or system.
8. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide 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 Part 2 "Comparable Products" Article for consideration of an unnamed product by the other named manufacturers.
9. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and matches Architect's/Engineer's sample. Architect's decision will be final on whether a proposed product matches.

    a. If no product available within specified category matches and complies with other specified requirements, comply with provisions in Part 2 "Product Substitutions" Article for proposal of 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 that complies with other specified requirements.

    a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, 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, Architect will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 PRODUCT SUBSTITUTIONS

A. Timing: Architect will consider requests for substitution if received within 30 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.

B. Conditions: Architect/Engineer will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect 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 Architect 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.

2.3 COMPARABLE PRODUCTS

A. Conditions: Architect/Engineer will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

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 architects and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION

Not Used

Knowledge for Creating and Sustaining the Built Environment

SUBSTITUTION REQUEST

(After the Bidding/Negotiating Phase)

Project: _____ Substitution Request Number: _____

_____ From: _____

To: _____ Date: _____

_____ A/E Project Number: _____

Re: _____ Contract For: _____

Specification Title: _____ Description: _____

Section: _____ Page: _____ Article/Paragraph: _____

Proposed Substitution: _____

Manufacturer: _____ Phone: _____

Address: _____

Trade Name: _____ Model No.: _____

Installer: _____ Phone: _____

Address: _____

History: ☐ New product ☐ 1-4 years old ☐ 5-10 years old ☐ More than 10 years old

Differences between proposed substitution and specified product:

☐ Point-by-point comparative data attached — REQUIRED BY A/E

Reason for not providing specified item:

Similar Installation:

Project: _____ Architect: _____

Address: _____ Owner: _____

_____ Date Installed: _____

Proposed substitution affects other parts of Work: ☐ No ☐ Yes; explain _____

Savings to Owner for accepting substitution: _____ ($ _____).

Proposed substitution changes Contract Time: ☐ No ☐ Yes [Add] [Deduct] _____ days.

Supporting Data Attached: ☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ _____

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SUBSTITUTION REQUEST

(After the Bidding/Negotiating Phase — Continued)

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

_____

Telephone: _____

Attachments: ☐

A/E's REVIEW AND ACTION

☐ Substitution approved - Make submittals in accordance with Specification Section 01 25 00 Substitution Procedures.
☐ Substitution approved as noted - Make submittals in accordance with Specification Section 01 25 00 Substitution Procedures.
☐ Substitution rejected - Use specified materials.
☐ Substitution Request received too late - Use specified materials.

Signed by: _____ Date: _____

Additional Comments: ☐ Contractor ☐ Subcontractor ☐ Supplier ☐ Manufacturer ☐ A/E
☐ Other:

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END OF SECTION 016000 – MATERIALS AND EQUIPMENT

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SECTION 01650 - STARTING OF SYSTEMS

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Starting systems.

B. Demonstration and instructions.

1.2 RELATED SECTIONS

A. Section 01700 - Contract Closeout: System operation and maintenance data and extra materials.

1.3 STARTING SYSTEMS

A. Coordinate schedule for start-up of various equipment and systems.

B. Notify Architect/Engineer and Owner seven days prior to start-up of each item.

C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, or other conditions which may cause damage.

D. Verify that tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

E. Verify wiring and support components for equipment are complete and tested.

F. Execute start-up under supervision of responsible manufacturer's representative and/or contractor's personnel in accordance with manufacturer's instructions.

G. When specified in individual specification sections, require manufacturer to provide authorized representative to be present at site to inspect, check and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

H. Submit a written report that the equipment or system has been properly installed and is functioning correctly.

PART 2 - PRODUCTS

(Not Applicable)

PART 3 - EXECUTION

3.1. EQUIPMENT DEMONSTRATION AND OWNER PERSONNEL INSTRUCTION

A. Two (2) weeks prior to date of Final Inspection, the Contractor is to provide demonstrations and instructions for all equipment and systems for which operating and maintenance data is required. Notify Architect/Engineer and Owner seven (7) days prior to start-up of each item.

B. Do not begin demonstrations until the component, assembly or system being demonstrated has been tested as specified and is in satisfactory operating condition. If seasonal limitations prevent demonstration of certain equipment, these demonstrations and instructions will be postponed to an appropriate time as directed by the Architect.

C. Demonstrations and instructions by the Contractor shall include:

1. Inspection and satisfactory operation, in presence of Engineer and Owner, of each system and item of equipment, including accessories. Utilize operation and maintenance manuals as basis for instruction.

2. Instruction of Owner's personnel in operation and maintenance of equipment and systems. The amount of time required for instruction on each item of equipment and system is that specified in individual sections.

    a. Provide all necessary instruction to satisfaction of Owner. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled times at equipment location.

3. Explanation of operating and maintenance manuals. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

4. Tour of building areas involved and identify:

    a. Maintenance points and access.

    b. Control locations and equipment.

5. Explanation of operating sequences.

    a. Identify location and show operation of switches, valves, etc., used to start, stop and adjust systems.

    b. Explain use of flow diagrams, operating sequence diagrams, etc.

    c. Demonstrate operation through complete control cycle and full range of operation in all modes, including testing and adjusting relevant to operation.

6. Explanation of control equipment, including temperature settings, switch modes, available adjustments, reading of gages, and functions that must be serviced only by authorized factory representatives.

7. Explanation of trouble-shooting procedures.

    a. Demonstrate commonly occurring problems.

    b. Note procedures which must be performed by factory personnel.

8. Explanation of maintenance procedures and requirements.

    a. Point out items requiring periodic maintenance.

    b. Demonstrate typical preventive maintenance procedures and recommended typical maintenance intervals.

    c. Demonstrate other commonly occurring maintenance procedures not part of preventive maintenance program.

    d. Identify maintenance materials to be used.

9. Furnishing all tools required.

D. Maintenance Materials and Spare Parts

1. The Contractor shall furnish to the Owner all maintenance materials, spare parts, tools and "attic supplies," as required by the Specifications, within seven (7) days after the Date of Substantial Completion.

2. The above items shall be packed in boxes clearly identifying:

   a. The trade name and stock number.

   b. Where item material is to be used.

   c. The name, address and phone number of the closest supplier.

END OF SECTION 01650 – STARTING OF SYSTEMS

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SECTION 01700 – CONTRACT CLOSEOUT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Inspection procedures.
2. Project Record Documents.
3. Operation and maintenance manuals.
4. Warranties.
5. Instruction of Owner's personnel.
6. Final cleaning.

B. Related Sections include the following:

1. Division 1 Section "Bonds, Certificates and Administrative Forms" for requirements for Applications for Payment for Substantial and Final Completion.
2. Division 1 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
3. Division 1 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
4. Divisions 02 through 33 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 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, damage or settlement 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. Complete startup testing of systems.
8. Submit test/adjust/balance records.

9. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
10. Advise Owner of changeover in heat and other utilities.
11. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
12. Complete final cleaning requirements, including touchup painting.
13. 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, Architect/Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect/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 Architect/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.

1.4 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 Architect's/Engineer's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect/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. Submit pest-control final inspection report and warranty.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training videotapes.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect/Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect 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 in previous inspections as incomplete is completed or corrected.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.

3. Include the following information at the top of each page:

   a. Project name.
   b. Date.
   c. Name of Architect.
   d. Name of Contractor.
   e. Page number.

1.6 PROJECT RECORD DOCUMENTS

A. General: Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

B. Record Drawings: Maintain and submit one original set of blue- or black-line white prints with two copies of Contract Drawings and Shop Drawings.

   1. 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 cannot be readily identified and recorded 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.
      d. Mark Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. Where Shop Drawings are marked, show cross-reference on Contract Drawings.

   2. 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.
   3. Mark important additional information that was either shown schematically or omitted from original Drawings.
   4. Note Construction Change Directive numbers, Change Order numbers, alternate numbers, and similar identification where applicable.
   5. Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location. Organize into manageable sets; bind each set with durable paper cover sheets. Include identification on cover sheets.

C. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications. Mark copy to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

   1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
   2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
   3. Note related Change Orders, Record Drawings**,** and Product Data, where applicable.

D. Record Product Data: Submit three copies of each Product Data submittal. Mark one set to indicate the actual product installation where installation varies substantially from that indicated in Product Data.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, Record Drawings, and Record Specifications, where applicable.

E. Miscellaneous Record Submittals: Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

1.7 OPERATION AND MAINTENANCE MANUALS

A. Assemble three complete sets 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. Maintenance Data:

a. Manufacturer's information, including list of spare parts.
b. Name, address, and telephone number of Installer or supplier.
c. Maintenance procedures.
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.

1.8 WARRANTIES

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

B. 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.

C. Provide additional copies of each warranty to include in each operation and maintenance manual.

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 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: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. 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. Provide a magnetic sweep of all areas around the building to retrieve stray nails, screws and other fasteners or metal shards.
   b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
   c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
   d. Remove tools, construction equipment, machinery, and surplus material from Project site.
   e. 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.
   f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
   g. Sweep concrete floors broom clean in unoccupied spaces.
   h. Clean transparent materials, including glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.
   i. Remove labels that are not permanent.
   j. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

      1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

   k. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

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 01700 – CONTRACT CLOSEOUT

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SECTION 01720 – PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.

B. Related Sections include but are not limited to the following:

1. Division 1 Section "Contract Closeout" for general closeout procedures and maintenance manual requirements.
2. Division 1 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
3. Divisions 02 through 33 Sections for specific requirements for project record documents of the Work in those Sections.

1.3 SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit copies of Record Drawings as follows:

a. Final Submittal: Submit three sets of marked-up Record Prints and one set of record transparencies. Print each Drawing, whether or not changes and additional information were recorded.

B. Record Specifications: Submit three copies of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit three copies of each Product Data submittal.

1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in the manual instead of submittal as Record Product Data.

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. Depths of foundations below first floor.
    d. Locations and depths of underground utilities.
    e. Revisions to routing of piping and conduits.
    f. Revisions to electrical circuitry.
    g. Actual equipment locations.
    h. Duct size and routing.
    i. Locations of concealed internal utilities.
    j. Changes made by Change Order or Construction Change Directive.
    k. Changes made following Architect's written orders.
    l. Details not on the original Contract Drawings.
    m. Field records for variable and concealed conditions.
    n. 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 Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Transparencies: Immediately before inspection for Certificate of Substantial Completion, review marked-up Record Prints with Architect. When authorized, prepare a full set of corrected transparencies of the Contract Drawings and Shop Drawings.

1. Incorporate changes and additional information previously marked on Record Prints. Erase, redraw, and add details and notations where applicable.
2. Refer instances of uncertainty to Architect for resolution.
3. Owner will furnish Contractor one set of transparencies of the Contract Drawings for use in recording information.

4. Print the Contract Drawings and Shop Drawings for use as Record Transparencies. Architect will make the Contract Drawings available to Contractor's print shop.

C. 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 Transparencies: Organize into unbound sets matching Record Prints. Place transparencies in durable tube-type drawing containers with end caps. Mark end cap of each container with identification. If container does not include a complete set, identify Drawings included.
3. 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.
4. Identification: As follows:

    a. Project name.
    b. Date.
    c. Designation "PROJECT RECORD DRAWINGS."
    d. Name of Architect/Engineer.
    e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of the manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
5. Note related Change Orders, Record Drawings, and Product Data where applicable.

2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, Record Drawings, and Product Data where applicable.

2.4 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

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 Architect's/Engineer's reference during normal working hours.

END OF SECTION 01720 – PROJECT RECORD DOCUMENTS

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SECTION 017329 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 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.

1.4 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.

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

1. Primary operational systems and equipment.
2. Fire-protection systems.
3. Control systems.
4. Communication systems.
5. Electrical wiring systems.

C. Miscellaneous Elements: Do not cut and patch the following elements or related components in a manner that could change their load-carrying capacity, which results in reducing their capacity to perform as intended, or that result in increased maintenance or decreased operational life or safety.

1. Water, moisture, or vapor barriers.
2. Membranes and flashings.
3. Piping and ductwork.

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 Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

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

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 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. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

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 support of Work to be cut.

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.

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, 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: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete & 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. Provide materials and comply with installation requirements specified in other Sections of these Specifications.

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. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. 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.

    a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

END OF SECTION 017329

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Salvaging nonhazardous demolition and construction waste.
2. Recycling nonhazardous demolition and construction waste.
3. Disposing of nonhazardous demolition and construction waste.

1.3 DEFINITIONS

A. Construction, Demolition and Land Clearing (CDL) Waste: Includes all non-hazardous solid wastes resulting from construction, remodeling, alterations, repair, demolition and land clearing. Includes material that is recycled, reused, salvaged or disposed as garbage. Construction waste includes packaging.

B. 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.

C. Recycle: The process of sorting, treating and reconstituting materials for the purpose of using the material in the manufacture of a new product.

D. Reuse: Making use of a material without altering its form. Materials can be reused on-site or reused on other projects off-site. Examples include, but are not limited to the following: Crushing or grinding of concrete for use as sub-base material. Chipping of land clearing debris for use of mulch.

E. Salvage: Recovery of demolition or construction waste and subsequent sale, reuse in another facility or sale to a third party.

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

G. Source-Separated CDL Recycling: The process of separating recyclable materials in separate containers as they are generated on the job-site. The separated materials are hauled directly to a recycling facility or transfer station.

H. Co-mingled CDL Recycling: The process of collecting mixed recyclable materials in one container on-site. The container is taken to a material recovery facility where materials are separated for recycling.

I. Approved Recycling Facility: Any of the following:

1. A facility that can legally accept CDL waste materials for the purpose of processing the materials into an altered form for the manufacture of a new product.
2. Material Recovery Facility: A general term used to describe a waste-sorting facility. Mechanical, hand-separation, or a combination of both procedures, are used to recover recyclable materials.

1.4 PERFORMANCE REQUIREMENTS

A. General: Achieve end-of-Project rates for salvage/recycling of 75 percent CDL waste by weight from the landfill by one or a combination of the following activities:

1. Salvage.
2. Reuse.
3. Source-Separated CDL Recycling.
4. Co-mingled CDL Recycling.

B. CDL waste materials that can be salvaged, reused or recycled include, but are not limited to, the following:

1. Demolition Waste:

a. Acoustical ceiling tiles.
b. Asphalt paving.
c. Asphalt shingles.
d. Carpet and carpet pad.
e. Concrete.
f. Concrete reinforcing steel.
g. Concrete masonry units.
h. Doors and frames.
i. Door hardware.
j. Field office waste including office paper, cans, plastic and office cardboard.
k. Fluorescent lamps and ballasts.
l. Glazing.
m. Gypsum board.
n. Insulation.
o. Land clearing debris (vegetation, stumpage, dirt, etc.).
p. Membrane and built-up Roofing.
q. Metals.
r. Metal studs.
s. Paint (through hazardous waste outlets).
t. Plastic film (sheeting, shrink wrap and packaging),
u. Plywood and oriented strand board.
v. Rough hardware.
w. Structural and miscellaneous steel.
x. Windows.
y. Wood.
z. Equipment.
aa. Piping.
bb. Supports and hangers.
cc. Valves.
dd. Sprinklers.
ee. Mechanical equipment.

ff. Refrigerants.
gg. Electrical conduit.
hh. Copper wiring.
ii. Lighting fixtures.
jj. Electrical devices.
kk. Switchgear and panelboards.
ll. Transformers.

2. Construction Waste:

a. Acoustical ceiling tiles.
b. Asphalt paving.
c. Asphalt shingles.
d. Carpet and carpet pad.
e. Concrete.
f. Concrete reinforcing steel.
g. Concrete masonry units.
h. Doors and frames.
i. Door hardware.
j. Field office waste including office paper, cans, plastic and office cardboard.
k. Fluorescent lamps and ballasts.
l. Glazing.
m. Gypsum board.
n. Insulation.
o. Land clearing debris (vegetation, stumpage, dirt, etc.).
p. Membrane and built-up Roofing.
q. Metals.
r. Metal studs.
s. Paint (through hazardous waste outlets).
t. Plastic film (sheeting, shrink wrap and packaging),
u. Plywood and oriented strand board.
v. Rough hardware.
w. Structural and miscellaneous steel.
x. Windows.
y. Wood.
z. Piping.
aa. Electrical conduit.
bb. 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.

1.5 ACTION SUBMITTALS

A. Waste Management Plan: Submit plan within 30 days of date established for the Notice of Award.

B. Waste Management Report: Submit report with each application for payment.

1.6 INFORMATIONAL SUBMITTALS

A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report:

1. Material category.
2. Generation point of waste.
3. Total quantity of waste in tons (tonnes).
4. Quantity of waste salvaged, both estimated and actual in tons (tonnes).
5. Quantity of waste recycled, both estimated and actual in tons (tonnes).
6. Total quantity of waste recovered (salvaged plus recycled) in tons (tonnes).
7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

B. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

C. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

D. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

E. 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.

F. Qualification Data: For refrigerant recovery technician.

G. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.7 QUALITY ASSURANCE

A. Waste Management Coordinator Qualifications: Experienced firm, with a record of successful waste management coordination of projects with similar requirements, that employs a LEED Accredited Professional, certified by the USGBC as waste management coordinator.

B. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

C. Regulatory Requirements: Conduct construction waste management activities in accordance with hauling and disposal regulations of all authorities having jurisdiction and all other applicable laws and ordinances.

D. Waste Management Conference: Conduct conference at Project site to comply with requirements in Section 01040 "Project Coordination." Review methods and procedures related to waste management including, but not limited to, the following:

1. Review and discuss waste management plan including responsibilities of waste management coordinator.
2. Review requirements for documenting quantities of each type of waste and its disposition.

3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
5. Review waste management requirements for each trade.
6. Attendees: Inform the following individuals, whose presence is required, of date and time of meeting.

a. Owner.
b. Architect/Engineer.
c. Contractor's superintendent.
d. Major subcontractors.
e. Waste Management Coordinator.
f. Other concerned parties.

7. Minutes: Record discussion. Distribute meeting minutes to all participants. Note: If there is an Architectural/Engineering consultant contracted by the State of Delaware, they will perform this role.

1.8 WASTE MANAGEMENT PLAN

A. General: Develop a waste management plan according to ASTM E 1609 and requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Distinguish between demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

B. Waste Identification: Indicate anticipated types and quantities of demolition, site-clearing and construction waste generated by the Work. List all assumptions made for the quantities estimates.

C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. The plan shall include the following information:

1. Types and estimated quantities, by weight, of CDL waste expected to be generated during demolition and construction.
2. Proposed methods for CDL waste salvage, reuse, recycling and disposal during demolition including, but not limited to, one or more of the following:

a. Contracting with a deconstruction specialist to salvage materials generated,
b. Selective salvage as part of demolition contractor’s work,
c. Reuse of materials on-site or sale or donation to a third party.

3. Proposed methods for salvage, reuse, recycling and disposal during construction including, but not limited to, one or more of the following:

a. Requiring subcontractors to take their CDL waste to a recycling facility;
b. Contracting with a recycling hauler to haul recyclable CDL waste to an approved recycling or material recovery facility;
c. Processing and reusing materials on-site;
d. Self-hauling to a recycling or material recovery facility.

4. Name of recycling or material recovery facility receiving the CDL wastes.
5. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on project site where materials separation will be located.

D. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Include the following:

1. Total quantity of waste.
2. Estimated cost of disposal (cost per unit). Include hauling and tipping fees and cost of collection containers for each type of waste.
3. Total cost of disposal (with no waste management).
4. Revenue from salvaged materials.
5. Revenue from recycled materials.
6. Savings in hauling and tipping fees by donating materials.
7. Savings in hauling and tipping fees that are avoided.
8. Handling and transportation costs. Including cost of collection containers for each type of waste.
9. Net additional cost or net savings from waste management plan.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 CONSTRUCTION WASTE MANAGEMENT, GENERAL

A. Provide containers for CDL waste that is to be recycled clearly labeled as such with a list of acceptable and unacceptable materials. The list of acceptable materials must be the same as the materials recycled at the receiving material recovery facility or recycling processor.

B. The collection containers for recyclable CDL waste must contain no more than 10% non-recyclable materials, by volume.

C. Provide containers for CDL waste that is disposed in a landfill clearly labeled as such.

D. Use detailed material estimates to reduce risk of unplanned and potentially wasteful cuts.

E. To the greatest extent possible, include in material purchasing agreements a waste reduction provision requesting that materials and equipment be delivered in packaging made of recyclable material, that they reduce the amount of packaging, that packaging be taken back for reuse or recycling, and to take back all unused product. Insure that subcontractors require the same provisions in their purchase agreements.

F. Conduct regular visual inspections of dumpsters and recycling bins to remove contaminants.

3.2 SOURCE SEPARATION

A. General: Contractor shall separate recyclable materials from CDL waste to the maximum extent possible. Separate recyclable materials by type.

1. Provide containers, clearly labeled, by type of separated materials or provide other storage method for managing recyclable materials until they are removed from Project site.
2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water and to minimize pest attraction. Cover to prevent windblown dust.
3. Stockpile materials away from demolition area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from weather.

3.3 CO-MINGLED RECYCLING

A. General: Do not put CDL waste that will be disposed in a landfill into a co-mingled CDL waste recycling container.

3.4 REMOVAL OF CONSTRUCTION WASTE MATERIALS

A. Remove CDL waste materials from project site on a regular basis. Do not allow CDL waste to accumulate on-site.

B. Transport CDL waste materials off Owner's property and legally dispose of them.

C. Burning of CDL waste is not permitted.

WASTE MANAGEMENT PROGRESS REPORT					
		Disposed in Municipal Solid Waste landfill	**Diverted from Landfill by Recycling, Salvage or Reuse**		
Material Category			Recycled	Salvaged	Reused
1.	Acoustical Ceiling Tiles				
2.	Asphalt				
3.	Asphalt Shingles				
4.	Cardboard Packaging				
5.	Carpet & Carpet Pad				
6.	Drywall				
7.	Concrete				
8.	Fluorescent Lamps and Ballasts				
9.	Land Clearing Debris (Vegetation, Stumpage & dirt)				
10.	Metals				
11.	Paint (Through Hazardous Waste Outlets)				
12.	Wood				
13.	Plastic Film (Sheeting, Shrink Wrap & Packaging)				
14.	Window Glass				
15.	Field Office waste (Office Paper, Aluminum Cans, Glass, Plastic and Coffee Cardboard)				
16.	Other (Insert Description)				
17.	Other (Insert Description)				

	Total (In Weight)		(TOTAL OF ALL ABOVE VALUES – IN WEIGHT)		
Percentage of Waste Diverted			(TOTAL WASTE DIVIDED BY TOTAL DIVERTED)		

END OF SECTION 017419 – CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

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SECTION 017823 - MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for preparing maintenance manuals, including the following:
   1. Maintenance documentation directory.
   2. Maintenance manuals for the care and maintenance of products, and materials.

B. Related Sections include but are not limited to the following:
   1. Division 1 Section "Submittals" for submitting copies of submittals for maintenance manuals.
   2. Division 1 Section "Contract Closeout" for submitting maintenance manuals.
   3. Division 1 Section "Project Record Documents" for preparing Record Drawings for maintenance manuals.
   4. Divisions 02 through 33 Sections for specific maintenance manual requirements for the Work in those Sections.

1.3 SUBMITTALS

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

1.4 COORDINATION

A. Where maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

PART 2 - PRODUCTS

2.1 MAINTENANCE DOCUMENTATION DIRECTORY

A. Organization: Include a section in the directory for each of the following:
   1. List of documents.
   2. Table of contents.

B. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

2.2 MANUALS, GENERAL

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
   1. Title page.
   2. Table of contents.
   3. Manual contents.

B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:
   1. Subject matter included in manual.
   2. Name and address of Project.
   3. Name and address of Owner.
   4. Date of submittal.
   5. Name, address, and telephone number of Contractor.
   6. Name and address of Architect/Engineer.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
   1. If maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
   1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
      a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
      b. Identify each binder on front and spine, with printed title "MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
   2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
   3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
   4. Supplementary Text: Prepared on 8-1/2-by-11-inch, 20-lb/sq. ft. white bond paper.
   5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
      a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
      b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 PRODUCT MAINTENANCE MANUAL

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. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:
   1. Product name and model number.
   2. Manufacturer's name.
   3. Color, pattern, and texture.
   4. Material and chemical composition.
   5. Reordering information for specially manufactured products.

D. 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.

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

F. 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. Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to operation and maintenance manuals.

B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

C. Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

D. 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.

E. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.
   1. Do not use original Project Record Documents as part of maintenance manuals.
   2. Comply with requirements of newly prepared Record Drawings in Division 1 Section "Project Record Documents."

F. Comply with Division 1 Section "Contract Closeout " for the schedule for submitting maintenance documentation.

END OF SECTION 017823 – MAINTENANCE DATA

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SECTION 02070 – REMOVAL DISPOSAL OF ACM

PART 1.00 - GENERAL

1.1 SCOPE OF WORK

A. The extent of asbestos-containing material (ACM) to be removed and disposed under this project is indicated in this Section. The work shall be conducted in accordance with all applicable codes, rules, and regulations including, but not limited to EPA NESHAP regulation (40 CFR Part 61, Subpart M), Delaware Asbestos Regulation 16 Delaware Code, Chapter 78 (16 **Del.C.** Ch. 78), and the Delaware Department of Natural Resources & Environmental Control (DNREC) Asbestos Management & Control Regulations

1. The abatement work area is located in select areas within Lums Pond State Park; Bear, DE. The Abatement Contractor shall refer to drawing C-04, the Site Utility Plan as prepared by URS, dated July 7, 2010 for a detailed representation of the general layout of the work areas and the extent of asbestos removal and disposal specified at each work area. The Site Plan is provided in the contract documents for reference.

2. The work consists of the removal and disposal of buried transite conduit in select areas as identified below:

   a. The scope of work will be to install new gravity sewer, water supply and electrical lines throughout an existing RV campground within the Park. The campground has three existing asbestos-containing (AC) transite lines that will be disturbed—a 10” AC gravity sewer line, an 8” AC pressurized water supply line, and an 8” forcemain;

   b. Abandoning in place about one thousand two hundred (1200) linear feet of the 10” AC gravity sewer line with flowable fill. The proposed gravity sewer system intersects the existing pipe perpendicularly (at about the same elevation), thus a section of the 10” pipe will need to be cut and removed. This is the extent of the expected work to the 10” AC gravity sewer line.

   c. Tapping into the 8” water supply line at a total of sixteen (16) different locations. There are fourteen (14) locations that will need tapping of the line with a ¾” PE water service, one (1) location that will tie in a 8”x8”x8” ductile iron tee, and one (1) location where a proposed 2 ½” SDR-26 water supply line will tie into the existing 8” line; and

   d. Abandoning in place the 8” forcemain (120 linear feet total) with flowable fill and cutting and disposing of 5 linear feet of the forcemain where it is tying into a manhole that will be replaced.

B. General Conditions

1. The Owner will make necessary arrangements prior to the start of asbestos abatement work to remove moveable objects from the proposed work areas where ACM is scheduled to be removed, as necessary, to provide the Abatement Contractor with sufficient access to specified work areas to construct required critical barriers which adjoin the work areas.

2. The asbestos abatement work shall be conducted by a Delaware Division of Facilities Management licensed asbestos abatement contractor in accordance with all applicable codes, rules, and regulations that apply to the work including, but not limited to the EPA NESHAP regulation (40 CFR Part 61, Subpart M), Delaware Asbestos Regulation 16 Delaware Code, Chapter 78 (16 **Del.C.** Ch. 78), and DNREC Asbestos Management &

Control Regulations.

3. Delaware Division of Facilities Management certified Asbestos Supervisors and Handlers. The Contractor shall provide the appropriate quantity of certified personnel to work as many shifts and as many hours as needed to complete the work within the specified time period as scheduled.

4. The Abatement Contractor shall field verify to his satisfaction all quantities, locations, and conditions of ACMs to be removed and disposed under this project. The Abatement Contractor shall review all project related drawings as to the extent, location and configuration of the abatement work areas.

5. The Abatement Contractor shall conduct or otherwise provide for personnel air sampling of abatement personnel employed on the project, including daily 8-hour Time-Weighted Average (TWA) and 30-minute Short Term Excursion Limit (STEL) air sampling, as required by OSHA 29 CFR Part 1926.1101. Personnel 8-hr. TWA and 30-min. STEL samples shall be analyzed for asbestos fibers by Phase Contrast Microscopy (PCM) and the results shall be conspicuously posted at the project site within 72-hours of collection.

6. The Abatement Contractor shall protect architectural finishes, landscaping, and equipment outside the abatement work area and all adjacent non-work areas from damage and, if any damage occurs, the Contractor shall be held liable for all costs related to the repair, restoration, or replacement of the damaged fixtures or structures at no cost to the Owner.

C. Asbestos abatement activities shall include:

1. Removal and disposal of buried asbestos-containing conduit. Dispose of all removed ACM material and associated debris as asbestos-contaminated debris.

2. Furnish all labor, materials, licenses/permits, facilities, equipment, services, employee training and testing necessary to perform the work required in accordance with these specifications, the latest regulations from the U.S. Environmental Protection Agency (EPA), the Occupational Safety and Health Administration (OSHA), the State of Delaware, the recommendations of the National Institute of Occupational Safety and Health (NIOSH), Standard 241 of the National Fire Protection Association (NFPA) and any other applicable federal, state, and local government regulations that apply to this project.

3. The work specified herein shall be performed by competent persons trained, knowledgeable and qualified in state-of-the-art technologies of asbestos abatement, handling, and the subsequent cleaning and disposal of contaminated areas. An accredited asbestos abatement supervisor shall be on-site during all phases of asbestos abatement activities.

1.2 SUBMITTALS

A. Approval by the Owner is required of the experience of the Abatement Contractor and will be based upon submission by Contractor evidence of the following.

1. The Contractor shall submit a listing of projects indicating skills and experience with all phases of abatement work as evidenced through participation in at least five asbestos abatement projects of comparable complexity with this project. Include a list of project/location names, project-monitoring firm and phone numbers of references.

2. The Contractor shall submit a notarized statement, signed by an officer of the company,

containing the following information:

a. A record of any citations, penalties, orders to comply, notices of deficiency, or notices of violations issued by Federal, State, or local regulatory agencies related to asbestos abatement activities. Include projects, dates and resolutions.

b. A list of penalties incurred through non-compliance with asbestos project specifications including liquidated damages, overruns in scheduled time limitations and resolutions.

c. Situations in which asbestos related contracts have been terminated including projects, dates and reasons for terminations.

d. A listing of any asbestos-related legal proceedings/claims in which the Abatement Contractor (or employees scheduled to participate in this project) has participated or are currently involved. Include descriptions of role, issue and resolution to date.

B. Prior to the start of the asbestos abatement work, the Abatement Contractor shall submit the following Pre-Abatement Submittals at least 10 days prior to the pre-construction meeting. The Owner or Owner's representative will review, for approval, the Contractors submittal package prior to commencing asbestos abatement work. Asbestos abatement work shall not commence until approval of the Pre-Abatement Submittal package has been obtained.

1. Contractor's Delaware Division of Facilities Management Asbestos License.

2. Asbestos Plan:

a. Submit a detailed plan of the work procedures to be used in the removal and disposal of ACM and asbestos-contaminated debris. The work plan shall include location of control areas, layout of decontamination chambers, sequencing of asbestos related work, negative air pressure filtration system plan, disposal plan, type of wetting agent, asbestos sealer to be used, personal air monitoring program, and a detailed description of the method to be employed in order to control pollution, including but not limited to emergency procedures for fire and medical emergencies. This plan must be approved by the Owner prior to the start of any asbestos work.

b. Submit a negative air pressure filtration system plan, if applicable to the project, which includes method of providing air into the work area, the anticipated location of the high efficiency purified air (HEPA) filtration system, anticipated HEPA filtration exhaust location(s), negative air pressure to be maintained in the work area, the method to control this pressure, and provision for maintaining effectiveness of the pre-filters.

c. Submit a copy of the forms to be used for maintenance of waste shipment records in compliance with USEPA NESHAPS regulations.

d. Submit manufacturer's certification that vacuums, filtration units, and other equipment required to contain airborne asbestos fibers conform to HEPA filtration requirements.

3. Waste Transporter Permit:

a. Submit a Waste Transporter Permit issued by the Delaware Department of Natural Resources & Environmental Control Division of Solid Waste and Hazardous Waste specifically for transporting asbestos waste and debris to an approved treatment, storage, or disposal facility. The permit shall include the name and location of each treatment, storage, or disposal facility, and a list of vehicles permitted to haul/transport asbestos waste in the State of Delaware.

4. Wastewater Discharge Permit:

   a. Submit, if applicable to the project, a Wastewater Discharge Permit issued by the County or local enforcement/permitting agency to discharge filtered wastewater to the municipal sanitary sewer system.

   b. If such a permit is not issued, the Abatement Contractor shall submit a letter stating the procedure and intent for handling and disposing of asbestos containing wastewater generated during the asbestos project.

5. Work Schedule:

   a. The Abatement Contractor shall submit written notification to the Owner of his intent to start work at least 10 days in advance. The Contractor shall not start work or post a notification until authorization to proceed is received from the Owner.

   b. The Abatement Contractor shall submit a bar-chart schedule, or similar, indicating each significant asbestos abatement phase and associated activity.

6. Emergency Telephone Numbers:

   a. Submit the names and telephone numbers of personnel (i.e., Supervisor, Project Manager, etc.) to contact in the event of an emergency. A representative of the Contractor shall be available at all times during the course of the project.

7. Asbestos Project Notifications:

   a. The Abatement Contractor shall submit, if applicable to the project, notification to:

      Asbestos NESHAP Coordinator (3WC32)
      U.S. Environmental Protection Agency - Region III
      1650 Arch St.
      Philadelphia, PA. 19103-2029

   b. The Abatement Contractor shall submit, if applicable to the project, notification to:

      Office of Management & Budget
      Division of Facilities Management
      Carvel State Office Building
      820 North French Street
      Wilmington, DE 19801

   c. The Abatement Contractor shall prepare a written notification to occupants of the site buildings for the asbestos abatement work, and post such notifications where the work will be performed in accordance with all applicable regulations.

   d. The Abatement Contractor shall prepare a written notification to the local fire/rescue department for the asbestos abatement work.

8. Legible copy (front and back) of each asbestos abatement supervisor's Asbestos Handling Certificate anticipated to be working at the project. An asbestos abatement supervisor shall be on site during all abatement activities.

9. Legible copy (front and back) of each asbestos abatement project personnel's Asbestos

Handling Certificate that is anticipated to be working on the project.

10. Legible copy of each asbestos abatement project personnel anticipated to be working at the project of having been trained in an EPA approved Supervisor or Handler course within the past 12 months.

11. Legible copy of each asbestos abatement project personnel anticipated to be working at the project of having been fit-tested within the past 12 months for using a negative-pressure air purifying respirator equipped with a high efficiency particulate air (HEPA) filter cartridges.

12. Legible copy of each asbestos abatement project personnel anticipated to be working on the project of having been examined by a qualified physician within the past 12 months, being capable of wearing respiratory protection and able to perform asbestos abatement work.

13. Submit Safety Data Sheets (SDS) for all materials and equipment as specified in this Section or otherwise proposed for use on the project by the Abatement Contractor.

C. Upon completion of the asbestos abatement work and as a condition of acceptance, the Contractor shall submit the following Post-Abatement (Project Close-out) Submittals:

1. All waste manifests and landfill receipts detailing disposal of all asbestos waste generated by the work at the Project.

2. All certified analytical results of all personal air samples collected as required by OSHA to document the 8-hour TWA and 30-minute STEL concentrations of asbestos fibers in the breathing zone of the asbestos abatement project personnel.

3. A legible copy of the Abatement Contractor's project logbook containing the day-to-day record of personnel entering the project site as well as the regulated asbestos work area(s), and any significant events occurring during the project.

1.3 QUALITY ASSURANCE

A. The Abatement Contractor shall assume full responsibility for compliance with all applicable codes, rules, regulations, and standards pertaining to asbestos work practices, transport and disposal of asbestos waste, and protection of workers, visitors, and public from the work site. The Abatement Contractor shall comply with all aspects of the Asbestos Hazard Emergency Response Act (AHERA) regulations as governed by the USEPA that are applicable to the project.

B. Except to the extent that more stringent requirements are written directly into the Contract Documents, the following regulations shall have the same force and effect as if copied directly into the Contract Documents, or as if copies were bound herewith:

1. OSHA 29 CFR Part 1910.134 - Respiratory Protection
2. OSHA 29 CFR Part 1910.145 - Accident Prevention
3. OSHA 29 CFR Part 1926.1101 - Asbestos
4. OSHA 29 CFR Part 1910.1200 - Hazard Communication
5. USEPA 40 CFR Part 61 - Asbestos National Emission Standards Hazardous Air Pollutants
6. USEPA 40 CFR Part 763 - Asbestos Abatement Projects Rule

C. Delaware regulations, which govern asbestos abatement, hauling, and disposal of asbestos waste materials include, but are not limited to, the following:

1. Delaware Asbestos Regulation 16 Delaware Code, Chapter 78; and

2. Delaware Department of Natural Resources & Environmental Control Solid Waste & Hazardous Waste Management regulations.

D. Consult with the local fire/rescue department in the preparation of the Emergency Procedures Plan for fire and medical emergencies. Notify the local fire/rescue department at least seven days prior to the start of abatement work. The Plan should, at a minimum, establish a system for alerting project personnel of fire or other hazards that require escape routes, development of an assigned meeting place, development of a building floor plan showing work areas and emergency exists, mark arrows on floor and/or walls in the work areas to show all emergency exits, provide an on-site telephone for emergency notification to authorities, provide a person who is trained in First Aid, and chemical fire extinguishers on site for emergencies. In case of emergency due to fire, shut off all negative air machines during the fire.

E. The Project Monitor is authorized by the Owner to oversee all removal work, interpret all procedures and enforce all provisions of the Contract Documents pertaining to asbestos removal and disposal. The Project Monitor is authorized to stop work if, in their judgment, there is substantial non-compliance with Contract Documents, or there is a situation of serious health risk to workers or occupants due to the performance of work by the Contractor. Such stop work order shall be effective immediately and remain in effect until corrective measures have been taken and the situation has been remedied to the satisfaction of the Owner. *Standby time required to resolve such situations shall be at the Abatement Contractor's own expense.*

F. Upon completion of asbestos abatement work, the Project Monitor shall submit to the Owner a full report of daily job events.

G. Negative Air Pressure Filtration System Monitoring shall include the following:

1. Continuous 24-hour per day monitoring of pressure differential relative to adjacent unsealed areas shall be performed by automatic recording instruments, *if applicable to the project*.

2. Pressure differential recordings for each day the negative air pressure filtration system shall be reviewed by the Project Monitor, *if applicable to the project*. The Project Monitor shall immediately notify the Abatement Contractor and the Owner of any variance in the pressure differential, which could cause exposure of adjacent unsealed areas to asbestos fiber contamination.

1.4 PRE-BID MEETING

A. Bidders are encouraged to attend a pre-bid meeting. Refer to Notice to Bidders for the designated time and location of the pre-bid meeting. Attendance at this meeting by the Bidders or his qualified representative will be recorded.

B. At the time of bid opening, each bidder shall acknowledge that he has investigated and satisfied himself as to:

1) Conditions affecting scope of work, including but not limited to, physical condition of the site, handling and storage of tools and materials, access to utilities.

2) Characteristics and quantity of all materials and obstacles encountered in so far as this information is reasonably ascertainable from an inspection of the site.

3) Condition, location and extent of ACM to be removed and disposed. The Owner is

not responsible for any conclusions or interpretations made by the Contractor.

C. The asbestos abatement work shall be conducted by a DE Division of Facilities Management licensed asbestos abatement contractor employing trained and certified personnel as required by all applicable codes and regulations. After the Contract has been awarded, no subcontracting of the abatement work to another abatement contractor will be permitted.

1.5 PRE-CONSTRUCTION CONFERENCE

A. Prior to start of any preparatory work under this Contract, the Abatement Contractor shall attend a pre-construction conference attended by Owner or designated representative, Environmental Consultant for the Owner, Project Architect/Engineer and Project Monitor.

B. Agenda for this conference will include but not necessarily be limited to:

1. Abatement Contractor's scope of work, work plan, schedule and list of required submittals.

2. Abatement Contractor's safety and health plan, PPE and decontamination procedures.

3. Project Monitor’s air monitoring plan, if applicable to the project.

4. Abatement Contractor's work procedures including, job site preparation, decontamination chamber set-up, wetting agents, methods of handling removed ACM, disposal procedures; cleanup procedures and equipment; signs and labels; fire exits; and emergency procedures.

5. Abatement Contractor's plan for 24-hour job security both for prevention of theft and for barring entry of curious, unprotected personnel or the public into work areas.

6. Location of temporary utilities.

7. Handling of mechanical, electrical, HVAC systems, and other moveable objects.

C. Before any site work begins, the Contractor shall conduct a space-by-space inspection with a representative of the building owner, and prepare a written inventory of all existing damage in those spaces, which may be impacted by the contractors work. Document existing condition of the work areas, review overall work plan, water supply and temporary electric tie-in locations

1.6 DELIVERY AND STORAGE

A. Store all materials at the job site in a suitable and designated area. Store materials subject to deterioration or damage away from wet or damp surfaces and under cover.

B. Remove damaged or deteriorated materials from the job site. Materials contaminated with asbestos shall be disposed of as asbestos debris as herein specified.

1.7 TEMPORARY UTILITIES

A. Electric:

1. Provide required temporary electric service with Ground Fault Circuit Interrupters (GFCI) for all electric requirements within each asbestos abatement work area. Provide temporary

wiring and receptacles in sufficient quantity to serve all negative air units, HEPA vacuums, tools and air monitoring equipment. Obtain electrical power from Owner's existing power distribution system providing: 1) Contractor provides moisture barriers around all electrical conduits and junction boxes that remain energized and pass through work areas and, 2) Contractor shall provide a back-up emergency generator for the duration of the abatement project to be used should failure of the normal power source occur.

2. Provide temporary lighting, *if required*, for all work areas. Lighting shall provide adequate intensity so the Project Monitor can perform daily monitoring procedures and abatement personnel can perform removal activities safely, efficiently and completely.

3. All temporary devices and wiring used in the work area shall be capable of decontamination procedures including HEPA vacuuming and wet-wiping.

B. Water:

1. Provide temporary source of water with separate valves for hot and cold water from Owner's existing system. *In the event of hot water shut off from Owner's system, the Abatement Contractor shall be prepared to provide hot water to meet all regulation requirements.* Hot and cold water service shall be provided to showers in the decontamination chamber.

1.8 ELECTRICAL CODES, STANDARDS, AND NOTIFICATIONS

A. Perform all electrical installation and removal work, *if required*, in accordance with applicable requirements of:

1. National Electrical Code (NEC)

2. Delaware Uniform Fire Prevention and Building Code

3. NFPA 101, "Life Safety Code".

B. All electrical devices, materials, and equipment shall meet the requirements of a recognized testing agency, such as the Underwriters' Laboratories, Incorporated, and shall bear its label.

C. If requested by the Owner, where equipment other than that specified is proposed for use under this Contract, submit a list of installations within the State of Delaware where the proposed equipment has operated satisfactorily for a period of at least five years.

D. Notify and obtain permission from the Owner 48 hours in advance of interrupting any utilities.

1.9 DEFINITIONS

A. The following definitions apply throughout the Contract Documents:

1. Aggressive Air Sampling - Air sampling technique whereby air samples are collected while fans are operated in work area, and while floors, walls, and other structural surfaces are swept with constant air movement to entrain any particles that may be present. Aggressive air sampling shall be used at the completion of abatement to obtain clearance air data.

2. Airlock - a system (consisting of three curtained doorways) for permitting ingress or egress without permitting air movement between any two adjacent areas.

3. Air Monitoring - The process of measuring the fiber content of a specific volume of air in a stated period of time. Analysis of air samples shall be by Phase Contrast Microscopy (PLM) in accordance with NIOSH Method 7400, or Transmission Electron Microscopy (TEM) in accordance with EPA methodology.

4. Amended Water - Water to which a surfactant has been added at a ratio according to the manufacturer's directions.

5. Area Air Sampling - Any form of air sampling or monitoring where the sampling device is placed at a stationary location.

6. Asbestos Handler - An individual, who installs, removes, applies, encapsulates, or encloses asbestos or asbestos material or who disturbs friable asbestos.

7. Asbestos Handling Certificate - Certificate issued by the Delaware Office of Management & Budget, Division of Facilities Management to a person who has satisfactorily completed an approved asbestos safety program.

8. Asbestos Handling License - A license issued by the Delaware Office of Management & Budget, Division of Facilities Management to a contractor engaged in the installation, removal, application, enclosure or encapsulation of asbestos or asbestos material or the disturbance of friable asbestos.

9. Asbestos Project - Work undertaken by a Contractor, which involves the installation, removal, encapsulation, enclosure of asbestos or asbestos material, or the disturbance of friable asbestos. At the time that such disturbance occurs, the project shall become an asbestos project and all further work on that portion of the project, which resulted in such disturbance, shall be conducted in accordance with the requirements of this specification. Where asbestos work is subcontracted to a Contractor with an asbestos handling license, only that part of work involving asbestos shall be deemed to be an asbestos project.

10. Asbestos Work Area - A work space as indicated in the contract drawings within which all exposed surfaces, except those covered with asbestos-containing materials being removed, or unless otherwise specified and fixed equipment have been sealed with intact layer(s) of polyethylene sheeting. Any work resulting in the release of asbestos fibers must be performed in the asbestos work area.

11. Authorized Visitor - A representative of the building owner, or a representative of any regulatory or other agency having jurisdiction over the project.

12. Background Monitoring - Method used to determine airborne asbestos fiber concentrations inside and outside of an abatement work area prior to starting an asbestos project.

13. Building Owner - The person or agency in which legal title to the premises is vested unless the premises are held in a land trust, in which instance Building Owner means the person to whom beneficial title is vested.

14. Equipment Room - A room between the holding room and non-work area, which is part of the equipment/waste decontamination enclosure system. The clean equipment room comprises an airlock and must be maintained in uncontaminated condition at all times.

15. Clean Room - An uncontaminated room, which is part of the worker decontamination enclosures system, with provisions for storage of workers' street clothes and protective equipment.

16. Critical Barrier - A unit of temporary construction, which provides separation of an asbestos work area and an adjacent, potentially occupied space. The critical barrier will be composed of at least two independent and intact sheets of 6-mil fire-retardant polyethylene. All seams shall be sealed airtight.

17. Curtained Doorway - A device, which is constructed, of three overlapping sheets of fire retardant 6-mil polyethylene sheeting over an existing or temporarily framed doorway.

18. Differential Air Pressure System - A portable, powered HEPA-filtered system used to exhaust air from the work area to outside the building. A differential pressure must be maintained at any point in the work areas no less than -0.025 inches water gauge relative to the pressure at any point outside the work area.

19. Encapsulant - A liquid material which can be applied to asbestos-containing material and which controls the release of asbestos fibers from the material by creating a membrane over the surface (bridging encapsulant) or by penetrating into the material and binding its components together (penetrating encapsulant).

20. Encapsulation - all herein specified procedures necessary to coat asbestos-containing material or asbestos contaminated surfaces with an encapsulant to control the possible release of asbestos fibers into the ambient air.

21. Enclosure - The construction of airtight walls, ceiling and floors between the asbestos material and the facility environment, or around surfaces coated with asbestos materials, which prevents the release of asbestos materials.

22. Environmental Consultant – A technical representative of/for the Building Owner.

23. Equipment/Waste Decontamination Enclosure System - A decontamination system for materials and equipment consisting of a designated area of the work area for a washroom, and holding room separated from the work area and from each other by two airlocks.

24. Equipment Room - A room, which is part of the personal decontamination enclosure system, with, provisions for storage of contaminated clothing or equipment. The equipment room shall be HEPA vacuumed and/or wet cleaned at the end of each shift.

25. Final Clearance Level - Air samples for analysis using PCM and/or TEM collected under aggressive sampling conditions. The airborne asbestos level will be considered acceptable upon meeting the criteria specified.

26. Glove Bag Technique - A method for removing asbestos material from heating, ventilating, and air conditioning ducts, piping runs, valves, joints, elbows, and other non-planar surfaces in a non-contained work area. The glove bag assembly is a manufactured device consisting of a glove bag construction of at least 6-mil transparent plastic, two inward-projecting long sleeve gloves, which may contain an inward-projecting water-wand sleeve, internal tool pouch, and an attached, labeled receptacle or portion for asbestos waste. The glove bag is constructed and installed in such a manner that it surrounds the area to be contaminated and to contain all asbestos fibers released during the abatement process.

27. Grade D Air - Breathing air which has between 19.5% - 23% oxygen, no more than 5 mg/m^3 of condensed hydrocarbons, no more than 20 ppm of carbon monoxide, no pronounced odor, and a maximum of 1000 ppm carbon dioxide.

28. Ground Fault Circuit Interrupter - A circuit breaker that is sensitive to very low levels of current leakage from a fault in an electrical system.

29. HEPA Filter - A high efficiency particulate air (HEPA) filter, which has a tested and documented efficiency for trapping and retaining a minimum of 99.97% of a 0.3-micrometer (aerodynamic diameter) dioctylpthalate (DOP) test aerosol.

30. HEPA Vacuum Equipment - vacuuming equipment with a HEPA filtration system capable of collecting and retaining asbestos fibers.

31. Holding Room - A room between the washroom and a non-contaminated work area.

32. Large Asbestos Project - An asbestos project involving the installation, removal, disturbance, enclosure, or encapsulation of 160 square feet or more of asbestos or asbestos material or 260 linear feet or more of asbestos or asbestos material as defined by the EPA NESHAP regulation.

33. Minor Asbestos Project - An asbestos project involving the installation, removal, disturbance, repair, encapsulation or enclosure of 10 square feet or less of asbestos material or 25 linear feet or less of asbestos or asbestos material.

34. Negative Pressure - An atmosphere created in a work area enclosure such that airborne fibers tend to be drawn through a filtration system rather than leak out into the surrounding areas. Air pressure inside the work area is less than that outside the work area.

35. Personal Air Monitoring - A method used to determine an individual's exposure to airborne fibers. The sample is collected outside the respirator in the person's breathing zone and analyzed in accordance with the OSHA reference method.

36. Personal Decontamination Enclosure System - A decontamination system for workers consisting of a clean room, a shower room, an equipment room, separated from each other and from the work area by three air locks.

37. Plasticize - To cover floors, walls, ceilings and other surfaces with fire retardant 6-mil polyethylene sheeting as herein specified.

38. Pre-cleaning - The process of cleaning all non-contaminated objects, ceilings, wall and floors of a proposed work area using wet cleaning methods, HEPA vacuuming equipment, etc., before abatement work commences.

39. PCM-Clearance Level - A maximum total fiber concentration achieved under aggressive sampling conditions deemed acceptable in a work area at the completion of asbestos-related work. The PCM-clearance level criteria of less than 0.01 total fibers longer than or equal to 5 micrometers per cubic centimeter of air (f/cc) is required as determined by PCM in accordance with NIOSH Method 7400.

40. Shower Room - A room between the clean room and the equipment room in the worker decontamination enclosure system equipped with a shower with hot and cold or warm running water. The shower will be suitably arranged for complete showering during decontamination with a sufficient supply of soap at all times.

41. Small Asbestos Project - A project involving the installation, removal, disturbance, enclosure, or encapsulation of more than 10 and less than 160 square feet of asbestos or asbestos material or more than 25 and less than 260 linear feet of asbestos material.

42. Surfactant - Water used for wetting asbestos-containing materials and for wet wiping asbestos-contaminated material/debris during cleanup operations shall be amended with a commercially available wetting agent (surfactant) per the manufacturer’s instructions. The surfactant used shall be non-carcinogenic and non-toxic under normal use.

43. Washroom - A room between the work area and holding area in the equipment/waste decontamination enclosure system. The washroom is separated from the work area and holding area by two air locks.

44. Wet Cleaning - The process of eliminating asbestos and particulate contamination from building surfaces and objects by using cloths, mops, or other cleaning tools, which have been dampened with amended water, and by afterwards disposing of these cleaning tools as asbestos-contaminated waste.

45. Work Area - Designated room, space, or area of the project in which asbestos abatement actions are to be undertaken or which may become contaminated as a result of such abatement actions. A contained work area is a work area, which has been sealed, plasticized, and equipped with a decontamination enclosure system. A non-contained work area is an isolated or controlled-access work area which has not been plasticized nor equipped with a decontamination enclosure system.

1.10 AIR MONITORING

A. Air monitoring, where applicable to the project, shall be completed by Delaware Office of Management & Budget, Division of Facilities Management licensed Project Monitor or Air Sampling Technician retained by the Owner. The Air Monitoring Firm shall have a minimum of 5-years experience performing visual inspections and air monitoring.

B. The air monitoring firm will collect clearance air samples in accordance with applicable regulations. Samples shall be analyzed using PCM methodology and/or TEM methodology, *if required*, by an AIHA approved asbestos Laboratory.

C. When final visual inspections and/or clearance air monitoring is required, the Abatement Contractor shall notify the Air Monitoring Firm 48 hours, excluding weekends and holidays, in advance of the day and time when the Contractor will be ready for such visual inspections or air monitoring events to be performed.

D. Air monitoring results generated by the air-monitoring firm shall not be used by the Contractor to represent compliance with regulatory agency requirements for monitoring of worker's exposure to airborne asbestos, nor shall any other activity on the part of the Air Monitoring Firm represent the Contractor's compliance with applicable health and safety regulations.

1.11 ENVIRONMENTAL CONSULTANT

A. An Environmental Consultant will be employed to advise the Owner in matters pertaining to the progress and/or completion status of the abatement procedures and will act as the Building Owner's liaison in technical matters involving the asbestos-related work.

B. The Environmental Consultant is authorized by the Owner to have unlimited access to all asbestos work areas while conducting visual inspections or other requirements of his duty.

C. The Environmental Consultant may stop the Abatement Contractors work if in the course of performing their inspection duties, they observe an instance of substantial non-conformance with the contract documents and/or a situation presenting a health hazard to workers or Building Owner employees. Work shall not resume until corrective measures have been carried out.

D. Any stop work orders issued by the owner or the Environmental Consultant pursuant to the above provisions will not be grounds for claims to be made by the Contractor for damages caused by the associated delay nor will it extend the contract completion date.

E. When visual inspections are specified, the Contractor shall notify the Environmental Consultant 48 hours, excluding weekends and holidays, in advance of the day and time when the Contractor will be ready for such inspections. The Contractor's supervisor must conduct a thorough inspection of work area prior to requesting review by the Environmental Consultant.

F. The Environmental Consultant's role in advising the Building Owner does not relieve the Contractor's obligation to comply with all applicable health and safety regulations promulgated by the federal, state, and local governments.

1.12 LICENSING AND CERTIFICATION – DELAWARE OFFICE OF MANAGEMENT & BUDGET, DIVISION OF FACILITIES MANAGEMENT REQUIREMENTS

A. The Abatement Contractor must hold a current, valid asbestos-handling license issued by the Delaware Office of Management & Budget, Division of Facilities Management.

B. A copy of the Abatement Contractor's license shall be conspicuously displayed proximate to but outside the work area during the duration of the project.

C. The Abatement Contractor shall permit only those persons who hold valid asbestos handling certificates to engage in work on this project.

PART 2.00 - PRODUCTS

2.1 RESPIRATORS

A. Select respirators from those approved by Mine Safety and Health Administration (MSHA) or National Institute for Occupational Safety & Health (NIOSH) as required by 29 CFR 1926.1101. Abatement contractor shall comply with section 3.2 of this specification and shall produce historical data representative of employee exposure, and shall use historical data to determine requirements for initial respiratory protection. Provide replacement HEPA cartridges to assure a change of filters at each decontamination shower procedure. *Single use, disposable-type respirators shall not be used.*

B. Whenever type "C" respirator protection is used, compressed air systems shall be designed to provide air volumes and pressures to accommodate respirator manufacturer's specifications. Compressors must meet the requirements of 29 CFR 1910.134(d) and must have an in-line carbon monoxide monitor equipped with an audible alarm.

C. Whenever powered purifying respirator protection is used, a sufficient supply of replacement batteries and HEPA filter cartridges shall be provided to the workers.

D. During encapsulation operations or use of organic based aerosols, *if required*, the Contractor shall provide workers with type GMB-H combination cartridges or equivalent respirator filters.

2.2 PROTECTIVE CLOTHING

A. The Abatement Contractor shall provide a sufficient quantity of protective clothing to all authorized persons entering regulated work areas until the work has been completed.

B. The Contractor shall provide fire retardant disposable whole body clothing, head coverings, gloves and foot coverings. Provide sufficient quantities to assure a minimum of four complete disposable outfits per day for each individual performing abatement related work.

2.3 TOOLS AND EQUIPMENT

A. Store materials subject to damage off the ground, away from wet or damp surfaces, and under cover to prevent damage or contamination. Materials not capable of being decontaminated shall be disposed of in accordance with applicable regulations.

B. Provide suitable tools for removal of asbestos-containing materials. Damaged materials shall not be used and shall be removed from the work site. *Wire brushes and pressure washers shall not be used as a means of removing or cleaning asbestos-containing materials.*

C. Airless sprayers capable of spraying amended water shall be provided in sufficient number to allow continuous uninterrupted work.

D. Transportation equipment, as required, shall be suitable for loading, temporary storage, and unloading of contaminated waste without exposure to persons or property, <u>and shall be quiet in motion if used within the building.</u>

E. Power tools used to drill, cut, saw or otherwise disturb asbestos material shall be equipped with HEPA filtered local exhaust ventilation.

F. The Contractor shall make available to authorized visitors, ladders and/or scaffolds of sufficient dimension and quantity so that all work areas can be easily and safely reached. Scaffolds and ladders shall comply with all applicable codes.

2.4 PERSONAL DECONTAMINATION SYSTEM ENCLOSURE

A. Personal decontamination enclosures shall be constructed and functional prior to commencing regulated abatement work area preparation activities. After installation of the personal decontamination system enclosure, all access to the regulated abatement work area shall be via the installed personal decontamination system enclosure.

B. Attached - Large Project

1. General: A personal decontamination system enclosure shall be provided outside the regulated abatement work area and attached to all locations where personnel shall enter or exit the regulated abatement work area. *One personal decontamination enclosure system for each regulated abatement work area shall be required.* The personal decontamination system enclosure shall be sized to accommodate the number of workers and equipment required for the intended purpose. At least one layer of six-mil fire-retardant plastic sheeting shall be installed on the ceiling, and walls of the enclosure system. At least two layers of six-mil fire-retardant reinforced plastic sheeting shall be used for flooring protection of this area. This system must be kept clean, sanitary and climate controlled at all times. This system shall remain on-site, operational and be used until completion of the asbestos project.

2. Rooms and Configuration: The personal decontamination system enclosure shall consist of a clean room, a shower room and an equipment room connected in series but separated from each other by airlocks. There shall be a curtained doorway separation between the equipment room and the regulated abatement work area, and there shall be a lockable door to the outside.

3. Curtained Doorway: An assembly which consists of at least three overlapping sheets of six-mil fire retardant plastic over an existing or temporarily framed doorway. One sheet shall be secured at the top left side, the second sheet at the top right side, and the third sheet at the top left side. All sheets shall have weights attached to the bottom.

4. Framing: Enclosures systems accessible to the public shall be fully framed; hard-wall sheathed, such as plywood or oriented strand board (OSB) sheathing material of at least 3/8-inch thickness.

5. Plastic Sheeting: Enclosure systems constructed at the work site shall use at least one layer of six-mil fire-retardant plastic sheeting on walls and ceiling. At least two layers of six-mil fire-retardant reinforced plastic sheeting shall be used for floor protection.

6. Prefabricated or Trailer Units: A completely watertight prefabricated unit does not require plasticizing. All prefabricated or trailer decontamination units shall be kept in good condition, and shall be decontaminated after final cleaning and immediately prior to clearance air sampling. Upon receiving satisfactory clearance air results of the regulated abatement work area, the prefabricated units shall be sealed then separated from the regulated abatement work area.

7. Clean Room: The clean room shall be sized to accommodate a full work shift of asbestos abatement personnel, as well as site visitors. The clean room shall be a minimum of six feet in height. A minimum of thirty-two square feet of floor space shall be provided for full shift abatement workers. A lockable door shall be provided to permit access to the clean room from outside the regulated abatement work area or enclosure and shall be used to secure the regulated abatement work area and decontamination enclosure during non-work hours.

8. Shower Room: The shower room shall contain one shower per full shift of abatement workers. Multiple showers shall be simultaneously accessible (installed in parallel) to certified personnel. Each showerhead shall be supplied with hot and cold water adjustable at the tap. The shower enclosure shall be constructed to ensure against leakage of any kind. Uncontaminated soap, shampoo and towels shall be available at all times. Shower water shall be drained, collected and filtered through a system with at least 5.0-micron particle size collection capability. Filtered wastewater shall be discharged in accordance with applicable codes. Contaminated filters shall be disposed of as asbestos contaminated waste.

9. Equipment Room: The equipment room shall be used for the storage of decontaminated equipment and tools. A one day supply of replacement filters for HEPA-vacuums and negative pressure ventilation equipment in sealed containers, and other materials that may be required during the abatement project may also be stored here. A container lined with a labeled, at least six-mil plastic bag for collection of clothing shall be located in this room. Contaminated footwear and work clothes shall be stored in this area.

10. Airlocks: Airlock construction shall consist of curtained doorways with three alternating six-mil fire retardant polyethylene curtains per doorway, such that one passes through one doorway into the airlock, allowing the doorway sheeting to overlap and close off the opening before proceeding through the next doorway.

C. Attached - Small Project

1. General: A personal decontamination system enclosure for a small asbestos project shall consist of, at a minimum, an equipment room, a shower room and a clean room separated from each other and from the regulated abatement work area and other areas by curtained doorways. All other provisions for personal decontamination system for a large asbestos project shall apply. Equipment storage, personal gross decontamination and removal of clothing shall occur in the equipment room just prior to entering the shower.

D. Remote

1. General: If a personal decontamination system cannot be attached to the regulated abatement work area, due to available space restrictions or other building and fire code restrictions, a remote personal decontamination system enclosure may be used. If during abatement activities, non-friable ACM becomes friable during the removal process, and it is logistically possible to attach the decontamination system enclosure, abatement work must stop immediately while the remote personal decontamination system is relocated to be attached and contiguous to the regulated abatement work area.

2. Protective Clothing: Workers shall don two (2) sets of disposable protective clothing and a supply of protective clothing shall be kept in the airlocks attached to the regulated abatement work area.

3. Location: The remote personal decontamination system shall be constructed as close to the regulated abatement work area as physically possible. If the remote personal decontamination system must be located at the exterior of the building due to space or code restrictions, it shall be constructed within fifty feet of the building exit used for access by the asbestos abatement personnel. The decontamination unit shall be cordoned off at a distance of twenty-five feet to separate it from public areas/access.

4. Airlocks: One set of airlock flaps shall be constructed at the entrance to the decon chamber, one set at the entrance to the shower, and one at the entrance to the equipment room or equipment/washroom. The last set of airlock flaps shall be constructed at the entrance to the containment or regulated abatement work area(s). These airlocks shall have lockable doorways at the entrance to the airlock from uncontaminated areas. These airlocks shall be cordoned off at a distance of twenty-five feet and appropriately signed. *Airlocks shall not be used as a waste decontamination area and shall be kept clean and free of asbestos containing material.*

5. Designated Pathway: The walkway from the regulated abatement work area to the personal decontamination system or next regulated abatement work area shall be cordoned off and signage installed.

6. Travel Through Uncontaminated Areas: If at any time a worker must travel through an uncontaminated area to access the personal decontamination area, the worker shall HEPA-vacuum and/or wet wipe his/her outer protective clothing while in the regulated abatement work area, then proceed into the airlock, which serves as a changing area, where he/she shall remove the outer clothing and don a clean set of protective clothing. The worker may then proceed to the personal decontamination system enclosure only along a designated pathway as described above.

7. Removal: The remote personal decontamination unit shall be removed only after satisfactory clearance air sampling results have been achieved.

2.5 WASTE DECONTAMINATION SYSTEM ENCLOSURE

A. General: A waste decontamination system enclosure shall be provided outside the regulated abatement work area and shall be attached to the regulated abatement work area. *One waste decontamination enclosure for each regulated abatement work area shall be required.* The waste decontamination system enclosure shall be sized to accommodate the number of workers and equipment for the intended purpose. Such system may consist of existing attached rooms outside of the regulated abatement work area, if the layout is appropriate, that can be plasticized and are accessible from the regulated abatement work area. This system must be kept clean, sanitary and climate controlled at all times.

B. Waste Decontamination System Enclosure - Large Asbestos Project

1. Rooms and Configuration: A waste decontamination system enclosure shall consist of a washroom and a holding area connected in series but separated from each other by an airlock. There shall be a lockable door to the outside, and there shall be a curtained doorway between the washroom and the regulated abatement work area.

2. Curtained Doorway: One sheet shall be secured at the top left side, the second sheet at the top right side, and the third sheet at the top left side. All sheets shall have weights attached to the bottom.

3. Washroom: A room/chamber between the regulated abatement work area and the holding area in the waste decontamination system enclosure, where equipment and waste containers are wet cleaned or HEPA vacuumed.

4. Equipment/Washroom Alternative: Where there is only one exit from the regulated abatement work area, the holding area of the waste decontamination system enclosure may branch off from the equipment room of the personal decontamination system enclosure. The equipment room will also be used as a waste washroom.

5. Plastic Sheeting: Waste decontamination system enclosures constructed at the work site shall use at least one layer of six-mil fire-retardant plastic sheeting on walls and ceiling. At least two layers of six-mil fire-retardant reinforced plastic sheeting shall be used for flooring protection of these areas.

6. Enclosure Security: The waste decontamination system enclosure and regulated abatement work area airlock(s) shall be constructed with lockable doors to prevent unauthorized entry. Enclosures systems located within twenty-five feet of an area of public access shall be fully framed and hard-wall sheathed for safety.

7. Drains: The waste washroom shall be equipped with a wash bin of sufficient size to perform waste container washing operations and shall have a submersible pump installed to collect waste water and deliver it to the shower wastewater filtration system.

C. Waste Decontamination System Enclosure - Small Asbestos Project

1. For Small asbestos projects with only one exit from the regulated abatement work area, the shower room may be used as a waste washroom. The clean room shall not be used for waste storage, but shall be used for waste transfer to carts, which shall be immediately removed from the enclosure. Waste shall be transferred only during times when the showers are not in use.

D. Waste Decontamination System Enclosure – With Remote Personal: When a remote personal decontamination system enclosure is allowed and utilized for a regulated abatement work area, the following requirements shall apply:

1. Minor Size Asbestos Project: No specific waste decontamination system enclosure is required for minor size regulated abatement work areas. The waste generated shall be immediately bagged or containerized within the regulated abatement work area.

2. Small & Large Size Asbestos Project

   (i) Washroom: An additional chamber shall be constructed within the regulated abatement work area, attached to the existing airlock used to access the work area. The washroom/airlock combination shall be utilized as the contiguous waste decontamination enclosure for waste bagging and transfer activities.

(ii) Removal: The washroom chamber shall be removed only after satisfactory clearance air sampling results have been achieved.

2.6 SIGNAGE AND LABELS

A. Provide (bilingual) caution signs and barrier tapes at all approaches to regulated work areas. Locate signs at such distance that personnel may read the sign and take the necessary protective steps required before entering the area. Provide caution signs in vertical format conforming to 29 CFR 1910.145(d) (4), and 1926.1101, minimum 20" x 14" displaying the following:

DANGER
ASBESTOS
CANCER AND LUNG DISEASE HAZARD
AUTHORIZED PERSONNEL ONLY
RESPIRATORS AND PROTECTIVE CLOTHING ARE
REQUIRED IN THIS AREA

B. Provide asbestos caution labels affixed to all disposable 6-mil plastic bags, drums or containers for waste containerization, asbestos scrap, waste, debris, and other products/materials contaminated with asbestos displaying the following:

DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD

C. The Abatement Contractor shall provide a daily entry/exit log, which shall be posted at the entrance to each regulated work area. All persons entering a regulated work area shall sign the entry/exit log upon every entry/exit. All persons, before entering a regulated work area, shall read and be familiar with all posted regulations and personal protection requirements. A copy of a valid asbestos-handling license of the Abatement Contractor and all abatement personnel who are performing the work shall be conspicuously displayed at the work site.

2.7 TEMPORARY ENCLOSURES (CRITICAL BARRIERS)

A. The framework and associated plywood sheeting (or similar) of the temporary enclosures shall be provided by the Abatement Contractor. The Contractor shall use these enclosures to completely isolate the asbestos work area from other non-work/unsealed parts of the building so as to prevent asbestos-containing dust or debris from passing beyond the isolated area.

B. Enclosures and/or critical barriers shall consist of double layer minimum 6-mil fire retardant polyethylene sheeting for wall, floor and ceiling surfaces and reinforced 6-mil fire retardant polyethylene sheeting for application to temporary framing. Vertical sheeting shall be secured to walls and/or temporary framing with spray adhesive then sealed with duct tape. Provide sheeting of up to 20' widths for floor and wall surfaces to minimize the number of joints. Smoke test all sealed openings for airflow.

C. Critical barriers shall be constructed by the Abatement Contractor at the interior side of all work areas and/or other required work areas such as but not limited to, classrooms, hallways, entrance/exit ways, and other rooms which adjoin specified work areas, and openings at windows, vents, ducts, near specified work areas.

D. Access to enclosure shall be through the decontamination chamber only.

E. Emergency fire exits shall be framed out and taped, and posted as emergency exits only. Use of emergency exits for other than fire emergencies shall constitute non-compliance with the Contract Documents resulting in a stop work order by the Project Monitor.

2.8 NEGATIVE AIR PRESSURE FILTRATION SYSTEM

A. Negative Air Pressure Equipment: All OSHA Class I, Class III, and interior Class II asbestos abatement projects shall employ negative air pressure equipment ventilation.

1. Operation: The negative air pressure equipment shall operate continuously from startup of negative pressure equipment until satisfactory clearance air sampling results are obtained.

2. Timing of Installation: The negative air ventilation units shall be installed and made operational after the critical barriers and isolation barriers are installed.

3. Negative Air Pressure: A negative air pressure, relative to areas outside of the enclosure, shall be maintained at all times in the regulated abatement work area to ensure that contaminated air does not escape back to an uncontaminated area.

4. Manometer: A manometer shall be used to document the pressure differential for all OSHA Class I Large and Small size asbestos projects. A minimum of –0.02 column inches of water pressure differential, relative to pressure outside the regulated work area, shall be maintained within the regulated work area, as evidenced by manometric measurements. The manometer shall be installed and made operational once the negative air has been established in the regulated abatement work area. *Once installed, at least twice per workshift, the Abatement Contractor shall document the manometer reading within the daily project log.*

5. Ventilation Units: If more than one primary HEPA-filtered ventilation unit is installed, the units shall be turned on one at a time and the integrity of temporary hardwall isolation barriers checked for secure attachment. A minimum of one additional unit having a capacity of at least equal to that of the primary unit shall be installed, as a backup unit to be used upon primary unit failure, or if necessary during primary unit filter changes. *Ventilation exhaust ducting shall not exceed twenty-five (25) feet in length.*

6. Power Failure: In the event of electric power supply failure, abatement shall stop immediately and not resume until power is restored and exhaust units are operational. In the event of extended power failure (longer than one hour), the decontamination system enclosure facilities shall be sealed airtight.

7. Air Changes: Negative air pressure ventilation equipment shall be installed and operated continuously to provide at least four air changes in the regulated abatement work area every hour including during clearance air sampling.

8. Openings in Enclosure: Openings made in the enclosure system to accommodate these units shall be made airtight with duct tape or caulking or both.

10. Installation and Care: Proper installation procedures, including use of appropriate filters and manufacturer's recommended operating procedures shall be followed.

11. Exhaust Location: Each negative pressure ventilation unit exhaust duct shall not terminate less than fifteen feet from a receptor or adversely affect the air intake of any building or structure. If the exhaust duct termination location for this section cannot be met due to allowable space restrictions or the regulated abatement work area being located above the ground floor, the exhaust shall terminate at the exterior of the building, and all

receptors less then fifteen feet from the exterior exhaust duct termination location shall be plasticized with two layers of at least six-mil polyethylene. Exhaust tubes may be grouped together in banks of no more than five tubes, with each tube exhausting separately and the bank of tubes terminating together at the same controlled area.

2.9 ABATEMENT CONTRACTOR DAILY PROJECT LOG

A. The Abatement Contractor shall maintain a daily project log of all pertinent events that occur throughout the asbestos project. This project log shall be updated daily by the on-site supervisor, and shall be kept on-site for the duration of the asbestos project. This log shall be made available upon verbal request of the Commissioner or his or her duly authorized representative.

B. The following list summarizes various items that require entries into the daily project log by the asbestos abatement contractor supervisor:

1. High air result(s) shall be noted with the time of work cessation, results of barrier and negative air system inspection, summary of any necessary repairs and required cleaning.

2. Manometer Readings which are to be documented twice per work shift.

3. Daily inspection results of the negative air system (*even days without work shifts*) and any necessary repairs to be documented.

4. Daily inspection results of HVAC System Positive Pressurization (*even days without work shifts*) and any necessary repairs to be documented.

5. Daily inspection results of barrier inspections (*even days without work shifts*) and any necessary repairs to be documented. <u>Inspections shall be twice per work shift on days with scheduled work.</u>

6. Daily testing results of barriers and enclosures and any necessary repairs shall be documented.

7. Documented daily cleaning of enclosures at the end of each work shift.

8. Results of each visual inspection and time of each intermediate completion shall be documented by the supervisor in the daily project log.

9. Visual inspections conducted by Project Monitor prior to Clearance Air Sampling.

10. Visual inspection conducted by Project Monitor for regulated abatement work areas exempt from Clearance Air Sampling.

11. Final Inspection, air sampling or visual, conducted by Project Monitor.

2.10 SCAFFOLDING

A. Provide scaffolding, if required, and/or staging as necessary to accomplish the work. The type, erection and use of scaffolding shall comply with all applicable OSHA provisions.

B. Scaffolding legs shall be provided with lockable rubber casters or equal means to protect plastic floor covering from damage. Scaffold joints and ends shall be sealed to prevent incursion of asbestos debris.

2.11 CHEMICAL REMOVAL AGENT (WETTING AGENT)

A. Sufficiently wet all ACMs prior to removal with a non-toxic, non-combustible chemical agent mixed and applied in accordance with manufacturer's printed instructions. Chlorinated removal agents shall not be used at this Project.

2.12 ENCAPSULANT

A. After first cleaning and prior to first sheeting removal, and after the work area has been rendered free of visible residues, a thin coat of an encapsulating agent may be applied to surfaces in the work area that were not the subject of removal.

B. Surfaces indicated on the Contract Drawings to be "encapsulated", *if any*, shall be sealed with a bridging encapsulant. The encapsulant shall be applied at an application rate recommended by the product manufacturer. The bridging type encapsulant with the following characteristics:

1. Shall not be solvent-based or utilize hydrocarbons in the liquid in which the solid parts of the encapsulant are suspended and be compatible with the anticipated replacement product.

2. Shall be non-flammable, compatible with concrete, metals, wood, cable jacketing, etc. and shall prevent fire, smoke, water and toxic fumes from penetrating through sealants.

C. Encapsulant shall be applied only after all specified asbestos materials have been removed and work area cleaned of all loose debris.

D. Where encapsulation is used to supplement removal of ACM pipe/pipefitting, a non-hardening lagging sealer shall be used for sealing all raw exposed edges and surfaces.

2.13 GLOVE BAGS

A. Glove bag removal, *if applicable to the project*, may be conducted in accordance with state and federal regulations. The following procedures must be followed for glovebag use:

1. Size: When abating pipe or duct insulation, the pipe or duct insulation diameter worked shall not exceed one half the bag working length.

2. Sealing: Duct tape shall be placed securely around the area of abatement to form a smooth seal. The glovebag shall then be secured to the duct tape and sealed airtight.

3. Seal Testing: After placement, each glovebag shall be subjected to and pass a smoke test.

4. Surface Irregularities: If material adjacent to the work section is damaged, or if it terminates, is jointed or contains an irregularity adjacent to the work section, the material shall be wrapped in at least six-mil fire-retardant plastic sheeting and sealed airtight.

5. Post-Stripping Wetting: After the asbestos material has been stripped, the surface from which it has been removed shall be wetted with amended water and scrubbed with a brush or abrasive pad to remove all visible asbestos material.

6. Sealing of Pipe Ends: When abating pipe insulation, any pipe insulation ends created shall be sealed or otherwise encapsulated with a non-asbestos product.

7. Collapsing of the Glovebag: A HEPA-vacuum shall be used to collapse the glovebag.

8. Tool Segregation: With glovebag collapsed and ACM in the bottom of the bag, twist the bag several times and duct tape the twist to seal that section. The tool pouch shall be

separated from the bag by twisting it several times, taping the twist and thus sealing the pouch. The glove(s) shall then be twisted several times, duct taped and thus sealed.

9. Sealing the Contaminated Items: The glovebag shall be tied off to contain the asbestos material prior to the glovebag being detached from the area where the asbestos was removed within the bag.

10. Containerizing the Glovebag: The sealed glovebag shall be placed into at least a six-mil plastic bag, sealed airtight and transferred from the regulated abatement work area for disposal as asbestos waste.

2.14 DISPOSAL BAGS, DRUMS, AND PLASTIC SHEETING

A. Provide, at a minimum, 6-mil polyethylene bags pre-printed with caution labels for asbestos debris. Provide, at minimum, 6-mil polyethylene plastic sheeting, affix asbestos caution labels accordingly. Provide clean 30 or 55-gallon fiber, plastic or metal drums capable of being sealed water tight for asbestos waste and debris. Affix asbestos caution labels accordingly.

2.15 HEPA VACUUM EQUIPMENT

A. Vacuuming performed under this Contract shall be performed with HEPA filter equipped industrial vacuums conforming to ANSI Z9.2. Wet-Vac units, when utilized, shall be exhausted to the manifold of the Negative Air Filtration Unit

B. Provide tools and specialized equipment including scraping nozzles with integral vacuum hoods connected to a HEPA vacuum with flexible hose. Power tools used to drill, cut, or otherwise disturb ACM shall be equipped with HEPA filtered local exhaust ventilation.

2.16 BEAD BLASTER EQUIPMENT

A. The Owner does not recommend, encourage or suggest the use of bead blasting type equipment for floor tile mastic removal. If the Contractor chooses to use this type of equipment in lieu of hand scraping or chemical removers, then the use of this type of equipment <u>must be approved by the Owner prior to implementation.</u>

PART 3.00 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. Perform asbestos related work in accordance with 29 CFR 1926.1101 and 40 CFR 61 as specified herein. Where more stringent requirements are specified, adhere to the more stringent requirements.

B. During the progress of the work, other contractors may be engaged in performing work. The Abatement Contractor shall coordinate his work with the work of other contractors in such a manner as the Owner or his Construction Manager may direct.

C. The Abatement Contractor shall complete all asbestos work within the accepted schedule, and shall provide staffing as necessary to complete the scope of work awarded by the Owner. This shall include working multiple shifts Monday through Friday, Saturday, and Sunday, if necessary. The Abatement Contractor's bid shall be inclusive of these costs.

D. In the event an area beyond the asbestos work area becomes contaminated with asbestos-containing dust or debris as a consequence of the work, immediately institute emergency

procedures. Contaminated non-work areas shall be isolated and decontaminated in accordance with procedures established for asbestos removal. *All costs incurred in decontaminating such non-work areas and the contents thereof shall be the responsibility of the Abatement Contractor, at no additional cost to the Building Owner.*

E. In the event of electric power failure while abatement is in process, abatement activities shall stop immediately and shall not resume until power is restored and exhaust units are fully operational. On extended power failure, longer than one hour, the decontamination facilities, after the evacuation of all abatement personal from the work area, shall be sealed airtight.

F. Prior to start of abatement work, shut down and lock out the building's heating, ventilating and air conditioning system, *if applicable to the project*, to the regulated asbestos work areas.

G. Water services will be made available by the building owner. The Abatement Contractor shall secure and maintain all hoses and connections in a leak-free state at all times.

H. Perform asbestos removal work using wet removal procedures. Avoid excessive water use as to not cause water damage (saturation of) interior building components (i.e., plaster or gypsum wallboard, ceiling system, flooring, electrical circuitry, etc.). Mix and apply surfactant and chemical agents in accordance with manufacturer's instructions. *Dry removal of asbestos-containing materials is not permitted.*

3.2 EXPOSURE ASSESSMENT MONITORING

A. The Abatement Contractor shall perform exposure assessment air monitoring as required by OSHA 29 CFR Part 1926.1101 to determine the airborne concentrations of asbestos to which workers may be exposed. Exposure shall be made from air samples that are representative of an 8-hour TWA exposure and a 30-minute Excursion Limit (EL) exposure to workers.

B. Representative TWA worker exposures shall be determined on the basis of one or more samples representing full-shift exposure for workers in each regulated work area. Representative short-term worker exposures shall be determined on the basis of one or more samples representing 30-minute exposures associated with operations that are most likely to produce exposures above the EL for workers in each regulated work area.

C. For any one specific operation, which will be performed by certified workers, the Abatement Contractor may demonstrate that worker exposures will be below the PELs by data, which conform to the following criteria:

1. Objective data demonstrating that the material containing asbestos or the activity involving such product or material cannot release airborne fibers in concentrations exceeding the TWA and EL under those work conditions; or

2. Where the Contractor has monitored prior asbestos jobs for the PELs within 12 months of the current job; the data were obtained during work operations conducted under workplace conditions "closely resembling" the processes, type of material, control methods, work practices, and the data show that under the conditions prevailing and which will prevail in the current workplace there is a high degree of certainty that worker exposures will not exceed the TWA and EL; or

3. The results of initial monitoring of the current job made from breathing zone air samples that are representative of the TWA and EL exposures of each worker covering operations, which are likely during the performance of the entire asbestos job to result in exposures over the PELs.

D. The Abatement Contractor shall conduct daily air monitoring that is representative of the exposure of each worker who is assigned to work within a regulated work area, unless the Abatement Contractor has made a negative exposure assessment for the entire operation.

E. The Contractor shall institute the exposure monitoring whenever there is a significant change in process, control equipment, personnel, or work practices that may result in new or additional exposures above the PELs or when there is any reason to suspect that a change may result in new or additional exposures above the PELs.

3.3 PRE-ABATEMENT REQUIREMENTS

A. The Abatement Contractor shall take all necessary measures to protect workers, subcontractors, consultants, authorized visitors, and building occupants from exposure to asbestos and shall limit use of the site to only those areas where the asbestos abatement work is required.

B. Decontamination Enclosure Systems shall be constructed prior to removal preparation activities. Personal Decontamination Enclosure Systems shall be provided outside the work area and attached to locations where persons will enter/exit the regulated work area(s).

C. Post warning signs at all appropriate work area barriers in accordance with 29 CFR 1910.145(d) (4), and 29 CFR 1926.1101.

D. The Contractor shall coordinate with the Owner or Owner's representative to lock out electric power to the work area, and then connect required temporary electrical service. Provide grounded temporary electrical service of sufficient size, capacity, and power to accommodate work, and provide overload-protected disconnect switches for each temporary circuit.

E. The Contractor shall coordinate with the Owner and the Owner's representatives to disable ventilation systems bringing air into or out of a work area by disconnecting wires, removing circuit breakers, and installing lockable switches that will prevent accidental or premature restarting of equipment.

F. Provide lighting in the Decontamination Enclosure System as required supplying a 50-foot candle minimum light level. Provide a minimum of one, 200-watt incandescent lamp per 1,000 SF of floor area to provide uniform lighting throughout each work area.

G. When applicable, maintain a minimum temperature of 70 degrees Fahrenheit throughout the work area and Decontamination Enclosure Systems.

3.4 WORK AREA PREPARATION

A. Regulated Work Area: The asbestos abatement work shall be conducted within regulated work areas which shall be demarcated in a manner that minimizes the number of persons within the area and protects persons outside the area from exposure to asbestos. Access to regulated work areas shall be limited to certified persons and authorized visitors.

B. Critical Barriers: Critical barriers shall be constructed at the interior side of the work areas such as but not limited to, offices, hallways, entrance/exit ways, and other rooms which adjoin specified work areas and at all openings at windows, doors, vents, ducts, louvers and grilles near specified work areas.

C. Isolation Barriers: Isolation barriers that seal off openings in the work area including, but not limited to, windows, corridors, doorways, skylights, ducts, grilles, diffusers and any other penetrations of the work area, shall be constructed using two layers of 6-mil fire-retardant

plastic sheeting sealed with duct tape. All seams in system components that pass through the work area shall be sealed. Doorways and corridors, which will not be used for passage during the abatement work, shall be sealed. Construction of isolation barriers to separate the work area from the remainder of the site shall be accomplished as follows:

1. Walls shall be constructed of wood or metal framing to support barriers in all openings larger than 32 square feet.

2. Sheathing material of at least 3/8-inch thickness shall be applied to the work side of the barrier.

3. Edges of the partition shall be caulked at the floor, ceiling, walls, and fixtures to form an airtight seal.

4. The work side of the partition shall be covered with two layers of 6-mil fire-retardant plastic sheeting with staggered joints and sealed.

5. All floor, wall and ceiling surfaces shall be covered with two layers of 6-mil fire-retardant plastic sheeting. The floor shall be plasticized first and the plastic sheeting shall extend up the walls at least 12 inches on all sides. The walls shall then be plasticized by applying plastic sheeting from ceiling to floor, and overlapping the floor sheeting by at least 12 inches. This process shall be repeated for the second layer of plastic sheeting for the floor and walls. All seams within a layer shall be separated by a distance of at least six feet and sealed airtight, and all seams between layers shall be staggered.

D. After completion of the decontamination enclosure, critical barriers and polyethylene sheeting applications, a minimum of 12 hours settling period is required before abatement work will be allowed to commence. Damage and defects in the barriers and/or enclosure system shall be repaired immediately upon discovery and prior to resumption of abatement activities.

E. Enclosure Inspections: *Daily inspections and smoke testing of all barriers shall be performed by the Abatement Contractor and shall be recorded in the daily project log.* These daily inspections shall occur prior to the start of a work shift and upon the completion of the same work shift. Inspections and observations shall be documented in a daily project log. If, at any time during abatement activities, visible emissions are observed outside the work area or if damage occurs to the barriers, work shall be stopped, repairs made, and visible residue immediately cleaned using HEPA vacuuming and/or wet cleaning methods prior to the resumption of abatement activities.

F. Personal/Waste Decontamination Enclosure System: The Contractor shall place all tools, equipment, and other materials in the work area, then construct or provide for a Personal/Waste Decontamination Enclosure System.

1. Construct a Clean Room sized to accommodate all personnel/authorized persons. Benches, lockers, and hooks shall be provided for street clothes, and shelves shall be provided for storing respirators. The Clean Room shall not be used for the storage of tools, equipment, or materials, and shall not be used for office space. The Clean Room shall be locked during non-work hours.

2. Construct a Shower Room supplied with hot and cold water adjustable at the tap. The Shower Room shall be separated from the Clean Room and the Equipment/Waste Wash Room by airlocks constructed of 6-mil, fire-retardant plastic sheeting. Soap, shampoo, and towels shall be available at all times. All used 5.0 micron filters used to filter wastewater from the shower units shall be treated as asbestos contaminated waste and disposed of as asbestos waste. Disposable towels shall be disposed of as asbestos waste. The Contractor shall provide temporary water heaters that are sufficient to provide hot water

service to the decontamination chambers upon demand.

3. Construct an Equipment/Waste Wash Room for the storage of equipment and tools after decontamination. The Equipment/Waste Wash Room shall be separated from the Work Area and the Holding Area by airlocks constructed of 6-mil fire-retardant plastic sheeting. A drum lined with a 6-mil plastic bag shall be located in the Equipment/Waste Wash Room to contain clothing.

4. Construct a Holding Area as a drop location for bagged asbestos waste passed from the Equipment/Waste Wash Room. The Holding Area shall be located so that bagged asbestos waste can be passed from the Equipment/Waste Wash Room into the Holding Area. The Holding Area shall be separated from the Equipment/Waste Wash Room by an airlock constructed of 6-mil, fire-retardant plastic sheeting. A lockable door shall be installed to permit removal of containerized asbestos waste from the Holding Area to a storage facility for transport to a disposal site. The Holding Area shall be locked during non-work hours.

G. Fire alarm equipment, including smoke detectors, is to remain and shall be protected and decontaminated. Coordinate system shut down, if required, with Owner at least 24-hours in advance prior to system shut down.

H. Pre-clean fixed objects within the work area using HEPA filtered equipment and/or wet wiping methods as appropriate. Enclose with two layers of 6-mil fire retardant polyethylene sheeting sealed with duct tape and/or spray adhesive.

I. In coordination with the Building Owner, shut down and isolate HVAC systems, if applicable, to prevent contamination and fiber dispersal to other areas of the building. Openings to ducts, fans, louvers, windows, and plenums shall be sealed with two layers of fire retardant sheeting prior to start of removal. The Abatement Contractor shall repair any damage to ductwork, grilles, dampers, windows, louvers or HVAC equipment scheduled to remain at the completion of the abatement work, at no cost to the Owner.

J. All electrical conduit joints, boxes, devices and cable systems within the work area, shall be sealed with tape and polyethylene sheeting sufficient to prevent water penetration during asbestos abatement operations. All loose cables and wiring present in the work area shall be supported so that they do not become disconnected or otherwise damaged during removal operations. Any damage to this wiring will become the responsibility of the Abatement Contractor to repair at his expense.

3.5 WORK AREA ENTRY/EXIT

A. The Abatement Contractor shall restrict all unauthorized persons from entering the regulated work areas and avoid asbestos-containing dust or debris from passing beyond the critical barriers of the regulated work areas. Should areas beyond a regulated work area become contaminated with asbestos or debris as a result of the work, the Abatement Contractor shall clean those areas in accordance with the applicable regulations. Such cleaning and/or decontamination of these non-work areas by the Abatement Contractor shall be performed at no additional cost to the Owner.

B. Authorized persons shall enter/exit regulated work areas through a Decontamination Enclosure System. Each time a regulated work area is entered, street clothes shall be removed in the Clean Room and disposable clothes and clean respirators shall be worn. Respirators shall be inspected prior to each use and fit-checked for proper seal. Personnel shall then proceed through the Shower Room to the Equipment/Waste Wash Room, and into the work area.

3.6 ASBESTOS REMOVAL

A. The abatement work areas are located throughout Building T 9000 and roof areas. The Abatement Contractor shall refer to, at a minimum, the Hazardous Materials Survey Report provided in the contract documents for a detailed representation of the general layout of the work areas and the extent of asbestos removal and disposal specified at each work area.

B. The Building Owner, Owner's representative or other authorized personnel shall be allowed unlimited access to all specified work areas located throughout the site building.

C. The work consists of the removal and disposal of buried transite conduit and associated debris. Dispose of all removed material and debris as asbestos-contaminated.

D. The Abatement Contractor shall provide appropriate means (i.e., scaffolding, ladders, etc.) to access the work areas. The Abatement Contractor shall decontaminate equipment prior to moving it from one work area to another and at the completion of the Project.

E. No dry removal or disturbance of asbestos materials shall be permitted.

F. Asbestos contaminated debris shall be cleaned using wet cleaning methods and/or HEPA vacuuming equipment. *Asbestos contaminated debris and water shall be placed in appropriate bags or containers, sealed, and removed from the work area daily or after each work shift.* Decontamination enclosure systems, clean room, shower, and equipment room shall be cleaned daily. The clean room shall be kept clean, dry and free of any waste.

3.7 EQUIPMENT & WASTE MATERIAL DECONTAMINATION

A. The Contractor shall remove equipment and asbestos-contaminated waste material from the regulated work area(s) through the Equipment/Waste Room according to the following:

1. At the wash down station, thoroughly wet-clean contaminated equipment and waste disposal bags and pass into the Equipment/Waste Wash Room.

2. When passing equipment or containers into the Equipment/Waste Wash Room, close all doorways of the Decontamination Enclosure System.

3. Once inside the Equipment/Waste Wash Room wet-clean bags, containers, and equipment.

4. When cleaning is complete, pass items into the Holding Area and close all doorways, except the doorway between the Equipment/Waste Wash Room and the Holding Area.

5. Workers from the exterior shall enter the Holding Area and remove decontaminated equipment and waste. The Contractor *shall require* these workers to wear protective clothing and appropriate respiratory protection.

6. Workers shall not use the Equipment/Waste Wash Room system as a means to leave or enter the washroom or the work area.

B. Clean debris from the inside of the Decontamination Enclosure System on a daily basis. All surfaces shall be wet-wiped and/or HEPA vacuumed after each shift change. The Abatement Contractor shall clean debris from shower pans on a daily basis.

C. Remove asbestos waste from the work area into the Decontamination Enclosure System at least at the end of each work shift, then directly into the waste storage container. Containerized asbestos waste shall not be stored outside of the work area or outside of the waste storage

container.

D. If required, provide a dust tight, enclosed, inclined chute for dropping asbestos material a distance greater than 10 feet. Drop asbestos-containing materials directly into a secured, labeled, container.

3.8 PERSONAL DECONTAMINATION

A. The Contractor shall require workers to follow a specified decontamination procedure, as a minimum requirement, when exiting a regulated work area:

1. Remove gross contamination while still in the work area. Gross removal shall be conducted by wet cleaning and/or HEPA vacuuming.

2. Remove disposable coveralls, head covers, and foot covers/boots in the Equipment/Waste Wash Room and deposit into a labeled container. Reusable contaminated clothing, footwear, headgear and gloves shall remain on in the Equipment Room.

3. While still wearing the respirator enter the shower room and clean the outside of the respirator and the exposed face area under running water prior to removal of the respirator, and then shower completely with soap and water to remove residual asbestos contamination.

4. Respirator filter cartridges shall be removed, wetted and disposed of in a container provided for the purpose.

5. Rinse the Shower Room walls and floor prior to exiting. After showering proceed to the Clean Room and don street clothes.

3.9 WORK AREA DECONTAMINATION

A. Cleaning For Large Asbestos Projects

1. External surfaces of containers, bags, and equipment shall be cleaned by wet cleaning and/or HEPA vacuuming in the work area before moving such items into the waste decontamination enclosure system washroom by persons assigned to this duty.

2. Once in the waste decontamination enclosure system, external surfaces of contaminated containers, bags, and equipment shall be cleaned of all visible debris, asbestos or otherwise, by wet cleaning.

3. The cleaned containers of asbestos material and equipment are to be dried of any excessive liquid, placed in uncontaminated plastic bags or sheeting and sealed airtight by workers in the holding room. Workers in the holding room may not enter the washroom area.

4. The clean re-containerized items shall be moved into the holding area. The washroom persons shall not enter this airlock. Workers shall exit the waste decontamination system through the work area and personnel decontamination system.

5. Containers and equipment shall be moved from the airlock and into the holding area by persons dressed in clean personal protective equipment, who have entered from uncontaminated areas.

6. The cleaned containers of asbestos material and equipment shall be placed in water tight carts with doors or tops that shall be closed and secured. These carts shall be held in the

holding area pending removal. The carts shall be wet cleaned and/or HEPA vacuumed at least once each day.

7. Where the waste removal enclosure is part of the personal decontamination enclosure, waste removal shall not occur during shift changes or when otherwise occupied. The exits from the decontamination enclosure system shall be secured to prevent unauthorized entry.
8. The Environmental Consultant shall verify the cleanliness of the work area by conducting a final clearance inspection. If any visible asbestos material, debris, dust or water is found in the work area, the contractor shall repeat the final cleaning process as prescribed herein.

9. Critical barriers and work area enclosures shall be removed only after satisfactory clearance air sampling results have been achieved. Any residual material found upon removal of the critical barriers shall be removed with a HEPA vacuum and/or wet cleaning methodology.

3.10 WASTE STORAGE, TRANSPORT & DISPOSAL

A. Provide a rigid, enclosed, and lockable waste storage container (i.e., dumpster, trailer, etc.) at the site to contain removed asbestos-containing material/debris which has been double-bagged or double-wrapped. The interior floor and walls of the waste storage container shall be lined with two layers of at least 6-mil plastic sheeting and shall be properly labeled on the exterior sides. The container shall be locked at the end of each workday and during non-work shifts.

B. Do not store containerized waste outside of a regulated work area or outside of the waste storage container. Load all containerized asbestos waste onto trucks, dumpsters, or other appropriate containers for storage prior to transport. The containerized asbestos waste shall be placed in an enclosed, locked truck or dumpster for storage. The waste storage/transport unit shall be locked when not in use to prevent unauthorized access to the waste material.

C. Double-bagged and/or double-wrapped asbestos waste may be transported on open trucks if loaded into rigid, steel drums that are properly closed and sealed. The Abatement Contractor shall label all waste disposal drums with the same warning labels as on the waste disposal bags. Drums that have been contaminated shall be disposed of as asbestos-containing waste.

D. The Contractor shall establish a manifest system that accounts for all ACM waste. The manifest system shall be described in writing and will be subject to the approval of the Owner. The Contractor shall retain receipts from the landfill where the asbestos waste is disposed. Separate waste disposal receipts shall be retained for each load of asbestos waste removed from the work site. The Contractor shall demonstrate custody over all asbestos waste from the time it is removed from the work area until it is deposited at the landfill.

E. Final manifests and landfill receipts shall be provided to the Owner within 15 working days of the removal of the asbestos waste from the site by the waste hauler. The Abatement Contractor shall comply with current Federal, State and local regulations governing the handling, transportation and disposal of asbestos waste.

F. Contaminated water from the asbestos work area shall not be disposed of through the shower. Contaminated water must be filtered through a separate 5.0 micron filter system and discharged into the municipal sanitary sewer system, if allowed. If filtered waste water is not allowed to be discharged in the sanitary sewer system, contaminated water, filtered or not, shall be disposed of as asbestos contaminated waste.

3.11 FINAL CLEARANCE TESTING

A. Clearance air sampling, *if applicable to the project*, may be performed using PCM methodology utilizing aggressive air sampling techniques. The clearance air samples shall be considered satisfactory when every PCM air sample result demonstrates an airborne concentration of total

fibers below 0.01 fibers per cubic centimeter (f/cc), or background level, whichever is greater.

1. If any PCM clearance air sample result indicates an airborne asbestos fiber concentration at or above 0.01 f/cc or the background level, whichever is greater, than the Abatement Contractor shall re-clean the affected work area and another set of PCM clearance air samples shall be collected and analyzed.

2. When PCM clearance tests indicate non-compliance with Contract Documents, the Abatement Contractor shall incur all costs associated with re-cleaning of the work area, additional air sampling and analysis until compliance is achieved.

B. Final clearance air sampling *if applicable to the project* shall be performed using TEM methodology in lieu of or in addition to PCM clearance sampling, utilizing aggressive air sampling techniques. The final clearance air samples shall be considered satisfactory when the average TEM asbestos fiber concentration for five air samples collected inside a large work area does not exceed 70 structures per square millimeter (s/mm^2).

1. If the average TEM asbestos fiber concentration for five air samples collected inside a large work area exceeds 70 s/mm^2 then the Abatement Contractor shall re-clean the affected work area in accordance with Industrial Code Rule 56, and another set of TEM clearance air samples shall be collected and analyzed.

2. When TEM clearance tests indicate non-compliance with Contract Documents, the Abatement Contractor shall incur all costs associated with re-cleaning of the work area, additional air sampling and analysis until compliance is achieved.

C. Testing requested by the Abatement Contractor for his information and/or convenience shall be paid for by the Abatement Contractor.

3.12 RESTORATION OF FINISHES

A. After clearance air testing has been achieved, the Abatement Contractor shall remove critical barriers, decontamination enclosure systems, negative air exhaust systems, and restore power affected by the abatement work.

B. Temporary power shall be disconnected, power lock-outs removed and power restored. All temporary plumbing shall be removed.

C. After the Abatement Contractor has completely removed equipment and materials from the work area, the Building Owner and/or the Environmental Consultant shall conduct an inspection (final walk-through) of the work area(s) to ensure it is in an acceptable condition.

D. Finishes, landscaping, structures and/or equipment damaged by the Abatement Contractor shall be restored. Finishes unable to be restored shall be replaced by the Contractor under this Contract at no additional cost to the Owner.

3.13 SATISFACTORY COMPLETION OF WORK

A. The asbestos abatement work is complete upon fulfilling the following:

1. Removal of identified ACM and other related materials, and equipment as specified in this Section**.**

2. Achieving satisfactory PCM/TEM clearance air sampling analytical results as specified by the Contract Documents and as required by all applicable codes, rules, and regulations, *if applicable to the project,* or satisfactory visual inspection of the work area(s).

3. Removing all asbestos abatement equipment and materials from the site.

4. Disposing of all removed asbestos waste material and related construction and demolition debris at an approved waste disposal landfill/facility. Submit waste shipment record forms signed by the Abatement Contractor, waste hauler, and landfill operator for each shipment of asbestos waste removed from the site.

B. Repairing and/or replacing damaged architectural finishes, mechanical systems, and/or equipment, except those which are specified for demolition, alteration, or removal.

C. The work under this section shall include but is not limited to the execution of the following principal items as they apply to Prime Contractors for Project Closeout:

1. Consent of surety for final payments.

2. Assurance, satisfactory to the Owner that unsettled claims will be settled and that work not completed and accepted will be completed without any undue delay.

3. Guaranties, Warranties and Bonds required by the General Conditions and any other extended guaranties or warranties stated in the Technical Sections of the Specifications.

END OF SECTION

SECTION 02100 – EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Contractor shall provide and maintain temporary and permanent erosion control measures for the duration of the construction project as shown on the drawings and as specified herein, including all areas disturbed by the Contractors.

1.02 REGULATORY REQUIREMENTS

A. All erosion and sediment control practices shall comply with the Delaware Department of Natural Resources and Environmental Control (DNREC) “Sediment and Stormwater Management” handbook (latest edition).

1.03 PERMITS AND INSPECTIONS

A. The Contractor shall assure all permits and approvals have been obtained before the Work can begin. Erosion and Sediment Control permits will be provided by the Owner.

PART 2 PRODUCTS

2.01 MATERIALS

A. Seed - See Section 02936 Site Restoration.

B. Mulch - See Section 02936 Site Restoration.

C. Fertilizer - See Section 02936 Site Restoration.

D. Soil Conditioner - See Section 02936 Site Restoration.

E. Straw Bales

1. Size - Nominal size (14 inches by 18 inches by 36 inches) as formed by any standard make baling machine.

2. Binding

a. Material shall be capable of withstanding weathering for the length of time the bale is functioning as a sediment control device or a maximum of three months.

b. Tension shall be set on the baling machine to form a bale with voids no greater than nominal thickness of the straw.

F. Silt Fence – in accordance with the Erosion and Sediment Control permit.

G. Stabilized Construction Entrance – in accordance with the Erosion and Sediment Control permit.

PART 3 EXECUTION

3.01 CONSTRUCTION METHODS

A. A pre-construction meeting shall be held prior to the start of the Work. At the pre-construction conference, the contractor shall submit for acceptance of his schedules for temporary and permanent erosion control work.

B. No work shall be started until the erosion control schedules and methods of operations have been accepted by the Engineer.

C. The Contractor shall follow the Sequence of Construction notes and the Erosion and Sediment Control notes in the Contract Drawings.

D. All Work shall comply with the procedures and practices as set for in the Delaware Erosion and Sediment Control Handbook, current version.

3.02 OUTSIDE ASSISTANCE

A. In case of repeated failures on the part of the Contractor to control erosion, pollution or siltation, the Engineer reserves the right to employ outside assistance or to use his own forces to provide the necessary corrective measures. Such incurred direct costs plus project engineering costs will be charged to the Contractor and appropriate deductions will be made from the Contractor's monthly progress estimate.

END OF SECTION 02100 – EROSION AND SEDIMENT CONTROL

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SECTION 02110 – S ITE CLEARING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Remove surface debris.

B. Remove paving, curbs, and/or other surface rock as required to complete the Work.

C. Clear site of all vegetation as required for construction.

D. Remove trees and shrubs.

E. Remove root system of trees and shrubs.

1.02 REGULATORY REQUIREMENTS

A. Conform to applicable codes for disposal of debris.

B. Coordinate clearing work with utility companies.

C. Conform to applicable Erosion and Sediment Control requirements.

PART 2 PRODUCTS

Not used

PART 3 EXECUTION

3.01 PREPARATION

A. Verify that existing plant life and features designated to remain are tagged or identified. Where items to remain are in conflict with the Work, the Contractor shall notify the Engineer before proceeding with the Work.

3.02 PROTECTION

A. Protect utilities that remain, from damage.

B. Protect trees, plant growth, and features designated to remain as final landscaping.

C. Protect benchmarks and existing structures from damage or displacement.

3.03 CLEARING

A. Clear areas required for access to site and execution of work.

B. Remove paving and curbs as required to finish the Work.

C. Remove trees and shrubs, stumps, root systems and surface rock.

D. Clear undergrowth and deadwood without disturbing subsoil.

3.04 DISPOSAL

A. All excess clean soil as determined by the Owner shall be disposed of on site at the direction of the Owner.

B. All unsuitable soil as well as other debris, rock, and extracted plant life shall be disposed of off site at a regulated landfill or other location.

END OF SECTION 02110 – SITE CLEARING

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SECTION 02150 - SEWAGE BYPASS PUMPING

PART 1 GENERAL

1.01 SCOPE

A. The Contractor is required to furnish all materials, labor, equipment, power, maintenance, etc. to implement a temporary pumping system for the purpose of diverting the existing flow around the work area to complete the work of the proposed project.

B. The design, installation and operation of the temporary pumping system shall be the Contractor's responsibility. The bypass system shall meet the requirements of all codes and regulatory agencies having jurisdiction.

C. When bypass pumping, a sound attenuated pumping unit capable of producing no more than 70 dBA @ 30 feet will be required. The Owner's pre-approval is required for bypass pumping between the hours of 8 PM and 7 AM,

1.02 SUBMITTALS

A. The Contractor shall prepare a specific, detailed description of the proposed pumping system and submit it to the Engineer for approval at least two weeks prior to the initiation of bypass pumping.

B. The Contractor shall submit to the Engineer detailed plans and descriptions outlining all provisions and precautions to be taken by the Contractor regarding the handling of existing wastewater flow. This plan must be specific and complete, including such items as schedules, locations, elevations, capacities of equipment, materials and all other incidental items necessary and/or required to insure proper protection of the facilities, including protection of the access and bypass pumping locations from damage due to the discharge flows, and compliance with the requirements and permit conditions specified in these Contract Documents. No construction shall begin until all provisions and requirements have been reviewed by the Engineer.

C. The plan shall include but not limited to details of the following:

1. Staging areas for pumps;
2. Sewer plugging method and types of plugs;
3. Number, size, material, location and method of installation of suction piping;
4. Number, size, material, method of installation and location of installation of discharge piping;
5. Bypass pump sizes, capacity, number of each size to be on site and power requirements;
6. Calculations of static lift, friction losses, and flow velocity (pump curves showing pump operating range shall be submitted); Estimated system curves shall be submitted showing multiple pump applications.
7. Downstream discharge plan;
8. Method of protecting discharge manholes or structures from erosion and damage;
9. Thrust and restraint block sizes and locations;
10. Sections showing suction and discharge pipe depth, embedment, select fill and special backfill;
11. Method of noise control for each pump and/or generator;
12. Any temporary pipe supports and anchoring required;
13. Design plans and computation for access to bypass pumping locations indicated on the drawings;
14. Calculations for selection of bypass pumping pipe size;

15. Schedule for installation of and maintenance of bypass pumping lines;
16. Plan indicating selection location of bypass pumping line locations.

PART 2 PRODUCTS

2.01. Equipment

A. All pumps used shall be fully automatic self-priming units that do not require the use of foot-valves or vacuum pumps in the priming system. The pumps shall be diesel powered. All pumps used must be constructed to allow dry running for long periods of time to accommodate the cyclical nature of effluent flows.

B. The Contractor shall provide the necessary automatic stop/start controls for each pump.

C. The Contractor shall include one stand-by pump of each size to be maintained on site. Back up pumps shall be on line but isolated from the primary system by a valve.

D. Discharge Piping - In order to prevent the accidental spillage of flows all discharge systems shall be temporarily constructed of rigid pipe with positive, restrained joints. Under no circumstances will aluminum "irrigation" type piping be allowed. Discharge hose will only be allowed in short sections and by specific permission from the engineer.

2.02 System Description

A. Design Requirements:

1. Bypass pumping systems shall have sufficient capacity to pump a peak flow. The Contractor shall provide all pipeline plugs, pumps of adequate size to handle peak flow, and temporary discharge piping to ensure that the total flow of the main can be safely diverted around the section to be repaired. Bypass pumping system may be required to be operated 24 hours per day depending on the work activity.

2. The Contractor shall have adequate standby equipment installed and ready for immediate operation and use in the event of an emergency or breakdown. One standby pump for each pump utilized shall be installed at the bypass pumping locations, ready for use in the event of primary pump failure.

4. Bypass pumping system shall be capable of bypassing the flow around the work area and of releasing any amount of flow up to full available flow into the work area as necessary for satisfactory performances of work.

5. The Contractor shall make all arrangements for bypass pumping during the time when the main is shut down for any reason. System must overcome any existing force main pressure on discharge.

6. **All lateral connections will be treated in the same manner as mainline sewers. Each will have a temporary sump and a pump and stand-by pump to transfer flows to a mainline manhole if required to complete the work.**

B. Performance Requirements:

1. It is essential to the operation of the existing sewerage system that there be no interruption in the flow of sewage throughout the duration of the project. To this end, the Contractor shall provide, maintain and operate all temporary facilities such as dams, plugs, pumping equipment (both primary and back-up units as required),

conduits, all necessary power, and all other labor and equipment necessary to intercept the sewage flow before it reaches the point where it would interfere with his work, carry it past his work and return it to the existing sewer downstream of his work.

2. The design, installation and operation of the temporary pumping system shall be the Contractor's responsibility. The bypass system shall meet the requirements of all codes and regulatory agencies having jurisdiction.

3. The Contractor shall provide all necessary means to safely convey the sewage past the work area. The Contractor will not be permitted to stop or impede the main line and lateral flows under any circumstances.

4. The Contractor shall maintain sewer flow around the work area in a manner that will not cause surcharging of sewers, damage to sewers and that will protect public and private property from damage and flooding.

5. The Contractor shall protect water resources, wetlands and other natural resources.

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL AND MAINTENANCE

A. Test:

1. The Contractor shall perform leakage and pressure tests of the bypass pumping discharge piping using clean water prior to actual operation. The Engineer will be given 24 hours notice prior to testing.

B. Inspection:

1. Contractor shall inspect bypass pumping system continuously throughout the course of the work to ensure that the system is working correctly.

C. Maintenance Service:

1. The Contractor shall insure that the temporary pumping system is properly maintained and a responsible operator shall be on hand at all times when pumps are operating.

D. Extra Materials:

1. Spare parts for pumps and piping shall be kept on site as required.

2. Adequate hoisting equipment for each pump and accessories shall be maintained on the site.

3.02 PREPARATION

A. Precautions

1. Contractor is responsible for locating any existing utilities in the area the Contractor selects to place the bypass pipelines. The Contractor shall locate his bypass pipelines to minimize any disturbance to existing utilities and shall obtain approval of the pipeline locations from the Owner and the Engineer. All costs associated with relocating utilities and obtaining all approvals shall be paid by the Contractor.

2. During all bypass pumping operation, the Contractor shall protect the Pumping Station, lateral pipes, sewer main and all local sewer lines from damage inflicted by any equipment. The Contractor shall be responsible for all physical damage to lateral pipes, the main and all local sewer lines caused by human or mechanical failure.

3.03 INSTALLATION AND REMOVAL

A. The Contractor shall remove manhole sections or make connections to the existing sewer and construct temporary bypass pumping structures as may be required to provide an adequate suction conduit for the bypass pump.

B. Plugging or blocking of sewage flows shall incorporate a primary and secondary plugging device. When plugging or blocking is no longer needed for performance and acceptance of work, it is to be removed in a manner that permits the sewage flow to slowly return to normal without surge, to prevent surcharging or causing other major disturbances downstream.

C. When working inside manhole or force main, the Contractor shall exercise caution and comply with OSHA requirements.

D. The installation of the bypass pipelines is prohibited in all saltmarsh/wetland areas. The pipeline must be located off streets, sidewalks and on shoulder of the roads. When the bypass pipeline crosses local streets and private driveways, the contractor must place the bypass pipelines in trenches and cover with plating or temporary pavement. Upon completion of the bypass pumping operations, the Contractor shall remove all the piping, restore all property to pre-construction condition and restore all pavement. The Contractor is responsible for obtaining any approvals for placement of the temporary pipeline within public ways from the agency with jurisdiction.

END OF SECTION 02150 – SEWAGE BYPASS PUMPING

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SECTION 02200 - WELL POINTING

PART 1 GENERAL

1.01 SCOPE

A. The Contractor is required to furnish all materials, labor, equipment, power, maintenance, etc. to implement a temporary pumping system for the purpose of completely dewatering excavations during the execution of the work.

B. The Contractor shall provide well pointing for all piping (including laterals), manholes and other structures as needed to keep excavations dry as required for the proper construction of those items.

C. This item shall include permitting, all well point installation, piping, pumping facilities, discharge facilities, restoration to items disturbed to facilitate well pointing, and associated facilities needed to install and operate the entire well pointing system.

D. All well point installation shall be in accordance with DNREC requirements and other local, state, or Federal requirements that may apply, including necessary installer certifications.

E. A sound attenuated pumping unit capable of producing no more than 70 dBA will be required.

1.02 SUBMITTALS

A. The Contractor shall prepare a specific, detailed description of the proposed dewatering system and submit it to the Engineer for approval at least two weeks prior to the initiation of well pointing. If Contractor plans to use a vendor, Contractor shall submit vendor's references.

B. DNREC Water Withdrawal and Discharge Permit

PART 2 PRODUCTS

(Not Used)

PART 3 EXECUTION

3.01 WELL POINTING

A. The well pointing shall be installed to the depth necessary to keep the excavation dry for the entire period needed to complete spot repairs and install piping, manholes, laterals, etc. The well pointing system shall operate continuously without interruption from at least one week prior to excavation until the installation is complete and the excavation backfilled.

B. The design, installation and operation of the temporary dewatering system shall be the Contractor's responsibility.

3.02 INSTALLATION AND REMOVAL

A. The installation of well point suction and discharge pipe is prohibited in all saltmarsh/wetland areas. When piping associated with well point system crosses local streets and private driveways, the contractor must place the pipelines in trenches and cover with plating or temporary pavement. Upon completion of the dewatering operations, the Contractor shall remove all the piping, restore all property to pre-construction condition and restore all pavement. The Contractor is responsible for obtaining any approvals for placement of the temporary

pipeline within public ways from the agency with jurisdiction.

END OF SECTION 02200 – WELL POINTING

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SECTION 02202 – ROCK REMOVAL

PART 1 GENERAL

1.01 WORK INCLUDED

A. Removal of discovered rock during excavation by mechanical means.

B. Explosives shall not be used on this project.

1.02 QUALITY ASSURANCE

A. Seismic Survey Firm: Company specializing in seismic surveys with five years documented experience.

1.03 DEFINITIONS

A. Rock: Solid mineral material with a volume in excess of 1/2 cu yd or rock that cannot be removed by a hydraulic excavator with a minimum manufacturer's operating weight of 41,000 pounds, 118 flywheel horsepower at 1800 rpm (Caterpillar E200 B EL equivalent or larger) and minimum 3 foot wide heavy duty bucket with rock teeth.

1.04 RELATED SECTIONS

A. Section 01026 – Unit Prices.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify site conditions and note irregularities affecting work of this Section.

3.02 ROCK REMOVAL

A. Excavate for and remove rock by mechanical means.

B. Cut away rock at excavation bottom to form level bearing.

C. Remove shaled layers to provide sound and unshattered base for footings and foundations.

D. In utility trenches, excavate to 6 inches below invert elevation of pipe and to a width shown on the Contract Drawings or 24" total width if not specified.

E. Remove excavated material from site.

F. Correct unauthorized rock removal in accordance with backfilling and compaction requirements of Section 02223.

3.03 FIELD QUALITY CONTROL

A. Provide for visual inspection of bearing surfaces and cavities formed by removal.

END OF SECTION 02202 – ROCK REMOVAL

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SECTION 02210 – SUBSURFACE UTILITY INVESTIGATION AND LOCATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Investigative work required to determine the precise horizontal and vertical location of utilities obtained by the actual exposure (or verification of previously exposed and surveyed utilities) and subsequent measurement and recording of the location of a subsurface utility.

B. Non destructive excavation to expose and verify the location of existing buried facilities.

l.02 FIELD MEASUREMENTS

A. Verify that survey information related to the horizontal and vertical location of existing utilities is recorded and submitted to the Engineer

1.03 REFERENCE STANDARDS

A. CI/ASCE 38-02*:* "Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data," American Society of Civil Engineers, 2003. QL A: Utility Quality Level A. QL A indicates the precise horizontal and vertical location of utilities obtained by the actual exposure (or verification of previously exposed and surveyed utilities) and subsequent measurement of subsurface utilities, usually at a specific point.

1.04 WORK LOCATIONS

A. Contractor shall use surface geophysical methods to locate and verify the location of existing utilities in areas scheduled for the open cut removal and replacement or abandonment of existing sanitary sewer pipe and manholes and/or as designated by the Engineer.

1.05 SUBMITTALS

A. Name and qualifications of the firm selected to investigate and record the location of existing facilities. The selected firm shall be regularly engaged in the business of utility location and shall be able to demonstrate this experience.

B. All required reports, documentation, studies, field notes and sketches, plan drawings, and electronic data shall be submitted for review and acceptance by the Engineer.

PART 2 PRODUCTS

Not used

PART 3 EXECUTION

3.0l PREPARATION

A. Deploy necessary personnel, equipment, and supplies to the work site, in preparation for the work.

B. Whenever the work will affect the movement of traffic or traffic safety, provide traffic control and utilize traffic control devices in conformance with the DelDOT MUTCD.

C. Obtain all necessary permits from the State of DE, DOT and/or local jurisdictions to allow the

Contractor to work within public rights of way.

D. Records and Information Research - Conduct appropriate investigations (e.g., owner records, DOT records, County records, personal interviews, visual inspections, etc.), to help identify utility owners that may have facilities within the project limits or that may be affected by the project.

E. Records Collection - Collect applicable records (e.g., utility owner base maps, "as built" or record drawings, permit records, field notes, geographic information system data, oral histories, etc.) on the existence and approximate location of existing involved utilities.

F. Records Review - Review records for: evidence or indication of additional available records; duplicate or conflicting information; need for clarification.

G. Compilation and Presentation of Data. - Transfer information on all involved utilities to appropriate plan sheets, electronic files, and/or other documents as required. Exercise professional judgment to resolve conflicting information.

3.02 EXISTING UTILITY MARK OUT

A. Identify surface features, from project maps (if available) and from field observations, that are surface appurtenances of subsurface utilities.

B. Select and apply appropriate surface geophysical method(s) to search for and detect subsurface utilities within the project limits, and/or to trace a particular utility line or system.

1. Based on an interpretation of data, mark the indications of utilities on the ground surface, for subsequent survey. Utilize paint or other method acceptable to Engineer for marking of lines.

2. Utilize the uniform color code of the American Public Works Association for marking of utilities.

3. Unless otherwise directed, mark centerline of single-conduit lines, and outside edges of multi-conduit systems.

4. Unless otherwise approved, maintain horizontal accuracy of +/- 1.5 feet (450 mm) in the marking of lines.

5. As an alternative to the physical marking of lines, the Contractor may, with the Engineers approval, utilize other means of data collection, storage, retrieval, and reduction, that enables the correlation of surface geophysical data to the project's survey control.

6. Record locations of all markings that indicate the presence of a subsurface utility.

3.03 EXCAVATION

A. Precise horizontal and vertical location of utilities is required prior to the excavation required to replace existing facilities at the site. The Contractor is required to “test pit” locations based on the requirements of the project and on existing subsurface utility information to accurately record the location of existing underground utilities at the site and assure the utilities are not damaged during construction or as a result of construction.

B. The Contractor shall comply with all applicable provisions of DE State Law when planning or performing excavations at utility test hole sites. Compliance actions include, but are not limited to: notify owners or operators of underground utility facilities at least two (2) business days prior (not including the day of actual notice) to making or beginning excavations in the

vicinity of such facilities; contact non-member utilities directly; coordinate with utility owner representatives as required for inspection or other on-site assistance; immediately cease excavation work, report any resultant utility line damage to utility owner and conduct the necessary repairs to utilities damaged as a result of excavation at no additional cost to the Owner.

C. The Contractor shall use minimally intrusive excavation techniques, acceptable to the Engineer, that ensure the safety of the excavation, the integrity of the utility line to be measured, and that of other lines which may be encountered during excavation. The Engineer intends that excavation shall be by means of air- or water-assisted vacuum excavation equipment manufactured specifically for the purpose. Provided, however, that approval of water-assisted vacuum excavation shall pose no risk of damage to the paved facility or utility lines.

1. Clear the test hole area of surface debris.
2. In paved areas, neatly cut and remove existing pavement.
3. Excavate the test hole by the method(s) chosen by the Contractor.
4. Expose the utility only to the extent required for identification and data collection purposes.
5. Avoid damage to lines, wrappings, coatings, cathodic protection or other protective coverings and features.
6. Hand-dig as needed to supplement mechanical excavation and to ensure safety.
7. Revise the test hole location as necessary to positively expose the utility.
8. Store excavated material for re-use or disposal, as appropriate.
9. Underpin adjacent structures which may be damaged by excavation work, including utilities and pipe chases.
10. Comply with all Federal, State and local codes, permits and regulations.
11. Excavation cut not to interfere with normal 45 degrees bearing splay of foundations or any other adjacent structures or utilities.
12. Grade top perimeter of excavation to prevent surface water from draining into excavation.
13. Hand trim excavation. Remove loose matter.
14. Remove lumped subsoil, boulders and rock at no extra cost to the Owner.
15. Notify Engineer of unexpected subsurface conditions or utility damage.
16. Correct unauthorized excavation at no extra cost to Owner.
17. Correct areas over-excavated by error.
18. Remove overburden / spoils from the site and dispose of in accordance with State and Local regulations.
19. Excavations shall be kept dewatered by such methods as the Contractor deems necessary. Where pumping is required, a sufficient number of pumps of adequate size shall be employed to keep the excavations dry and free of water at all times

during excavation, and until the work is completed. Sumps shall be constructed where necessary. Water removed from excavations shall be directed to a sediment bag, or other approved device, and shall be disposed of in such a manner as to not cause injury to public health, private property, street surfaces, embankments or to any portion of the work completed or in progress.

20. Support excavations with sheathing, shoring and bracing or with a "trench box" as required to comply with OSHA regulations.

21. Install adequate excavation supports to prevent ground movement or settlement to adjacent structures, pipelines or utilities. Damage due to settlement because of failure to provide support or through fault of the Contractor in any other manner, shall be repaired at the Contractor's expense.

22. Withdraw excavation supports when work is complete.

3.04 COLLECTION, RECORDING, AND PRESENTATION OF DATA.

A. Measure and/or record the following information on an appropriately formatted test hole data sheet that has been sealed and prepared by the Contractor.

1. Elevation of top and/or bottom of the utility tied to the project datum, to a vertical accuracy of +/- 0.05 feet (15 mm).

2. Elevation of existing grade over utility at test hole.

3. Horizontal location referenced to project coordinate datum, to a horizontal accuracy consistent with applicable DOT survey standards.

4. Field sketch showing horizontal location referenced to a minimum of three (3) swing ties to physical structures existing in the field and shown on the project plans.

5. Approximate centerline bearing of utility line.

6. Outside diameter of pipe, width of duct banks, and configuration of non-encased multi-conduit systems.

7. Utility structure material composition, when reasonably ascertainable.

8. Identity of benchmarks used to determine elevations.

9. Other pertinent information as is reasonably ascertainable from test hole.

3.05 SITE RESTORATION

A. Backfill excavation and restore the area disturbed.

1. Replace bedding material around exposed utility lines in accordance with owner's specifications or as otherwise directed or approved.

2. Backfill and compact the excavation in a manner acceptable to Engineer. If approved, re-use excavated material with appropriate moisture/density control.

3. Install color-coded warning ribbon within the backfill area and directly above the utility line.

4. As applicable, provide permanent pavement restoration within the limits of the original cut using materials, compaction, and pavement thickness shown on the Contract Details attached to the Contract Documents.

5. Repair or replace backfill or pavement that fails (i.e., subsidence and/or loss of pavement material)in accordance with the Warranty period required in the Contract Documents.

6. For excavations in unpaved areas, restore disturbed area as nearly as practicable to pre-existing conditions and in conformance to the restoration requirements of the Contract Documents.

END OF SECTION 02210 – SUBSURFACE UTILITY INVESTIGATION AND LOCATION

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SECTION 02211 – ROUGH GRADING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Remove topsoil and stockpile for later reuse.

B. Excavate subsoil and stockpile for later reuse.

C. Grade and rough contour site.

D. Exercise the necessary means and methods to control dust on the site as well as in off-site work areas where excavation or grading are required.

E. When it is necessary to haul soft or wet soil materials over roadways, use suitably tight vehicles to prevent spillage. Clear salvage or materials on roadways at no expense to the Owner.

F. Excess on-site suitable materials shall remain on the property of the Owner and shall be stockpiled and stabilized on-site where directed by the Owner. Unsuitable material such as sod, stumps and spongy soils shall become the property of the Contractor and shall be legally disposed of off-site.

1.02 PROJECT RECORD DOCUMENTS

A. Accurately record location of utilities remaining, rerouted utilities, new utilities by horizontal dimensions, elevations or inverts, and slope gradients.

1.03 PROTECTION

A. Protect trees, shrubs, lawns, and other features remaining as portion of final landscaping.

B. Protect bench marks, existing structures, fences, roads, sidewalks, paving, and curbs if not to be removed.

C. Protect above or below grade utilities pipes and conduits which are to remain.

D. Contractor shall assume complete responsibility for replacement and restitution of damaged or destroyed items or features by Work of this contract to the satisfaction of the Owner and at no expense to the Owner.

PART 2 PRODUCTS

2.0l MATERIALS

A. Topsoil: Excavated material, graded free of roots, rocks larger than one inch; subsoil, debris and large weeds.

B. Subsoil: Excavated material, graded free of soil lumps larger than 6 inches, rocks larger than 4 inches and debris.

PART 3 EXECUTION

3.01 PREPARATION

A. Identify required lines, levels, contours and datum.

B. Identify known below grade utilities. Stake and flag locations.

C. Identify and flag above grade utilities.

D. Maintain and protect existing utilities remaining which pass through work area.

E. Notify utility company of work.

3.02 TOPSOIL EXCAVATION

A. Excavate topsoil from areas to be further excavated, relandscaped, or regraded and stockpile in area designated on site.

B. Do not excavate wet topsoil.

C. Stockpile topsoil and cover to protect from erosion.

3.03 SUBSOIL EXCAVATION

A. Excavate subsoil from areas to be relandscaped or regraded, marked areas and stockpile on site.

B. When excavation through roots is necessary, perform work by hand and cut roots with a sharp ax.

3.04 TOLERANCES

A. Top Surface of Subgrade: Plus or minus one inch.

END OF SECTION 02211 – ROUGH GRADING

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SECTION 02222 – EXCAVATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Excavation for building foundations.

B. Excavation for slabs-on-grade, paving, landscaping, erosion and sediment controls and utilities.

C. Excavation for site structures.

1.02 FIELD MEASUREMENTS

A. Verify that survey benchmark and intended elevations for the Work are as indicated.

PART 2 PRODUCTS

Not used

PART 3 EXECUTION

3.0l PREPARATION

A. Identify required lines, levels, contours and datum.

3.02 EXCAVATION

A. Underpin adjacent structures which may be damaged by excavation work, including utilities and pipe chases.

B. Excavate subsoil required to accommodate pipes, building foundations, slabs-on-grade, paving and site structures as shown on the Drawings.

C. Comply with all Federal, State and local codes, permits and regulations.

D. Excavation cut not to interfere with normal 45 degrees bearing splay of foundations or any other adjacent structures or utilities.

E. Grade top perimeter of excavation to prevent surface water from draining into excavation.

F. Hand trim excavation. Remove loose matter.

G. Remove lumped subsoil, boulders and rock to a minimum of 6-inches below the proposed pipe or structure.

H. Notify Engineer of unexpected subsurface conditions or utility damage.

I. Correct unauthorized excavation at no extra cost to Owner.

J. Correct areas over-excavated by error.

K. Stockpile excavated material in area designated on-site.

L. Excavations for structures shall be kept dewatered by such methods as the Contractor deems necessary. Where pumping is required, a sufficient number of pumps of adequate size shall be employed to keep the excavations dry and free of water at all times during excavation, and until the foundation work is completed. Sumps shall be constructed where necessary. Water removed from excavations shall be disposed of in such a manner as to not cause injury to public health, private property, street surfaces, embankments or to any portion of the work completed or in progress.

M. Support excavations with sheathing, shoring and bracing or with a "trench box" as required to comply with Federal and State laws and codes.

N. Install adequate excavation supports to prevent ground movement or settlement to adjacent structures, pipelines or utilities. Damage due to settlement because of failure to provide support or through fault of the Contractor in any other manner, shall be repaired at the Contractor's expense.

O. Withdraw excavation supports when work is complete.

3.03 FIELD QUALITY CONTROL

A. Provide for visual inspection of bearing surfaces.

3.04 PROTECTION

A. Protect excavations by methods required to prevent cave-in or loose soil from falling into excavation.

B. Protect bottom of excavations and soil adjacent to and beneath foundation, from freezing.

END OF SECTION 02222 – EXCAVATION

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SECTION 02223 – BACKFILLING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Building perimeter, trench and site structure backfilling to subgrade elevations.

B. Site filling and backfilling.

C. Fill under slabs-on-grade and paving.

D. Consolidation and compaction.

E. Fill for over-excavation.

F. Each Contractor shall be responsible for the backfilling required for the Work of his Contract.

1.02 REFERENCES

A. ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb. (2.49 kg) Rammer and 12 inch (304.8 mm) Drop. (Standard Proctor).

B. ASTM D1556 – Test Method for Density of Soil in Place by the Sand-Cone Method.

C. ASTM D2922 – Test Methods for Density of Soil and Soil aggregate in place by Nuclear methods.

D. Delaware Department of Transportation Specifications for Road and Bridge Construction.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. Type A: Delaware Department of Transportation Select Granular Material CR-1.

B. Type B: AASHTO No. 57 (3/4 inch clean stone).

C. Type C: AASHTO No. 7 clean stone (small pipe bedding).

D. Type D – Borrow Material – Material meeting the requirements of clayey/silty materials (SM, ML, SC, SM-ML or CL) as defined by the Unified Soil Classification System (ASTM D-2487) laboratory verification and approval of engineer, shall be obtained before placement of these materials.

E. Type E – On-site Excavated Material – Reuse on-site excavated material free of topsoil, ice, frozen material, debris and roots. Maximum particle size shall be four inches.

F. Concrete: Structural concrete with a compressive strength of 3000 psi.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify fill materials to be reused are acceptable. For each material to be used as backfill, whether on-site or borrow, a sample shall be provided to the testing agency for proctor analysis at least ten (10) days prior to fill or backfill operations. Contractor shall employ and

pay for testing agency per Section 01400. By submitting samples of these materials, the contractor agrees and guarantees that fill materials actually used in the construction will conform to the accepted samples submitted.

3.02 PREPARATION

A. Generally, compact subgrade to density requirements for subsequent backfill materials.

B. Cut out soft areas of subgrade not capable of in-situ compaction. Backfill with Type B, D or subsoil fill and compact to density equal to or greater than requirements for subsequent backfill material.

C. Prior to placement of aggregate base course material at paved areas, compact subsoil to 95 percent of its maximum dry density in accordance with ASTM D698 unless otherwise specified (DELDOT).

3.03 BACKFILLING

A. Backfill areas to contours and elevations with unfrozen materials.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.

C. Employ a placement method that does not disturb or damage foundation perimeter drainage, foundation damp-proofing, protective covers or utilities in trenches.

D. Maintain optimum moisture content of backfill materials to attain compaction density of 95% Standard Proctor (ASTM D698).

E. Backfill against supported structures or utilities.

F. Backfill simultaneously on each side of unsupported structures or utilities.

G. Slope grade away from structures minimum 2 inches in 10 ft., unless noted otherwise.

H. Place and compact materials in continuous 8 inch loose lifts unless otherwise specified.

3.04 TOLERANCES

A. Top Surface of Backfilling: Plus or minus one inch from required elevations.

3.05 FIELD QUALITY CONTROL

A. Field testing will be performed under provisions of Section 01400.

B. Testing and analysis of fill material shall be performed by the Contractor's Testing Agency in accordance with ASTM D1556, ASTM D2992, ASTM D698 and with Section 01400.

C. Frequency of Tests: Contractor shall provide a minimum of one test for every 50 cubic yards of backfill material. Engineer may call for additional compaction tests on any backfilled material.

D. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

E. Where manholes are located in paved areas, the provisions of paragraph 3.05 shall apply. Where manholes are not in pavement, paragraph 3.05 does not apply.

3.06 PROTECTION OF FINISHED WORK

A Protect finished Work.

END OF SECTION 02223 – BACKFILLING

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SECTION 02225 – TRENCHING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Excavation of trenches for utilities and pipes.

B. Compacted bedding.

C. Backfilling and compaction.

D. Each Contractor shall be responsible for the trenching required for the Work of his Contract.

1.02 REFERENCES

A. ANSI/ASTM D1557 - Test methods for moisture - density relations of soils and soil-aggregate mixtures using 5.5 pound rammer and 12 inch drop. (Standard Proctor Density).

1.03 FIELD MEASUREMENTS

A. Verify the survey benchmark and intended elevations for the work are as shown on Project Drawings.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. Types A, B, C, D or E materials as described in Section 02223.

2.02 BED MATERIALS

A. Type B as described in Section 02223 for piping 4 inches in diameter and larger.

B. Type C as described in Section 02223 for piping less than 4 inches in diameter.

2.03 COVER MATERIALS

A. Topsoil: In accordance with Section 02936-2.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify fill material to be reused, is acceptable.

3.02 PREPARATION

A. Identify required lines, levels, contours and datum.

B. Maintain and protect existing utilities and piping remaining which pass through work area.

C. Cut out soft areas of subgrade not capable of insitu compaction. Backfill with Type B fill and compact to density greater than or equal to requirements for subsequent backfill material.

3.03 EXCAVATION

A. Excavate subsoil required for piping.

B. Cut trenches sufficiently wide to enable installation of utilities and allow inspection.

C. Excavation shall not interfere with normal 45 degree bearing splay of foundations.

D. Hand trim excavation. Remove loose matter.

E. Remove lumped subsoil, boulders, and rock to a minimum of 6-inches below the proposed pipe.

F. Correct unauthorized excavation at no cost to Owner.

G. Correct areas over-excavated by error.

H. All excavations must be kept free of water below the subgrade of the work while work is in progress. Water removed from excavations shall be disposed of in such a manner as to not cause injury to public health, private property, street surfaces, embankments or any portion of the work completed or in progress.

I. Saw cut any paving prior to trench excavation.

3.04 BEDDING

A. Support pipe and conduit during placement and compaction of bedding fill.

3.05 BACKFILLING

A. Backfill trenches to contours and elevations with unfrozen materials.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.

C. Fill: Place and compact material in continuous layers not exceeding 8 inches.

D. Employ a placement method that does not disturb structures, utilities, etc.

E. Maintain optimum moisture control of backfill materials to attain required compaction density of 95% Standard Proctor (ANSI/ASTM D698) unless otherwise noted.

F. Remove surplus backfill materials from site.

G. Leave fill material stockpile areas completely free of excess fill materials.

3.06 TOLERANCES

A. Top surface of backfilling: Plus or minus one inch from required elevations.

3.07 FIELD QUALITY CONTROL

A. Field testing will be performed under provisions of Section 01400.

B. Frequency of Tests: Contractor shall provide a minimum of one test for every 50 cubic yards of backfill material. Engineer may call for additional compaction tests on any backfilled material.

C. If tests indicate Work does not meet specified requirements, remove Work replace and retest at no cost to the Owner.

3.08 PROTECTION OF FINISHED WORK

A. Protect finished work.

END OF SECTION 02225 – TRENCHING

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SECTION 02500- PAVING

PART 1 GENERAL

1.01 WORK INCLUDES

A. The Contractor shall install hot-mix, hot laid asphaltic concrete pavement and base courses in accordance with details provided on the Drawings and specifications.

B. Work shall include all labor, materials and equipment necessary to perform all paving and surfacing where shown on the contract drawings. The type of material, thickness and typical sections shall be as shown on the Contract Drawings.

C. Paving associated with manhole frame and cover replacements, test pits, manhole and pipe abandonment, spot repairs, cleanout installations, patching, etc. is incidental to those pay individual items.

1.02 QUALITY ASSURANCE

A. Perform work in accordance with Section 01400.

B. Specifications: Delaware Department of Transportation (DELDOT) Specifications for Road and Bridge Construction, August 2001, latest edition.

C. Source Quality Control: Maintain quality in products by using those of a qualified bituminous concrete producer having qualified plant operating personnel.

D. Experience: The bituminous concrete producer shall be DELDOT approved and shall be a bulk producer regularly engaged in production of hot-mixed, hot-laid bituminous concrete conforming to the standards referenced herein.

E. Workmen Qualifications: Provide workmen thoroughly trained and experienced in the skills required who understands the design and is completely familiar with the application of stone base and bituminous concrete paving work.

1.03 REFERENCE STANDARDS

A. Delaware Department of Transportation (DELDOT) Specifications for Road and Bridge Construction, August 2001, latest edition.

1.04 JOB CONDITIONS

A. Weather Limitations: Apply tack coats only when ambient temperature is above 40° F and rising, and when temperature has not been below 35° F for 12 hours immediately prior to application. Do not apply when base is wet or contains an excess of moisture.

B. Construct asphaltic concrete surface course (wearing course) only when atmospheric temperature is above 40° F and when base is dry. Binder course may be placed when air temperature is above 35° F and rising.

C. Grade Control: Establish and maintain required lines and elevations.

1.05 SUBMITTALS

A. Submit work items for review in accordance with Section 01300.

B. Mix designs for bituminous concrete shall be submitted in writing by the Contractor sufficiently in advance of paving operations to allow for review approval. The design information shall include the following:

1. The use of which the material is proposed.
2. The designation, source and anticipated gradation of each of the component aggregates.
3. The estimated percentage of each aggregate required to yield the desired blend.
4. The resulting percentage passing each sieve size stipulated by the appropriate band.
5. The source of the asphalt material to be used.

C. Delivery Tickets: Submit for each placed on the project.

PART 2 PRODUCTS

2.01 MATERIALS

A. The asphalt for the plant mix shall comply with Delaware Department of Transportation (DELDOT) Specifications for Road and Bridge Construction, August 2001, latest edition. The asphalt material shall meet the requirements of Division 800. A certificate of compliance will be acceptable.

B. The mineral aggregate for asphalt plant mix shall consist of coarse aggregate and fine aggregate. The course aggregate shall be sound, angular crushed stone, crushed gravel or crushed slag. Uncrushed coarse aggregate may be used in base course mixtures if the mixture meets all the design criteria. The fine aggregate shall be well graded, moderately sharp to sharp sands.

C. The mineral aggregate and asphalt shall be combined in a mixing plant to meet the gradations for asphalt concrete base and surface, as specified by the Delaware Department of Transportation.

2.02 PAVEMENT MIXES

A. Composition of Mixtures: Binder and wearing course mixture composition shall conform to the requirements of the above referenced specifications and the following.

1. The approved job-mix formula shall lie within the specification limits and be suitable for the layer thickness and other conditions prevailing. It shall not be changed after work has started without the approval of the Engineer.

PART 3 EXECUTION

3.01 GENERAL

A. Construction requiring the removal and replacement of roads, driveways, parking areas, curb and gutter, walks and paved areas, and new paving shall be as required herein and shall meet the following jurisdictional requirements.

1. Delaware Department of Transportation (DELDOT) Specifications for Road and Bridge Construction, August 2001, latest edition.

3.02 REMOVAL OF EXISTING PAVEMENT

A. Cut existing pavement in advance of excavating to neat lines.

B. Saw cut existing pavement to the full depth of paving. Remove transfer devices where they exist.

C. For walkways and curb and gutter provide temporary facilities as directed by the Engineer.

3.03 USE OF STEEL PLATING

A. Whenever steel plating is required or used during construction within a paved roadway, the following requirements shall apply:

1. Notify Engineer at least 48 hours in advance of placing steel plates in roadway. Unless otherwise approved by the Engineer, steel plates shall be removed in not more than seven days.

2. Provide steel plate warning signs to crossing vehicular traffic.

3. Steel plates shall be at least one inch thick and large enough to allow a minimum of one foot of bearing on all sides of the excavation. Pin plates to prevent movement.

4. Provide cold bituminous mix on all edges of the steel plate tapered from the height of the steel plate extending a minimum of one foot to the existing road surface.

5. During months of the year when snowfall may be expected, mark steel plates with a two inch square stake painted International Orange and extending at least four feet above the ground, placed adjacent to the edge of the roadway.

6. If an emergency condition occurs due to the excavation and plate placement that the Owner's forces must correct, the Contractor will be charged for cost of the corrective measures required.

3.04 PREPARATION AND PLACEMENT OF PAVEMENT

A. All debris, vegetation, or other perishable materials shall be removed from the jobsite, except for trees and shrubs designated for preservation. The site to be paved shall be graded to the required section and all excess material removed from the location of the work. Material in soft spots shall be removed to the depth required to provide a firm foundation and shall be replaced with Type B Backfill material.. The entire subgrade area shall be thoroughly compacted to minimum density of 95 percent of the maximum dry density as determined by the Standard Proctor. The surface of the subgrade after compaction shall be hard, uniform, smooth, and true to grade cross-section.

B. Excavate, replace or adjust as required existing features to assure a smooth transition to proposed paving including but not limited to water valve boxes, manhole frames and covers, etc.

C. A tack coat shall be applied on the subgrade and base course. The rate of application of the tack coat shall comply with Delaware Department of Transportation (DELDOT) Specifications for Road and Bridge Construction, August 2001, latest edition.

D. The Contractor shall provide the necessary equipment, materials, and labor to complete the job acceptable to the owner.

E. The contractor shall furnish for testing and analysis representative samples to the designated testing laboratory. All materials and applications shall comply with DELDOT Standards. The contractor shall provide certification that the material furnished is in accordance with the contract. Sampling and testing shall be in accordance with the latest revisions of the American Association of State Highway and Transportation Officials (ASSHTO) or the American Society for Testing Materials (ASTM). A certificate of compliance will be acceptable.

F. The surface of the completed work when tested with a 10'-0" straight edge shall not have irregularities in excess of ¼ inch.

G. For all areas of more than 200 square yards asphalt base and surface courses shall be spread and struck off with a paving machine. Any irregularities in the surface of the pavement course shall be corrected directly behind the paving machine. Excess material forming high spots shall be removed with a shovel or a lute. Indented areas shall be filled with hot mix and smoothed with a lute or the edge of a shovel being pulled over the surface. Casting of mix over such areas shall not be permitted.

H. If it is impractical to use a paving machine or spread box in areas of less than 200 square yards, asphalt base and surface courses maybe spread and finished by hand. Wood or steel forms rigidly supported to assure correct grade and cross section maybe used. Placing by hand shall be performed carefully to avoid segregation of the mix. Broad casting of material shall not be permitted. Any lumps that do not break down readily shall be removed.

I. Rolling shall start as soon as hot mix material can be compacted without displacement. Rolling shall continue until thoroughly compacted and all roller marks have disappeared.

J. In areas too small for the roller a vibrating plate compactor or hand tamper shall be used to achieve thorough compaction.

K. The contractor shall guarantee in writing the satisfactory performance of the completed pavement for a period of five (5) years.

3.05 FIELD QUALITY CONTROL

A. Thickness: In-place compacted thickness will not be acceptable if exceeding allowable variation from required thickness:

1. Base Course: 1/2", plus or minus.
2. Surface Course: 1/4", plus or minus.

B. Surface Smoothness: Test finished surface of each asphaltic concrete course for smoothness, using 10 foot straightedge applied parallel with, and at right angles to centerline of paved area. Surfaces will not be acceptable if exceeding following tolerances for smoothness:

1. Base Course Surfaces: 1/4".
2. Wearing Course Surface: 3/16".

3.06 PROTECTION

A. Protect from damage and vehicular traffic until paving has cooled and attained its maximum degree of hardness.

END OF SECTION 02500 – PAVING

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SECTION 02650 - SEWER LINE CLEANING

PART 1 GENERAL

1.01 SCOPE

A. Work includes the cleaning (including root cutting) of sewer pipes prior to the television inspection of the pipe or as necessary to complete the Work of this Contract. All material removed from the pipe as a result of cleaning must be hauled off site to an area designated by the Contractor and properly disposed of in accordance with applicable codes.

B. The intent of sewer line cleaning is to remove ALL foreign materials from the lines prior to televising, lining, sealing, etc. the pipe. The success of the other phases of work will depend a great deal on the cleanliness of the lines. The importance of this phase of the operation cannot be over emphasized. Light Cleaning is defined as three or less passes in a pipe segment utilizing High–Velocity Jet (Hydrocleaning) Equipment. It is recognized that there are some conditions such as major blockages that prevent cleaning from being accomplished. The Contractor will be required to inform the Engineer of any major blockage prior to continuing the cleaning of the pipe. If in the course of normal cleaning operations, damage results to the pipe or structure as a result of the cleaning, the Contractor will be required to repair the damage or replace the pipe or structure, at no additional cost to the Owner.

1.02 REQUIREMENTS

A. The Contractor shall be aware that this Contract requires work in active sewers and shall follow all federal, state and local requirements for safety in confined spaces.

1.03 RELATED SECTIONS

A. Temporary Bypass Pumping.

B. Notifications.

1.04 SUBMITTALS

A. Submit work items for review in accordance with Section 01300.

B. Proposed equipment to be utilized to accomplish heavy cleaning of sewer pipe and removal of debris.

C. “Heavy Cleaning Plan” describing the schedule of the work, equipment to be used, anticipated water pressure at point of cleaning, easement reels, auxiliary booster pumping equipment, root cutting equipment, material capture method, material transfer method from work area to trucks used for disposal, temporary bypass pumping, etc.

D. The Contractor shall submit the name of the legal disposal area he has chosen to receive the materials removed from the cleaning of sewer pipe under this section.

PART 2 PRODUCTS

2.01 CLEANING EQUIPMENT

A. Hydraulically Propelled Equipment: The equipment used shall be of a movable dam type and be constructed in such a way that a portion of the dam may be collapsed at any time during the cleaning operation to protect against flooding of the sewer. The movable dam shall be equal in

diameter to the pipe being cleaned. If cleaning balls or other equipment, which cannot be collapsed, are used, special precautions to prevent flooding of the sewers and public or private property shall be taken.

B. High-Velocity Jet (Hydrocleaning) Equipment: All high-velocity sewer cleaning equipment shall be constructed for ease and safety of operation. The equipment shall have a selection of high-velocity nozzles. The nozzles shall be capable of producing a scouring action from 15 to 45 degrees, in all size lines designated to be cleaned. Equipment shall also include a high-velocity gun for washing and scouring structure walls and floor. The gun shall be capable of producing flows from a fine spray to a solid stream. The equipment shall carry its own water tank, auxiliary engines, pumps, and hydraulically driven hose reel.

C. Mechanically Powered Equipment: Bucket machines shall be in pairs with sufficient power to perform the work in an efficient manner. Machines shall be belt operated or have an overload device. Machines with direct drive that could cause damage to the pipe will not be allowed. A power rodding machine shall be either a sectional or continuous rod type capable of holding a minimum of 750 feet of rod. The rod shall be specifically heat-treated steel. To insure safe operation, the machine shall be fully enclosed and have an automatic safety clutch or relief valve.

D. Root Cutting Equipment: Root cutters shall use the high-pressure water from a sewer jet truck and auxiliary equipment as required to create the necessary water pressure and speed to operate a hydraulic root cutter as recommended by the cutter manufacturer. The high-pressure water shall turn a hydraulic motor, which has a root cutting blade attached to the motor shaft. As with the cleaning nozzles, there shall be rear-facing jets on the root cutter assembly, which propels the cutter up and down the sewer pipe. The use of “chain cutters” is prohibited without prior approval of the Engineer.

2.02 WATER SUPPLY

A. The Owner will supply a source of water for cleaning at some location within the Park, as selected by the Owner. The Contractor is responsible for transporting water from the source to the location necessary to complete his work. The Contractor shall take all care necessary to fill their water tanker slowly to prevent disturbance to settled material and deposits in the water main pipe. The Contractor shall use a hydrant wrench to open and close hydrants and not a pipe wrench.

PART 3 EXECUTION

3.01 CLEANING PRECAUTIONS

A. During pipe cleaning operations, satisfactory precautions shall be taken in the use of cleaning equipment.

B. When hydraulically propelled cleaning tools (which depend upon water pressure to provide their cleaning force) or tools which retard the flow in the pipe line are used, precautions shall be taken to insure that the water head pressure created does not damage or cause flooding of public or private property being served by the sewer.

C. When possible, the flow of water in the pipe shall be utilized to provide the necessary head pressure for hydraulic cleaning devices.

D. No fire hydrant shall be used without permission from the Owner and, if permission is given, the hydrant shall not be obstructed in case of a fire in the area served by the hydrant.

E. Gate valves, backflow preventers or an air gap shall be incorporated in the direct connection to a potable water source.

3.02 SEWER CLEANING

A. The designated sewer manhole sections shall be cleaned using hydraulically propelled, high-velocity jet, or mechanically powered equipment. Selection of the equipment used shall be based on the conditions of lines at the time the work commences.

B. The equipment shall be capable of removing dirt, grease, rocks, sand, branches, leaves, roots and other materials and obstructions from the sewer lines and structures.

C. If cleaning of an entire section cannot be successfully performed from one structure, the equipment shall be set up on the other structure and cleaning again attempted.

3.03 MATERIAL REMOVAL

A. Debris such as dirt, sand, rocks, grease, roots and other solid or semisolid material resulting from the cleaning operation shall be removed at the downstream structure of the section being cleaned.

B. Passing material from sewer section to sewer section, which could cause line stoppages, accumulations of sand, etc. shall not be permitted.

C. **The Engineer will televise segments of pipe downstream of the proposed segments of pipe designated for cleaning under this project just prior to and after the work of the Contractor. If it is determined that the Contractor has allowed significant solids to pass through the area of his work downstream into the sewer, the Contractor will be responsible to clean these pipe segments and dispose of materials at no additional cost to the Owner.**

3.04 DISPOSAL OF MATERIALS

A. The Contractor shall arrange for a site and properly dispose of all materials removed from the sewer in accordance with all applicable laws and regulations.

3.05 ADJACENT PROPERTY

A. Contractor shall notify adjacent property owners of the work prior to the start of pipe cleaning operations and advise property owners to close lids on toilets, cover sink drains, etc.

B. Contractor shall promptly clean up areas within private property that get wet as a result of cleaning water back flushing up lateral pipes and resulting in a “blow out” inside a structure. Clean up shall include drying of wet areas with clean rags and the use of proper disinfectants to assure areas are left in a clean and sanitary condition.

3.06 FINAL ACCEPTANCE

A. Acceptance of sewer line cleaning shall be made upon the successful completion of the television inspection and shall be to the satisfaction of the Owner's Representative.

B. If TV inspection shows the cleaning to be unsatisfactory, the Contractor shall be required to re-clean and re-inspect the sewer line until the cleaning is shown to be satisfactory, at no additional cost to the Owner.

END OF SECTION 02650 – SEWER LINE CLEANING

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SECTION 02651- TELEVISION INSPECTION

PART 1 GENERAL

1.01 SCOPE

A. Provide all labor, materials, tools, equipment and incidentals specified, and required to perform a pre and post rehabilitation television (TV) inspection of the existing pipe including sewer mains and sewer lateral connections.

B. Provide all labor, materials, tools, equipment and incidentals specified, and required to televise segments of pipe designated for rehabilitation.

1.02 DEFINITIONS

A. Pre-Construction Inspection: TV inspection of main line sewers and lateral pipe to determine the location of construction, structural and O&M features, and to ascertain that the condition of pipe meets acceptable standards for the proposed rehabilitation.

B. Warranty Inspection (Post Construction Inspection): TV inspection of sewer to be performed 18 to 24 months after completion of rehabilitation.

1.03 REQUIREMENTS

A. The Contractor shall be aware that this Contract requires work in active sewers and shall follow all federal, state and local requirements for safety in confined spaces.

1.04 RELATED SECTIONS

A. Temporary Bypass Pumping.

B. Cleaning of Sewers.

1.05 PERFORMANCES REQUIREMENTS

A. Inspection shall be performed by a NASSCO *Pipeline Assessment Certification Program* (PACP) certified operator and shall meet the coding and reporting standards and guidelines as set by PACP. These same standards shall also be used for lateral inspections regardless of whether conducted using cleanout launched or mainline launched lateral camera. All report annotations, pipe conditions and pipe defects shall be identified properly using PACP codes as defined by PACP, and severity ratings shall be calculated according to PACP.

B. Quality of inspection recording shall be acceptable to Engineer when viewed on a standard computer monitor.

1.06 SUBMITTALS

A. Submit work items for review in accordance with Section 01300.

B. Pre-Construction Inspection: Submit 2 copies of the written inspection report and 2 copies, on data DVD, of Digital Inspection Recordings in mpeg format. Include written inspection reports in PDF format.

C. When Sonding for cleanouts: Submit 2 copies, on data DVD, of Digital Surface Photographs of

proposed cleanout locations as specified below.

D. Joint Testing and Grouting Observations: Submit 2 copies on DVD of observation of televised joint and lateral testing and retesting.

E. Warranty Inspection: Same as Pre-Construction Inspection.

F. Copies of PACP certificate for inspectors completing the work.

1.07 REFERENCE STANDARDS

A. NASSCO prepared *Pipeline Assessment and Certification Program,* Second Edition Reference Manual, 2001. This manual includes a standard TV inspection form and sewer condition codes.

PART 2 PRODUCTS

2.01 TELEVISION EQUIPMENT

A. Closed Circuit TV Equipment: Select and use closed-circuit television equipment that will produce a color recording.

B. Pipe Inspection Camera: Produce video recording using a pan-and-tilt, radial viewing, pipe inspection camera that pans $\pm$ 275 degrees and rotates 360 degrees. Use a camera with an accurate footage counter that displays on the TV monitor the exact distance of the camera from the centerline of the starting manhole. Use a camera with camera height adjustment so that the camera lens is always centered at one-half the inside diameter, or higher, in the pipe being televised. Provide a lighting system that allows the features and condition of the pipe to be clearly seen. A reflector in front of the camera may be required to enhance lighting in large diameter pipe. Lighting shall not cause shadows within the field of view of the camera, either when forward viewing or when using pan/tilt. The camera, television monitor and other components of the video system shall be capable of producing a minimum 500-line resolution colored video picture. Picture quality and definition shall be to the satisfaction of the Engineer.

C. Mainline Launched Lateral Inspection Camera: Produce a video recording using a fixed orientation color camera capable of extending into open lateral connects for a minimum distance of 80 feet from the lateral connection. Minimum performance standards are as noted above in 2.01.B.

D. Lateral Cleanout Launched Lateral Inspection Camera: Alternatively, Contractor may produce a video recording of the sewer lateral between the sewer lateral cleanout and the mainline using a mini-cam launched from the sewer lateral cleanout. Minimum performance standards are as noted above in 2.01.B.

E. When Sonding: Provide a sonde transmitter built into or attached to the head of lateral camera and a sonde receiver for surface location efforts. The sonde transmitter shall be capable of transmitting through 20 vertical feet of cover, such as the FV-20 from Prototek.

F. TV Studio: TV studio is to be contained in an enclosed truck, trailer or van. It shall have room and seating for the operator and the ENGINEER and also room for at least one standing visitor with the doors closed. The studio shall have air conditioning and heating. Normal operation of all equipment, including the TV camera, monitor, and winches is to be from a control panel in the studio. When joint testing and sealing is to be performed, the equipment shall be contained in the same unit as its TV equipment and shall be operated from the same control panel.

G. Recording: All recordings are to be in digital format.

1. Image Capture – Digitized picture images shall be stored and be exportable as JPEG formats. Minimum photo quality shall be resolution 1024 x 768 and 5 megapixels.

2. Video Capture – Full time live video and audio files shall be captured for each pipe segment and lateral inspected. The files shall be stored in industry standard MPEG format viewable from a DVD. The MPEG video shall be ISO-MPEG Level 1 (MPEG-1) coding with a resolution of 352 pixels (x) by 240 pixels (y) and an encoded frame rate of 29.97 frames per second. System shall perform an automatic disk image/file naming structure to allow saved video/data sections to be "Burned" to digital format. It shall have the capability of "burning" a minimum of 120 minutes of recording to digital media. The video recording shall be free of electrical interference and shall produce a clear and stable image. The audio recording shall be sufficiently free of background and electrical noise as to produce an oral report that is clear and discernible. The digital recordings and inspection data shall be cross-referenced to allow instant access to any point of interest within the digital recording.

PART 3 EXECUTION

3.01 TELEVISUAL INSPECTION

A. Sewer main lines and lateral pipes are required to be clean in accordance with the Cleaning of Sewers section in this specification. Prior to the television inspection, any sewer main line or lateral pipe found to be dirty during the TV inspection process will be cleaned by the Contractor.

B. Televise the sewer lines to document the condition of the line. Notify the Engineer 48 hours in advance of any TV inspection so that the Engineer may observe inspection operations. Provide a color recording showing the completed work.

C. For mainline inspections, inspections shall be from center of the starting manhole to the center of the ending manhole. Distances along the pipe should be measured from the center of the upstream manhole. Marking on cable, or the like, which would require interpolation for depth of manhole, will not be allowed. Measurement meters shall be accurate to two-tenths of a foot over the entire length of the sewer line section being inspected. Prior to recording the location of defects, construction features, and service connections, slack in the cable of the television inspection camera shall be taken up to ensure metering device is designating proper footage. Accuracy of the measurement meters shall be checked daily by use of a walking meter, roll-a-tape, or other suitable device.

D. For lateral inspections, insert a lateral inspection camera into the lateral line to observe and document the condition of the service connection line. Inspections shall be from center of the sewer main (or from the manhole wall for laterals connected directly to manholes) to the lateral cleanout if utilizing a mainline launched lateral inspection camera or vice versa when using a cleanout launched camera. Measurement meters shall be accurate to two-tenths of a foot over the entire length of the sewer lateral being inspected. Prior to recording the location of defects and construction features, slack in the cable of the television inspection camera shall be taken up to ensure metering device is designating proper footage. Accuracy of the measurement meters shall be checked daily by use of a walking meter, roll-a-tape, or other suitable device. CONTRACTOR shall assign each lateral to a property by its respective address. Multiple laterals to the same property shall be addressed and numbered (i.e., "123 Main Street Lat1"). Should no address be apparent specify details to denote location (i.e., "vacant lot to south of 123 Main Street"). **To avoid delays in project completion, the Contractor shall complete lateral televising as soon as practical in the overall schedule and submit the results to the Engineer for review.**

E. When sonding for cleanouts, provide digital photographs to denote the surface location of cleanouts. Photographs must meet the standard outlined in section 2.01 G above. CONTRACTOR is required to provide photographs renamed with the address of the lateral.

F. Log any preset footage while recording to ensure the complete pipe is televised. Provide consistent recording of the inspection (i.e. the counter should not suddenly reset or jump during the recording). If a preset point on the CCTV cable is used to set the counter, CONTRACTOR shall back up the camera after setting the preset and record the entry to the pipe to the manhole.

G. Center the camera in the middle of the pipe.

H. Move the camera through the line (in the downstream direction whenever possible) at a uniform rate not to exceed 30 feet per minute.

I. Stop at every joint for three seconds. When infiltration or other defects are evident, use pan and tilt to document pipe condition. Stop elsewhere when necessary to ensure proper documentation of the sewer's condition.

J. Stop at every lateral connection. Center the camera so that the lighting and the pan and tilt view can be used to inspect as far into the lateral connection as possible. Recording all defects found in the service connection. Where lateral flow is observed, observe flows from service connections for approximately two minutes to ascertain if the flow is sanitary or extraneous flow. The video recording may be paused during observation. Record results of the flow observed on video recording and inspection logs.

K. Insert a lateral inspection camera into the lateral line as far as possible to observe and document the condition of the service connection line.

L. Capture color still shots of video recordings for all defects encountered.

M. Use manual winches, power winches, TV cable, and powered rewinds or other devices that do not obstruct the camera view or interfere with proper documentation of the sewer conditions to move the camera through the sewer line.

N. TV inspection recordings shall be continuous for each pipe segment. Ensure entirety of each pipe is televised by beginning recording at center of start manhole, before proceeding to any pre-set footages.

O. Contractor is responsible for adjusting light levels, cleaning fouled or fogged lens, and allowing vapor to dissipate from camera lights in order to produce acceptable recordings. All TV inspection recordings that do not meet the requirements of this Specification shall be re televised at no additional cost to the OWNER.

3.02 FLOW CONTROL

A. Adequately control the flow in the section being televised so that the depth of flow is 5% or less in the pipe being televised.

B. Whenever flows in a sewer line are blocked, plugged, pumped, or bypassed, sufficient precautions must be taken to protect the sewer lines from damage that might be inflicted by excess sewer surcharging.

C. Contractor is responsible for all damages to Contractor owned and operated equipment, Owner facilities, and privately owned facilities caused by malfunction plugs, pumps or other Contractor owned or operated equipment.

D. It is anticipated that portions of the sanitary sewer are bowed or bellied and as a result the camera will be submerged. **Wherever the camera encounters a submerged condition, or where the wastewater flow depth exceeds the maximum allowable, reduce the flow depth**

to an acceptable level by performing the survey TV inspection during minimum flow hours, or by pulling a camera with swab, high-velocity jet nozzle or other acceptable dewatering device. Recordings made while floating the camera are not acceptable unless approved by Engineer.

3.03 PASSAGE OF TV CAMERA

A. If during TV inspection of a pipe segment the camera is unable to pass an obstruction even though flow is unobstructed, televise the pipe segment from the opposite direction in order to obtain a complete recording of the line. Contractor shall also measure the distance between the manholes (centerline to centerline) with a tape or wheel to accurately determine the total length of the manhole segment.

3.04 INSPECTION DELIVERABLES

A. Written Inspection Reports

1. Main line inspections shall provide printed location records to clearly identify the location of each defect, or lateral connection, in relation to adjacent manholes, using a standard stationing system zeroed on the upstream manhole. Record all information requested using proper NASSCO PACP defect codes. The reports shall include at least the minimum amount of information required by PACP, including required PACP header information. Color still shot images of all defects encountered shall be included with each pipe segment.

2. Lateral inspections shall meet the requirements detailed in 3.04 A1 above for each lateral pipe. In addition, provide a main line cover sheet detailing the main line manholes, length of main, orientation of flow, direction of survey and position of all lateral connections (by footage along the main and by assigned property address).

B. Electronic Inspection Reports

1. Provide a PACP- certified database listing all PACP required data fields for each pipe segment.

2. Provide all written inspection reports in PDF format.

C. Electronic Inspection Recordings

1. Provide digital inspection recordings for all recordings, unless otherwise specified in Paragraph 1.06.

2. Recording shall be of a quality sufficient for Engineer to evaluate the condition of the sewer main lines and lateral pipes, locate the sewer service connections, and verify cleaning and joint testing. If Engineer determines that the quality is not sufficient, Contractor shall re-televise the sewer segment and provide a new recording and report at no additional compensation. Camera distortions, inadequate lighting, high water level, dirty lens, or blurred/hazy picture will be cause for rejection. Payment for televised inspection will not be made until Engineer approves the recordings and reports.

3. Digital recordings: Each pipe segment, or lateral, must be its own electronic file in mpeg format. Each pipe segment file shall be named for pipe ID number, upstream manhole to downsteam manhole (i.e. MH 2 to MH 3.mpeg). Lateral pipe files shall be named using their assigned property address (i.e. 234 Main Street, Lateral 2). Electronic recording file must allow snap scrolling to allow easy and quick access of the entire recording.

4. Contractor shall maintain a master copy of all recordings and Inspection Reports submitted for two years after delivery of reports and recordings.

5. Label each DVD with the following information:

    a. File Number.

    b. CONTRACTOR's Name.

    c. Project Name.

    d. Contract Number.

    e. Inspection Type: Post Cleaning, Repair.

    f. Tape Number.

    g. Date Televised.

    h. Pipe Segments.

END OF SECTION 02651 – TELEVISION INSPECTION

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SECTION 02831 – CHAIN LINK FENCE

PART 1 GENERAL

1.01 WORK INCLUDED

A. The Contractor shall furnish and install a chain link fence as specified herein and as shown on the Drawings.

1.02 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate detailed dimensions, post with concrete foundation details, brace and anchor requirements.

C. Product Data: Provide product data on fabric, posts and accessories.

D. Manufacturer's Installation Instructions: Indicate installation requirements and special procedures.

E. Samples – Provide three samples indicating color choices for vinyl coating.

1.03 QUALITY ASSURANCE

A. Perform Work in accordance with Section 01400.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle equipment according to manufacturer's instructions and the provisions of Section 01600.

1.05 WARRANTY

A. The contractor shall provide a warranty against any defects or malfunction due to workmanship in the equipment and accessories for a period of one year from date the system is put into service.

B. A written manufacturer's warranty shall be supplied.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Anchor Fence or approved equal.

2.02 FENCE - GENERAL

A. Contractor shall provide a complete installation including fence, gates, locks, posts and concrete foundations. Fence shall have an overall height of 6'-0". Contractor shall supply all necessary hardware to install gates.

B. All steel parts shall be hot-dipped galvanized.

2.03 FENCE FABRIC

A. The chainlink fence fabric shall be vinyl coated thermally fused to the steel core wire: ASTM F668 Class 2b, 7 mil. thickness thermally fused (Permafused). Bonded or extruded and glue fabric may not be used.

1. The wire size shall be 0.148" (9 gauge) with a mesh size of 2". Both sides for fabric shall have knuckled selvage.

2. Color to be determined by Owner.

3. Samples: Provide three samples indicating color choices for vinyl coating.

2.04 TENSION WIRE

A. Tension wire shall be thermally fused vinyl (permafused) applied to metallic coated steel wire, 7 gauge, (0.177") diameter core and shall be fastened to the fabric of machine intervals of 24" with galvanized fasteners.

2.05 POSTS

A. All posts and rails shall be ASTM F1083, standard weight Schedule 40 minimum yield strength of 25,000 psi. Hot-dipped galvanized with a minimum average of 1.8 oz/ft^2 of coated surface size per ASTM F1043. Sizes as indicated below.

1. Line posts shall be nominal 1-1/2" with an outside diameter of 1.9", wall thickness of 0.145" and weight of 2.72 lbs/ft.

2. Terminal, end, corner and pull post shall be nominal 2" with an outside diameter 2.375" wall thickness of 0.154" and weight of 3.65 lbs./ft.

3. Rails and braces shall be nominal 1-5/8" with an outside diameter of 1.66", wall thickness of 0.140" and weight of 2.27 lbs/ft.

   Top rails shall be furnished in approximately 20. ft. lengths. Brace rails shall be furnished as required and located midway between the top rail and the ground.

4. Gate post shall be as follows:

Gate Leaf Single Width	Nominal Post Size (Round)	Weight
a. 6 ft. or less	2.50 in.	5.79 lb/ft.
b 6 ft. to 12 ft.	4.00 in.	10.79 lb/ft.
c. 12 ft. to 19 ft.	6.00 in.	18.97 lb/ft.
d. 19 ft. to 23 ft.	8.00 in.	28.55 lb/ft.

B. Post shall be of sufficient length to extend 36 inches into concrete footings.

C. Posts shall be no further apart than 10 feet on center.

2.06 POST CAPS

A. Galvanized formed steel. Provide one cap for each post with provision for barb wire when necessary.

2.07 TOP RAIL AND BRACE RAIL ENDS

A. Galvanized formed steel. Provide, as required, for connection of rail and brace to terminal posts.

2.08 TOP RAIL SLEEVES

A. Galvanized formed steel. Top rail sleeves shall be 6” long sleeve allowing for expansion and contraction of top rail and indented to prevent creeping.

2.09 WIRE TIES

A. Wire ties: 9 gauge (0.148”) galvanized steel wire for attachment of fabric to line posts. Double wrap 13 gauge (0.092”) for rails and braces. Hog ring ties of 12-1/2 gauge (0.0985”) for attachment of fabric to tension wire. Space at 18 inch intervals on top rail and 12 inch intervals on line posts.

2.10 BRACE AND TENSION BAR BANDS

A. Brace and tension (stretcher bar) bands: Galvanized pressed steel.

2.11 TENSION BARS

A. Tension (stretcher) bars: Galvanized one piece lengths equal to 2 inches less than full height of fabric with a minimum cross-section as recommended by manufacturer (vinyl coating not required). Provide tension (stretcher) bars where chain link fabric meets terminal posts.

2.12 TRUSS RODS AND TURNBUCKLES

A. Truss rods: Steel rods with minimum diameter of 5/16” with turnbuckle to maintain proper tension.

2.13 NUTS AND BOLTS

A. Nuts and bolts are galvanized but not vinyl coated.

2.14 GATES

A. Gate frames shall be in accordance with ASTM F900 using galvanized steel tubular members, 2” square, weighing 2.60 lb/ft. Gates shall be welded construction forming rigid one-piece unit.

B. Chain link fence fabric shall be PVC thermally fused to metallic coated steel wire, ASTM F668, Class 2b, in color, mesh, and gauge to match fence.

C. Install fabric with hook bolts and tension bars at all 4 sides. Attach to gate frame at not more than 15” on center.

D. Hardware materials: Hot dipped galvanized steel shapes to suit gate size.

E. Hinges: Structurally capable of supporting gate leaf and allow opening and closing without binding. Non-liftoff type hinge design shall permit gate to swing 180° inward or outward as shown on Drawings.

F. Latch: Forked type capable of retaining gate in closed position and have provision for padlock. Latch shall permit operation from either side of gate.

G. Keeper: Provide keeper for each gate leaf. Gate keeper shall consist of mechanical device for securing free end of gate when in full open position.

H. Double gates: Provide drop rod to hold inactive leaf. Provide gate stop pipe to engage center drop rod. Provide locking device and padlock eyes as an integral part of latch, requiring one padlock for locking both gate leaves.

2.15 LOCKS

A. Contractor shall provide one (1) lock and two (2) keys for each gate. Locks and keys to match Owner's key system or provide as directed by Owner.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify that site is ready to receive work of this Section. Areas to receive fencing must be complete to final grades and elevations.

B. Beginning of installation means acceptance of existing conditions.

3.02 PREPARATION

A. Coat metal surfaces below grade with bituminous paint.

3.03 INSTALLATION

A. Install concrete foundations, posts, fence and gate in accordance with ASTM F567, manufacturer's instructions and the Drawings.

B. Drill holes for concrete in firm soil. Excavate deeper as required for adequate support in soft or loose soils. Place concrete around posts in continuous pour. Trowel finish around posts. Slope to direct water away from posts. Ensure concrete is of adequate strength prior to installing fabric.

C. Locate terminal post at each fence termination and change in horizontal or vertical direction of 30° or more.

D. Space line posts uniformly at 10' on center maximum.

E. Install each post plumb. Check for vertical and top alignment. Maintain in position during placement and finishing operations.

F. Bend ends of tie wires to minimize hazard to persons and clothing.

G. Install gates plumb, level and secure for full opening without interference.

H. Set gate keeper, stops and sleeves in concrete.

3.04 ADJUSTING AND CLEANING

A. Clean surfaces. Remove debris and unused materials from site.

B. Adjust gate to function smoothly.

END OF SECTION 02831 – CHAIN LINK FENCE

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SECTION 02936 – SITE RESTORATION

PART 1 GENERAL

1.01 WORK INCLUDED

A. All disturbed areas shall be restored in accordance with this section.

B. Preparation of subsoil.

C. Placing topsoil.

D. Fertilizing.

E. Seeding.

F. Mulching.

1.02 DEFINITIONS

A. Noxious Weeds: Includes Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwork, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.03 REGULATORY REQUIREMENTS

A. Conform to requirements of the latest edition of the Delaware Department of Transportation (DELDOT) State Highway Administration Standard Specifications for Construction and Materials and applicable permit requirements.

B. Comply with regulatory agencies for fertilizer and herbicide composition.

C. Comply with requirements of DNREC Division of Soil and Water Conservation, Sediment and Stormwater Section.

1.04 QUALITY ASSURANCE

A. Provide seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.

1.05 SCHEDULING AND COORDINATION

A. Coordinate Work of this Section with Work of other Sections.

B. Schedule site restoration operations to minimize the time disturbed areas will be left exposed to erosion.

1.06 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide data on all seed mixes with certified statement of weight, composition, mixture, percentage of purity, and germination as verification that the proper materials and volumes have been used. Also provide data on all soil amendment materials, herbicides, or other chemicals to be used for Work of this Section.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and protect Products to site under provisions of Section 01600.

B. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.

C. Deliver fertilizer in original, unopened waterproof bags showing weight, chemical analysis, and name of the manufacturer.

PART 2 PRODUCTS

2.01 SEED MIXTURE

A. Permanent grass seed mixture shall be in accordance with Sediment and Erosion Control Notes on the Drawings.

B. The date of the last germination of the seed shall be within a period of six months prior to commencement of planting operations. Seed shall be from same of previous year's crop; each variety of seed shall have a purity of not less than 85%, a percentage of germination not less than 90%, shall have a weed content of not more than 1% and contain no noxious weeds.

2.02 TOPSOIL

A. Excavated material from site and free of roots, rocks larger than one inch, subsoil, debris, and weeds.

2.03 MULCHING AND BINDER

A. Dry oat or wheat straw, free from weeds and foreign matter detrimental to plant life. Hay is not acceptable.

B. Synthetic binder for mulch shall be non-asphaltic emulsion, Mulch Mate Super Tack or approved equal.

2.04 SOIL SUPPLEMENTS

A. Add limestone and fertilizer in accordance with Erosion and Sediment Control Notes on the Drawings.

2.05 WATER

A. Clean, fresh and free of substances or matter which could inhibit vigorous growth of grass.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify that subgrade is ready to receive the work of this Section.

3.02 PREPARATION OF SUBSOIL

A. Prepare subsoil to eliminate uneven areas and low spots. Maintain lines, levels, profiles and contours. Make changes in grade gradual. Blend slopes into level areas.

B. Remove foreign materials, weeds, and undesirable plants and their roots. Remove contaminated subsoil.

C. Prepare subgrade to obtain satisfactory bond between subsoil and topsoil by scarifying subsoil to a depth of 3 inches where topsoil is to be placed. Repeat cultivation in areas where equipment, used for hauling and spreading topsoil, has compacted subsoil. This operation shall not be performed when subgrade is frozen, excessively wet or dry. Scarify immediately prior to topsoil placement.

3.03 PLACING TOPSOIL

A. Spread topsoil to a minimum depth of 4 inches over area to be seeded. Rake until smooth.

B. Place topsoil during dry weather and on dry, unfrozen subgrade.

C. Remove vegetable matter and foreign non-organic material while spreading.

D. Grade to eliminate rough, low, or soft areas, and to ensure positive drainage.

3.04 SOIL SUPPLEMENTS

A. Apply limestone and fertilizer according to manufacturer's instructions, and E&S Drawings.

B. Apply after smooth raking of topsoil and prior to roller compaction.

C. Do not apply lime or fertilizer at same time or with same machine as will be used to apply seed.

D. Mix thoroughly into upper 2 inches of topsoil.

E. Lightly water to aid the dissipation of fertilizer.

F. Any irregularities or depressions caused by liming or fertilizing operations shall be corrected prior to seeding.

3.05 SEEDING

A. Apply seed at a rate of 3 lbs per 1000 square feet either by hydroseeding or mechanical spreading.

B. If using mechanical spreading apply evenly in two intersecting directions. Rake in lightly.

C. Do not seed area in excess of that which can be mulched on same day.

D. Do not sow immediately following rain, when ground is too dry, or during windy periods.

E. Roll seeded area with roller not exceeding 112 lbs.

3.06 MULCHING

A. Immediately following seeding and compacting, apply mulch at 1-1/2 tons per acre for an approximate thickness of 2 inches.

B. Apply mulch binder at a rate recommended by manufacturer immediately after placement of mulch.

C. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches of soil.

3.07 MAINTENANCE

A. General restored areas shall be cut to a height no less than 2 1/2".

B. Neatly trim edges and hand clip where necessary.

C. Control growth of weeds. If necessary, apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.

D. Reseed any areas which do not show even stand.

E. Contractor shall water restored areas until Final Completion.

3.08 GUARANTEE PERIOD

A. All restored areas shall be guaranteed by the Contractor for not less than one full year from the date of Final Completion.

B. During first planting season after Final Completion, any restored areas not demonstrating satisfactory stands, as determined by the Engineer, shall be renovated, reseeded, and maintained by Contractor until satisfactory stands are attained at all restored areas.

C. A satisfactory stand shall be defined as an even stand of grass, after cutting, at least 2 1/2" tall with at least 85% germination.

END OF SECTION 02936 – SITE RESTORATION

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SECTION 02970 – MANHOLE FRAME AND COVER REPLACEMENT

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Work included under this item shall include any clearing and grubbing necessary for access, removal and disposal of the concrete collar, manhole frame and cover, block, brick, mortar, the measurement of the manhole to determine the size seal required, cleaning of the manhole surfaces, any necessary preparation work, application of Wrapidseal primer to insure a surface for proper sealing of the Wrapidseal, supply, and installation of the Wrapidseal. Also including in this item shall be costs for supply and installation of concrete grade adjustment rings, new frames and covers, Infra-risers, concrete collars, backfill, compaction, topsoiling, fertilizing, seeding, mulching, paving, and anything else necessary for this work.

B. The raising of manhole lids to provide positive drainage away from the manholes is included in this work.

C. Protection of work space as well as by-pass pumping if necessary for manholes located in drainage swales is included in this work.

D. See the Manhole Replacement and Rehabilitation Scope of Work spreadsheet at the end of this Section for detailed requirements.

1.02 SUBMITTALS

A. Submit manufacturer's literature on the Wrapidseal, precast concrete grade adjustment rings, class IIA air entrained concrete, frames and covers, and Infra-risers in accordance with Section 01300.

1.03 WARRANTY

A. Frame and cover replacement will be warranted for one year.

PART 2 PRODUCTS

2.01 MATERIALS

A. Wrapidseal

Wrapidseal primer, closures, and width will be as required and manufactured by Canusa-CPS a division of ShawCor Inc., 2408 Timberloch Place Building C-8, The Woodlands, Texas 77380 USA, (281)367-8866.

B. Precast Concrete grade adjustment rings in accordance with New Castle County Standard Specifications.

C. Class IIA air entrained Concrete in accordance with New Castle County Standard Specifications.

D. Rubber Infra-risers in accordance with New Castle County Standard Specifications.

PART 3 EXECUTION

3.01 EXECUTION

A. Refer to specifications, construction details, and follow manufacturer's recommendations for products used.

B. A manufacturer's representative is required to be on site for first 5 installations of Wrapid seal to insure proper installation unless previously approved as an installer by the manufacturer.

3.02 MEASUREMENT AND PAYMENT

A. Manhole frame and cover replacement shall be included in the bid based on the quantity listed on the Bid Form and in Section 01026 – Unit Prices.

B. Raising of frame and covers is considered incidental to the work and will not be measured or paid separately.

END OF SECTION 02970 – MANHOLE FRAME AND COVER REPLACEMENT

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SECTION 02980 – INTERIOR MANHOLE REHABILITATION

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Work covered by this item shall include preliminary repairs to the manholes and the drilling and injection of chemical grout to seal leaking pipe penetrations and pre-cast concrete joints. The Contractor and Engineer will inspect the manholes prior to the rehabilitation work. The Engineer will determine the areas of the manhole to be pressure grouted by the Contractor.

B. In general, the chemical sealing materials shall be an Acrylic or Acrylate Base Grout or a flexible Urethane Base Grout, or approved equal. Mixing and handling of all the chemical sealing materials shall be in strict accordance with the manufacturer's recommendations.

C. Protection of work space as well as by-pass pumping if necessary for manholes located in drainage swales is included in this work.

D. See the Manhole Replacement and Rehabilitation Scope of Work spreadsheet at the end of Section 02970 for more specific requirement, however the actual scope of the rehabilitation work will be determined subsequent to the inspection of the manholes by Engineer and Contractor discussed in Section 1.01.A above.

1.02 SUBMITTALS

A. Submit manufacturer's literature on the proposed chemical grout and hydraulic cement including the manufacturer's recommended application procedures in accordance with Section 01300.

B. Submit a Certified statement from the grout manufacturer that Contractor is an approved installer of the material along with certificates of training for the lead crew person directing the work of the Contractor in the field.

1.03 WARRANTY

A. The Contractor shall provide a one-year warranty on the work of this section. Any leaks found in the repaired joints and pipe penetrations shall prior to the end of the warranty period be repaired by the Contractor at no cost to the Owner.

PART 2 PRODUCTS

2.01 PERFORMACE STANDARDS

A. While being injected, the chemical grout must be able to react in moving water.

B. The final cured grout must be capable of withstanding submergence in water without degradation over the life of the grout.

C. The resultant grout formation must be impervious to water penetration over the life of the grout.

D. The grout material, after fully curing, must be flexible, not brittle or rigid.

E. The final grout should be able to withstand freeze-thaw and wet-dry cycles without causing adverse changes to the grout.

F. The final grout formation must not be biodegradable.

G. The cured grout should be chemically stable and resistant to concentrations of acids, alkalis, and organics found in normal sewage.

H. The grout shall contain a root killer and preventive.

2.02 APPLICATION REQUIREMENTS

A. All component materials shall be easily transportable by common carrier.

B. Packaging of component materials should be compatible with field storage requirements.

C. Grout components must be packaged in such a fashion as to provide for maximum worker safety when handling the materials and minimize spillage when preparing for use.

D. Mixing of components should be compatible with field applications and not require precise measurements.

E. Catalyzation shall take place at the point of injection / repair.

F. Clean up must be able to be completed without inordinate use of flammable hazardous materials.

G. Materials must be capable of being pumped through a minimum of 500 feet of ½ inch to ¾ inch diameter hose.

H. Residual sealing material must be removable from the sewer after injection to insure no flow reduction, restriction or blockage of sewer flows.

2.03 CHEMICAL GROUT

A. Acrylic or Acrylate Base Grout

1. Two-part chemical grout mixed at point of injection.

2. Minimum 25 percent acrylic or acrylate base material by volume.

   a. Use higher concentration of base material at Contract Manager's direction to increase strength or offset dilution during injection period.

3. Controllable reaction time: 10 seconds to 1 hour.
4. Viscosity: 1.5 centipoise water.
   a. May increase viscosity to no more than 2.5 centipoise water, at Contract Manager's direction.
   b. Remain constant throughout injection period.
5. Tolerates dilution and reacts in moving water.
6. Final reaction:
   a. Produces continuous irreversible, impermeable, non-porous still gel in pure form.
   b. Produces stabilized soil in ground that will not become brittle or rigid.
7. Gel does not bleed water under stress.
8. Dehydrated gel returns to 90 percent of its original volume and form after a prolonged period of low ground water.
9. Do not use catalyst containing dimethyl amino propionitrile (DMAPM).
10. Use root inhibitor (50% active dichobenil) when roots are present in manholes.
11. Use Latex additive for increased tensile strength.
12. Tinted to allow detection of grout in drill holes or at leakage locations.
13. Approved Manufacturers.
    a. Grout
       1) Avanti International, AV 118 Duriflex
       2) Or Equal.
    b. Root Inhibitor.
       1) Avanti, Norosac AC 50W.
       2) Or Equal.
    c. Latex Additive.
       1) Avanti, AV-257 Icoset
       2) Or Equal.

B. Urethane Base Grout

1. Ratio: One part urethane prepolymer to 1 to 10 parts water by volume (10 to 50 percent prepolymer).
2. Liquid prepolymer:
   a. Solids content: 77 to 83 percent.

b. Specific Gravity: 1.04

c. Flash Point: 20 degrees C.

d. Viscosity: 200 to 1,200 centipoise at 70 degrees F.

3. Water for reacting prepolymer: pH of 5 to 9.

4. Use gel control agent to control cure time as required.

5. Final Reaction:

a. Produces chemically stable, non-biodegradable, flexible gel, impermeable to water at pressures up to 15 psi.

6. Use root inhibitor (50% active dichlobenil) when roots are present in manholes.

7. Use Latex additive for increased tensile strength.

8. Tinted to allow detection of grout in drill holes or at leakage locations.

9. Approved Manufacturers.

a. Grout.

1) Avanti International, AV 350.

2) Or Equal.

b. Root Inhibitor.

1) Avanti, Norosa AC 50W.

2) Or Equal.

c. Latex Additive.

1) Avanti, AV-257 Icoset

2) Or Equal.

2.04 HYDRAULIC PATCHING CEMENT

A. Hydraulic patching cement shall be Octoshield as manufactured by IPA Industries or Waterplug manufactured by Thoro Systems or approved equal.

PART 3 EXECUTION

3.01 SEWER FLOW CONTROL

A. Plugging/blocking or pumping/bypassing of the sewage flows may be required. Whenever flows in a sewer line are blocked, plugged, pumped or bypassed, sufficient precautions must be taken to protect the sewer lines from damage that might be inflicted by excessive sewer surcharging. Further precautions must be taken to ensure that sewer flow control operations do not cause flooding or damage to public or private property being served by the sewers involved. No overflows are permitted. The Contractor is responsible for all damages.

3.02 MANHOLE PREPARATION

The Contractor shall prepare the manhole for chemical grouting per the grout manufacture recommendations, however the following will be required:

A. Pressure wash and clean the interior of the manhole to remove all loose mortar, concrete, debris, oil, grease and any other extraneous materials.
   1. Handle cleaning water enclosed discharge hoses to prevent water and residue from causing damage.
   2. Do not discharge debris through the sewage collection system. Remove debris from the manholes and properly dispose of off site.

B. Cut and trim all roots within the manhole.

C. Fill and seal all unfilled lifting holes, large voids and cracks greater than ½ " in size with hydraulic patching cement.

3.02 MANHOLE SEALING PROCEDURE

A. At each point of leakage within the manhole structure, a hole shall be carefully drilled from within the manhole and shall extend through the entire manhole wall. In cases where there are multiple leaks around the circumference of the manhole, fewer holes may be drilled, providing all leakage is stopped from these holes.

B. Into the previously drilled holes, chemical sealant injection devices shall be placed in such a way that they will provide a watertight seal between the holes and the injection device. A hose or hoses shall be attached to the injection device from an injection pump.

C. A mixture of manhole chemical sealants as specified shall then be pumped through the hose until material refusal is recorded on the pressure gauge mounted on the pumping unit or a predetermined quantity of sealant has been injected. Care shall be taken during the pumping operation to insure that excessive pressures do not develop and cause damage to the manhole structure or surrounding surface. The Contractor can assume minimum gel time of 30 seconds.

D. Upon completion of the injection, the packers shall be removed and the remaining holes shall be cleaned out and filled with hydraulic cement and troweled flush with the surface of the manhole walls. The cement used shall be submitted to the Engineer for review.

3.03 RESIDUAL GROUT MATERIAL

A. Any residual sealing materials that reduce the pipe diameter, or restrict the flow in the pipe or manhole shall be removed. The sealed joints shall be reasonably "flush" in dimension with the existing pipe or manhole surface. If excess residual sealing materials accumulate in the pipe or manhole, that area shall be cleaned to remove excess material at no cost to the Owner.

3.04 FINAL ACCEPTANCE

A. Acceptance of the manhole grouting work shall be made upon the successful demonstration of the sealing and mortaring of the manhole leaks. This may require an

inspection during a rain event. The work shall be to the satisfaction of the Owner's representative.

3.05 SEALING RECORDS

A. Complete records shall be kept of all sealing repairs performed. The records will document the manhole number and location in which the sealing was done, the location of each joint sealed, the amount of material used to seal the joint and the results of the final inspection of the repairs.

3.06 WARRANTY INSPECTIONS

A. The Engineer will perform a visual inspection of the rehabilitated manholes during the one year warranty period to determine the integrity of the rehabilitation materials and the water-tightness of the manholes. The Contractor will be required to repair all deficiencies observed in his work.

3.07 MEASUREMENT AND PAYMENT

A. The initial inspection of the manholes with the Engineer, bypass pumping, manhole preparation and other items not specifically listed below are considered incidental to the work of other items and will not be measured or paid separately.

B. The Drilling and Grouting will be paid at each pipe penetration /pipe seal, precast concrete base joint or precast concrete wall joint actually drilled and grouted. The payment will be based on the amount of work to be included in the Bid, adjusted by the Unit Price on the Bid Form to reflect the amount of work actually performed.

C. The amount of "Chemical Grout" used for grouting of joints will be based on the quantity of work indicated to be included in the Bid, adjusted by the Unit Price on the Bid Form to reflect the amount of work actually performed. The quantity will be based on the actual gallons of chemical grout used to complete the repair of deficiencies. The Contractor shall allow measurements to be taken during the work and shall demonstrate acceptable grout volumetric measuring techniques to the Engineer prior to the start of work.

END OF SECTION 02980 – INTERIOR MANHOLE REHABILITATION

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SECTION 02990 – MANHOLE REPLACEMENT

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Work covered by this item shall include, but not limited to the sawcutting of existing paving or concrete surface if in paving, excavation, sheeting and shoring, removal and disposal of the existing manhole and casting, bypass pumping of sewage around the work (including by-pass pumping, back-up pumps, controls, and alarm system), dewatering and well pointing (if necessary) of the excavation, preparation of subgrade to provide a stable subgrade for the manhole and adjacent piping, furnishing and placement of all materials including stone bedding per details, new manhole, frame and cover, backfill (borrow where required), the connections to existing piping entering and leaving the manhole with SDR 35 PVC pipe couplings, compaction of backfill, base course, tack coat, pavement restoration, any necessary surface preparation, curb, sidewalk, topsoil, seed and any other items necessary for or incidental to this item of work.

B. At the completion of the work, all manholes and the connection to existing pipes shall be watertight.

C. Protection of work space as well as by-pass pumping if necessary for manholes located in drainage swales is included in this work.

D. See the Manhole Replacement and Rehabilitation Scope of Work spreadsheet at the end of Section 02970 for detailed requirements.

1.02 REFERENCES

A. New Castle County Standard Specifications for Construction, Article 32.02

1.03 RELATED DETAILS

A. Precast Concrete Manhole per Contract Drawings

B. Manhole Frame and Cover per Contract Drawings

1.04 MANHOLE TYPES

A. All manholes greater than 4’-0” in height shall be type A-2.

1.05 SUBMITTALS

A. Submit manufacturer's literature on precast manholes in accordance with Section 01300.

1.06 PERMITS

A. If well pointing is necessary for dewatering, the Contractor will be responsible for obtaining any and all permits.

PART 2 PRODUCTS

2.01 MATERIAL REQUIREMENTS

A. The pipe to manhole connection shall use an A-Lock gasket or equal.

B. The manhole barrel gaskets shall be D-Lock or equal.

C. A concrete collar shall be constructed around all manhole frame and covers as indicated on the plans.

D. Manhole frames and covers shall be as indicated on the plans and as discussed in other sections of these Contract Documents.

E. Pipe shall be SDR 35 PVC. Couplings shall be SDR 35 PVC couplings or other couplings if existing pipe is not PVC.

F. Borrow, if existing material is not suitable as backfill, shall meet the requirements of Type C Borrow

PART 3 EXECUTION

3.01 Section 32.02-3 of the New Castle County Standard Specifications for Construction shall be modified to include the following:

A. Mortar (where applicable)

1. Mortar for all work shall be ASTM C270 Type M with a minimum comprehensive strength of 2,500 psi.

2. Masonry during weather of 90° F or more shall be protected from direct rays of the sun. All finished work shall be covered, wetted or both for a period of seven days.

3. All channels must be pre-cast at the manufacturer's plant. Cast in place channels in the field are not acceptable. All inferior pre-cast channels shall be repaired to the satisfaction of the Engineer or the manhole shall be removed and replaced with an acceptable manhole at no additional cost to the owner.

END OF SECTION 02990 – MANHOLE REPLACEMENT

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SECTION 03300 – CAST-IN-PLACE CONCRETE

PART I GENERAL

1.01 WORK INCLUDES

A. Extent of the work is indicated on drawings.

B. Work of this section includes, but is not necessarily limited to, the following:

1. Structural concrete.
2. Concrete appurtenances such as equipment pads and entrance pads.
3. Footings and slabs on grade.
4. Concrete reinforcement and accessories.
5. Vapor barrier under slabs on grade.
6. Hardener/Sealer application.

1.02 CODES AND STANDARDS

A. Except as modified by the requirements specified herein and/or the details on the Drawings, all Work included in this Section shall conform to the applicable provisions of the following codes and standards:

1. ACI 211.1 - Recommended Practice for Selecting Proportions for Normal and Heavy Weight Concrete
2. ASTM C260 - Air Entraining Admixture for Concrete
3. ACI 301 - Specifications for Structural Concrete for Buildings. The Contractor shall have one copy of ACI 301 available for reference on the work site at all times.
4. ANSI/ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement
5. ANSI/ASTM A497 - Welded Deformed Steel Wire Fabric for Concrete Reinforcement
6. ASTM A615 - Deformed and Plain Billet-Steel for Concrete Reinforcement
7. ASTM C33 - Concrete Aggregates
8. ASTM C150 - Portland Cement
9. ASTM C330 - Lightweight Aggregate for Structural Concrete
10. ASTM C994 - Preformed Expansion Joint Filler for Concrete (Bituminous Type)
11. ACI-304 - Recommended Practice for Measuring, Mixing, and Placing Concrete
12. ACI-305 - Recommended Practice for Hot Weather Concreting
13. ACI-306 - Recommended Practice for Cold Weather Concreting

14. ACI-311 - Manual of Concrete Inspection

15. ACI-315 - Manual of Standard Practice for Detailing Reinforced Concrete

16. ACI-318 - Building Code Requirements for Reinforced Concrete

17. ASTM C94 - Ready Mixed Concrete

18. ASTM Standards C143, C31, C173, C231, C172 and C39

19. ACI-350 - Concrete Sanitary Engineering Structures

20. ASTM D2103 - Polyethylene Film and Sheeting

B. Definitions:

1. ACI - American Concrete Institute,
P. O. Box 19150, Detroit, Michigan 43219

2. ASTM - American Society for Testing Materials

3. CRSI - Concrete Reinforcing Steel Institute, “Manual of Standard Practice”
228 N. LaSalle Street, Chicago, IL 60601

1.03 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of the codes, specifications and standards listed in 1.02 (above), except where more stringent requirements are shown or specified.

B. Concrete Testing Service: Contractor shall engage a testing laboratory approved by Engineer, to perform material evaluation tests and to design concrete mixes under provisions of Section 01400. Quality Control Testing requirements are described in Part 3 of this Specification.

1.04 SUBMITTALS

A. Product Data:

1. Proposed design mix.

2. Submit data for materials indicated herein:

a. Admixtures: Provide manufacturer's written certification that chloride ions content complies with specified requirements.

b. Submit data for materials and accessories, including reinforcement and forming accessories, admixtures, patching compounds, joint systems, waterstop, curing compounds, dry-shake finish materials, expansion bolts, adhesive anchors, vapor barrier and grout.

B. Shop Drawings: Reinforcement: Submit shop drawings for fabrication, bending, and placement of concrete reinforcement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, diagrams of bent bars, and arrangement of concrete reinforcement.

C. Laboratory Test Reports: Submit laboratory test reports as specified to Engineer.

PART 2 PRODUCTS

2.01 MATERIALS

A. Forms:

1. Forms for Exposed Finish Concrete: Unless otherwise indicated, construct formwork for exposed concrete surfaces with plywood, metal, metal-framed plywood faced or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings. Provide form material system shown on drawings. Provide form material with sufficient thickness to withstand pressure of newly-placed concrete without bow of deflection.

2. Forms for Unexposed Finish Concrete: Form concrete surfaces which will be unexposed in finished structure with plywood, lumber, metal or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.

3. Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.

B. Reinforcing Materials:

l. Reinforcing Bars: ASTM A615, Grade 60, deformed.

2. Welded Wire Fabric: ASTM A185, welded steel wire fabric.

a. The type of mesh shall be approved by the Engineer.

3. Supports for Reinforcement: Provide supports for reinforcement including boosters, chairs, spacers and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying with CRSI specifications, unless otherwise acceptable.

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

C. Concrete Materials:

l. General: Calcium chloride or admixtures containing more than 0.1% chloride ions are not permitted.

2. Portland Cement: ASTM C150, Type II, unless otherwise acceptable to Engineer. Use one (l) brand of cement throughout project.

3. Normal Weight Aggregates: ASTM C33, and as herein specified. Provide aggregates from a single source for exposed concrete.

a. For exterior exposed surfaces, do not use fine or coarse aggregates containing spalling-causing deleterious substances.

4. Water: Drinkable

5. Air-Entraining Admixture: ASTM C260.

a. Products: Subject to compliance with requirements, provide one of the following:

"Sike Aer"; Sika Corp.
"MB-VR or MB-AE"; Master Builders
"Dorex AEA"; W.R. Grace
"Edoco 2001 or 2002"; Edoco Technical Products

6. Water-Reducing Admixture: ASTM C 494, Type A and contain not more than 0.1% chloride ions.

a. Subject to compliance with requirements, provide one of the following:

"Eucon WR-75"; Euclid Chemical Co.
"Pozzolith 344"; Master Builders
"Plastocrete 160"; Sika Chemical Corp.
"Chemtard"; Chem-Masters Corp.

D. Related Materials:

l. Chemical Hardener: Colorless aqueous solution containing a blend of magnesium fluosilicate and zinc fluosilicate combined with a wetting agent, containing not less than 2 lbs. of fluosilicates per gal.

a. Products: Subject to compliance with requirements, provide one of the following:

"Surfhard"; Euclid Chemical Co.
"Lapidolith"; Sonneborn-Contech
"Saniseal 100"; Master Builders
"Burk-O-Lith"; The Burke Co.
"Hornolith"; A.C. Horn

2. Moisture-Retaining Cover: One of the following, complying with ASTM C171

Waterproof paper
Polyethylene film
Polyethylene-coated burlap

2.02 PROPORTIONING AND DESIGN OF MIXES

A. Design Mixes:

l. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. If trial batch method is used, use an independent testing facility acceptable to Engineer for preparing and reporting proposed mix designs. The testing facility shall not be the same as used for field quality control testing unless otherwise acceptable to Engineer.

2. Submit written reports to Engineer of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until mixes have been reviewed by Engineer.

3. Design mixes to provide normal weight concrete with the following properties, as indicated on drawings and schedules:

a. Type II, air-entrained 3000 PSI 28 days compressive strength; w/c ratio, 0.50 maximum

4. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant; at not additional cost to Owner and as accepted by Engineer. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Engineer before using in work.

B. Admixtures:

l. Use water-reducing admixture in concrete as required for placement and workability.

2. Use air-entraining admixture in exterior exposed concrete and all floor slabs, unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content within the limits of 2% to 4% air.

3. Use admixtures for water-reducing and set-control in strict compliance with manufacturer's directions.

C. Mix Proportioning:

l. Water-Cement Ratio: Provide concrete for following conditions with maximum water-cement (WC) ratios as follows:

a. Subjected to freezing and thawing; WC 0.50.

b. Subjected to deicers/watertight; WC 0.45.

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

a. Slabs: Not more than 3".

b. Reinforced foundation systems: Not less than l" and not more than 4".

c. Other concrete: Not more than 4".

2.03 CONCRETE MIXES

A. Ready-Mix Concrete: Comply with requirements of ASTM C94, and as herein specified.

l. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C94 may be required.

2. When air temperature is between 85°F (30° C) and 90°F (32° C), reduce mixing and delivery time form 1-1/2 hours to 75 minutes, and when air temperature is above 90°F (32° C), reduce mixing and delivery time to 60 minutes.

2.04 ACCESSORIES

A. Waterstop: 6” x 3/8”, ribbed with center bulb, PVC waterstop as manufactured by Vinylex Corporation, or approved equal. Splicing shall be heat fused per manufacturer’s recommendations.

B. Bentonite Water Stop: RX101 waterstop by Volclay or approved equal.

C. Preformed Bituminous Joint Filler: Resilient, non-extruding type premolded bituminous impregnated fiberboard units complying with AASHTO-M-213, ASTM D-1751, Federal Specification HH-F-341F, Type 1.

D. Rubber Joint Sealant: The sealant shall be a multipart chemically curing polyurethane sealant which meets or exceeds the curing requirements of Federal Specification TT-S-00227D, (1) Type I (flow type) and Type II (nonsag type), Class A, (compounds resistant to 50 percent total joint movement). The color shall be gray to match concrete.

1. A primer shall be used as recommended by the sealant manufacturer. A bond breaker such as masking tape, polyethene film, or backing rod as supplied by the manufacturer shall be used at the bottom of the joint.

2. Multi-part, non-sag, urethane sealant. W.R. Meadows Dualthane, Percora Corp. Dynatrol II or approved equal.

E. Concrete Joint Sealer, Poured Elastic Type

1. Hot-poured joint sealer shall conform to AASHTO M 173. The joint sealer shall be composed of a resilient and adhesive compound capable of effectively sealing joints in concrete against the infiltration of moisture and foreign material throughout repeated cycles of expansion and contraction with temperature changes. The material shall be capable of being brought to a uniform pouring consistency for completely filling the joints.

2. Overheating of some joint materials may cause inadequate performance. Temperature control and mechanical agitation devices are recommended.

F. Expansion Bolts: Shall be as follows (bolts, washers, and nuts shall be made of 304L stainless steel unless noted otherwise):

Trade Designation	Manufacturer
Star Slugin	Star Expansion Co. Mountainville, NY 10953
Rawl Multi-Calk	The Rawplug Co. 224 Peterson Road New Rochelle, NY 10802
Kwik-Bolt	Hilti Fastening Systems One Cummings Point Road Stamford, CT 06904
Expansive Screw Anchor	Ackerman-Johnson Co. 99 Commercial Drive Addison, IL 60101
Phillips Red Head Self Drilling Concrete Anchor	Phillips Drill Co. U.S. 12 and Liberty Trail Michigan City, IN 46360
Wej-IT	Wej-IT Corporation 500 Alter Street Broomfield, Co 80020

Cinch Expansion Anchor	Anchor Alloys, Inc. 966 Meeker Avenue Brooklyn, NY 11222

G. Adhesive Anchors System: Shall be as follows (bolts, washers, and nuts shall be made of 304L stainless steel unless noted otherwise):

Trade Designation	Manufacturer
Redi-Chem Concrete Anchor System	Phillips Drill Co. U.S. 12 and Liberty Trail Michigan City, IN 46360
Rawl Chem-Stud Anchor System	The Rawlplug Co. 224 Peterson Road New Rochelle, NY 10802
HVA Adhesive Anchor System	Hilti Fastening Systems One Cummings Point Road Stamford, CT 06904

H. Vapor barrier: Polyethylene film .006” thick, lapped 12” at laps.

I. Grout: Shall be nonshrink grout; Embeco No. 636 or Masterflow No. 713 as manufactured by Master Builder or an approved equal.

J. Epoxy Grout: Sikadur 32, high-mod, high-strength epoxy bonding/grouting adhesive.

PART 3 EXECUTION

3.01 FORMS

A. Design, erect, support, brace and maintain formwork to support vertical and lateral loads that might be applied until such loads can be supported by concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation and position.

B. Design formwork to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.

C. Construct forms to sizes, shapes, lines and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide back-up at joints to prevent leakage of cement paste.

D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and for easy removal.

E. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings on forms at inconspicuous locations.

F. Form Ties: Factory-fabricated, adjustable-length, removable or snapoff metal form ties, designed to prevent form deflection, and to prevent spalling concrete surfaces upon removal.

l. Unless otherwise indicated, provide ties so portion remaining within concrete after removal is 1" inside concrete and will not leave holes larger than l" diameter in concrete surface.

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

H. Cleaning and Tightening: Thoroughly clean forms and adjacent surface to receive concrete. Remove chips, wood, sawdust, dirt or other debris just before concrete is placed. Retighten forms and bracing as required to eliminate mortar leaks and maintain proper alignment.

3.02 PLACING REINFORCEMENT

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

B. Before placing, clean surface to remove loose rust and mill scale, earth, ice and other materials which reduce or destroy bond with concrete.

C. Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required.

D. Place reinforcement to obtain at least minimum coverages for concrete protection. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.

F. Reinforcement shall not be bent or straightened in a manner injurious to the material.

G. Reinforcement shall be secured in position and reviewed by the Engineer before pouring concrete.

3.03 JOINTS

A. Construction Joints: Locate and install construction joints as indicated.

B. Provide keyways at least 1-1/2" deep in construction joints in walls, slabs and between walls and footings.

C. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints.

D. Construction Joints in Slabs-on-Grade: Construct isolation joints in slabs-on-grade and vertical surfaces, such as column pedestals, foundation walls and elsewhere as indicated.

3.04 INSTALLATION OF EMBEDDED ITEMS

A. General: Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete.

1. Use setting drawings, diagrams, instructions and directions provided by suppliers of items to be attached thereto.

B. Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface. Provide and secure units sufficiently strong to support types of screed strips by use of strike-off templates or accepted compacting type screeds.

C. Pipe Sleeves: Where piping, as specified under Section 15000 and as shown on Drawings, is required to pass through concrete construction, furnish a sleeve in the concrete work.

3.05 PREPARATION OF FORM SURFACES

A. Clean re-used forms of concrete matrix residue, repair and patch as required to return forms to acceptable surface condition.

B. Coat contact surfaces of forms with a form-coating compound before reinforcement is placed.

l. Thin form-coating compound only with thinning agent of type, and in amount, and under conditions of form-coating compound manufacturer's directions. Do not allow excess form-coating material to accumulate in forms or to come in contact with in-place concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

2. Coat steel forms with a non-staining, rust-preventative form oil or otherwise protect against rusting. Rust-stained steel formwork is not acceptable.

3.06 CONCRETE PLACEMENT

A. Preplacement Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast-in. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work. Moisten wood forms immediately before placing concrete where form coatings are not used.

B. Coordinate the installation of joint materials and moisture barriers with placement of forms and reinforcing steel.

C. General: Comply with ACI 304 "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete", and as herein specified.

l. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which is hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation.

D. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 24" and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

E. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI recommended practices.

F. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to rapidly penetrate placed layer and at least 6" into preceding layer. Do not insert vibrators in lower layers of concrete that have begun to set. At each insertion limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.

G. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.

H. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.

I. Bring slab surfaces to correct level with straightedge and strikeoff. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.

J. Maintain reinforcing in proper position during concrete placement operations.

K. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306 and as herein specified.

L. When air temperature has fallen to or is expected to fall below 40°F (4°C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50°F (10°C), and not more than 80°F (27°C) at point of placement.

M. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

N. Hot Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.

O. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90°F (32°C). Mixing water may be chilled or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing water. Use of liquid nitrogen to cool concrete is Contractor's option.

P. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.

l. Fog spray forms, reinforcing steel and subgrade just before concrete is placed.

Q. Use water-reducing retarding admixture (Type D) when required by high temperatures, low humidity, or other adverse placing conditions.

3.07 FINISH OF FORMED SURFACES

A. Rough Form Finish: For formed concrete surfaces not exposed-to-view in the finish work or hidden by other construction, unless otherwise indicated. This is the concrete surface having texture imparted by form facing material used, with tie holes and defective areas repaired and patched. Fins and other projections exceeding 1/4" in height, shall be rubbed down or chipped off.

B. Smooth Form Finish: For formed concrete surfaces exposed-to-view, or that are to be covered with a coating material applied directly to concrete, such as waterproofing, dampproofing, painting or other similar system. Repair and patch defective areas. Fins or other projections shall be completely removed and smoothed.

C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces occurring 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.

3.08 MONOLITHIC SLAB FINISHES

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

1. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units. Check and level surface plane, so that depressions between high spots do not exceed 5/16" under a 10' straightedge. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

B. Non-Slip Broom Finish: Apply non-slip broom finish to exterior concrete slabs.

1. Immediately after trowel finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with Engineer before application.

3.09 CONCRETE CURING AND PROTECTION

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

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

2. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.

B. Curing Methods: Perform curing of concrete by curing and sealing compound, by moist curing, by moisture-retaining cover curing, and by combinations thereof, as herein specified.

1. Provide moisture curing by following methods.

a. Keep concrete surface continuously wet by covering with water.

b. Continuous water-fog spray.

2. Provide moisture-cover curing as follows:

a. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and end lapped at least 3" and

sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3. Provide curing and sealing compound to slabs, as follows:

a. Apply specified curing and sealing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours). Apply uniformly incontinuous operation by power-spray or roller in accordance with manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.

b. Do not use membrane curing compounds on surfaces which are to be covered with coating material applied directly to concrete, liquid floor hardener, waterproofing, dampproofing, membrane roofing, flooring (such as ceramic or quarry tile, glue-down carpet), painting, and other coatings and finish materials, unless otherwise acceptable to Engineer.

4. Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, floor topping, and other flat surfaces by application of appropriate curing method.

a. Final cure concrete surfaces to receive liquid floor hardener or finish flooring by use of moisture-retaining cover, unless otherwise directed.

5. Sealer and Dustproofer: Apply a second coat of specified curing and sealing compound only to surfaces given a first coat.

3.10 REMOVAL OF FORMS

A. Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50°F (10^{oC}) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.

3.11 RE-USE OF FORMS

A. Clean and repair surfaces of forms to be re-used in work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form coating compound as specified for new formwork.

B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use "patched" forms for exposed concrete surfaces, except as acceptable to Engineer.

3.12 MISCELLANEOUS CONCRETE ITEMS

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

B. Reinforced Masonry: Provide concrete grout for reinforced masonry lintels and bond beams where indicated on drawings and as scheduled. Maintain accurate location of reinforcing steel during concrete placement.

3.13 CONCRETE SURFACE REPAIRS

A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to Engineer.

l. Cut out honeycomb, rock pockets, voids over 1/4" in any dimension, and holes left by tie rods and bolts, down to solid concrete but, in no case to a depth of less than 1". Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water and brush-coat the area to be patched with specified bonding agent. Place patching mortar after bonding compound has dried.

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

C. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Engineer. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets; fins and other projections on surface; and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry pack mortar, or precast cement cone plugs secured in place with bonding agent.

D. Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.

E. Repair of Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plan to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness, using a template having required slope.

F. Repair finished unformed surfaces that contain defects which affect durability of concrete. Surface defects, as such, include crazing, cracks in excess of 0.01" wide or which penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, pop-outs, honeycomb, rock pockets, and other objectionable conditions.

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

H. Correct low areas in unformed surfaces during, or immediately after completion of surface finishing operation by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used when acceptable to Engineer.

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

J. Repair isolated random cracks and single holes not over l" in diameter by dry-pack method. Groove top of cracks and cut-out holes to sound concrete and clean of dust, dirt and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of one part portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place dry pack after

bonding compound has dried. Compact drypack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.

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

L. Repair methods not specified above may be used, subject to acceptance of Engineer.

3.14 QUALITY CONTROL TESTING DURING CONSTRUCTION

A. The Contractor shall employ a testing laboratory to perform tests and to submit test reports under the provisions of Section 01400.

B. Sampling and testing for quality control during placement of concrete shall include the following, as directed by Engineer.

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

1. Slump: ASTM C143; one test at point of discharge for the first batch of concrete each day, additional tests when concrete consistency seems to have changed. Test before and after the authorized addition of mix water. One test for each set of compressive strength test specimens.

2. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C231 pressure method for normal weight concrete; one for each day's pour of each type of air-entrained concrete, and one test for each set of compressive strength test specimens.

3. Concrete Temperature: ASTM C1064, Test hourly when air temperature is 40°F (4°C) and below, and when 80°F (27°C) and above; each time a set of compressive strength test specimens are made and after authorized addition of mix water.

4. Compressive Strength Tests: ASTM C 31; one set of four standard cylinders for each day's pour plus additional sets for each 25 cu. yds. over and above the first 50 cu. yds. of each concrete class placed in any one day; two specimens tested at 7 days, two specimens tested at 28 days.

a. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength tests meet or exceed the requirements of ACI 214 "Recommended Practice for Evaluation of Strength Test Results of Concrete", and ACI 318.

b. Mold and store cylinders for laboratory cured test specimens except when field cure test specimens are required.

D. Test results will be reported in writing to Engineer and Contractor within 24 hours that tests are made. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and type of break for both 7-day tests and 28-day tests.

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

F. Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Engineer. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed. Contractor shall pay for such tests conducted, and any other additional testing as may be required, when unacceptable concrete is verified.

END OF SECTION 03300 – CAST-IN-PLACE CONCRETE

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SECTION 03341- FLOWABLE FILL

PART 1 GENERAL

1.01 DESCRIPTION

A. This item shall consist of all work necessary to gain access to, prepare and place stabilized flowable fill in accordance with these Specifications and as directed by the Engineer. The flowable fill shall be used to fill sanitary sewer pipes and manholes to be abandoned.

1.02 REFERENCE STANDARDS AND PUBLICATIONS

A. ASTM C403 - Standard Test Method for Time of Setting of Concrete Mixtures by Penetration Resistance

B. ASTM C495 - Standard Test Method for Compressive Strength of Lightweight Insulating Concrete

C. ASTM C109 - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens)

D. ASTM C939 - Standard Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method).

E. ASTM C138 - Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete.

F. ASTM C939 - Standard Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method)

G. Specifications: Delaware Department of Transportation (DELDOT) Specifications for Road and Bridge Construction, August 2001, latest edition.

1.03 QUALITY ASSURANCE

A. Grout materials and installation shall conform to the Reference Specifications & Publications and Delaware Department of Transportation (DELDOT) Specifications for Road and Bridge Construction, August 2001, latest edition.

1.04 QUALIFICATIONS

A. The applicator of the flowable fill shall be regularly engaged in the placement of flowable fill, including completion of pipeline filling operations of at least 1,000 cubic yards in the past 3 years.

1.05 SUBMITTALS

A. Submit samples, manufacturer's product data and installation instructions in accordance with Section 01300.

B. Detailed descriptions of equipment and operational procedures to accomplish the abandonment of existing pipes and manholes including mixing and pumping schedule and methods for monitoring the effectiveness of the grouting.

C. Qualifications and experience of personnel performing the work

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D. Flowable fill mix design.

E. Bulkhead designs

F. Flow control

G. Vent location plans

1.06 DELIVERY, STORAGE, AND HANDLING

A. Care shall be taken in shipping, handling of grout materials to avoid damage.

1.07 WARRANTY

A. All pipeline and manhole abandonment shall be fully guaranteed by the Contractor for a period of 5 years from the date of Final Acceptance unless otherwise stipulated in writing by the Owner prior to the date of Final Completion. During this period, all serious defects discovered by the Owner or Engineer shall be removed and replaced by the Contractor in a satisfactory manner at no cost to the Owner.

PART 2 PRODUCTS

2.01 MATERIALS

A. The Contractor shall provide all materials and equipment in suitable and adequate quantity and quality as necessary to accomplish the work specified herein. Flowable fill shall consist of a mixture of portland cement, fly ash, mineral filler, water and admixtures proportioned to provide a non-segregating, free-flowing, self-consolidating material that will result in a hardened, dense backfill. The Contractor shall prepare a mix design as specified herein to determine the proportion of materials necessary to meet the Specification requirements.

B. The flowable fill shall be proportioned to be non-segregating, free-flowing, self-consolidating, low-shrink slurry with a minimum unconfined compressive strength at 28 days of 100 psi as determined in accordance with ASTM D 4832. The flowable fill shall have a minimum unit weight of 70 pcf. The Contractor and its supplier shall determine the materials and proportions used to meet the requirements of these Specifications. At least 21-days before starting placement of flowable fill, the Contractor shall submit a mix design for the flowable fill to the Engineer.

PART 3 EXECUTION

3.01 FLOWABLE FILL

A. Batching, mixing and delivery shall conform to the requirements of either ASTM C 94 or C 685.

B. Flowable fill shall be placed when the weather conditions are favorable and when the ambient temperature is above 40 degrees F. Flowable fill placement shall stop when the ambient temperature is below 40 degrees F.

C. At the time of placement, flowable fill shall have a temperature of at least 50 degrees F.

D. The Contractor shall verify, through site investigation, that the appropriate pipe and manhole is going to be filled. No functioning pipes shall be filled with flowable fill.

E. The Contractor shall make a reasonable attempt, as determined by the Engineer, to ascertain if the pipe to be abandoned is clogged. Two methods of construction exist:

1. If it is determined that the abandoned drainage pipe is not clogged or that the pipe is sufficiently open to allow the flowable fill to gravity feed the entire length of the pipe, the Contractor shall seal the lower end of the pipe by means suitable to the Engineer. The seal shall be vented such that air voids do not form in the pipe when the flowable fill is placed. The flowable fill shall be discharged from a mixer into the high end of the abandoned drainage pipe by any means acceptable to the Engineer. No flowable fill shall be placed into the adjacent pipes or manhole to render these structures non-functional. After completing the work, both ends of the abandoned drainage pipe should be sealed in a neat, workmanlike manner that is acceptable to the Engineer.

2. If it is determined that the abandoned drainage pipe is clogged, the Contractor shall make a reasonable attempt to clear the obstruction. If the Engineer determines that the obstruction(s) cannot be removed, the Contractor shall first fill the low end of the pipe with flowable fill. The flowable fill shall be discharged from a mixer into the low end of the pipe to be abandoned by any means acceptable to the Engineer. A seal will be required to fill the low end of the pipe. The Contractor shall seal the low end of the pipe by means suitable to the Engineer. After completing work at the low end of the pipe, the Contractor shall place the flowable fill in the high end of the pipe as indicated above.

F. After completing the work, the Contractor shall remove from the project site any excess flowable fill that resulted from spillage, et cetera, and restore the project site to match existing conditions or as directed by the Engineer. If excavation is required to reach the abandoned pipe, the contractor shall restore the area to its original condition as directed by the Engineer.

3.02 TESTING

A. The Contractor shall employ a testing laboratory to perform tests and to submit test reports under the provisions of Section 01400.

B. The flowable fill shall be sampled and tested in the field in conformance with either ASTM C 94 or C 685 and in conformance with these Specifications. Samples for tests shall be taken for each days pour.

C. Tests shall include temperature and four compressive strength cylinders. Compressive strength sampling and testing shall conform to ASTM D4832 with one specimen tested at 7 days, two at 28 days, and one held for each batch of four specimens.

D. The sampling and testing shall be performed by a qualified, independent commercial testing laboratory employed by the Contractor with results submitted to the Engineer within 48 hours of completion of testing.

END OF SECTION 03500 – FLOWABLE FILL

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SECTION 03400 – PRE-CAST CONCRETE STRUCTURES

PART 1 GENERAL

1.01 WORK INCLUDES

A. Precast concrete structures.

1.02 REFERENCES

A. ACI 301 - Structural Concrete for Buildings.

B. ACI 318 - Building Code Requirements for Reinforced Concrete.

C. ACI 350 R - Concrete Sanitary Engineering Structures.

D. ASTM A153 - Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

E. ASTM A307 - Specification for Low-Carbon Steel Externally and Internally Threaded Standard Fasteners.

F. ASTM A325 - Specification for High Strength Bolts for Structural Steel Joints, Including Suitable Nuts and Plain Hardened Washers.

G. ASTM A615 - Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

H. ASTM C33 - Concrete Aggregates.

I. ASTM C150 - Portland Cement.

J. ASTM C260 - Air Entraining Admixtures for Concrete.

K. ASTM C330 - Lightweight Aggregates for Structural Concrete.

L. ASTM C494 - Chemical Admixtures for Concrete.

M. PCI MNL-116 - Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products.

N. PCI MNL-120 - Design Handbook - Precast and Prestressed Concrete.

O. PCI MNL-123 - Manual on Design of Connections for Precast Prestressed Concrete.

P. PCI MNL-127 - Manual on Recommended Practice for Erection of Precast Concrete.

Q. Concrete Reinforcing Steel Institute, "Manual of Standard Practice."

R. The most stringent code shall govern.

1.03 QUALITY ASSURANCE

A. Testing:

1. Certification from independent testing agency supplied by the manufacturer.

2. Cost of Testing: Borne by Contractor.

B. Codes and Standards:

1. Except as modified by the requirements specified herein and/or the details shown on the Project Drawings, all work included in this section shall conform to the applicable provisions of the following codes and standards:

a. ACI 301

b. ACI 318

c. ASTM C890

d. ASTM C913

e. PCI MNL-116

f. PCI MNL-120

g. PCI MNL-123

h. Concrete Reinforcing Steel Institute, “Manual of Standard Practice”.

1.04 STRUCTURAL DESIGN REQUIREMENTS

A. The Contractor shall address all anticipated loading conditions as indicated on the Drawings, as specified herein, and as required by local and state building codes. All load cases shall

be considered and the design shall be based on the governing cases which produce the greatest stresses on the structure. Load cases to be addressed include:

1. Tanks empty with saturated soil outside.

2. Tanks full with saturated soil outside.

3. Tanks full with dry soil outside.

4. Tanks full with no soil pressure outside.

B. Maximum ground water elevation shall be assumed to be at finish grade level. Saturated soil shall be assumed to exert a minimum equivalent fluid pressure of 90 p.c.f. onto the structure.

C. All structures shall be designed to resist buoyancy when empty. The minimum safety factor against buoyancy shall be 1.25. Only the weight of the empty concrete structure and the weight of the soil directly above the anti-flotation collar shall be considered in calculating the forces to resist buoyancy. The dry density of the soil shall be assumed at 100 lbs./cu. ft. The density of concrete shall be assumed to be 150 lbs./cu. ft.

D. Effects of all vertical, horizontal and lifting loads anticipated on the finished structure shall be included in the analysis and design. Loading from piping and equipment, snow, and adjacent H-20 live load shall be included.

E. All structures shall be watertight as defined by Section 03500 “Leakage Tests for Concrete Structure”

F. Where conditions arise which are not specifically covered by these notes and specifications, the Current Standards of ACI 301, 304, 306, 311, 315, 318, ASTM C-94, C890 and C913 shall govern.

G. Design calculations for the above conditions shall be prepared, signed and sealed by a Registered Professional Engineer, registered in the State of Delaware and submitted to the Engineer for review.

1.05 SUBMITTALS

A. Submit shop drawings under provisions of Section 01300.

B. Submit design calculations and shop drawings indicating fabrication details, reinforcement, connection details, support items, member cross-sections and dimensions, gaskets, openings, manhole steps, size and type of reinforcement and lifting devices which shall be signed and sealed by a Professional Engineer licensed in the State of Delaware.

C. Indicate design loads, deflections, cambers, bearing requirements, and special conditions.

D. Submit product data under provisions of Section 01300.

E. Submit product data indicating standard component configurations, design loads, deflections, cambers, and bearing requirements.

F. Submit data on proposed used of any admixture under provisions of Section 01300.

G. Submit fabricator's installation instructions under provisions of Section 01300.

H. Submit design data under provisions of Section 01300.

I. Submit design data reports indicating calculations for loadings and stresses of fabricated, designed framing.

1.06 QUALIFICATIONS

A. Fabricator: Company specializing in manufacturing the work of this Section with minimum three years documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site at such times to assure continuity of installation.

B. Handle precast members in position consistent with their shape and design. Lift and support only from support points.

C. Lifting or Handling Devices: Capable of supporting member in positions anticipated during manufacture, storage transportation, erection.

D. Store and protect members to prevent staining, cracking, chipping, spalling, or other physical damage of concrete.

E. Mark each member with date of production and final position in structure.

PART 2 PRODUCTS

2.01 CONCRETE MATERIALS

A. Water: Clean and free of organic materials, strong acids or alkalis, oils and salt. Potable.

B. Portland Cement ASTM-C150, Type I or Type III American manufacture. One (1) brand used throughout project.

C. Sand: (Fine aggregate) shall be clean, sharp, coarse, (minimum fines) hard, natural sand free from salt, loam, clay and other deleterious materials and shall conform to ASTM Specification C33 or C330.

D. Coarse Aggregate: Shall be well graded, washed gravel or crushed stone and shall conform to ASTM Specification C33 for normal weight aggregate.

E. Admixtures: Determined by precast fabricator as appropriate to design requirements and conforming to ASTM Specification C494.

2.02 REINFORCEMENT

A. Reinforcing Steel: Reinforcing bars shall be deformed high strength bars conforming to ASTM A615, Grade 40 or 60.

B. Welded Wire Fabric: Fabric shall conform to ASTM A185.

2.03 FORMWORK

A. Forms: Wood, metal, plastic, or other acceptable material that will produce required finish surfaces and is non-reactive with concrete.

B. Maintain formwork to provide completed precast concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances specified in PCI MNL-116.

2.04 ACCESSORIES

A. Grout: Non-shrink, non-metallic, pre-mixed, non-corrosive, non-staining product containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water reducing agents. Minimum yield strength of 10,000 psi at 28 days.

B. High Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy bolts, and hardened washers complying with ASTM A325. Exposed units galvanized per ASTM A153; others painted with rust-inhibitive primer.

C. Anchor Bolts, Nuts and Washers: Low-carbon steel bolts, regular hexagon nuts and carbon steel washers conforming to ASTM A307. Exposed units galvanized per ASTM A153; others painted with rust-inhibitive primer.

D. Supports for Reinforcement: Provide bolsters, chairs, spacers, and other devices for spacing, supporting and fastening reinforcing in accordance with CRSI and ACI recommendations.

E. Gaskets: Pipe penetrations in precast structures shall be constructed with integrally cast rubber or neoprene gaskets unless otherwise indicated. Integrally cast gaskets shall be Dura Seal III, A-lok, Dual Seal or approved equal.

F. Wall sleeves: Where indicated on the Drawings, precast structures shall have integrally cast mechanical joint wall sleeves. Integrally cast wall sleeves shall be cast iron Clow F-1429, Omni-Sleeve, or approved equal.

G. Plastic coated steel steps: Manhole steps made by M.A. Industries, Inc. Peachtree City, GA. or approved equal.

H. All steps shall be capable of resisting the following loads without loosening or damage.

1. Minimum horizontal pull out load 400 lb.

2. Minimum vertical load 800 lb.

I. Joint Sealant: Watertight sealant shall be installed between all precast sections. Ramsneck mastic tape or approved equal.

2.05 FABRICATION

A. Fabrication procedure to conform to PCI MNL-116.

B. Maintain plant records and quality control program during production of precast members. Make records available upon request.

C. Reinforcing steel surface shall be free of rust, mill scale and any coating including ice that could destroy or reduce bond.

D. Ensure reinforcing steel, anchors, inserts, plates, angles, and other cast-in items are embedded and located as indicated on shop drawings. Locate anchors where they do not affect position of main reinforcement or placing of concrete.

E. Tension reinforcement tendons as required to achieve design load criteria.

F. Cast-in required openings with a dimension larger than 6 inches or where indicated on Drawings.

G. Concrete Strength: Minimum ultimate compressive strength of the concrete at age 28 days shall be 5000 psi. Slump shall not exceed 4 inches.

2.06 FINISHING

A. Ensure exposed-to-view finish surfaces of precast concrete members are uniform in color and appearance.

B. Cure members under identical conditions to develop required concrete quality, and minimize appearance blemishes such as non-uniformity, staining, or surface cracking.

C. Interior and exterior above grade surfaces - Exposed-to-View Finish: Normal plant finish with fins and protrusions removed, ground edges and ends, and flat face surfaces.

D. Exterior below grade surfaces - Normal plant finish; normal form joint marks, small surface holes caused by air bubbles, minor chips, and spalling at edges or ends, without major discoloration will be tolerated, but no major or unsightly imperfections, honeycomb or structural defects will be permitted.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that site conditions are ready to receive work and field measurements are as on Drawings.

B. Ensure excavation is free of water and precast units will not be placed on frozen or soft ground.

C. Beginning of installation means installer accepts existing conditions.

3.02 PREPARATION

A. Prepare support equipment for the erection procedure, temporary shoring and bracing, and induced loads during erection.

3.03 INSTALLATION

A. Install precast units according to manufacturer's recommendations and the Drawings without damage to structural capacity, shape, or finish. Replace or repair damaged members.

B. Align and maintain uniform horizontal and vertical joints, as erection progresses.

C. Maintain temporary bracing in place until final support is provided. Protect members from staining.

D. Grout open spaces at connections and joints. Provide forms or other acceptable method to retain grout in place until sufficiently hard to support itself. Pack spaces with stiff grout material, tamping until voids are completely filled. Place grout to finish smooth, plumb and level with adjacent concrete surfaces. Keep grouted joints damp for not less than 24 hours after initial set. Promptly remove grout material from exposed surfaces before it hardens.

E. Do not use power-actuated fasteners for surface attachment of accessory items in precast, prestressed unit unless otherwise accepted by precast manufacturer.

3.04 TESTING

A. All precast structures designed to retain fluids, including manholes, shall be tested for leaks in accordance with Section 03500.

3.05 ERECTION TOLERANCES

A. Erect members level and plumb within allowable tolerances.

B. Conform to PCI MNL-127.

END OF SECTION 03400 – PRE-CST CONCRETE STRUCTURES

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SECTION 03401 – LEAKAGE TESTS FOR CONCRETE STRUCTURES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. All fluid retaining concrete structures are required to be watertight and shall be tested by the Contractor and witnessed by the Engineer. Structures shall be tested with water as specified.

B. All tests shall be conducted in a manner to minimize as much as possible any interference with the Contractor's work or progress.

C. The Contractor shall notify the Engineer when the work is ready for testing, and tests shall be made as soon thereafter as possible. Personnel for reading meters, gauges, or other measuring devices and all other labor, equipment, air, water, and materials, including meters, gauges, fuel, bulkheads, and accessory equipment, shall be furnished by the Contractor.

1.02 REFERENCES

A. AWWA Journal “A Summary Report on Concrete Water-Holding Structures," AWWA Committee on Concrete Holding Structures

B. ACI Manual of (1989) "Environmental Engineering Practice Concrete Structures," ACI Committee 350 R-89, Part 4, Detroit, MI

1.03 QUALITY ASSURANCE

A. Leakage tests of chambers and tanks shall be made before backfilling by filling the structure with water up to the operating level and observing the water surface level for the following 24 hours. Inspection for leakage will be made of the exterior surface of the structure, especially in the area around construction joints.

B. Each section of water-holding structure which can be isolated in actual operation shall be isolated and tested for leakage.

1.04 ALLOWABLE LIMITS

A. Leakage within the allowable limits will be accepted for structures from which there are no visible leaks and in which the surface water drops not more than 1/2 inch during the 24 hr test due to leakage.

B. If leakage exceeds the allowable limits, the structure shall be repaired by locating, removing and replacing the leaking portions of the structure, in accordance with the requirements of Section 03732 or by other means approved by the Engineer. Each structure shall be retested until leakage is within the specified limits.

PART 2 PRODUCTS

(Not Used)

PART 3 EXECUTION

3.01 WATER

A. Water for the filling of the structures will be supplied by the Contractor. The Contractor shall supply all hoses, pumps, labor, and other material to fill the structures. Water for subsequent fillings, if required, shall be at the expense of the Contractor.

3.02 TEST RESULTS

A. The test results shall be reported in writing to the Engineer on the same day that the tests are made.

3.03 ADDITIONAL TESTS

A. Contractor shall perform additional tests, at no additional cost to the owner, as may be required to demonstrate concrete repairs are adequate and conform to the leakage criteria established herein.

END OF SECTION 03401 – LEAKAGE TESTS FOR CONCRETE STRUCTURES

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SECTION 03732 – CONCRETE REPAIR

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preparation of concrete and application of repair materials.

B. Rehabilitation of concrete surfaces.

1.02 REFERENCES

A. ANSI/ASTM C404 - Aggregates for Masonry Grouts.

B. ANSI/ASTM C882 - Bond Strength of Epoxy-Resin Systems Used with Concrete.

C. ASTM C33 - Concrete Aggregates.

D. ASTM C150 - Portland Cement.

1.03 SUBMITTALS

A. Submit narrative on repair methods and product data under provisions of Section 01300.

B. Submit product data indicating product standards, physical and chemical characteristics, technical specifications, limitations, maintenance instructions, and general recommendations regarding each material.

C. Submit manufacturer's installation instructions under provisions of Section 01300.

D. Accurately record actual locations of structural reinforcement repairs and type of repair. Submit information under section 01720.

1.04 QUALITY ASSURANCE

A. Materials Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum three years documented experience.

B. Applicator: Company specializing in concrete repair approved by materials manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Section 01600.

B. Store and protect products under provisions of Section 01600.

C. Comply with instructions for storage, shelf life limitations, and handling.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

A. Epoxy adhesive: Two-part epoxy adhesive meeting the following minimum characteristics:

Characteristic	Test Method	Results*
Bond Strength	ANSI/ASTM C882	1,900 psi
Tensile Strength	ASTM D638	4,800 psi
Flexural Strength	ASTM D790	7,400 psi
Compressive Strength	ASTM D695	9,500 psi

* 14 day Test Results

Epoxy adhesive shall be Sikadur 32, Hi-Mod, as manufactured by Sika Corporation or approved equal.

B. Repair Mortar: A one component, ready to use with water, high strength polymer modified cementious patching mortar for horizontal, vertical and overhead repair of concrete. The repair mortar shall be Octocrete as manufactured by IPA Systems, Inc. or approved equal.

C. Bonding Agent: Acrylic Bonding Agent shall be Octoblen, as manufactured by IPA Systems, Inc. or approved equal.

D. Portland Cement: ASTM C150, Type 1; gray.

E. Sand: ASTM C33; uniformly graded, clean.

F. Water: Clean and potable.

G. Cleaning Agent: Commercial muriatic acid of 10 percent strength.

2.02 MIXING EPOXY ADHESIVE

A. Mix in accordance with manufacturer's instructions for purpose intended.

B. Mix components in clean equipment or containers. Conform to pot life and workability limits.

2.03 MIXING CEMENTITIOUS REPAIR MORTAR

A. Mix mortar in accordance with manufacturer's instructions for purpose intended.

B. Include bonding agent as additive to mix as recommended by manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work.

B. Beginning of installation means installer accepts existing surfaces.

3.02 PREPARATION

A. Clean concrete surfaces of dirt, laitance, corrosion, or other contamination by water blasting, sand blasting, acid washing as required by the manufacturers instructions. Rinse surface and allow to dry.

B. Flush out cracks and voids with water to remove laitance and dirt.

C. Provide temporary entry ports spaced to accomplish movement of fluids between ports, no deeper than the depth of the crack to be filled. Limit port size diameter to be no greater than the thickness of the crack. Provide temporary seal at concrete surface to prevent leakage of adhesive.

D. For areas to be patched, remove broken and soft concrete 1/4 inch deep. Remove corrosion from steel. Clean surfaces mechanically; wash with acid and rinse with water.

3.03 REPAIR WORK

A. Repair exposed structural, shrinkage, and settlement cracks of concrete by the epoxy injection method.

B. Repair holes and cavities with Repair Mortar.

3.04 INJECTION - EPOXY RESIN ADHESIVE

A. Inject adhesive into prepared ports under pressure using equipment appropriate for particular application.

B. Begin injection at lower entry port and continue until adhesive appears in adjacent entry port. Continue from port to port until entire crack is filled.

C. Remove temporary seal and excessive adhesive.

D. Clean surfaces adjacent to repair and blend finish.

3.05 APPLICATION - REPAIR MORTAR

A. Trowel apply mortar mix as recommended by the manufacturer. Tamp into place filling voids at spalled areas.

B. For patching honeycomb, trowel mortar onto surface, working into honeycomb to bring surface flush with surrounding area. Finish trowel surface to match surrounding area.

C. Cover exposed steel reinforcement with epoxy mortar; feather edges to flush surface.

END OF SECTION 03732 – CONCRETE REPAIR

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SECTION 05500 – MISCELLANEOUS METALS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Custom fabricated metal items and prime paint or other finish.

1.02 REFERENCE STANDARDS

A. ASTM A36 – Structural Steel.

B. ASTM A307 – Low-Carbon Steel Externally and Internally Threaded Fasteners.

C. ASTM A325 – High Strength Bolts for Structural Steel Joints Including Suitable Nuts and Plain Hardened Washers.

D. ASTM A490 – Quenched and Tempered Alloy Steel Bolts for Structural Steel Joints.

E. ASTM A502 – Steel Structural Rivets.

F. AWS D1.1 – Structural Welding Code.

1.03 SUBMITTALS

A. Submit shop drawings of metal fabrications and product data on manufactured items in accordance with Section 01300.

B. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners and accessories.

C. Include erection drawings, elevations and details where applicable.

D. Indicate welded connections using standard AWS welding symbols. Indicate net weld lengths.

PART 2 PRODUCTS

2.01 GENERAL

A. Provide and install items as indicated on the drawings, complete in respect to function as intended.

2.02 MATERIALS

A. Steel: ASTM A36.

B. Bolts, Nuts and Washers: High strength type recommended for structural steel joints; ASTM A325.

C. Welding Materials: Applicable AWS D1.1, type required for materials being welded.

D. Primer: Sherwin Williams (Kem Kromik, B50 Series) or equal

2.03 FABRICATION

A. Verify dimensions on-site prior to shop fabrication.

B. Fabricate items with joints neatly fitted and properly secured.

C. Fit and shop assemble in largest particle sections for delivery to site.

D. Grind exposed welds smooth and flush with adjacent finished surfaces.

E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts unobtrusively located consistent with design or structure, except where specifically noted otherwise.

F. Make exposed joints flush butt type hairline joints where mechanically fastened.

G. Supply components required for proper anchorage of metal fabrications. Fabricate anchorage and related components of same material and finish as metal fabrication, unless otherwise specified in schedule herein.

H. Thoroughly clean surfaces of rust, scale, grease and foreign matter prior to prime painting or galvanizing.

I. Galvanize and prime paint items as scheduled. Do not shop prime surfaces in contact with concrete or requiring field welding. Shop prime in 1 coat.

PART 3 EXECUTION

3.01 ERECTION

A. Obtain Engineer's review prior to site cutting or making adjustments which are not part of scheduled work.

B. Install items square and level, accurately fitted and free from distortion of defects.

C. Make provision for erection stresses by temporary bracing. Keep work in alignment.

D. Replace items damaged in course of installation.

E. Perform field welding in accordance with AWS D1.1.

F. After installation, touch-up field welds and scratched and damaged prime painted and galvanized surfaces. Use a primer consistent with shop coat. Use a primer recommended for galvanized surfaces.

G. Supply to appropriate sections, items requiring to be cast into concrete or embedded in masonry, complete with necessary setting templates.

END OF SECTION 05500 – MISCELLANEOUS METALS

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SECTION 05510 –ALUMINUM AND STAINLESS STEEL FABRICATION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Custom fabricated aluminum items.

1.02 REFERENCE STANDARDS

A. AA DAF-45 - Designation System for Aluminum Finishes

B. AA SAA-46 - Standards for Anodized Architectural Aluminum

C. ASTM B211 - Aluminum-Alloy Bars, Rods, Wire.

D. ASTM B221 - Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubing.

E. ASTM B241 - Aluminum-Alloy Seamless Pipe and Seamless Extruded Tubes.

F. ASTM B429 - Aluminum-Alloy Extruded Structural Pipe and Tube.

G. AWS Dl.l - Structural Welding Code, and the Aluminum Association Standards; latest addition.

1.03 SUBMITTALS

A. Submit shop drawings of metal fabrications and product data on manufactured items in accordance with Section 0l300.

B. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners and accessories.

C. Include erection drawings, elevations and details where applicable.

D. Indicate welded connections using standard AWS welding symbols. Indicate net weld lengths.

1.04 QUALITY ASSURANCE

A. Qualification of Installer: Use adequate numbers of skilled workman who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper performance of the work of this section.

B. Qualification of Manufacture: Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production of these items.

C. Requirements of Regulatory Agencies: All installations shall be in compliance with BOCA, Basic Building Code and Local Ordinances, and with the U.S. Department of Labor, Occupational Safety and Health Administration (OSHA) Standards.

PART 2 PRODUCTS

2.0l GENERAL

A. Provide and install items as indicated on the Drawings, complete in respect to function as intended.

2.02 MATERIALS

A. Aluminum: Aluminum work shall be fabricated of plates and rolled or extruded shapes. All aluminum shall conform to the appropriate current ASTM Specifications and alloy listed in the following table:

Application	ASTM Designator	ASTM Alloy
Plate	B209	6061-T6
Bolts, Screws	B211	6061-T6
Nuts, 1/4" Tap and Under	B211	2024-T4
Nuts, 5/16" Tap and Over	B211	6061-T6
Rolled or Extruded Shapes	B308	6061-T6
Extruded Bar	B211	6061-T6
Drawn Tube	B210	6061-T6
Extruded Tube	B221	6061-T6
Pipe	B241	6061-T6
Shims	B209	1100-0

B. Stainless Steel: Stainless steel work shall be fabricated of plates and rolled or cold drawn shapes. All stainless steel shall conform to the appropriate current ASTM Specifications and shall be Type 304L (extra low carbon).

2.02 FASTENERS & ANCHORAGE

A. Anchorage shall be provided where necessary for fastening miscellaneous metal items securely in place. Anchorage not otherwise specified or indicated shall include slotted inserts made to engage with the anchors, expansion shields, and power-driven fasteners when approved for concrete; toggle bolts for masonry; machine and carriage bolts for aluminum.

B. ASTM A193 GRB8 stainless steel bolts with (2) stainless steel plate washers and ASTM Al94 GRF8 nuts.

2.03 FABRICATION

A. Verify dimensions on-site prior to shop fabrication.

B. Fabricate items with joints neatly fitted and properly secured.

C. Fit and shop assemble in largest particle sections for delivery to site.

D. Grind exposed welds smooth and flush with adjacent finished surfaces.

E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts unobtrusively located consistent with design or structure, except where specifically noted otherwise.

F. Make exposed joints flush butt type hair line joints where mechanically fastened.

G. Supply components required for proper anchorage of metal fabrications. Fabricate anchorage and related components of same material and finish as metal fabrication, unless otherwise specified in schedule herein.

2.04 DISSIMILAR MATERIALS

A. Where dissimilar metals are in contact, or where aluminum is in contact with concrete, mortar, masonry, wet or pressure-treated wood, or absorptive materials subject to wetting, the surfaces shall be protected with a coat of bituminous paint.

PART 3 EXECUTION

3.0l ERECTION

A. Obtain Engineer's review prior to site cutting or making adjustments which are not part of scheduled work.

B. Install items square and level, accurately fitted and free from distortion or defects.

C. Make provision for erection stresses by temporary bracing. Keep work in alignment.

D. Replace items damaged in course of installation.

E. Perform field welding in accordance with AWS Dl.l.

F. After installation, touch-up field welds and scratched and damaged surfaces.

G. Supply to appropriate sections, items requiring to be cast into concrete or embedded in masonry, complete with necessary setting templates.

END OF SECTION 05510 – ALUMINUM AND STAINLESS STEEL FABRICATION

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SECTION 07900 – JOINT SEALERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. The required applications include, but are not necessarily limited to the following:

1. Concrete construction joints, waterstops.

2. Joints at doors, windows and other built-in items.

1.02 REFERENCES

A. ASTM D1751

B. FS HH-F-341

C. FS TT-C-598

D. AASHTO M213

1.03 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Manufacturer's Data, Joint Sealers

1. Submit manufacturer's specifications, recommendations and installation instructions for each type of material required. Include manufacturer's published data, or letter of certification, or certified test laboratory report, indicating that each material complies with the requirements and is intended generally for the applications shown. Show by transmittal that one copy of each recommendation and instruction has been distributed to the Installer.

Samples, Joint Sealers

1. Submit samples of each color required (except black) for each type of joint sealer exposed to view.

1.04 QUALITY ASSURANCE

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

1.05 ENVIRONMENT

A. Weather Conditions: Do not proceed with installation of sealants under adverse weather conditions, or when temperatures are below or above manufacturer's recommended limitation for installation. Proceed with the work only when forecasted weather conditions are favorable for proper cure. Wherever joint width is affected by ambient temperature variations, install elastomeric sealants only when temperatures are in the lower third of manufacturer's recommended installation temperature range.

PART 2 PRODUCTS

A. Joint Sealer

1. Colors: For exposed materials provide color as indicated or, if not indicated, as selected by Engineer from manufacturer's standard colors. For concealed materials, provide the natural color which has the best overall performance characteristics.

2. Hardness: As recommended by manufacturer for application shown, unless otherwise indicated.

3. Modulus of Elasticity: Provide the lowest available modulus of elasticity which is consistent with exposure to weathering, indentation, vandalism, abrasion, support of loading and other requirements.

4. Compatibility: Before purchase of each required material, confirm its compatibility with each other material it will be exposed to in the joint system.

5. Size and Shape: As shown or, if not shown, as recommended by the manufacturer for the type and condition of joint, and for the indicated joint performance or movement.

6. Grade of Sealant: For each application, provide the grade of sealant (non-sag, self-leveling, no-track, knife grade, performed, etc.) as recommended by the manufacturer for the particular condition of installation (location, joint shape, ambient temperature, and similar conditions), to achieve the best possible overall performance. Grades specified herein are for normal condition of installation.

B. Elastomeric Sealants

See Cast-in-Place Specifications.

C. Caulking Compounds

1. Oleo-Resinous Caulking Compound (where "caulk" is called for on drawings).

a. Oil-based resinous caulking compound complying with FS TT-C-598, non-staining, no-bleeding, paintable.

D. Joint Fillers

1. Bituminous and Fiber Joint Filler (PBJ)

a. Provide resilient and non-extruding type premolded bituminous impregnated fiberboard units complying with ASTM D1751, FS HH-F-341, Type I and AASHTO M213.

E. Miscellaneous Materials

1. Joint Primer/Sealer: Provide the type of joint primer/sealer recommended by the sealant manufacturer for the joint surfaces to be primed or sealed.

2. Bond Breaker Tape: Polyethylene tape or other plastic tape as recommended by the sealant manufacturer to be applied to sealant-contact surfaces where bond to the substrate or joint filler must be avoided for proper performance of sealant. Provide self-adhesive tape wherever possible.

3. Sealant Backer Rod: Compressible rod stock of polyethylene foam, polyethylene jacketed polyurethane foam, butyl rubber foam, neoprene foam or other flexible permanent, durable non-absorptive material as recommended for compatibility with sealant by the sealant manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. The Installer must examine the joint surfaces and backing, and their anchorage to the structure, and the conditions under which the joint sealer work is to be performed, and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work and performance of the sealers. Do not proceed with the joint sealer work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

3.02 PREPARATION

A. Clean joint surfaces immediately before installation of sealant or caulking compound. Remove direct, insecure coatings, moisture and other substances which would interfere with bond of sealant or caulking compound. Etch concrete and masonry joint surfaces as recommended by sealant manufacturer. Roughen vitreous or glazed joint surfaces as recommended by sealant manufacturer.

B. Prime or seal the joint surface wherever shown or recommended by the sealant manufacturer. Do not allow primer/sealer to spill or migrate onto adjoining surfaces.

3.03 INSTALLATION

A. Comply with manufacturer's printed instructions except when more stringent requirements are shown or specified, and where manufacturer's technical representative directs otherwise.

B. Set joint filler units at proper depth or position in the joint to coordinate with other work, including the installation of bond breakers, back roads and sealants. Do not leave voids or gaps between the ends of joint filler units.

C. Install sealant backer rod for liquid elastomeric sealants.

D. Install bond breaker tape wherever required by manufacturer's recommendations to ensure that elastomeric sealants will perform properly.

E. Employ only proven installation techniques, which will ensure that sealants will be deposited in uniform, continuous ribbons without gaps or air pockets, with complete "wetting" of the joint bond surfaces equally on opposite sides. Except as otherwise indicated, fill joint to a slightly concave surface slightly below adjoining surface and vertical surface, fill joint to form a slight cover, so that joint will not trap moisture and dirt.

F. Install sealants to depths as shown or, if not shown, as recommended by the sealant manufacturer but within the following general limitations, measured at the center (thin) section of the bead;

1. For normal moving joints sealed with elastomeric sealants but not subject to traffic, fill joints to a depth equal to 50% of joint width, but neither more than 1/2" deep or less than 1/4" deep.

2. For joints sealed with non-elastomeric sealants and caulking compounds, fill joints to a depth in the range of 75% to 125% of joint width.

3.04 CLEANING

A. Clean work under provisions 01700.

B. Clean adjacent soiled surfaces.

END OF SECTION 07900 – JOINT SEALERS

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SECTION 08305 – ACCESS HATCHES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Access doors and frames.

1.02 SUBMITTALS

A. Submit Shop Drawings, Product Data and installation instructions under provisions of Section 0l300.

B. Include sizes, types, finishes, drains, scheduled locations and details of adjoining work.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Halliday Products: Series W1S or W2S Access Cover.

B. Approved equal by WACO, ITT Flygt Corporation, or Bilco Company.

2.02 ACCESS HATCHES

A. The single leaf frames and covers shall have a ¼ inch thick one-piece, mill finish, extruded aluminum channel frame, incorporating a continuous concrete anchor. A 1-1/2 inch drainage coupling shall be located in the front left corner of the channel frame. A bituminous coating shall be applied to the frame exterior where it will come in contact with concrete.

B. Door panel shall be ¼ inch aluminum diamond plate, reinforce to withstand a live load of 300 pounds per square foot. Door shall open to 90 degrees and automatically lock with a stainless steel hold open arm with an aluminum release handle. Door shall close flush with the frame.

C. Hinges and all fastening hardware shall be stainless steel. Unit shall lock with a non-corrosive locking bar and have a non-corrosive handle.

D. Unit shall be watertight and guaranteed against defects in material and/or workmanship for a period of 10 years.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify rough openings for door and frame are correctly sized and located.

B. Beginning of installation means acceptance of existing conditions.

3.02 INSTALLATION

A. Coordinate placement with other trades such as concrete installer or precaster.

B. Install frame plumb and level in floor openings.

C. Position to provide convenient access to concealed work requiring access.

D. Secure rigidly in place in accordance with manufacturer's instructions.

E. Provide doors to precast concrete supplier if required by its location as shown on the Drawings.

F. Assure aluminum in contact with concrete is coated.

G. Provide drain where indicated on Drawings.

END OF SECTION 08305 – ACCESS HATCHES

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SECTION 09900 – PAINTING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Prepare surfaces which are to receive finish.

B. Finish surfaces as indicated in schedule at end of this Section.

C. Refer to drawings for other information on locations of finishes.

D. Refer to other Specification Sections for descriptions of substrates.

1.02 QUALITY ASSURANCE

A. Manufacturer's Labels: Include on label or containers manufacturer's name, type of paint, manufacturer's stock number, color, instructions for reducing where applicable, label analysis and FS number.

B. Field Quality Control: Request review of first finished room, space or item of each color scheme for color, texture and workmanship. Use first acceptable room, space or item as project standard for each color scheme. For spray application, paint surface not smaller than l00 SF as project standard.

C. Manufacturer's Instructions: Follow in executing work.

D. Field and Shop Coat Compatibility: To insure satisfactory paint and coating performance, it is a Contract requirement that products applied in the shop and field be mutually compatible.

1. Contractor shall require fabricators and equipment manufacturers to apply shop coats that are compatible with field coats specified herein.

2. Above requirement does not apply to full factory-finished items, this is, items having both primer and final finish coatings, except as specified in this Section.

1.03 SUBMITTALS

A. Submit product data in accordance with Section 0l340.

B. Submit the following for approval.

1. List of manufacturers and products Contractor intends using.

2. Two sets of color chips for each product.

1.04 MAINTENANCE MANUALS AND SPARE PARTS

A. Leave on premises, acceptably stored, not less than one gallon of each color used.

B. Containers to be tightly sealed and clearly labeled for identification.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver paint materials in sealed original labeled containers, bearing manufacturer's name, type of paint, brand name, color designation and instructions for mixing and/or reducing.

B. Provide adequate storage facilities. Store paint materials at minimum ambient temperature of 45 degrees F (7 degrees C) in well ventilated area.

C. Take precautionary measures to prevent fire hazards and spontaneous combustions.

1.06 ENVIRONMENTAL CONCERNS

A. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finished unless moisture contents of surfaces are below following maximums:

l. Plaster and gypsum wallboard: l2%

2. Masonry, concrete and concrete block: l2%, including mortar joints

3. Interior located wood: l5%

4. Exterior located wood: As recommended by manufacturer

B. Ensure surface temperatures or the surrounding air temperature is above 40 degrees F before applying finishes. Minimum application temperature for varnish finishes is 65 degrees F.

C. Provide adequate continuous ventilation and sufficient heating facilities to maintain temperatures above 45 degrees F for 24 hours before, during and 48 hours after application of finishes.

D. Provide minimum l5 foot candles of lighting on surfaces to be finished.

E. Comply with DNREC Division of Air and Waste Management Regulation Number 41 limiting emissions of volatile organic compounds (VOC's).

1.07 PROTECTION

A. Adequately protect other surfaces from paint and damage. Repair damage as a result of inadequate or unsuitable protection.

B. Furnish sufficient drop cloths, shields and protective equipment to prevent spray or droppings from fouling surfaces not being painted and, in particular, surfaces within storage and preparation area.

C. Place cotton waste, cloths and material which may constitute a fire hazard in closed metal containers and remove daily from site.

D. Remove electrical plates, surface hardware, fittings and fastenings, prior to painting operations. These items are to be carefully stored, cleaned and replaced on completion of work in each area. Do not use solvent to clean hardware that may remove permanent lacquer finish.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Products of the Sherwin Williams have been listed to establish a standard of product formulation and quality.

B. Equal products of the following manufacturers are approved:

Benjamin Moore
Pennsbury

C. All products shall comply with DNREC Division of Air and Waste Management Regulation Number 41 limiting emissions of volatile organic compounds (VOC's).

2.02 MATERIALS

A. Materials furnished shall be by manufacturers listed and shall comply with all requirements of the specifications.

B. Select products from description of systems which follows.

C. Select all primary products of a coating system from the products of a single manufacturer.

D. Secondary products not specified by name and required for the job shall be "best grade" or first line" products of a reputable manufacturer.

2.03 COLORS

A. Colors shall be in accordance with a color schedule.

B. Colors of paints, including shades of stain, shall match color samples approved by the Engineer.

C. All colors shall be submitted to and approved by the Owner prior to application.

2.04 MIXING AND TINTING

A. Deliver paints and enamels ready-mixed to jobsite.

B. Accomplish job mixing and job tinting only when acceptable to Engineer.

C. Mix only in mixing pails placed in suitable sized non-ferrous or oxide resistant metal pans.

D. Use tinting colors recommended by manufacturer for the specific type of finish.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine surfaces scheduled to receive paint and finishes for conditions that will adversely affect execution, permanence or quality of work and which cannot be put into an acceptable condition through preparatory work as included in Preparation of Surfaces.

B. Do not proceed with surface preparation or coating application until conditions are suitable.

3.02 PREPARATION OF SURFACES

A. Remove mildew, by scrubbing with solution of tri-sidum phosphate and bleach. Rinse with clean water and allow surface to dry completely.

B. Remove surface contamination from aluminum surfaces requiring a paint finish by steam, high pressure water or solvent washing. Apply etching primer or acid etch. Apply paint immediately if acid etching.

C. Remove dirt, oil, grease and sand if necessary to provide adhesion key, when asphalt, creosote or bituminous surfaces require a paint finish. Apply compatible sealer or primer.

D. Remove dirt, grease and oil from canvas and cotton insulated coverings.

E. Remove contamination, acid etch and rinse new concrete floors with clear water. Ensure required acid-alkali balance is achieved. Allow to thoroughly dry.

F. Remove contamination from copper surfaces requiring paint; finish by steam, high pressure water or solvent washing. Apply vinyl etch primer or acid etch. Apply paint immediately if acid etching.

G. Remove contamination from copper surfaces required to be oxidized. Apply oxidizing solution of copper acetate and ammonium chloride in acetic acid. Rub on repeatedly for correct effect. Once attained, rinse surfaces well with clear water and allow to dry.

H. Remove contaminations from gypsum wallboard surfaces and prime to show defects, if any. Paint after defects have been remedied.

I. Remove surface contamination and oils from galvanized surfaces and wash with solvent. Apply coat of etching type primer.

J. Remove dirt, loose mortar, scale, powder and other foreign matter from concrete and concrete block surfaces which are to be painted or to receive a clear seal. Remove oil and grease with a solution of tri-sodium phosphate, rinse well and allow to thoroughly dry.

K. Remove stains from concrete and concrete block surfaces caused by weathering or corroding metals with a solution of sodium metasilicate after being thoroughly wetted with water. Allow to thoroughly dry.

L. Fill hairline cracks, small holes and imperfections on plaster surfaces with patching plaster. Smooth off to match adjacent surfaces. Wash and neutralize high alkali surfaces where they occur.

M. Remove grease, rust, scale, dirt and dust from steel and iron surfaces. Where heavy coatings or scale are evident, remove by wire brushing, sandblasting or any other necessary method. Ensure steel surfaces are satisfactory before paint finishing.

N. Clean unprimed steel surfaces by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolt and nuts are similarly cleaned. Prime surfaces to indicate defects, if any. Paint after defects have been remedied.

O. Sand and scrape shop primed steel surfaces to remove loose primer and rust and touch-up primer. Feather out edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime any bare steel surfaces. Field prime steel including shop primed steels where specified.

P. Wipe off dust and grit from miscellaneous wood items and millwork prior to priming. Spot coat knots pitch stacks and sappy sections with sealer. Fill nail holes and cracks after primer has dried and sand between coats. Back prime interior and exterior woodwork.

Q. Remove dust, grit and foreign matter from exterior wood siding which is to receive paint finish. Seal knots, pitch streak and sappy sections. Fill nail holes with exterior caulking compound after prime coat has been applied.

3.03 APPLICATION

A. Apply each coat at proper consistency.

B. Each coat of paint is to be slightly darker than preceding coat unless otherwise approved by Engineer.

C. Sand lightly between coats to achieve required finish.

D. Do not apply finishes on surfaces that are not sufficiently dry.

E. Allow each coat of finish to dry before following coat is applied, unless directed otherwise by manufacturer.

F. Where clear finishes are required, ensure tint fillers match wood. Work fillers well into the grain before set. Wipe excess from the surface.

G. Backprime interior woodwork, which is to receive paint finish, with exterior primer paint.

H. Backprime interior woodwork, which is to receive paint or enamel finish, with enamel undercoater paint.

I. Backprime interior and exterior woodwork, which is to receive stain and/or varnish finish, with gloss varnish reduced 25% with mineral spirits.

J. Prime top and bottom edges of metal doors with enamel undercoat when they are to be painted.

3.04 MECHANICAL AND ELECTRICAL WORK

A. Refer to mechanical and electrical sections with respect to factory made identification banding and labeling of equipment, ducting, piping and conduit.

B. Remove prime coated grilles, covers and access panels for mechanical and electrical systems from location and paint separately.

C. Finish paint primed equipment to color selected.

D. Where exposed to view in spaces otherwise scheduled to be painted, prime and paint insulated and bare pipes, equipment, conduits, boxes, insulated and bare ducts, hangers, brackets, collars and supports, except where items are factory painted, plated or covered with a pre-finished coating.

E. Replace identification markings on mechanical or electrical equipment when painted over or spattered.

F. Paint interior surfaces of air duct, convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint, to limit of sight line. Paint dampers exposed immediately behind louvers, grilles, covector and baseboard cabinets to match face panels.

G. Paint both sides and edges of any plywood backboards for electrical equipment before installing backboards and mounting equipment on them.

H. Color code equipment, piping, conduit and exposed ductwork in accordance with requirements indicated on color schedule to be used by the Engineer.

I. Paint all non-aluminum exposed conduit and mechanical ductwork, pipes, stacks, equipment and supports above the roof level or outside the building.

3.05 CLEANING

A. As work proceeds and upon completion, promptly remove paint where spilled, splashed or spattered.

B. During progress of work keep premises free from any unnecessary accumulation of tools, equipment, surplus materials and debris.

C. Upon completion of work leave premises neat and clean, to the satisfaction of Engineer.

3.06 SURFACES NOT TO BE PAINTED UNDER THIS SECTION

A. Structural steel and steel joists concealed from view.

B. Stone.

C. Prefinish wall, ceiling and floor coverings.

D. Prefinished cabinet work.

E. Items of equipment having factory applied final finish (other than prime coat).

F. Concealed ductwork (except as noted).

G. Concealed conduits (except as noted).

H. Concealed pipe insulation (except as noted).

I. Stainless steel, weathering steel and prefinished steel panels.

J. Aluminum, stainless steel, glass, chrome, siding and pressure treated wood.

3.07 PAINTING SYSTEMS

Items to be Painted	No. of Coats	Prime Coat	No. of Coats	Finish Coat
Interior Doors, Exterior Doors, Metal Frames, Metal Molding Panels, Sash	1 Coat	Mfg. Shop Applied Seal	2	Industrial Enamel B54 Series
Exterior Concrete/Masonry Below Grade and Aluminum Surfaces in contact with Concrete	1	TarGuard Coal Tar Epoxy B69R60/Red	2	TarGuard Coal Tar Epoxy B69B60/Black
Submerged Metal Surface (Below High Water Levels)	1	MacroPoxy 646 Fast Cure Epoxy B58 Series	3	MacroPoxy 646 Fast Cure Epoxy B58B600/Black
Metal Pipe, Conduit, Supports Structural members, Hydrants, Hose Bibs, Etc.	1	KemKromik Universal Metal Primer, B50 Series	2	Industrial Enamel B54 Series

Pums, Motors Like Machinery (If Not Shop Primed)	1	KemKromik Universal Metal Primer, B50 Series	2	Industrial Enamel B54 Series
Interior Masonry Walls	1	Heavy Duty Block Filler B42W46	2	TileClad HS Epoxy B62WZ Series
Exterior Carpentry	1	A-100 Alkyd Wood Primer Y24W20	2	Industrial Enamel B54 Series
Ceiling	1	PreRite 200 Latex Primer	2	Tile Clad HS Epoxy B62WZ Series
Interior Steel and Cast Iron (Includung Pipes)	1	KemKromik Universal Metal Primer, B50 Series	2	Industrial Enamel B54 Series

3.08 SCHEDULE - COLORS

A.	Conduits	-	OSHA Orange
B.	Potable Water Line	-	OSHA Blue
C.	Compressed Air Line	-	Dark Green
D.	Walls & Ceiling	-	To be selected by Owner
E.	Pumps	-	Manufacturer's Stds.
F.	Sewer Piping & Fittings	-	Gray
G.	Other Interior Metals	-	To be selected by Owner
H.	Exterior Metals	-	To be selected by Owner
I.	Siding, trim, doors	-	To be selected by Owner
J.	Chlorine Solution	-	Yellow
K.	Irrigation Piping	-	Olive Green

END OF SECTION 09900 – PAINTING

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SECTION 11308 – PUMP STATION

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Work covered by this item shall include but is not limited to excavation, sheeting and shoring, removal and disposal off-site of the existing ejector stations, bypass pumping of sewage during removal of existing ejector stations and start up of proposed pump stations (including by-pass pumping, back-up pumps, controls, and alarm system), dewatering and well pointing (if necessary) of the excavation, preparation of subgrade to provide a stable subgrade for the pump station and adjacent piping, furnishing and placement of all materials including stone bedding per details, modified pump station wet well, backfill (borrow where required), valve vaults, connections to existing force mains, compaction of backfill, and surface preparation including grading, topsoiling, seeding.

B. Furnish and install duplex submersible nonclog pumps, guide rails, internal piping, valves, control panel, level sensor, automatic pump controller, internal wiring and all accessories required by the Drawings and this Specification.

1.02 SUBMITTALS

A. Submit manufacturer's Shop Drawings, Product Data and installation instructions in accordance with Section 01300.

B. Prior to pump delivery, submit certified copies of factory pump performance tests.

C. By-pass pumping.

1.03 QUALITY ASSURANCE

A. Design and construct the pumps in accordance with standards of the Hydraulic Institute. The efficiency of the pumps, when operating under conditions of the specified capacities and heads shall be as near peak efficiency as practicable.

B. Obtain pumping equipment, motors, drives, pump controls and appurtenances from the pump supplier whose responsibility it is to insure that the pumping equipment is properly coordinated and operated in accordance with these Specifications.

C. After the installation is complete, a qualified factory representative shall place the pump station in operation, conduct a complete function check, and make all necessary adjustments for regular service in accordance with Section 01400.

D. Control components including control panel, level sensor and automatic controller shall be from the same manufacturer.

1.04 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Sections 01300 and 01700.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle equipment according to the provisions of Section 01600.

1.06 WARRANTY

A. Provide a one year warranty which begins when the pump station is placed in service in accordance with Section 01700.

1.07 PERMITS

A. If well pointing is necessary for dewatering, the Contractor will be responsible for obtaining any and all permits.

PART 2 PRODUCTS

2.01 PUMPS

A. GENERAL REQUIREMENTS

1. Contractor shall furnish all labor, materials, equipment and incidentals required to provide two non-clog submersible centrifugal sewage pump(s) and related appurtenances as specified and/or shown.

2. Pump shall be equipped with stainless steel nameplate, stating the unit is accepted for use in NEC class 1, division 1, group C, D hazardous locations with third party, Factory Mutual, approval.

B. OPERATING CONDITIONS

Furnish and install two submersible wastewater pumps suitable for pumping untreated sewage in each lift station.

1. LS #1 [ALTERNATE BID ITEM]: Provide two Hydromatic submersible solids handling pumps, model #H4HXP1000DC. Provide a 8.75" impeller and 4" ANSI discharge flange. Each pump shall be rated 10 HP, 208 volts, 60 hertz, 1800 RPM, 3 phase oil-filled design. The motor shall be explosion proof listed. The pumps shall operate at the following conditions; 0 GPM at 91 TDH and 500 GPM at 44 feet TDH with a minimum pump efficiency of 61%. The pump shall be capable of handling a 3' spherical solid. The pump shall be non-overloading throughout the entire rage of operation without employing service factor. The pump shall reserve a minimum service factor of 1.30. The performance curve submitted for approval shall state in addition to head and capacity performance, the pump efficiency, solid handling capacity and reflect motor service factor.

2. LS #2 [ALTERNATE BID ITEM]: Provide two Hydromatic solids handling submersible centrifugal sewage pumps, model #S4NX500DC. Each pump shall be rated 5 HP, 200 volts, 3 phase, 60 hertz, and 1750 RPM. The unit shall produce 310 US GPM at 31 feet TDH with a minimum pump efficiency of 62% and maximum input kW of 4.8 kW. The pump shall be capable of handling a 3' spherical solid. The pump shall be non-overloading throughout the entire rage of operation without employing service factor. The pump shall reserve a minimum service factor of 1.20. The performance curve submitted for approval shall state in addition to head and capacity performance, the pump efficiency, solid handling capacity and reflect motor service factor.

3. LS #3: Provide two Hydromatic solids handling submersible centrifugal sewage pumps, model #S4NVX500DC. Each pump shall be rated 5 HP, 200 volts, 3 phase, 60 hertz, and 1750 RPM. The unit shall produce 245 US GPM at 25 feet TDH with a minimum pump efficiency of 36% and maximum input kW of 4.8 kW. The pump shall be capable of handling a 3' spherical solid. The pump shall be non-overloading throughout the entire rage of operation without employing service factor. The pump shall reserve a minimum service factor of 1.15. The performance curve submitted for approval shall state in addition to head and capacity performance, the pump efficiency, solid handling capacity and reflect motor service factor.

    a. Furnish and install one submersible basin mixer in Lift Station #3 as indicated on the drawings:

        1. Provide one Hydromatic sealed submersible mixer, model HBM(X)200M6-4. The mixer shall be rated at 2 HP, 200 volts, 3 phase, 60 hertz and 1750 R.P.M.

B. CONSTRUCTION

Submersible wastewater pumps:

1. Impeller—ASTM B584-836 Ductile Iron Class 65 with SST
2. Fasteners/Hardware—316 Stainless Steel
3. Elastomers-O-Rings/Mechanical Seals/Cord Grip Grommets—Nitrile
4. Mechanical Seals—Carbon/silicon carbide
5. Volute— ASTM Class 30 with SST
6. Electrical Power Cord—Epoxy potted, a minimum of 35’

Submersible Basin Mixer:

1. The impeller, motor and seal housing—high quality gray cast iron, ASTM A-48, Class 30
2. All external mating parts—machined and Buna-N rubber O-ring sealed on a beveled edge
3. Gaskets are not acceptable
4. All fasteners exposed to the pumped liquid—300 series stainless steel.

C. MANUFACTURER

The pump shall be manufactured by Hydromatic Pump, Inc.

2.02 DUPLEX PUMP CONTROL PANEL

A. The duplex pump control panel shall be a factory wired with all applicable components for automatic operation of a set of duplex pumps controlled by a level pressure transducer as the primary control and ball floats for backup level control. Power supply will be 120/208 volt, 3-phase, 4 wire, 60 Hz.

B. The duplex pump control panel shall be a NEMA 12 aluminum enclosure. The enclosure shall be a wall mount type with a minimum depth of 8” sized to adequately house all the components. All operator components shall be mounted on the enclosure door. Cutouts for breaker handles shall be provided to allow operation of breakers without opening the door.

C. Each pump motor shall be provided with a NEMA rated starter and adequately sized MCP (motor circuit protector). The MCP shall provide short circuit and ground fault protection per the NEC. Pump circuit breakers shall be provided with locking provisions.

D. The control panel shall be inspected and approved as a complete unit and bear a serialized UL label. The inspection shall be as required under UL standard 508 Industrial Control Equipment.

E. The control system shall utilize a microprocessor-based controller. The microprocessor-based controller shall incorporate an indicator panel to allow monitoring of the system status, as well as a keypad to facilitate parameter changes, resets and manual operation of the station. Key switch or password protection shall be provided for locking control parameters against unauthorized change.

F. The microprocessor controller shall provide the following control features:
1. Pump 1 Run indicator
2. Pump 2 Run indicator
3. Pump 1 Drive Failure indicator
4. Pump 2 Drive Failure indicator
5. Wet Well High Level alarm
6. Manual/Off/Automatic Operation selector switch
7. Fault Reset pushbutton
8. Alarm Reset pushbutton
9. Alternation Mode selector switch (fixed sequence or alternating lead)

G. The Pump Control Panel shall provide the following manual operator control devices mounted in the door:
1. Pump 1 Manual-Off-Auto selector switch
2. Pump 2 Manual-Off-Auto selector switch
3. Pump 1 Running indicator
4. Pump 2 Running indicator
5. Pump 1 Elapsed Time meter
6. Pump 2 Elapsed Time meter
7. Pump 1 Temperature and Seal Leak Detection indicators
8. Pump 2 Temperature and Seal Leak Detection indicators
9. Wet Well High Level Interlock indicator
10. Wet Well High Level Interlock Reset pushbutton

H. The Pump Control Panel Trouble alarm will be a summary alarm point covering the following conditions:
1. Pump 1 Leak Detection
2. Pump 2 Leak Detection
3. Pump Control Panel Loss of Power
4. Analog Signal Failure

I. The keypad shall also provide access to set or change the following parameters:

1. Level settings of “Pump Run” and “Pump Stop”
2. Time delays for “Pump Run” and “Pump Stop”
3. Time delays for Delay Fault operation

J. Pump Controller Description

1. The pump controller shall normally operate the duplex pump system based on a 4-20mA analog Wet Well level signal. The level shall be displayed on the indicator panel, calibrated to show Wet Well level in feet. Operating set-points on this signal shall pilot the pump motor controllers On and Off. The controller shall alternate the Lead Pump after each Stop signal. The operating set-points shall be as follows:
   a. High Level Alarm
   b. Lag Pump Run
   c. Lead Pump Run
   d. Both Pumps Stop
2. The pump seals shall be monitored for leakage. The module shall signal an alarm on sensing a seal leak.
3. The pump motor temperature shall be monitored. An alarm shall be signaled on high motor temperature and the pump shall be shutdown.
4. The pump controller shall provide isolated (dry contact) relay outputs for the following conditions:
   a. Pump 1 Failure
   b. Pump 2 Failure
   c. Wet Well High Level
   d. Pump Control Panel Trouble
5. The micro-processor shall be a Micro V-PAC II as manufactured by Healy-Ruff or approved equal.

K. Backup Level Control

1. High and Low Level ball floats are to be provided as backup to the analog signal and microprocessor controller.
2. The ball float circuit shall consist of relay logic powered separately from the microprocessor controller. Failure of the analog controls, causing the Wet Well level to reach the High Level ball float, shall transfer control of the Station to ball float control and lock out all microprocessor output functions. On ball float control, both pumps shall run. Provide a 20 second (adjustable) time-delay between the starting of the two pumps so that the pumps do not both start at the same time.
3. When the level reaches the Wet Well Low Level ball float, both pumps shall stop.
4. Pressing a High Level Interlock Reset pushbutton shall return control to the microprocessor controller.

L. Hydromixer interlock consisting of SPDT relay that is energized whenever a sewage pump is operating shall be provided for enable/disable signal to the Hydromixer Control Panel.

2.03 BASIN MIXER CONTROL PANEL FEATURES

A. UL508A Panel with integrated Variable Frequency Drive and programmable timer for mixer cycle control. 200 volts, 3 phase, 60 Hz, 3 wire incoming service with power transformer, primary and secondary fusing

B. Hand/Off/Selector switch. Drive run and seals fail indicator lights

C. Nema 1 enclosure with hinged front access door and inner panel suitable for wall mounting with through the door rotary operator and pad lockable.

2.04 LEVEL TRANSDUCER

A. Provide a submersible level transducer to measure level.

1. The transducer body shall be manufactured from 316 stainless steel and include a 2 ½" convoluted VITON diaphragm. It shall be filled with Dow Corning series 200 silicone oil.
2. Transducer accuracy shall be ± 1% of full scale including linearity, hysteresis and repeatability over a temperature range of 32 to 122° F.
3. The transducer shall be provided with sufficient cable to reach the control panel and shall not be spliced.
4. An intrinsically safe barrier shall be provided.'

B. Transmitter shall be a Sigma Model 6100 or approved equal.

2.05 BALL FLOAT SWITCHES

A. The switch assembly shall be weighted and suspended on its own cable.

B. Functional/Performance:

1. Temperature Rating 0 to 50 degrees C
2. Contact Rating Up to 250 VAC/VDC, and 10 Amps AC, 5 Amps DC.
3. Contact Arrangement Normally Open or Open as required

C. Physical:

1. Contact Sealed mercury switch housed in a chemical-resistant polypropylene casing.
2. Flexible Support Cable Synthetic three wire cable, minimum 19 AWG wire. Provide cable of sufficient length to reach terminal boxes. No splices are allowed in the cable.

3. Specific Gravity Match to fluid being measured.
4. Manufacturers:
   Warrick – Series M
   Nohken, Inc. Model FQ-6A

2.06 PUMP ACCESSORIES

A. Lifting Cable: Each pump shall be equipped with 20 linear feet of SS lifting cable positive recovery system.

B. Guide Rails: Provide two 3/4 inch diameter stainless steel (Schedule 40) guide rails with guide rail brackets for the pump.

2.07 PUMP HOIST

A. Provide and install a portable, hand winch operated hoist with platform mounting base capable of lifting the pump from wet well considering an appropriate safety factor and required lift distance.

B. Hoist and base shall be of stainless steel.

C. Sufficient length of wire rope shall be supplied to allow complete removal of pump from wet well.

D. Portable hoist shall be Davit Crane, Thern Model 5110 M2.

2.08 SPARE PARTS

A. Pump manufacturer shall recommend and provide spare parts for first year of operation.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's recommendations, Specification Section 01600, and Drawings.

3.02 INITIAL START-UP

A. After the installation is complete, a qualified factory representative shall place the pump station in operation, conduct a complete function check, and make all necessary

adjustments for regular service in accordance with Specification Sections 01600 and 01650.

B. Manufacturer's representative shall certify in writing that pump and controls have been checked for:

1. Alignment
2. Rotation
3. Lubrication
4. Absence of pipe strain
5. Suction and discharge pressures
6. Current readings
7. Stop/start, lead/lag operation
8. Alternation of pumps
9. Alarm initiation
10. General installation conditions

3.03 EQUIPMENT DEMONSTRATION

A. After initial start-up, demonstrate that all components operate as specified in accordance with Specification Section 01400.

B. Ensure pumps operate at specified system fluid temperature without vapor binding and cavitation, provide the specified flow at system head conditions, are non-overloading in operation, and operate in accordance with the published efficiency curve.

C. Ensure controls operate as specified and initiate alarms as required.

D. Ensure hoist operates in accordance with manufacturer's requirements.

E. Provide instruction to Owner in accordance with Section 01400.

END OF SECTION 11308 – PUMP STATION

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SECTION 15000 – PIPING AND VALVING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Pipe and fittings
B. Valves
C. Wall pipe and sleeves
D. Hangers and supports
E. Adaptors and couplings
F. Labels

1.02 REFERENCE STANDARDS

A. National Standard Plumbing Code
B. AWWA C200, C208, C206, C207, C205, C203, C2l4 and AWWA Mll for steel pipe, fittings and joints, coatings and installation.
C. AWWA C900, Cll0, Clll, ASTM Dl785, D224l, F477, D3l39, Dl784, ANSI/ASTM 232l, D2729, ASTM C564 for PVC water and sewer pipe, fittings, joints, gaskets and installation.
D. ASTM Al20 for galvanized steel pipe.
E. AWWA C500 for gate valves.
F. AWWA C504 for butterfly valves.
G. AWWA C508 for swing check valves.
H. ANSI/AWWA C104/A21.4 - Cement - Mortar Lining for Ductile Iron Pipe and Fittings for Water.
I. ANSI/AWWA C110/A21.10 - Ductile Iron and Gray Iron Fittings.
J. ANSI/AWWA C111/A21.11 - Rubber Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings.
K. ANSI/AWWA C115/A21.15 - Flanged Ductile Iron Pipe with Ductile Iron or Gray Iron Threaded Flanges.
L. ANSI/AWWA C150/A21.50 - Thickness Design of Ductile Iron Pipe.
M. ANSI/AWWA C151/A21.51 - Ductile Iron Pipe Centrifugally Cast.
N. ANSI/AWWA C153/A21.10 - Ductile Iron Compact Fittings, 3 in. through 16 in. for Water and other liquids.
O. ANSI/AWWA C600 - Installation of Ductile Iron Water Mains and their Appurtenances.
P. ASTM D2774 – Recommended Practice for Underground Installation of Thermoplastic Pressure Piping and PVC Pipe.
Q. ASTM D3034 - Specification for Sewer Pipe and Fittings.
R. ASTM D3212 – Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
S. ASTM D2564 – Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
T. ASTM D2321 – Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe.
U. ANSI B31.1 – Code for Pressure Piping.
V. ASTM D1248 – Polyethylene Plastics molding and Extrusion Materials.
W. ASTM D2837 – Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials.
X. ASTM D3350 – Polyethylene Plastic Pipe and Fitting Materials.
Y. ASTM B88-96 Seamless Copper Water Tube.

1.03 QUALITY ASSURANCE

A. Materials shall conform to manufacturer's specifications and instructions.

1.04 SUBMITTALS

A. Submit samples, manufacturer's product data and installation instructions in accordance with Section 0l300.

B. Submit manufacturer's technical Product Data, installation instructions, and directions for adjustment for all Products required to complete Work of this Section.

C. Submit Shop Drawings: Indicate pipe materials and fittings used, valves, joining methods, all equipment of this Section, installation and piping connections for all piping systems to be installed under this Section.

D. Submit one set of as-built plans for all water mains including horizontal locations and vertical elevations to the Owner upon completion of work. Submit a second set to the State Division of Public Health Office of Drinking Water (see Paragraph 3.05.A. of this Section).

1.05 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 01300 and 01700.

B. Maintenance Instructions: Include maintenance instructions and procedures, and spare parts lists.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle Products to site under provisions of Section 01600.

B. Deliver and store valves in shipping containers, with labeling in place.

C. Provide temporary protective coating on valves.

D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

PART 2 PRODUCTS

2.01 MANUFACTURER'S

A. Where manufacturer's products are specified, it is for the purpose of establishing a standard of quality and construction.

B. Request for substitution of equivalent products of other manufacturer's may be submitted under the provisions of Paragraph 1.06.C. of Section 01600 at least 10 calendar days prior to bid.

2.02 DUCTILE CAST IRON PIPE (DIP)

A. Ductile cast iron pipe shall conform to AWWA Cl50 and AWWA Cl5l and shall have an ANSI Class 52 minimum thickness for below grade installation and ANSI Class 53 minimum thickness for above grade piping unless otherwise specified.

B. All buried pipe shall receive an outside bituminous seal coat and cement interior lining in accordance with AWWA C104. Above ground or exposed piping shall be uncoated and suitable for painting.

C. Above ground or exposed ductile cast iron pipe shall be flanged in accordance with ANSI A21.15. Buried ductile cast iron pipe shall have push-on joints or mechanical joints. Rubber gaskets shall conform to AWWA Clll for mechanical and push-on joints.

D. Ductile cast iron fittings shall conform with the "Standard Specifications for Ductile Cast Iron Pipe and Special Castings" for Class D fittings. All buried joints shall be restrained type similar to Mega-lug or equal.

E. All gaskets between flanged connections and fittings shall be non-asbestos composition minimum thickness of 1/8", and shall be coated with thread lubricant prior to making up joints. Flange bolts, nuts and washers shall be of mild steel with sound, well-fitted threads, the nuts shall be cold-punched, hexagonal, trimmed, and chamfered. Heads, nuts and threads shall be United States standard sizes. Bolts shall be of such length as to project one-quarter inch beyond the nut when the flanged joint with gasket is assembled.

F. Ductile iron pipe shall be as manufactured by U.S. Pipe and Foundry Company, Inc., American Cast Iron Pipe Company, or approved equal.

2.03 STAINLESS STEEL PIPE

A. Stainless steel pipe shall be Schedule 5, Schedule 10 or Schedule 40 as shown on the drawings. Stainless steel pipe shall meet the requirements of ASTM A312/A 312 M, seamless, Grade TP316, Schedule 40S with dimensions conforming to ASME B36.19M.

B. Schedule 5 and 10 pipe shall be 304L stainless steel.

C. 1 through 3 inch shall be Schedule 40.

D. Stainless steel piping shall be joined by threaded couplings. Dielectric fittings or isolation joints shall be provided between all dissimilar metals.

E. Stainless steel threaded fittings shall be austenitic stainless steel, ASTM A182/A 182M Grade TP 316, conforming to ASME B16.11, and threaded in accordance with ASME B1.20.1. Polytetrafluoroethylene (PFE) pipe thread tape conforming to ASTM D3308 shall be used for lubricant/sealant.

2.04 PVC GRAVITY PIPE

A. PVC pipe compound shall conform to ASTM D1784. "Standard Specification for Rigid Polyvinyl Chloride (PVC) Compounds".

B. PVC pipe eight inches and larger shall conform to ASTM D3034, SDR 35, Type PSM, with integral bells meeting requirements of ASTM D3212. Rubber gaskets shall conform to ASTM F477.

C. Fittings for PVC pipe eight inches and larger shall conform to ASTM D3034, SDR 35, Type PSM. Joints shall meet requirements of ASTM D3212 and gaskets shall conform to ASTM F477.

D. Pipe and fittings shall be manufactured by CertainTeed Corporation; J-M Manufacturing Company, Inc. or equal.

2.05 PVC PRESSURE PIPE

A. PVC materials shall meet the requirements of ASTM D-l784, "Standard Specification for Rigid Polyvinyl Chloride (PVC) Compounds". Cell classification 1245-A or l245-B.

B. Underground PVC pressure pipe less than 4".

1. Pipe shall be of size shown on Drawings, manufactured in accordance with ASTM D2241 with gasketed bell and spigot push-on joints. Gaskets shall comply with ASTM F477. All joints shall comply with ASTM D3139. Laying lengths shall be twenty (20') feet.

2. Wall thickness shall be SDR 21 Pipe shall be clearly marked with SDR number and size.

3. All fittings shall be gasketed push-on.

C. Above ground PVC pipe less than 4"

1. Pipe shall meet the requirements of ASTM D1785, Schedule 40 or Schedule 80 where indicated on Drawings.

2. Fittings, etc. shall meet the requirements of ASTM D2466, D2467, or D2464 Type 1, Grade 1.

3. Schedule 40 PVC and fittings pipe shall be solvent cemented and the cement shall conform to ASTM D2564.

4. Schedule 80 PVC pipe and fittings may be solvent cemented or theaded.

2.06 WATER SERVICE PIPE

A. All below ground water service pipe shall be HDPE SDR-11 tubing/pipe. Transition to copper service shall be made above the finish floor, unless otherwise indicated on drawings.

2.07 FITTINGS AND JOINTS

A. Unless otherwise specified, fittings shall be, in general, of the same material, weight and class and shall have the same lining and coating as the pipelines in which they are installed.

2.08 GATE VALVES

A. Valves 12" or smaller

1. Gate valves shall be furnished and installed where indicated on the Drawings. Each gate valve shall conform to AWWA Standard C509 for resilient wedge gate valves. The cast iron gate valves shall be epoxy coated inside and out. The valve stem shall be constructed of manganese bronze and shall be equipped with a wedge nut to provide low operating torque. Stem sealing shall be accomplished by dual o-rings allowing replacement of o-ring seals while the valve is open and under pressure. Buried valves shall be equipped with a two inch square operating nut. Valves shall be Mueller Model H-2370-20, Clow Corporation, M&H Valve, A.P. Smith Company, Darling, Kennedy or approved equal.

B. Valve Key

1. The Contractor shall furnish two five foot long valve operating wrenches, Mueller A-24510 or equal.

C. Valve Boxes

1. All buried valves shall be furnished with a suitable cast iron valve box. Valve boxes shall be two or three piece, screw or slide type installed over the bonnet and operating nut of the valve and be of sufficient length to reach the surface of the

ground, but not to extend above the ground surface. They shall be Clow F-2450, F-2452, F-2454 or approved equal. Valve box covers (similar to Clow F-2490) shall be marked “SEWAGE” or “WATER” as appropriate.

2. Installation shall be such that when setting a valve box in place, the base should rest two or more inches above the flanged joint of the cover. The top of the operating nut should be no higher than the hub or upper part of the valve box base where it connects to the center section. This location for the valve box will leave ample space all around the valve, prevent the box from touching the valve in any way, and permit free access to the operating nut with a valve wrench.

2.09 CHECK VALVE

A. Check valves shall be furnished and installed where indicated on the Drawings. Each valve shall conform to AWWA C508. Each check valve shall be of the iron body, bronze-mounted swing type. Valve body, bonnet and disc shall be ASTM Al26 cast iron. Body shall be furnished with ASA Bl6.l l25E flanges. Bonnet shall be sufficiently large to permit cleaning and maintenance of inner works without removing the valve body from the line. Disc and valve body shall be provided with machine-faced bronze seating rings. Valve disc shall be securely bolted to malleable iron hinges; hinges shall be secured to bronze hinge pins, supported by bronze bearings mounted in the valve body. Hinge pins shall extend through the valve bearings mounted in the valve body. Hinge pins extend through the valve body and shall be suitable for attachment of outside weight and lever assembly. They shall be as manufactured by Dresser, Fairbanks, Clow, GA Industries, Apco Industries.

2.10 AIR RELEASE VALVES

A. Air release valves shall be single body combination air valves for sewage service. The valves shall be float operated. The valves shall be designed to exhaust large amounts of air during filling, admit large amounts of air upon impending vacuum during draining, and automatically release accumulated air and gases from a sewage pipe while the system is pressurized and operating. Body and cover shall be ASTM A126 Class B cast iron. Leverage mechanism and float shall be stainless steel. Orifice seats shall be Buna-N. The valve shall be manufactured by GA Industries, Model Fig. 942F, 2” X 2” or approved equal. Flushing attachments shall be provided.

B. Valves installed on irrigation effluent mains inside the control building shall have outlet piped to nearest floor drain as shown on drawings. These valves shall be short body sewage air and vacuum valves, Model 935-F with 2” NPT inlet and 1” NPT outlet.

2.11 BUTTERFLY VALVES

A. Butterfly valves shall be furnished and installed where indicated on the drawings. Each valve shall conform to pressure class 150B AWWA C504. Each valve shall be of cast iron construction with mechanical joints. Valves shall have molded rubber seats and shall be bubble tight under all pressure conditions. Valve shall be designed for direct burial and shall be provided with buried service operator with 2” standard AWWA nut. Valve shaft shall be 18-8 Type 304 stainless steel, two piece, stub type, keyed for operator connection. Valve operator shall be designed to hold the valve in any intermediate position between full open and fully closed without creeping or fluttering.

B. Valves shall be “Groundhog” butterfly valves as manufactured by the Henry Pratt Company, equal valve by DeZurik, Clow, or approved equal.

2.12 YARD HYDRANTS

A. The yard hydrant spout shall be cast iron, threaded for 3/4 inch hose, with a 1" galvanized pipe column. The cast beams shut-off valve shall be operated below frost line. The upright pipe shall drain through a drain hole in the shut-off valve. The yard hydrant shall be as manufactured by Woodford Model Y34, or equal.

2.13 FIRE HYDRANTS

A. Hydrants shall be dry-barrel type conforming to AWWA C502 with valve opening at least 5 inches in diameter and designed so that the flange at the main valve seat can be removed with the main valve seat apparatus remaining intact, closed and reasonably tight against leakage and with a breakable valve rod coupling and breakable flange connections located no more than 8 inches above the ground grade. Mueller Model No. A-423 Super Centurion 250, or equal.

B. All proposed fire hydrants and water mains shall be installed in accordance with the most current edition of the Delaware State Fire Prevention Regulations (DSFPR Regulation 702, Chapter 6 & 7)

C. Fire hydrants shall be color coded in accordance with the DSFPR Regulation 703, Chapter 3, Section 4. This includes both color coding the bonnet and 2" reflective tape around the barrel under the top flange

D. Hydrants shall have a 6 inch bell connection, two 2-1/2 inch hose connections and one 4-1/2 inch pumper connection.

E. All threads provided for fire department connections, to sprinkler systems, standpipes, yard hydrants, or any other fire hose connections shall be uniform to those used by the fire department in whose district they are located (DSFPR Regulation 703, Chapter 1, Section 1.5).

F. Working parts shall be bronze.

G. Design, material, and workmanship shall be equal to the latest stock pattern ordinarily produced by the manufacturer.

H. Suitable bronze adapter for each outlet, with caps, shall be furnished.

2.14 PRESSURE GAUGE

A. Liquid filled pressure gauges shall be supplied with l/2" valves with black, drawn steel cases and 4-l/2" dials. Pressure gauges shall be Model l279 - 4-l/2" - A - stem - l/2 NPT LM as manufactured by Ashcroft or approved equal. The pressure range figure interval, and gradation shall be as selected by Engineer for each location. Provide gauge saver with elastomeric bladder to protect each pressure gauge from process fluid.

2.15 WALL SLEEVES AND WALL PIPES

A. Pipe passing through walls, floors or other structural members shall utilize wall sleeves or wall pipes as shown on the Contract Drawings.

B. Wall sleeves shall be steel with an intermediate waterstop flange as manufactured by Thunderline Corporation or approved equal. Sleeves shall be primed in accordance with Section 09900.

C. All sleeves and wall pipes shall be sized to conform to the Contract Drawings.

D. Pipe and sleeves for non-water containing structures shall be sealed with Link-Seal as manufactured by Thunderline Corporation or filled with non-shrink grout.

E. Wall pipes for water containing structures shall be D.I.P. as manufactured by Clow Corp. or approved equal.

2.16 FLOOR BOXES

A. Floor boxes shall be cast in precast concrete vault tops where indicated on Drawings. Floor boxes shall provide support for extension stems and provide cover for operating nut.

B. Floor boxes shall be bushing type F-5695 by Clow Corporation or approved equal.

2.17 STEM EXTENSIONS AND GUIDES

A. Stem extensions and guides shall be installed where indicated on Drawings and shall be sized according to manufacturer's recommendations based on project conditions. Guides shall be installed at locations which does not allow stem be unsupported for more than 10 feet.

B. Stem guide shall be Type 5660 by Clow Corporation or approved equal.

C. Stem extension shall be provided by sluice gate manufacturer in required length to allow installation as shown on Drawings.

2.18 HIGH DENSITY POLYETHYLENE (HDPE) PIPE

A. The pipe shall be made from polyethylene resin compound qualified as Type III, Category 5, Class C, Grade P34 in ASTM D1248. This material shall have a long-term hydrostatic strength of 1600 psi when tested and analyzed by ASTM D2837.

B. The raw material shall contain a minimum of 2%, well dispersed, carbon black.

C. The pipe shall contain no recycled compound except that generated in the manufacturer's own plant from resin of the same specification and from the same raw supplier.

D. The minimum cell classification shall be PE 345434C for PE 3408 materials per ASTM D3350.

E. Compliance with the requirements of this paragraph shall be certified in writing by the pipe supplier, upon request.

F. The pipe shall be SDR11 as manufactured by KWH Pipe, Ltd.; Phillips Driscopipe or equal.

2.19 COPPER PIPE

A. Above ground copper pipe shall be Type L conforming to ASTM B88-96.

B. Underground copper pipe shall be Type K conforming to ASTM B88-96.

C. Copper fittings shall be compressive type only.

2.20 TRANSITION COUPLINGS

A. Transition couplings between differing piping materials, and where indicated on drawings, shall have cast iron sleeves, ductile or malleable iron glands, corrosion resistant alloy

steel bolts and nuts. Glands and gaskets of appropriate type to fit pipe O.D. shall be supplied.

B. Transition couplings shall be Smith Blair cast coupling or equal.

2.21 PIPE TAPS

A. Provide taps where shown or required for small pipe or instrument connections. Where the pipe or fitting wall thickness is insufficient to provide required number of threads, a stainless steel boss or stainless steel tapping saddle shall be installed or pipe class shall be increased. Threads shall be protected with temporary plugs.

2.22 UNDERGROUND WARNING TAPE

A. Contractor shall provide and install underground detectable warning tapes for all underground pipeline installations. Metal detector shall be capable of locating tape. Tape shall be marked as required for water, sewer or electric.

2.23 BALL VALVES

A. Provide ball valves of the size shown on the Drawings. Bronze ball valves shall be one piece body with bronze trim and TFE seats, Nibco Model T-560-BR-Y-20 or approved equal.

2.24 BACKFLOW PREVENTER

A. Backflow preventer shall be reduced pressure principle type in accordance with AWWA C511 consisting of two independently acting poppet-type check valves, an automatic pressure differential relief valve located between the two check valves; and four test cocks for field testing. Backflow preventer shall be Cla-Val Co. Model RP-2 or equal.

2.25 PVC/DIP ADAPTERS

A. Where indicated on the Drawings, Contractor shall supply Smith Blair 413 steel transition coupling, Clow Transition Sleeve, or approved equal for joining PVC to other pipe materials, except with AWWA C-900 pipe which shall have DIP fittings.

2.26 PLUG VALVES

A. Plug valves shall be cast iron body rated for 150 psi with neoprene resilient plug, stainless steel bearings, and Buna N packing. Valves shall be flanged style, lever actuated with adjustable, open position memory stop.

2.27 ASBESTOS CEMENT PIPE

A. The DNREC Division of Air and Waste Management, Air Quality Management Section (302-323-4542) will be contacted at least five business days before any work related to the existing asbestos cement pipe occurs.

B. All work related to the existing asbestos cement pipe will be performed in accordance with paragraphs (a) through (e) of Section 10.9 of Regulation No. 21, Emission Standards for Hazardous Air Pollutants of the Delaware Regulations Governing the Control of Air Pollution.

C. Cutting of the existing asbestos cement pipe will be performed with wet cutting tools only and the cutting area will be kept continuously wet during the cutting operation. Any crushing or pulverizing of the asbestos cement pipe is completely prohibited.

D. Sections of asbestos cement pipe needing to be removed to allow room for new pipe tie ins or capping for replacement of flowable fill will be buried in a trench immediately adjacent to the sections of pipe to remain and will be backfilled with suitable on site excavated material meeting the requirements of type “C” backfill compacted in 8” lifts.

PART 3 EXECUTION

3.01 PRESSURE PIPE AND VALVE INSTALLATION

A. Pipe installation shall comply with the requirements of AWWA C600 (latest revision). All pipe shall be installed according to manufacturer's written instructions.

B. The Contractor shall verify the dimensions of all valves, fittings, equipment, etc., so that all of the pipework performed will fit together properly and conform to the general arrangement shown on the Drawings. All pipe, valves, fittings and related accessories shall be carefully examined for defects before installing and no defective pieces shall be installed. All pieces shall be thoroughly cleaned before they are installed and shall be kept clean and dry.

C. Adjoining pipe, valves and/or equipment to be joined by flanges shall be blocked and shimmed to true elevation with bolt holes in perfect alignment before bolts are inserted and tightened. Bolts shall be tightened uniformly. Drawing skewed joints into alignment by tightening flange bolts will not be permitted. All gaskets between flanged connections and fittings shall be coated with thread lubricant prior to making up joints. Flange bolts, nuts and washers shall be of mild steel with good, sound, well-fitted threads; the nuts shall be cold-punched, hexagonal, trimmed, and chamfered. Heads, nuts and threads shall be United States standard sizes. Bolts shall be of such length as to project one-quarter inch beyond the nut when the flanged joint with gasket is assembled.

D. Piping shall be firmly and properly supported by malleable or wrought iron hangers, guides, saddles, clamps, etc., as necessary. Concrete pedestals or piers shall be provided where indicated or required. Where drilling of anchor bolt holes becomes necessary, the Contractor shall secure permission from the Engineer prior to starting the drilling. The Contractor shall furnish and install all necessary supports, hangers, guides, saddles, clamps, etc. required to provide a complete operational facility. The type of hangers, guides, etc. shall be reviewed with the Engineer and meet with his approval.

E. During construction, the Contractor shall keep all ends of pipes or conduits, and all equipment connections, closed with caps, plugs, or wooden flange covers, so as to prevent entrance of dirt, building materials, or other foreign matter.

F. Proper and suitable tools and equipment for the same and convenient handling and laying of the pipe and fittings shall be used in accordance with the manufacturer's standards. Pipe and fittings shall be carefully handled and lowered into position.

G. Whenever a pipe requires cutting to fit in the line to bring it to the required location, the Work shall be done without extra compensation, in a satisfactory manner so as to leave a smooth end perpendicular to the axis of the pipe.

H. Before any joints are actually made, the Contractor shall demonstrate to the Engineer, by making a sample joint, that the methods he will employ conform with specifications and will secure a watertight joint, and that the workmen whom he intends to use in this Work are familiar with the requirements.

I. All laying, jointing, testing for defects and for leakage shall be performed in the presence of the Engineer. All defects in workmanship rejected by the Engineer shall be promptly corrected by the Contractor and defective material removed from the Project.

J. The excavation in which the pipe is being laid shall be kept free from water, and no joint shall be made under water, care shall be used to secure water-tightness and to prevent damage to, or the disturbing of, the joints during the backfilling process or at any other time. After pipes have been laid and the joints have been made, there shall be no walking on or working over them except as may be necessary in tamping until there is a covering at least two (2) feet in depth over their top. After joint materials, which require it, have received their set, backfilling of the trench may proceed in the manner specified.

K. A metallic lined underground warning tape shall be placed over the entire length of all buried pipe. The tape shall be placed 24" above the pipe. The tape shall be 3", color green, with the message "Buried Sewer Line Below". Tape shall be equal to "Seton Nameplate Corporation" detection tape printed on polyethylene with a metallic core.

L. Before joints are made, each pipe shall be well bedded on a solid foundation and no pipe shall be brought into position until the preceding length has been thoroughly embedded and secured in place. No pipe shall be laid in wet trench conditions that preclude proper bedding, or on a frozen trench or weather conditions are unsuitable for proper installation. Any defects due to settlement shall be corrected by the Contractor at his own expense. Bell holes or coupling holes shall be dug sufficiently large to insure making of proper joints. In no case will pipe be closer than four (4) inches from bed rock.

M. In laying pipe, special care shall be taken to insure that each length shall abut against the next in such a manner that there shall be no shoulder or unevenness of any kind along the inside of the pipe line.

N. No wedging or blocking will be permitted in laying pipe unless by written order from the Engineer.

O. Pipe and fittings shall be thoroughly cleaned before they are laid and shall be kept clean until the acceptance of the completed Work. The open end shall be kept closed with a stopper until the next length is laid. At the close of work each day, the end of the pipe line shall be tightly closed with an expansion stopper so that no dirt or other foreign substances may enter the line, and this stopper shall be kept in place until pipe laying is again resumed.

P. Cold weather protection shall be provided, during freezing weather, for all masonry, mortar and concrete construction connected with the exterior piping by maintaining a temperature of not less than 50°F for a period of three (3) days, or by backfilling immediately, or by covering with backfill material in a temporary manner, all as directed by the Engineer.

3.02 TESTING OF PRESSURE PIPES

A. The Contractor shall furnish all labor, tools, materials, including water and equipment, including pumps, compressors, stopwatch, gauges and meters subject to the approval of the Engineer for testing in accordance with these specifications.

B. The Engineer shall be notified in advance of all tests and all tests shall be conducted to his entire satisfaction.

C. <u>All</u> pressure pipe shall be tested according to AWWA C600. Minimum test pressure shall be 100 psi. The effluent force mains shall be tested at 150 psi.

D. The mains shall be filled with water, supplied by the Contractor, or as directed by the Engineer, and the pressure raised to obtain a minimum test pressure measured at the highest point of the section of pipeline under test. Particular care shall be taken to eliminate all air from the pipeline. The mains shall be subject to a leakage test at the specified test pressure, measured at the highest point of the section of pipeline under test. This test shall

be a minimum of four (4) hours' duration during which time the leakage shall not exceed the leakage limits.

E. All leaks shall be repaired by the Contractor at no expense to the Owner. The Contractor shall make any and all repairs at his expense that may be necessary until the leakage test requirements have been met.

F. Contractor shall test all pipe in the presence of the Engineer. All defects revealed by the tests, shall be corrected by the Contractor by replacement or repair of materials, as directed by the Engineer, at the Contractor's expense. After such replacement and/or repair, tests shall be repeated until all piping system are shown to be tight to the degrees specified. All labor, tools, materials, and equipment necessary for making these tests shall be adequately braced and supported during the test to prevent movement, displacement, or damage upon application of the test pressure. All equipment used in testing shall be subject to the approval of the Engineer.

G. Pressure Pipe (Greater Than 6 psi Working Pressure)

1. All pressure pipe shall be tested in accordance with AWWA C600.

2. Pressure pipe shall be tested for a minimum working pressure of 100 psi. Test pressure for the effluent force main shall be tested at 150 psi.

3. No pipe installation shall be accepted if the leakage is greater than the value calculated for allowable leakage.

Allowable leakage per 1,000 ft. of pipeline*

Nominal Pipe Diameter (in.)	Allowable Leakage (GPM) per 1,000 ft. 100 psi	150 psi	200 psi
1	0.08	0.09	0.11
1.5	0.11	0.14	0.16
2	0.15	0.18	0.21
3	0.23	0.28	0.32
4	0.30	0.37	0.42
6	0.45	0.55	0.64
8	0.60	0.74	0.85
10	0.75	0.92	1.06
12	0.90	1.10	1.27
16	1.20	1.47	1.70
36	2.70	3.31	3.82

If the pipeline contains sections of various diameters, the allowable leakage will be the sum of computed leakage for each size.

*Taken from AWWA C600-87.

a. Any section of pipe disclosing leakage greater than specified shall be repaired or replaced at Contractor's expense and retested as necessary until the leakage is within the specified allowance.

b. Visible leaks shall be repaired at Contractor's expense regardless of amount of leakage.

c. Pipe shall be accepted when all repairs are completed, pipe has been retested, and leakage is within specified allowance.

3.03 BUTTRESSES AT FITTINGS

A. Buttresses shall be installed on all underground pressure lines at all valves, bends, tees, and at reducers or other fittings where changes in direction or pipe size occur. The buttresses shall be as shown on the Drawings. Concrete shall bear against solid, undisturbed earth.

B. Cold weather protection shall be provided, during freezing weather, for all masonry, mortar and concrete construction connected with the piping by maintaining a temperature of not less than 60 deg F. for a period of three (3) days.

3.04 DISINFECTION OF PIPING

A. All piping, fittings and related equipment which carry potable water shall be disinfected before water is used for domestic consumption. The procedure to be used shall be in accordance with the latest edition of AWWA Standard C65l. Contractor shall obtain Certificate of Approval to Operate from the State Division of Public Health Office of Drinking Water and submit a copy to the owner.

B. Water for disinfection shall be furnished by the Contractor from an approved source; the Contractor shall furnish and install all bulkheads, pipes, valves, taps, plugs, labor and other equipment required to sterilize the facilities. Water for filling the facilities should be introduced slowly and the quantity of chemical applied proportionately to the rate of water introduced.

C. Water used for disinfection shall be disposed of in environmentally sound manner and to prevent damage to work of other sections.

3.05 SEWER (NON-PRESSURE) PIPE INSTALLATION

A. No pipework is to be started until all materials, layout, schedules, stakeout, and cut sheets have been approved by the Engineer in writing. Samples of all materials to be incorporated in the Work shall be submitted for the approval of the Engineer sufficiently in advance of Work commencement to allow time for specified testing. Sewer pipe alignment shall be maintained through the use of laser alignment equipment. All installation shall follow the requirements of ASTM D232l.

B. Proper and suitable tools and equipment for the safe and convenient handling and laying of the pipe and fittings shall be used in accordance with manufacturer's standards. Pipe and fittings shall be carefully handled and lowered into the trench.

C. Whenever a pipe requires cutting to fit in the line or to bring it to the required location, the Work shall be done without extra compensation, in a satisfactory manner so as to leave a smooth end perpendicular to the axis of the pipe.

D. Before any joints are actually made in the trench, the Contractor shall demonstrate to the Engineer, by making a sample joint, that the methods he will employ conform with specifications and will secure a watertight joint, and that the workmen whom he intends to use in this Work are familiar with the requirements.

E. All laying, jointing, testing for defects and for leakage shall be performed in the presence of the Engineer. All defects in workmanship rejected by the Engineer shall be promptly corrected by the Contractor and defective material removed from the Project.

F. The excavation in which pipe is being laid shall be kept free from water, and no joint shall be made under water. Care shall be used to secure water-tightness and to prevent damage to, or the disturbing of, the joints during the backfilling process or at any other time. After pipes

have been laid and the joints have been made, there shall be no walking on or working over them except as may be necessary in tamping until there is a covering at least two (2) feet in depth over their top. After joint materials, which require it, have received their set, backfilling of the trench may proceed in the manner specified.

G. Before joints are made, each pipe shall be well bedded on a solid foundation and no pipe shall be brought into position until the preceding length has been thoroughly embedded and secured in place. No pipe shall be laid in wet trench conditions that preclude proper bedding, or on a frozen trench bottom, or when in the opinion of the Engineer, the trench or weather conditions are unsuitable for proper installation. Any defects due to settlement shall be corrected by the Contractor at his own expense. Bell holes or coupling holes shall be dug sufficiently large to insure making of proper joints. In no case will pipe be closer than four (4) inches from bedrock.

H. In laying pipe, special care shall be taken to insure that each length shall abut against the next in such a manner that there shall be no shoulder or unevenness of any kind along the inside of the pipe line.

I. No wedging or blocking will be permitted in laying pipe unless by written order from the Engineer.

J. Pipes and fittings shall be thoroughly cleaned before they are laid and shall be kept clean until the acceptance of the completed Work. The open end shall be kept closed with a stopper until the next length is laid. At the close of work each day, the end of the pipe line shall be tightly closed with an expansion stopper so that no dirt or other foreign substances may enter the line, and this stopper shall be kept in place until pipe laying is again resumed.

K. Cold weather protection shall be provided, during freezing weather, for all masonry, mortar and concrete construction connected with the exterior piping by maintaining a temperature of not less than 50°F for a period of three (3) days, or by backfilling immediately, or by covering with backfill material in a temporary manner, all as directed by the Engineer.

L. All dead-ends of pipe lines, and fittings, shall be provided with standard plugs and caps either temporarily or permanently as directed by the Engineer. A concrete or other approved thrust blocking shall be provided at all dead ends. Where plugged or capped outlets are to be tied to fittings with clamps and tie rods, as indicated on the Contract Documents or as directed by the Engineer, the minimum number and size of rods and other pertinent details shall be as shown and/or specified.

M. A metallic lined underground warning tape shall be placed over the entire length of all buried pipe. The tape shall be placed 12” below grade. The tape shall be 3”, color green, with the message “Buried Sewer Line Below”. Tape shall be equal to “Seton Nameplate Corporation” detection tape printed on polyethylene with a metallic core.

N. Manholes shall be built as pipe laying progresses, and the Engineer may stop work entirely on laying pipe until the manhole just passed has been completed.

3.06 SEWER (NON-PRESSURE) PIPE TESTING

A. The Contractor shall furnish all labor, tools, materials including water and equipment including mirrors, flashlights or other artificial lighting, weirs, pump, compressors, stopwatch, gauges, and meters, subject to the approval of the Engineer for testing in accordance with these specifications.

B. Acceptance Pressure Test:

1. All branch fittings and ends of lateral stubs shall be securely plugged to withstand internal test pressures. The section of line being tested shall also be securely plugged at each manhole. All stoppers shall be adequately braced when required.

2. Air shall be slowly supplied to the plugged pipe line until the internal air pressure reaches 8.0 pounds per square inch. At least two minutes shall be allowed for temperature stabilization before proceeding further.

3. The rate of air loss shall then be determined by measuring the time interval required for the internal pressure to decrease by l.0 pound per square inch.

4. The line shall be considered acceptable if the time, T, in seconds; required for the l.0 psi pressure drop is not less than l0 minutes.

C. Acceptance Visual Test:

1. A high powered light shall be placed at one end of the line in a manhole and the Contractor, in the presence of the Engineer, shall place a mirror at the next manhole to visually inspect the sewer for cleanliness and straightness.

3.07 PROTECTION OF INSTALLED WORK

A. Protect installed pipe, joints, fittings and appurtenances from damage or displacement during the backfilling process or other construction activities.

B. Keep pipe interior free from debris. Stopper open ends of pipe each day and until next length of pipe is laid.

3.08 ADJUSTING

A. Adjust Work in accordance with Section 01700 and manufacturer's instructions.

END OF SECTION 15000 – PIPING AND VALVING

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SECTION 16010 - GENERAL PROVISIONS

PART 1 GENERAL

1.01 NOTICE

A. The General Conditions, Special Conditions, General Requirements and Drawings are hereby made a part of this Section as fully as if repeated herein. Contractor shall consult these sections in detail, as he will be responsible for and governed by conditions set forth therein and work indicated.

B. Attention is directed to other sections of the specifications, which affect the work under this section.

C. The Contractor shall be responsible for coordination with Delmarva Power for the disconnection and reconnection of the primary service at the primary meter on Howell School Road and the disconnection of the existing service and the new primary service along Route 71. Any charges by Delmarva Power for their work shall be borne by the Contractor.

1.02 JOB CONDITIONS

A. The Contractor shall visit the site and familiarize himself with all existing and limiting conditions that have a bearing on his work. Failure to do so will not relieve him of any subsequent responsibilities pertinent to this project.

B. The Contractor shall coordinate with all other trades for proper interface and installation of all associated electrical items indicated or specified.

C. No consideration of extras will be accepted for additional work associated with the Contractors failure in being knowledgeable of existing conditions and failure in the coordination with other trades performed work under this project.

1.03 PERMITS AND INSPECTIONS

A. Permits and licenses necessary for the execution of this work shall be secured and paid for by the Contractor.

B. Contractor shall arrange for all inspections specified herein or required by all agencies having jurisdiction and furnish required certificates of inspection to Owner, including certificate from State licensed electrical inspection agency.

1.04 CODES AND STANDARDS

A. The installations shall conform to all applicable codes and standards. The construction of the systems indicated and called for in these specifications shall be performed in accordance with practices, except as otherwise indicated or specified. The Contractor shall be responsible for obtaining the necessary information to comply with these requirements. Any modification of the drawings or specifications that may be necessary to meet these requirements must be approved by the Engineer or authorized representative before they are made.

B. The Contractor shall give all notices and comply with all laws, ordinances, codes, rules and regulations bearing on the conduct of the work as drawn and specified. If the Contractor observes that the drawings and/or specifications are at variance therewith, he

shall promptly notify the Engineer in writing of any necessary changes of work. If the Contractor performs any work knowing it to be contrary to such laws, ordinances, codes, rules and regulations and does not give such notice to the Engineer, he shall bear all costs arising from it.

C. Requirements of the following organizations shall be considered minimum:
1. National Electrical Code
2. National Electrical Safety Code
3. Local Utility Company
4. OSHA
5. Local City and County Codes

1.05 ELECTRICAL ABBREVIATIONS, REFERENCES AND DEFINITIONS

A. Abbreviations and symbols herein and on Drawings are in accordance with ANSI Standard Y1.

B. References to technical societies, trade organizations and governmental agencies in the Electrical Division are in accordance with the following:
1. ANSI - American National Standards Institute
2. ASTM - American Society for Testing Materials
3. IEEE - Institute of Electrical and Electronics Engineers, Inc.
4. NEC - National Electrical Code
5. NEMA - National Electrical Manufacturers Association
6. NFPA - National Fire Protection Association
7. OSHA - Occupational Safety and Health Administration
8. UL - Underwriters' Laboratories, Inc.

C. The following definitions of terms and expressions are applicable to the Electrical Division.
1. "Provide" shall denote "furnish and install."
2. "Herein" shall denote "contents of a particular Division" where this term appears.
3. "Indicated" shall denote "indicated on Contract Drawings."
4. "Equal" shall denote "approved equivalent."
5. "Contractor" shall denote "Contractor or subcontractor for work described."

1.06 TESTS

A. Arrange and pay for all tests. Notify Engineer three (3) working days before tests are made. Conduct tests in presence of Engineer or authorized representative. Repeat tests after defects are corrected.

B. Prior to tests, provide feeders and branch circuits continuous from main distribution panel to outlets, fixtures and equipment.
1. Demonstrate system is free from short circuits and properly grounded.
2. Test load balance as specified herein.

1.07 SYSTEM OPERATION INSTRUCTIONS

A. Verbal Instruction
1. After all tests and adjustments, Contractor shall instruct attendant or Owner's representative in all details of operation of distribution.
2. Supply attendants to operate the systems until Engineer is satisfied that the systems have been installed in accordance with these Drawings and Specifications and are functioning properly.
3. Provide services of the equipment manufacturer's engineer to instruct representative of Owner in operation and maintenance of Electrical equipment.

B. Written Instruction
1. Provide three (3) copies of printed instructions and diagrams covering operation and maintenance of each item of equipment in conformance with Section 01700.
2. Instructions furnished in bound covers and posted at locations designated by Engineer or authorized representative.

1.08 LAYOUTS

A. Electrical system layouts indicated are generally diagrammatic and location of outlets and equipment is approximate; exact routing of raceways, locations of equipment shall be governed by site conditions and obstructions. The Contractor shall be responsible for the exact layout of all equipment. This is not to be construed to permit redesigning systems; all outlets and equipment shall be interconnected as indicated. Locate and install equipment requiring maintenance and operation so that it will be readily accessible. Any relocation of equipment must be approved by the Engineer or authorized representative before erection. The right is reserved to make any reasonable change in location of equipment prior to "roughing-in" without involving additional cost.

B. Coordinate the installation of wiring, raceways, sleeves, anchors, and other concealed or embedded items so that this work is properly in place before concrete placement or backfilling.

1.09 SHOP DRAWINGS

A. The Contractor shall submit within 20 days after the award of the contract a list of materials required for the project. This list shall be complete and include all items or systems called for in this contract. Partial lists submitted from time to time will not be acceptable. The list shall identify the specific item, manufacturer, and vendor. Vendor information only will not be acceptable.

B. After approval of the material list, the Contractor shall secure descriptive drawings or catalog cuts of equipment to be furnished under his contract. He shall review these Shop Drawings for conformance to contract documents prior to submission for approval. No equipment shall be ordered until they have been approved.

C. Shop Drawings shall be in accordance with General Conditions and Supplementary General Conditions of these Specifications and Section 01300.

D. All Shop Drawing submittals shall have the following identification data, as applicable, contained therein or permanently adhered thereto.
1. Project name
2. Project number
3. Subcontractor's, Vendor's and/or Manufacturer's name and address
4. Product identification
5. Applicable contract drawings and specifications section number
6. Shop Drawing title, drawing number, revision number, and date of drawing and revision

1.10 SUBSTITUTES

A. Manufacturers' names and catalog numbers of materials and equipment are given to describe type, quality and design of material and equipment required. Where possible, three (3) or more manufacturers are listed.

B. Where materials or manufacturers are specified and where the words "or equal" or "approved equal" are not used, only those specified shall be furnished and installed. Where "equal" is used, equal equipment shall be submitted for approval in accordance with Section 01600, but no less than ten (10) days prior to bid date to permit checking and appropriate action. If approved, an Addendum will be issued. No request for substitution will be considered later than ten (10) days before bids are due.

1.11 MATERIALS AND EQUIPMENT REQUIREMENTS

A. Provide materials and equipment conforming to those specified herein. Manufacturers' names and catalog numbers are given to describe type, quality and design of material and equipment required.

B. All material and equipment shall conform to capacity, efficiency, design and material specified and shall meet dimension and space requirements. Sizes of materials and equipment indicated or specified are minimum requirements. The Contractor may use larger sizes to expedite the work provided that such change meets space requirements and does not result in additional installation, maintenance or operating cost to the Owner. Equipment or materials of the same type or classification, used for the same purpose, shall be the products of the same manufacturer.

C. All materials shall be new, of the best of their respective kind and shall conform with accepted standards of the trade in every case where such a standard has been established for the particular type of material in question. Equipment and accessories not specifically described or identified by manufacturer's catalog numbers shall be designed in conformity with applicable technical standards and specification of societies, organizations and/or agencies listed herein, suitable for maximum working pressure and shall have neat and finished appearance.

D. Materials and appliances of types for which there are UL standard requirements, listings or labels shall have such listing of UL, be so labeled, and shall conform to their requirements.

E. In all cases where a device or part of the equipment is herein referred to in the singular number, it is intended that such reference shall apply to as many such items as are required to complete the installation.

F. Contractor shall, without charge, replace any work or material, which develop defects, except ordinary wear and tear, or fail to perform satisfactorily, within one (1) year from the date of final acceptance.

1.12 FINAL CLEANING

A. Cleaning: Complete the following cleaning operations before requesting Substantial Completion inspection:
   1. Remove labels that are not permanent labels.
   2. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films and similar foreign substances. Leave concrete floors broom clean.
   3. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean light fixtures and lamps.
   4. Clean the site of all construction material.

B. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction.

C. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful or dangerous materials into drainage systems. Remove waste materials from the site and dispose of in a lawful manner.

1. Where extra materials of value remaining after completion of associated Work have become the Owner's property, arrange for disposition of these materials as directed.

1.13 DEMOLITION WORK

A. Contractor shall remove all existing high voltage switches, sectionalizing cabinets, pad-mounted transformers, and panelboards attached to transformers and all other items becoming inactive under this project. Removal of electrical work shall include removal of all appurtenances including existing conduit, wiring, disconnect switches, devices, etc.

B. Existing direct buried primary cables shall be removed in areas where they conflict with new work. Cable risers shall be removed to the depth of the horizontal laid cable. Undisturbed horizontal laid existing buried cable shall be abandon in place.

C. Unless noted otherwise the Contractor shall have salvage rights to all electrical work removed under this project. All removed electrical work shall be removed from premises.

PART 2 PRODUCTS

Not Applicable

PART 3 EXECUTION

Not Applicable

END OF SECTION 16010 – GENERAL PROVISIONS

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SECTION 16050 - BASIC MATERIALS AND METHODS

PART 1 GENERAL

1.01 SCOPE

A. Provide material and perform all work as outlined in this Section for all basic material and methods required in the installation of the electrical work.

B. Contractor shall consult Section 16010, General Provisions in detail as he will be responsible for and governed by conditions set forth therein and work indicated and provisions of Division 0 and Division 1.

1.02 SUBMITTALS

A. Consult Sections 01300 and 16010 for requirements in submitting submittals on all materials specified in this section.

PART 2 PRODUCTS

2.01 PANELBOARD AND CIRCUIT BREAKERS

A. Panelboards
1. Dead front safety type, constructed in accordance with UL Standard 50 for cabinets with rust inhibiting primer and gray baked enamel finish. Door shall be flush mounted clasp, and provided with typewritten directory. Panelboard shall be service entrance rated where required.
2. Bussing assembly: Bus structure and main lugs or main breaker shall have current ratings as indicated. Ratings shall be established by heat rise tests with maximum hot spot temperature on any connector or bus bar not to exceed 50 deg. C rise above ambient and constructed in accordance with UL Standard UL 67.

B. Circuit Breakers for Panelboards
1. Plug-on, quick make and quick break type with inverse time characteristics secured through use of bimetallic tripping element supplemented by magnetic trip with 10,000 minimum RMS symmetrical amperes rating at 240 volts.
2. Tripping indication shall be clearly visible by operating element assuming neutral position between "on" and "off". Individual circuit number shall identify each breaker.
3. Multi-pole breakers designed so that overload in one pole automatically causes all poles to open by means of common trip.

C. Standards: Panelboards shall be UL listed and bear UL label.

D. Manufacturer: Square D Type NQ to match the manufacturer of the panelboards and circuit breakers predominantly used throughout the park, for purposes of standardization.

2.02 STATION ENCLOSURES

A. Freestanding vertical enclosure shall be NEMA Type 4 construction and be labeled by Underwriters' Laboratories. The enclosure shall be two-door, double access design constructed of 12-gauge, type 304 stainless steel, suitably braced internally for structural rigidity and strength. All exposed welds, seams or edges shall be ground smooth.

B. Enclosure shall be provided with overlapping (center post not acceptable) full-length, gasketed access doors. Doors shall be mounted with strong, continuous, stainless steel; piano type hinges and doors shall be provided with stainless steel pad lockable door handles, three point latches and hold open hardware.

C. Interior flat steel panels with white finish shall be provided for mounting of electrical equipment indicated on the drawings.

D. Metallic wireway and/or PVC conduit shall be used for all wiring within the enclosure. Metal clad cable may be used for wiring of interior light, switch, thermostat and ventilation fan. No exposed wiring shall be permitted.

E. Cooling fan with intake stainless steel shroud, thermostat and stainless steel exhaust louver shall provide ventilation of the enclosure. An aluminum filter shall be provided at the fan and the louver. Fan and louver airflow volume shall be sized to limit the heat gain in the enclosure to 20°F above outside temperature.

F. Each cabinet is to be provided with a fluorescent lighting fixture controlled by a separate switch control.

G. Cabinet construction shall comply with industrial standards UL 508, NEMA/EEMAC Type 4 and E.I.A RS-310-D.

H. Manufacturer: Hoffman or equal.

2.03 DISTRIBUTION PANEL ENCLOSURES

A. Freestanding vertical enclosure shall be NEMA Type 4 construction and be labeled by Underwriters' Laboratories. The enclosure shall be single-door, single or dual access design as scheduled on the drawings. Construction shall be 12-gauge, type 304 stainless steel, suitably braced internally for structural rigidity and strength. All exposed welds, seams or edges shall be ground smooth.

B. Enclosure shall be provided with full-length, gasketed access door. Door shall be mounted with strong, continuous, stainless steel; piano type hinges and the door shall be provided with stainless steel pad lockable door handles, three point latches and hold open hardware.

C. Interior flat steel panel with white finish shall be provided for mounting of electrical equipment indicated on the drawings.

D. Stainless steel intake and exhaust louvers with aluminum filters shall provided for natural ventilation of the enclosure.

E. Cabinet construction shall comply with industrial standards UL 508, NEMA/EEMAC Type 4 and E.I.A RS-310-D.

F. Manufacturer: Hoffman or equal.

2.04 CONDUCTORS/CABLES

A. Single Conductors
1. Copper single conductor 600 volt insulated. Conductors shall be type THHN/THWN-2: 75°C wet/90°C dry rated.
2. Minimum wire size for branch circuits shall be #12 AWG except non-load carrying control circuits may be No. 14 AWG.

3. Manufacturers: Rome, Southwire, Okonite or equal.

B. Multi-conductor Power Cable
1. Type TC, 600 volt, multiple THWN (75°C wet and dry rated) insulated stranded copper conductors cabled together with a Class B stranded grounding conductor and suitable nonhygroscopic filers covered with suitable binder tape for a round cable assembly. The cable assembly shall be covered with a flame-retardant, moisture and sunlight resistant PVC jacket UL listed as sunlight resistant.
2. 600 volt multi-conductor cables shall satisfy the requirements of NEC and UL Standard 1277 for Type TC cables and be UL listed for direct burial use. Conductor insulation shall comply with UL Standard 83 for thermoplastic insulated wires.
3. Manufacturers: Rome, Southwire, Okonite or equal.

B. Instrumentation/Control Cable
1. 600 volt rated for instrumentation and control.
2. Soft annealed bare copper conductors in a cable with an overall shield. Number of pairs and conductor gauge shall be as indicated.
3. NEC Type PLTC listed. UL Standard 13.
4. 105 degree Centigrade PVC insulated conductors with an overall PVC jacket.
5. Aluminum polyester foil tape with tinned copper drain for 100% coverage.
6. Manufacturer: Alpha, Belden, Coleman or equal.

2.05 CONDUITS

A. Rigid Galvanized Steel conduit
1. Material: Hot dipped galvanized rigid steel.
2. Fittings: Cast metal, screwed fittings; 1-1/2” and larger, mogul type. (Zinc coupling or nonferrous metal fittings are not acceptable).
3. Standards: ANSI C80.1, ANSI C80.4.
4. Manufacturers: Spang, Triangle, Wheatland or Allied.

B. Polyvinyl chloride conduit (PVC)
1. Material: Schedule 80, polyvinyl chloride rigid conduit listed for 90°C conductors or cable and use in direct sunlight.
2. Fittings: Coupling type.
3. Joints: Connections shall be made by solvent welding.
4. Standards: NEMA, UL, NEC, ASTM D 1784.
5. Manufacturers: Carlon EPC 80, Triangle and Robroy.

C. Liquid-tight flexible metallic conduit
1. Flexible galvanized steel core with continuous copper ground in the convolutions covered with extruded polyvinyl chloride.
2. Connectors: Nylon insulated screw in ground core type connectors constructed of malleable iron Thomas & Betts Liquid-tight fittings or equal.
3. Manufacturers: Triangle, Electri-Flex or Robroy.

2.05 GENERATOR RECEPTACLES

A. Receptacle shall be for “reversed service” as a power supply inlet.
1. Rated 100A, 600V, 3-pole, 4-wire with a spring cover, Hubbell Cat. No. HBL4100RS1WR or equal.
2. Receptacle shall be mounted on a 15 degree angle back box, Cat. No. MB601008W or equal.

2.05 OUTLET BOXES & FITTINGS

A. Cast boxes, Fittings and Conduit Bodies
   1. Standard general purpose cast aluminum type with threaded hubs, gaskets and cover.
   2. Choice of body types shall be made to conform to installation arrangement, wiring and device content, etc.
   3. Aluminum metallic finish.
   4. Manufacturers: Crouse Hinds, Appleton or Killark.

2.06 JUNCTION AND PULL BOXES

A. Smaller than 150 cubic inches: Standard outlet boxes with cover.

B. 150 cubic inches and larger: Construct same as cabinets and conforming to UL "Standards for Cabinets and Boxes".

C. Junction and pull boxes shall be:
   1. NEMA Type 4 enclosure
   2. Type 316L stainless steel enclosure and exterior hardware.
   3. Stainless steel hinged door clamps, hasp and stable for padlocking, and neoprene gaskets.
   4. External mounting brackets.
   5. Manufacturers: Hoffman, Bulletin A4S or equal.

2.07 CONNECTORS

A. Connectors
   1. Conductors No. 8 and larger terminated and spliced with Burndy or T&B mechanical pressure connectors.
   2. Conductors No. 10 and smaller terminated and spliced with insulated expandable live spring type twist-on compression type connector. Connectors shall be Buchanan "B-Cap" or 3M "Hy-Flex".
   3. Connect conductors to apparatus by means of approved lugs or connectors as manufactured by Thomas & Betts, or equal.

B. Insulating tape
   1. Vinyl plastic insulating tape, 7-mil thick, Scotch 33+ or equal.
   2. Apply at all joints and splices.

2.08 TAGS AND NAMEPLATES (Systems under 600V)

A. Identify branch circuit and feeder conductors in boxes and cabinets with letters and numerals as manufactured by W. H. Brady, Cat. No. B-500 vinyl or equal with prior approval. Letters and numerals shall be black printing on a white vinyl background, 0.006 inches thick. Identification includes circuit number and panel designation.

B. Provide adhesive-backed black-faced laminated plastic nameplates with engraved white lettering as follows:
   1. Panelboard nameplate shall be 4" x 1-5/8" x 1/16"
   2. Enclosed breaker: 4" x 1-5/8" x 1/16".
   3. Pump Control Panel: 4" x 1-5/8" x 1/16".
   4. Transfer Switch: 4" x 1-5/8" x 1/16".

C. Panelboard nameplate shall include voltage and phase identification.

2.09 RV POWER CENTERS

A. Recreational Vehicle (RV) power centers shall be UL listed, made from VALOX thermoplastic resin, suitable for post applications, with corrosion resistant internal components. Power center shall have a hinged cover with pad locking provisions. Power center shall be un-metered and rated for 100 amps, 120/240 volts, 1-phase, 3-wire with ground.

B. Recreational power center shall have:
   1. NEMA rated receptacles
      a. (1) 20amp, NEMA 5-20R2 GFI
      b. (1) 30 amp, NEMA R32U
      c. (1) 50 amp, NEMA 14-50R
   2. Circuit Breakers
      a. (1) 20 amp/ 1 pole – 125 volts
      b. (1) 30 amp/ 1 pole – 125 volts
      c. (1) 50 amp / 2 pole – 125/250 volts
   3. 250 – kcmil loop –feed lugs, neutral bar and equipment ground lug.
   4. 7 watts – light and photo cell.

C. All circuit breakers, receptacles and the light shall be factory pre-wired.

D. Manufacturer: Midwest Electric Products, Inc. Parkmate model number: VKKJHAUT or equal by Eaton Corp. Newport CampMate model number: CHU1N4N7GSU, with enter photocell controlled 7-watt fluorescent light.

2.10 SURGE PROTECTIVE DEVICES (SPD)

A. This section describes the materials and installation requirements for a Surge Protective Device (SPD). These devices are used to protect sensitive electronics from the effects of lightning induced transients, substation switching transients and internally generated transients resulting from inductive and/or capacitive load switching.

B. The specified system shall be designed, manufactured, tested and installed in compliance with the following codes and standards:
   1. Institute of Electrical and Electronic Engineers (ANSI/IEEE C62.11, C62.41, C62.45)
   2. American National Standards Institute
   3. Federal Information Processing Standards Publication 94 (FIPS PUB 94)
   4. National Electrical Manufacturer Association (NEMA LS-1 1992 Peak Current Testing)
   5. National Fire Protection Association (NFPA 70, 75 and 780)
   6. MIL Standard 220A Method of Insertion Loss Measurement
   7. National Electric Code
   8. Underwriters Laboratories UL 1283 and UL 1449 (most recent edition)
   9. Canadian Standards (CUL)

C. Environmental Requirements:
   1. The operating temperature range shall be -40° to 70° C (-40° to 160° F).
   2. The unit shall be capable of operation up to 13,000 feet above sea level.

D. Quality Assurance and Warranty:
   1. The SPD and supporting components shall be guaranteed by the manufacturer to be free of defects in material and workmanship for a period of thirty (30) years from the date of substantial completion of service and activation of the system to which the suppressor is attached. Additionally, during the applicable warranty period, any SPD which fails due to any electrical anomaly, including lighting, shall

be repaired or replaced by the manufacturer without charge. Special or optional warranties in excess of the unit's standard warranty for purposes of this bid are not acceptable.

2. Since "Acts of Nature" or similar statements typically include the threat of lightning to which the SPDs shall be exposed, any such clause limiting warranty responsibility in the general conditions of this specification shall not apply to this particular section. That is, the warranty must specifically provide for unlimited free replacements of the SPD in the event of failure caused by the effects of lightning and all other electrical anomalies. The warranty shall cover the entire device, not just various components, such as modules only.
3. Provide electrically operated equipment specified in this Section that is listed and labeled. As defined in the National Electrical Code, Article 100, Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.
4. Comply with NFPA 70 and NEMA LS1.
5. The manufacturer's test laboratory shall be certified under ETL's, UL's or other nationally recognized test lab's client Test Data Submittal Program to conduct testing in accordance with UL 1449 (most recent edition) (Standard for Safety for Transient Voltage Surge Suppressors) and UL 1283 (Standard for Safety for Electromagnetic Interference Filters) covering Transient Voltage Surge Suppression, duty cycle, Dielectric Voltage Withstand and Leakage Current Tests. In addition, the manufacturer's test laboratory shall be certified under a nationally recognized test laboratory's Client Test Data Submittal Program to conduct testing in accordance with the new UL classification Program for evaluation of transient voltage surge suppressors in accordance with a IEEE C62.41-1991, recommended practice on surge voltages in Low-voltage AC power circuits.

E. Materials/Construction

1. The SPD shall be listed by ETL, UL, or other nationally recognized test laboratory to UL's 1283 and UL's 1449 standards (latest edition, latest revision), and not merely the components or modules. All SPD's shall be Type 1 for use in Type 1 and Type 2 locations.
2. The TVSS shall protect all modes L-G, L-N, L-L, and N-G, have discrete suppression circuitry in L-G, L-N and N-G, and have bidirectional, positive and negative impulse protection. Line-to-neutral-to-ground protection is not acceptable where line-to-ground is specified, and accordingly reduced mode units with suppression circuitry built into only 4 modes are not acceptable. In delta systems, line-to-ground-to-line protection is not acceptable where line-to-line is specified.
3. Obtain all surge suppression devices through one source from a single manufacturer.
4. The maximum continuous operating voltage (MCOV) of all components shall not be less than 125% for a 120V system and 120% for 220 and 240V systems, and 115% for 277 and 480V systems.
5. All SPD's shall be equipped with a comprehensive monitoring system which shall include a visual LCD panel display providing information on unit status and phase loss/protection loss.
6. All SPD's shall be Total Protection Solutions. No unit will be accepted as an "approved equal" unless it meets the warranty, strength, safety features, IEEE let-through levels, modes of discrete suppression circuitry, fusing, independent per mode surge testing, and all other requirements of this specification.
7. If a disconnect switch is specified, the disconnect switch and the SPD as a system shall be capable of interrupting up to a 200kA symmetrical fault current with 600 VAC applied.
8. Each design configuration shall have the maximum single pulse surge current capacity per mode verified through testing at an independent, nationally recognized

test laboratory. To be considered for approval, the manufacturer must submit a test report on a unit which was tested with internal over current fusing in place. The test shall include a 1.2 X 50 µsec 6000V open circuit voltage waveform and an 8 X 20 µsec 500A short circuit current waveform to benchmark the unit's suppression voltage, followed by a single pulse surge of maximum rated surge current magnitude with an approximated 8 X 20 µsec waveform. To complete the test, another identical surge shall be applied to verify the unit's survival. Compliance is achieved if the suppression voltage found from the two impulses does not vary by more than +10%. Test data on an individual module is not acceptable.

F. Subpanel and Lighting Panel Protection

1. SPD(s) for this location shall be as indicated on project drawings. SPD shall be separate from panelboard. Integral SPD shall not be acceptable. SPD's shall be certified to UL1283 and UL1449 Third Ed. Type 1 for use in Type 1 and Type 2 locations.
2. The manufacturer shall provide written specifications showing let-through voltage of the unit with six inches of lead length (at the module or at the lug data is not acceptable as it does not represent true "as installed" performance) pursuant to ANSI/IEEE C62.41 and C62.45, 2002, categories A1 & A3 ring wave, 180 degree phase angle, category B3 Ringwave, and UL suppressed voltage ratings, 90 degree phase angle, positive polarity, measurements in peak voltage from the zero reference, all dynamic tests except N-G, which shall be no higher than:

ANSI/IEEE C62.41-1991 Measured Limiting Voltage

A1 Ring Wave (2kV, 67A) Tested at 180 degree phase angle

Voltage (Voltage Code)	L-N	L-G	L-L	N-G
120/240 (1S240)	29V	46V	39V	40V
120/208 (3Y208)	29V	46V	39V	40V
277/480 (3Y480)	34V	54V	40V	39V

A3 Ring Wave (6kV, 200A) Tested at 180 degree phase angle

Voltage (Voltage Code)	L-N	L-G	L-L	N-G
120/240 (1S240)	56V	61V	88V	112V
120/208 (3Y208)	56V	61V	88V	112V
277/480 (3Y480)	66V	115V	83V	94V

B3 Ring Wave (6kV, 500A) Tested at 90 degree phase angle

Voltage (Voltage Code)	L-N	L-G	L-L	N-G
120/240 (1S240)	437V	592V	612V	324V
120/208 (3Y208)	437V	592V	612V	324V
277/480 (3Y480)	670V	785V 1	020V 3	24V

UL Voltage Protection Ratings

Voltage (Voltage Code)	L-N	L-G	L-L	N-G
120/240 (1S240)	700V	700V	1000V	700V
120/208 (3Y208)	700V	700V	1000V	700V
277/480 (3Y480)	1200V	1200V	2000V	1200V

3. The unit shall have a peak surge current of no less than 120kA/phase, 60kA/mode, 8 X 20 us waveform, single impulse, verified by third party test reports.
4. Internal Fusing – Overcurrent Protection
   a. Each Metal Oxide Varistor, or other primary suppression component, shall be individually fused for safety and performance to allow the SPD to withstand the full rated single pulse peak surge capacity per mode

without the operation or failure of the fuses. Overcurrent fusing that limits the listed peak surge current of the SPD is not acceptable. Replaceable cartridge type per phase or per mode overcurrent fusing is not acceptable where there is more then one MOV per mode.

b. For arc quenching capability, minimization of smoke and contaminates in the event of a failure, and to ensure the safest possible design, all surge components, current carrying paths and fusing shall be packed in fuse grade silica sand.

c. Fusing shall be present in every mode, including Neutral-to-Ground.

d. The fusing shall be capable of interrupting up to a 200kA symmetrical fault current with 600VAC applied.

e. The SPD shall be capable of attenuating internally generated ringing type transients and noise, and shall have an enhanced transient filter supported by a specification sheet which lists the IEEE A1 Ring Wave let-through levels no higher than those set forth above.

f. Because of space limitation, the enclosure shall not exceed 4.0” D x 4.0” W x 10.3” H to allow close-to-the load installation on flush mount panels and between adjacent panelboard. For recessed panels, a flush mount cover plate shall be provided with each unit.

g. The suppressor shall include Form C dry contacts (N.O. or N.C.) for remote monitoring capability, and shall have at minimum a NEMA 1 steel enclosure.

h. The SPD shall come standard with not less than a Thirty Year Warranty, and the warranty shall include unlimited free replacements of the unit if destroyed by lightning or other transients during the warranty period. Special or optional warranties in excess of the unit’s standard warranty for purposes of this bid are not acceptable.

i. The SPD shall have an internal audible alarm with mute on front cover.

G. Manufacturer: Total Protection Solutions Series ST or equal.

2.11 UNDERGROUND SPLICE/PULL HANDHOLES

A. Handholes shall be constructed of polymer concrete and reinforced by heavy-weave fiberglass. The handhole shall have open bottoms and shall be stackable. Provide handhole of the size indicated on the drawings. The Contractor shall determine number and depth of handhole sections.

B. The cover shall have design load rating of 15000# and be equipped with a pull slot and have “Electric” logo. The cover shall be secured to body of handhole with two stainless steal hex head bolts with washers.

C. Manufacturer: Quazite Composolite “PG” style or approved equal.

2.12 MANUAL TRANSFER SWITCH

A. Construction

1. Type: Heavy duty type, non-fusible 240 volt, double throw 3-position, size as indicated.
2. Standards: UL 98, NEMA KS1, CSA, and NOM
3. Terminal lugs: UL listed for copper cables and front removable.
4 Switch blades: Blades shall have quick make and quick break operating handle with dual cover interlock to prevent door opening in “ON” position.
5. Enclosure: NEMA 1, On-Off-On marking and pad lockable in ON & OFF positions.
6. Accessory: Neutral assembly

B. Manufacturers: Square D “Heavy Duty”, or equal Cutler-Hammer, or Siemens

2.13 ENCLOSED MAIN CIRCUIT BREAKER

A. A circuit breaker with trip rating as indicated shall be suitable for use as service entrance use and shall conform to those specified for panelboards. Minimum RMS symmetrical amperes shall be 25,000 at 240 volts AC and 14,000 at 480 volts AC.

B. Enclosures shall be NEMA Type 1, UL listed and equipped with insulated groundable neutral assembly.

C. Manufacturers: Square "D" sized for appropriate breaker frame size.

2.14 EQUIPMENT SUPPORTS AND STANDS

A. Design and construct supporting structures of strength to safely withstand stresses to which subjected and to distribute properly the load and impact over building.

B. Respective Contractor provides required supports for equipment provided by them and submits detailed shop drawings for approval before construction.

PART 3 EXECUTION

3.01 PANELBOARDS

A. Install circuit breaker and panelboard in accordance with manufacturer's recommended procedures. Provide necessary protection during construction period to insure against mechanical damage and dust accumulation.

B. Field tests prior to energization:
1. Megger check of phase to phase and phase to ground insulation level.
2. Continuity.
3. Short Circuit.

C. Adjust operating mechanisms for free mechanical movement. Tighten all bus connections and mechanical fasteners per manufacturer’s torque requirements. Touch-up scratched or marred surfaces to match original finish.

D. Connect panelboard branch circuit loads so that the load is distributed as equally as possible between the phase busses.

E. Type circuit directories giving location and nature of load served. Install circuit directories in each panelboard.

F. Attach an identification engraved nameplate as specified in this section.

3.02 SURGE PROTECTIVE DEVICE

A. Install the SPD’s with the conductors as short and straight as practically possible.

B. Follow the SPD manufacturer’s recommended installation practice as outlined in the equipment installation manual. The electrical contractor shall ensure that all neutral conductors are bonded to the system ground prior to installation of the associated SPD.

C. The SPDs ground shall be connected to the power system ground.

D. The installing contractor shall comply with all applicable codes.

3.03 CONDUIT CLASSIFICATION

A. Rigid galvanized steel conduit shall be used for wiring installed underground to sewage pump station wet wells.

B PVC conduit shall be used for underground sleeves for primary and secondary service conductors, and for wiring inside pump station enclosure except as indicated otherwise.

C. PVC conduit sleeves shall be used for electrical crossings under Park roads. The sleeves shall be installed by the “Horizontal Directional Drill” method to avoid cutting the pavement. The Contractor shall be responsible for locating and coordinating with existing and new underground utilities.

3.04 CONDUIT INSTALLATION

A. Install conduit in accordance with following:
1. Minimum size conduit shall be 3/4". Other sizes shall be as indicated or required by the NEC for number and size of conductors installed.
2. All joints shall be cut square, reamed smooth, and made up tight. Rigid metal conduit shall be threaded. Bends or offsets in metal conduit shall be made with conduit ells, tied bends made with approved bender or hickey, or hub type conduit fitting. Radius of bends shall conform to NEC. Number of bends per run shall conform to NEC limitations. All scratched, cut, threaded, or where galvanized finish is disturbed and has exposed steel in the conduit system shall have two coats of Zinc-Rich's ZR or Zinc-X applied after cleaning off dirt, chips, and oil.
3. Concealed and exposed conduits shall be run with long sweep bends and offsets.
4. Conduits shall be continuous from outlet to outlet and from outlets to cabinets, pull or junction boxes, and shall be secured to all boxes with locknuts and bushings in such a manner that each system shall be electrically continuous throughout. Conduit ends shall be capped to prevent entrance of foreign materials during construction.
5. Conduit terminations at cabinets and boxes shall be rigidly secured with locknuts and bushings as required by the NEC. On all conduit 1-1/4" trade size and larger, bushings shall be of the insulated or insulating type with double locknut as manufactured by Thomas & Betts or approved equal.
6. All conduit systems must be installed complete before conductors are pulled. All empty raceways shall have a pull cord installed, with 12 in. coiled in box for future wire pulling.
7. All underground conduits entering electrical equipment/enclosures shall be effectively sealed to prevent water moisture or any other foreign matter from entering.
8. Underground conduit system shall consist of wide sweep elbows and bends and shall be completely watertight. Conduits shall be not less than 30" below finish grade.
9. Routing of all underground conduits and cables to be identified by placing a continuous plastic tape in the trench backfill twelve inches below finished grade. The tape is to be non-biodegradable type plastic at least 4" wide, red in color, and imprinted with the legend "Caution - Buried Electric Line Below".
10. Utility crossings under Park roads shall be installed by the “Jack & Bore Method” to avoid cutting the pavement. The Contractor shall be responsible for locating and coordinating with existing and new underground utilities.

B. Support conduit in accordance with the following:

1. Horizontal and vertical conduit runs shall be supported by one hole malleable straps, clamp backs, split ring, or other approved devices with suitable machine threaded bolts. Provide concrete inserts, expansion anchors, and strut assemblies for mounting to concrete structure. See "SUPPORTS AND HANGERS" section on requirements for electrical work being mounted on masonry or support structures.

3.05 SUPPORTS AND HANGERS

A. Rigid metal conduit shall be supported in accordance with Article 344-30 of the National Electrical Code.

B. Conduits shall be supported by stainless steel Unistrut or Kindorf channels and straps, or equal, with prior approval, or by beam clamps.

C. Continuous rigid cable supports such as wireways, cable troughs, ladders and channels shall be supported by brackets or hangers made of stainless steel Unistrut or Kindorf channels, or equal, with prior approval. Unless otherwise specified on the drawings, maximum spacing between supports shall be 10 feet.

D. No electrical equipment of any nature shall be fastened directly to masonry surfaces or steel beams or columns. Lengths of stainless steel Unistrut or Kindorf steel channel shall first be fastened to the structure, and then the electrical equipment fastened to the channel with metal fasteners designed for the purpose.

E. Provide "supports" or "hangers" (brackets, plates, flat iron, rods, angle iron, channel, etc.) where required to fasten or support electrical equipment to the building as shown on the plans.

F. The required strength of the supporting equipment, and the size and type of anchors, shall be based on the combined weight of conduit, hanger and cables.

3.06 JUNCTION AND OUTLET BOX INSTALLATION

A. Install boxes approximately as indicated:
1. Set boxes true and flush and rigidly secure in position.
2. Use painted or galvanized iron hangers to support ceiling outlets.
3. Set boxes so that front edges of box are flush with finished wall or ceiling line or not more than 1/4" back of same, except where conduit is exposed.

B. Provide boxes of sizes and types to accommodate following:
1. Structural conditions
2. Size and number of conductors or cables entering
3. Device or fixture for which required

3.07 CONDUCTOR INSTALLATION

A. Install conductors of size and number indicated or required in accordance with requirements of NEC.
1. Do not draw conductors into conduit until conduit is free from moisture.
2. Leave sufficient slack to permit connection of switches and equipment without additional splices; 8" minimum.
3. Minimum wire size for branch circuits shall be #12 AWG except that home runs longer than 100 feet from panel to load shall be minimum #10 AWG.
4. Each motor shall be supplied by an individual branch circuit, unless indicated otherwise.

B. Make taps and splices in wire as follows:
   1. Conductors shall be square cut with a hacksaw or cable cutter without deforming the strands. Insulation shall be removed with a penciling cut to avoid nicking the strands and surface oxides shall be removed by brushing exposed strands with a wire brush or card file. Where conductor bends are less that 8 times cable diameter, foregoing operations shall be done after bendings.
   2. Compression connectors shall be selected to fit the conductor.
   3. Splice only in accessible pull, junction or outlet boxes.
   4. Use mechanical wire splices and joints for #8 wire and larger and AL/CU pressure connectors for #10 wire or smaller.
   5. Insulate joint at least 100% in excess of wire insulation.
   6. Splices in underground handholes shall be made with EPDM rubberized molded assemblies with AL/CU rated compression splice kit; Homac Flood-Seal Submersible Splice Kit or equal.

3.08 GROUNDING

A. Ground neutral of service and all noncurrent carrying metallic parts of electrical system to service grounding system.
   1. Service to be grounded to ground rod and water piping.
   2. Metallic parts to be grounded shall include cabinets, panelboards, conduit, outlet boxes, motor frames, control panels, transformers, and switchgear.
   3. Bond with suitable ground clamps.
   4. Provide all wiring, grounding conductors and grounding devices required to comply with NEC.

B. Provide maximum resistance of 15 ohms or conform to requirements of Power Company.

3.09 EXCAVATION AND BACKFILLING

A. Contractor shall perform all necessary excavation and backfilling required for the installation of their work. The Contractor shall be required to locate all buried utilities prior to excavation.

B. Excavate bottom of trenches to exact depth, refill excavation below required grade of cable or raceway with firmly compacted sand. Deposit excavated materials on side of trench; do not leave material where it will interfere with traffic. Protect trenches and openings with signs, barricades, enclosures or flashing light.

C. Trenches shall not be backfilled until all required tests are performed and until the utilities systems, as installed, conform to the requirements for the installation of the various utilities. Trenches improperly backfilled shall be reopened to the depth required for proper compaction, then refilled and compacted as specified, or the condition shall be otherwise corrected as permitted by the Owner.
   1. Lower Portion of Trench:
      a. Backfill material shall be deposited in 6-inch maximum thickness layers and compacted with suitable tampers to the density of the adjacent soil until there is a cover of not less than one foot. The backfill material in this portion of the trench shall consist of sandy clay, sand, gravel, soft shale, or other approved materials free from hard clods and stones larger than one inch in any dimension.
   2. Remainder of Trench:
      a. The remainder of the trench shall be backfilled with material that is free of stones larger than 1 inch in any dimension. Backfill material shall be deposited in layers not exceeding the thickness specified, and each layer

shall be compacted to the minimum density specified as applicable to the particular area.

b. For installation involving directly buried cable, stones or pieces of paved surfacing larger than one inch in any dimension, or pieces of scrap cable, shall not be buried in the trench as a means of disposal.

c. Routing of all underground lines to be identified by placing a continuous plastic tape in the trench backfill 12" below finished grade. The tape is to be non-biodegradable type plastic at least 4" wide, red in color, and imprinted with the legend “Caution-Buried Electric Line Below”.

D. Construction shall be arranged so that trenches will be left open for the shortest practical time to avoid creating a hazard to the public and to minimize the likelihood of trench collapse due to other construction activity, rain, accumulation of water in the trench, etc.

3.10 HORIZONTAL DIRECTIONAL DRILLING

A. Directional drilling shall include all work necessary and required for the installation of polyvinyl chloride (PVC) conduit sleeves under paved roads as indicated on the drawings and as specified herein. Services furnished by the Contractor shall be performed in accordance with the best industry practice and these Contract Documents. The Contractor shall furnish all labor, equipment and consumables necessary to accomplish the Work specified herein including, but not limited to, the following tasks:

1. Clearing, grading and general site/access preparation necessary for construction operations.
2. Transportation of all equipment, labor, consumables and company supplied material to and from the job sites.
3. Assembly of PVC conduit sleeves.
4. Erection of drilling equipment at the rig sites.
5. Drilling of a pilot hole along the alignment defined on the Drawings and as specified herein.
6. Reaming the pilot hole as specified herein to a diameter suitable for installation of the PVC conduit sleeve.
7. Pulling the assembled PVC conduit sleeve through the reamed hole.
8. Testing of PVC conduit sleeve after installation.
9. Closing ends of PVC conduit sleeve with removal caps.
10. Disposal off site at a regulated landfill or other location of all drilling spoils.
11. Clean-up and final restoration of all work areas.

B. The Contractor’s operations will be conducted in a location which contains existing underground utilities. Therefore, the Contractor must exercise caution including, but not limited to, undertaking the following steps:

1. Verify the location of all adjacent underground utilities.
2. Modify drilling practices or down hole assemblies to prevent damage to adjacent underground utilities.

3.11 ACCEPTANCE CABLE TESTING (SINGLE CONDUCTOR & MULTI-CONDUCTOR ASSEMBLIES)

A. Cables - Low Voltage (600 volts and less)

1. Visual and Mechanical Inspection

a. Cables to be inspected for physical damage and proper connection in accordance with single line diagram.

b. Cable mechanical connections shall be tested to manufacturer's recommended values with a calibrated torque wrench.

2. Electric Tests
   a. Perform insulation resistance test on each cable with respect to ground and adjacent cables.
   b. Perform continuity test to insure proper cable connections.
3. Test Values
   a. Insulation resistance tests shall be performed at 1000 volts D.C. for one (1) minute.
   b. When insulation resistance must be determined with all switchboards, panelboards, fuse holders, switches, and overcurrent devices in place, the insulation resistance when tested at 500 volts D.C. shall be no less than Table 3.1.

Table 3.1

MINIMUM INSULATION RESISTANCE

Conductor or Circuit Size	Minimum Resistance
No. 14 and 12 AWG	1,000,000 ohms
25 ampere circuits and above	250,000 ohms

3.12 ELECTRIC SERVICE INSTALLATION

A. Install secondary service conductors underground from pad mounted transformers to the connection of the existing conductors in PVC conduit.

B. Provide PVC conduit sleeves for primary conductors turning up into transformers.

C. Provide secondary conductor terminations at the service transformers.

3.12 STATION AND DISTRIBUTION ENCLOSURES

A. Enclosures shall be handled carefully to avoid damage to the finish and shall be set on concrete pad positioned in accordance with the site plan and specifications.

B. Enclosures shall be anchored to the concrete pad with expansion type anchors and stainless steel hardware.

C. Seal perimeter of enclosures with clear RTV sealant. Vary application as required to seal base of enclosure with the surface of the concrete pad.

D. Metallic wireway and/or PVC conduit shall be used for wiring within the Station Enclosures. Metal clad (Type MC) cable shall be used for wiring of interior light, switch, thermostat, and cooling fan. Exposed wiring within the enclosure is prohibited.

E. All conduit entries into the Distribution Enclosures shall be extended to the panel and or enclosed circuit breakers. Exposed wiring within the enclosure is prohibited.

END OF SECTION 16050 – BASIC MATERIALS AND METHODS

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SECTION 16053 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Underground-line warning tape.
5. Warning labels and signs.
6. Instruction signs.
7. Equipment identification labels.
8. Miscellaneous identification products.

1.02 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

1.03 QUALITY ASSURANCE

A. Comply with ANSI A13.1.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

PART 2 PRODUCTS

2.01 POWER RACEWAY IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.

B. Colors for Raceways Carrying Circuits at 600 V or Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage and system type.

C. Snap-Around, Color-Coding Bands for Raceways Carrying Circuits at 600 V or Less: Slit, pre-tensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

2.02 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Write-On Tags: Polyester tag, 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.

C. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.03 CONDUCTOR IDENTIFICATION MATERIALS

A. Description: Tubing/sleeve type wire marker system. Identification labeling shall utilize sleeve identification labeling system with numbers (and/or letters) permanently printed using HEAT TRANSFER technology. Dot Matrix type print on vinyl sleeves is NOT considered acceptable.

B. Locations: In general, each conductor or cable required to be labeled shall be identified in every panelboard gutter space, pull box, and at the load connection termination. Control and instrumentation cabling is to be identified in each device enclosure; control station, wiring termination cabinet and at main (or auxiliary) control panels. Telecommunication/Data and Instrumentation wiring shall be labeled as outlined in other Sections of these Contract Documents.

C. Legend:
1. Power and Lighting Circuits: Branch circuit or feeder number indicated.
2. Control Circuits: Control wire number indicated on schematic and interconnection diagrams. All control wiring shall be tagged with a legible permanent coded wire marking sleeve. Sleeves shall be white PVC tubing with machine print black marking. Markings shall be in accordance with the wire numbers shown on the control wiring diagrams. All I/O wiring shall be labeled. The process controllers address shall be included in the wire identification tag.

D. Manufacturers:
1. Brady
2. Seton
3. LEM
4. Panduit

2.04 UNDERGROUND-LINE WARNING TAPE

A. Tape:

1. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core, bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
2. Printing on tape shall be permanent and shall not be damaged by burial operations.
3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:

1. Comply with ANSI Z535.1 through ANSI Z535.5.
2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE.
3. Inscriptions for Orange-Colored Tapes: OPTICAL FIBER CABLE.

2.05 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

C. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning (For 300 Volts and Below): "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."
3. Workspace Clearance Warning (For 600 Volts and Below): "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 42 INCHES."

2.06 EQUIPMENT IDENTIFICATION LABELS

A. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.

B. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

2.07 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in Division 09 painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

3.01 INSTALLATION

A. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

B. Apply identification devices to surfaces that require finish after completing finish work.

C. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

D. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

E. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches overall.

F. Painted Identification: Comply with requirements in Division 09 painting Sections for surface preparation and paint application.

3.02 IDENTIFICATION SCHEDULE

A. Accessible Raceways, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 300 V to ground: Install labels at 30-foot maximum intervals. Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage.

B. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.

1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded feeder and branch-circuit conductors.
   a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
   b. Colors for 208/120-V Circuits:
      1) Phase A: Black.
      2) Phase B: Red.
      3) Phase C: Blue.
   c. Colors for 480/277-V Circuits:
      1) Phase A: Brown.
      2) Phase B: Orange.
      3) Phase C: Yellow.
   d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

C. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.

D. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.

1. Limit use of underground-line warning tape to direct-buried cables.
2. Install underground-line warning tape for both direct-buried cables and cables in raceway.

E. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

F. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting:

1. Comply with 29 CFR 1910.145.
2. Identify system voltage with black letters on an orange background.
3. Apply to exterior of door, cover, or other access.
4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:

    a. Power transfer switches.
    b. Controls with external control power connections.

G. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:
2. Indoor Equipment: self-adhesive, engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch high letters on 1-1/2-inch high label; where two lines of text are required, use labels 2 inches high.
3. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
4. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
5. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

END OF SECTION 16053 – IDENTIFICATION OF ELECTRICAL SYSTEMS

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SECTION 16400 - SERVICE AND DISTRIBUTION

PART 1 GENERAL

1.01 DESCRIPTION

A. Perform all work necessary and/or required and furnish all materials, labor and equipment for a complete system of electrical service and distribution. Such work includes, but is not limited to, the following:

1 Remove the existing primary cables, existing sectionalizing cabinets, high voltage switches, pad-mounted transformers, and panelboards attached to transformer and all associated items being de-energized under this project.

2. Provide new underground primary cables, pad mounted switchgear, sectionalizing cabinets, pad mounted transformers, load-break termination system, panels, free-standing enclosures and underground splice handholes as shown on drawings.

B. Refer to Section 16050 for work, materials and methods specified in that Section.

C. The Contractor shall remove demolished items and equipment from the site. The transformers shall be removed from the site and disposed of properly.

1.02 SUBMITTALS

A. Consult Sections 01300 and 16010 for requirements in submitting submittals on all materials specified in this section.

1.03 ELECTRIC SERVICE

A. All primary and secondary electric services shall be underground from pad-mounted sectionalizing cabinets and transformers.

B. Contractor shall coordinate the installation of the work on the primary and secondary distribution with the Owner and provide all work as required.

C. All service interruptions shall be coordinated with the Owner's representative to limit durations of outages to the Lums Park.

D. The primary service voltage is 24900/14000 volts, 3-phase.

E The secondary service voltage shall be 208Y/120 volt, 3-phase, 4-wire and 120/240 volts, 1-phase, 3-wire.

1.04 WORK RESPONSIBILITIES

A. The Contractor performing this work shall have a minimum of five years of experience in termination of primary medium voltage cable.

B. The Contractor shall provide all necessary supervision, labor, materials, tools, test instruments or other equipment or services and expenses required to inspect, test, adjust, set, calibrate, functionally and operationally check all work and components of the electrical systems throughout the installation. Also, the Contractor shall include the furnishing of sufficient personnel to assist operating forces in any additional checks they

may require for acceptance, start-up and placing the equipment and systems into continuous service.

C. The Contractor shall engage the services of a competent, nationally recognized, independent electrical equipment testing laboratory or organization to perform part of the required field inspections, tests, and adjustments specified. The testing firm shall not be a subsidiary, division, or department of either the installing Contractor or the manufacturer of the equipment, materials or systems being inspected and tested. The Engineer and Owner shall approve the testing firm proposed for use by the Contractor. The testing firm shall be a fully accredited member of the National Electrical Testing Association, Incorporated (NETA) and have the specialized experience and skill in the supervision and performance of all inspection testing specified herein. The Contractor, when requested, shall submit proof of the proposed testing firm's qualifications, accreditation, and experience for evaluation for approval by the Engineer and Owner. Contractor is referred to 16900 Electrical Testing & Startup for description of testing requirements.

D. The Contractor shall notify the Engineer two (2) weeks prior to performing the following tests so that a Representative of the Owner may witness the test. All test data must be turned over to the Owner prior to release of final payment.

1.05 SERVICE AND DISTRIBUTION TESTS AND INSPECTIONS

A. Contractor Responsibility: The Contractor shall provide all necessary supervision, labor, materials, tools, test instruments or other equipment or services and expenses required to inspect, test, adjust, set, calibrate, functionally and operationally check all work and components of the underground electrical systems throughout the installation. Also, the Contractor shall include the furnishing of sufficient personnel to assist operating forces in any additional checks they are required for acceptance, start-up and placing the equipment and systems into continuous service.

B. Independent Testing Laboratory: As specified herein, the Contractor shall engage Services of a competent nationally recognized independent Electrical Equipment Testing Laboratory or organization to perform part of the required field inspections, tests and adjustments as specified. The testing firm shall not be a subsidiary, division, or department of either the installing contractor or the manufacturer of the equipment, materials or systems being inspected and tested. The Engineer and Owner must approve the testing firm proposed for use by the contractor prior to the close of the bid period as required in the Instructions to Bidders. The testing firm shall be a fully accredited member of the National Electrical Testing Association, Incorporated (NETA) and have the specialized experience and skill in the supervision and performance of all inspection testing herein specified. The contractor, when requested, shall submit proof of the proposed testing firm's qualifications, accreditation, and experience for evaluation for approval by the Engineer or Owner.

C. The contractor shall perform the following tests and notify the engineer two (2) weeks prior to testing so a representative of the owner may witness the test. All test data must be turned over to the owner prior to release of final payment.

1. The primary cable shall have high voltage potential testing as recommended by the cable manufacturer and approved by the Engineer. Cables shall be tested after installation of cable termination devices.
2. The contractor must exercise great care in properly locating existing feeders and phasing out and identifying new high voltage feeders. The contractor shall arrange and schedule the Owner's representative to be present when new system is energized.

PART 2 PRODUCTS

2.01 PRIMARY CABLE (25 KV)

A. Type: Single conductor #1/0AWG solid aluminum 25 KV rated with full size neutral, 105ºC rated underground power cable.

B. Central Conductor: Aluminum per ASTM B-609,

C. Conductor Screen: Extruded semi-conducting, Ethylene-Propylene Rubber meeting the requirements of ICEA S-94-649 and AEIC CS8.

D. Insulation: 260 mils 100% insulation level, Ethylene-Propylene Rubber (EPR) per ICEA S-94-649.

E. Insulation Screen: Extruded semi- conducting Ethylene-Propylene Rubber per ICEA S –94-649.

F. Concentric Bare Conductors: 16 x 14 AWG.

G. Jacket: Black encapsulating polyethylene jacket with 3 red identification stripes.

H. Standards: Cable manufactured and listed in accordance with the latest revisions of:

1. ICEA Pub. No. S 94-649

2. ASTM B-609

3. AEIC CS8

4. Delmarva Power Company Requirements.

I. Manufacturer: Okonite Okoguard-URO-J, or approved equal.

2.02 PRIMARY CABLE TERMINATIONS

A. 15 kV and 25 kV Class, 200 ampere loadbreak termination systems, designed to meet ANSI/IEEE Standard 386, for separable connectors and components. All electrically conductive elements are to be of copper. Elbow crimp connections shall be of aluminum. All items shall be U.L.listed for submersible duty, made of molded EPDM rubber. The system shall consist of but limited to the following:

1. Power Cable Elbow Connectors shall consist of a contact probe, test point, compression type wire connector; stainless steel reinforced pulling eye and EPDM insulation with EPDM molded shield. A cold shrink concentric neutral cable sealing kit shall be provided for each connector.

2. Bushing well inserts, insert bushings, insulating bushing well plug and insulating bushing caps and insulated standoff bushings

3. 18 kV (25 kV System) Class insulated pug-in dead front surge arrestors, fully shielded, gapless, solid state of a metal oxide varistor design with bonding cable for connecting to the system ground in the high voltage compartment.

4. 15 kV and 25 kV Class Loadbreak junctions consisting of 3 & 4 point contact assemblies with U-straps for installation on mounting plates in sectionalizing cabinets.

5. Manufacturer shall be Cooper Power Systems, Elastimold or Raychem.

2.03 PAD MOUNTED SWITCHGEAR

A. Construction

1. Factory assembled, free standing, pad-mounted, dead front elbow connected, encased components, 25 kV rated gear with totally enclosed 600 ampere switch and 200 ampere fuse compartments. Switches shall be rated for full load switching with no external arc or flame.

2. Enclosure: Free standing, self-supporting, tamper-resistant, constructed of 11-gauge sheet steel with welded joints and baked-on exterior finish. Enclosure construction meets the requirements of ANSI C57.12.28 for integrity. A 12" riser base shall be provided at the enclosure's open bottom for cable entrance. The enclosure shall provide free-flow natural ventilation. The roof shall be undercoated with insulating "no-drip" compound and the sections over the cable compartments shall be hinged. A resilient closed-cell gasket shall be provided on the bottom flange. The enclosure shall have doors on both sides with stainless steel hinges, and hold open hardware. Fuse compartment doors shall be equipped with a spare fuse assembly.

3. Terminal Compartment: The switch and fused terminal compartments shall be provided with insulated 200-ampere rated bussing wells. Bushing wells shall be in accordance with ANSI/IEEE Standard 386. Parking stands shall be provided adjacent to each bushing well.

4. Barriers: Fiberglass-reinforced polyester barriers shall be provided to achieve 125 BIL at 25 kV.

5. Switch: Each three-pole interrupter switch shall be gang operated with external folding style handle secured inside the switch-operating-hub pocket. Each switch shall have a quick-make, quick-break mechanism with positive locking of the blades in the opened and closed position and one-time duty-cycle fault closing ratings equal to or exceeding the short circuit (rms, sym.) ampere rating of 25000 at 14.4 kV and 12,500 at 25 kV. Each switch shall be constructed with silver-clad copper jaw contacts, arc compressors with blade wipes, one-piece formed hard-drawn copper blades. The switches shall have key interlocks to prevent opening fuse-compartment doors unless the switches are locked open.

6. Fuses: S & C type SME-20 power fuse components, Type E rated (14,000 amperes rms symmetrical) with blown fuse indication. Fuses shall have silver or pre-tensioned nickel-chrome elements and be of solderless construction. Provide fuse storage features in compartments 3 and 4 and three spare fuse refill units for each size fuse.

7. Grounding: Ground rod shall extend the full width of each switch terminal compartment and ground rings ring assembly shall be extend the width of each fuse terminal compartment.

8. Provide Warning and Danger safety labeling meeting ANSI Z535.4 Standards.

B. Manufacturer: S&C Electric PME Models as indicated on single diagram or an approved equal.

2.04 THREE-PHASE PAD-MOUNTED TRANSFORMER

A. Application

The transformer shall be a liquid-filled, outdoor three-phase pad-mount style unit constructed in compliance with the latest applicable standards.

B. Applicable Standards

1. All characteristics, definitions, and terminology, except as specifically covered in this specification, shall be in accordance with the latest revision of the following ANSI/IEEE, NEMA, and Department of Energy standards.

C57.12.00 – IEEE Standard for Standard General Requirements for Liquid Immersed Distribution, Power, and Regulating Transformers.

C57.12.28 – Pad-Mounted Equipment - Enclosure Integrity.

C57.12.34 – IEEE Standard Requirements for Pad-Mounted, Compartmental-Type, Self-Cooled, Three-Phase Distribution Transformers (2500 kVA and Smaller) - High Voltage: 34500GrdY/19920 Volts and Below; Low-Voltage: 480 Volt 2500 kVA and Smaller

C57.12.90 – IEEE Standard Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers and IEEE Guide for Short-Circuit Testing of Distribution and Power Transformers.

C57.12.91 – Guide for Loading Mineral-Oil-Immersed Transformers.

NEMA TR 1-1993 (R2000) – Transformers, Regulators and Reactors, Table 0-2 Audible Sound Levels for Liquid-Immersed Power Transformers.

NEMA 260-1996 (2004) – Safety Labels for Pad-Mounted Switchgear and Transformers Sited in Public Areas.

10 CFR Part 431 – Department of Energy – Energy Conservation Program for Commercial Equipment: Distribution Transformers Energy Conservation Standards; Final Rule.

C. Quality Assurance

Manufacturer shall be a company specializing in distribution transformers with ten years documented experience.

D. Construction

1. The core and copper coil shall be vacuum processed to ensure maximum penetration of insulating fluid into the coil insulation system. While under vacuum, the windings will be energized to heat the coils and drive out moisture, and the transformer will be filled with preheated filtered degassed insulating fluid. The core shall be manufactured from burr-free, grain-oriented silicon steel and shall be precisely stacked to eliminate gaps in the corner joints. The coil shall be insulated with B-stage, epoxy coated, diamond pattern, insulating paper, which

shall be thermally cured under pressure to ensure proper bonding of conductor and paper.

2. The average temperature rise of the windings, measured by the resistance method, shall be 65 ºC when the transformer is operated at rated KVA output in a 40 ºC ambient. The transformer shall be capable of being operated at rated load in a 30ºC average, 40ºC maximum ambient, as defined by ANSI C57.12.00 without loss of service life expectancy.

3. The dielectric coolant shall be listed less-flammable fluid meeting the requirements of National Electrical Code Section 450-23 and the requirements of the National Electrical Safety Code (IEEE C2-2002), Section 15. The dielectric coolant shall be non-toxic*, non-bioaccumulating and be readily and completely biodegradable per EPA OPPTS 835.3100. The base fluid shall be 100% derived from edible seed oils and food grade performance enhancing additives. The fluid shall not require genetically altered seeds for its base oil. The fluid shall be certified to comply with the US EPA Environmental Technology Verification (ETV) requirements, and tested for compatibility with transformer components. The fluid shall be Factory Mutual Approved, UL Classified Dielectric Medium (UL-EOUV) and UL Classified Transformer Fluid (UL-EOVK), Envirotemp® FR3 fluid. *(Per OECD G.L. 203)

4. The high and low voltage compartments shall be located side by side, separated by a steel barrier. When facing the transformer, the low voltage compartments shall be on the right. Terminal compartments shall be full height, air-filled, with individual doors. The high voltage door fastenings shall not be accessible until the low voltage door has been opened. Hinge pins and associated barrels shall be constructed of corrosion-resistant material, passivated AISI Type 304 or the equivalent. Both compartments shall be accessible by penta-head bolts.

5. The transformer shall be rated as indicated, self cooled (OA), dead front loop feed type. Primary and secondary voltages shall be as indicated on drawings, with two 2-1/2 % full capacity taps above normal and two 2-1/2 % taps below normal. The tap changer shall be clearly labeled to reflect that the transformer must be de-energized before operating the tap changer as required by Section 4.3 of ANSI C57.12.34. Impedance shall meet ANSI Standards for transformer size as indicated. Basic impulse level of the primary winding shall be 95 kV at 12 kV and 125 kV at 25 kV. The secondary winding BIL shall be 30 kV.

6. The transformer tank shall be sealed construction with sufficient strength to withstand a pressure of 7 psi without permanent distortion and 15 psi without rupture. The tank shall be provided with an automatic pressure release valve. The cover on single transformers shall be a welded dome assembly. The transformer shall remain effectively sealed for a top oil temperature range of -5 ºC to 105 ºC. When required, cooling panels will be provided on the back and sides of the tank. Lifting eyes and jacking pads will be provided. Exterior shall be painted Munsell 7GY3.29/1.5 Green and the cabinet interior and front plate shall be painted ANSI 61 gray.

7. Bay-O-Net style, current limiting, 25kV class fuses shall be furnished and installed in the primary compartment. Provide one set of spare fuses.

8. The high voltage terminations and equipment shall be dead-front design with six (6) high voltage bushings in accordance with Figure 2 dimensions of ANSI C57.12.34 for loop feed configuration. The high voltage bushings shall be 15/25 kV 200A bushing wells with loadbreak bushing well inserts installed. Bushing

wells and inserts shall be in accordance with ANSI/IEEE Standard 386. Parking stands shall be provided adjacent to each high voltage bushing.

9. The low voltage bushings shall be molded epoxy, and provided with tin-plated blade-type spade terminals with NEMA standard hole spacing arranged for vertical take-off. The low voltage neutral shall be an insulated bushing, grounded to the tank by a removable ground. All spade terminals shall be provided with a PVC insulation boot.

10. Additional Accessories

    a. Nameplate in low voltage compartment
    b. Drain/Sampling valve.
    c. Dial-type thermometer
    d. Dial-type oil level gauge
    e. Pressure vacuum gauge
    f. Automatic pressure relief valve.

11. Production Testing

    Tests shall be conducted in accordance with the provisions of ANSI C57.12.90 and shall include, as a minimum, the following tests:

    a. Winding resistance measurement Test
    b. Ratio tests using all tap settings
    c. Polarity and phase relationship tests
    d. Percent impedance (85ºC) at rated current
    e. No-Load (85ºC) at rated current
    f. Excitation current (100% voltage) test
    g. Total (85ºC) losses at rated current
    h. Induced potential tests
    i. Full wave and reduce wave impulse test
    j. Leak Test

12. EFFICIENCY STANDARD

    Minimally, transformers shall conform to efficiency levels for liquid immersed distribution transformers, as specified in Table I.1 of the Department of Energy ruling. “10 CFR Part 431 Energy Conservation Program for Commercial Equipment: Distribution Transformers Energy Conservation Standards; DOE 2016.” Manufacturer shall comply with the intent of all regulations set forth in noted ruling.

E. Manufacturers: Cooper Power System, Square D, ABB or equal

2.05 SINGLE-PHASE PAD-MOUNTED TRANSFORMER

A. Application

The transformer shall be a liquid-filled, outdoor single-phase pad-mount style unit constructed in compliance with the latest applicable standards.

B. Applicable Standards

All characteristics, definitions, and terminology, except as specifically covered in this specification, shall be in accordance with the latest revision of the following ANSI/IEEE, NEMA, and Department of Energy standards.

C57.12.00 – IEEE Standard for Standard General Requirements for Liquid Immersed Distribution, Power, and Regulating Transformers.

C57.12.25 –American National Standard for Transformer – Pad-Mounted, Compartment Type, Self-Cooled, Single-Phase Distribution Transformers with Separable Insulated High-Voltage Connectors; High Voltage, 34,500Grd/19920 Volts and Below; Low Voltage, 240/120 Volts; 167 kVA and Smaller - Requirements

C57.12.28 – Pad-Mounted Equipment - Enclosure Integrity.

C57.12.90 – IEEE Standard Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers and IEEE Guide for Short-Circuit Testing of Distribution and Power Transformers.

C57.12.91 – Guide for Loading Mineral-Oil-Immersed Transformers.

NEMA TR 1-1993 (R2000) – Transformers, Regulators and Reactors, Table 0-2 Audible Sound Levels for Liquid-Immersed Power Transformers

10 CFR Part 431 – Department of Energy – Energy Conservation Program for Commercial Equipment: Distribution Transformers Energy Conservation Standards; Final Rule.

C. Quality Assurance

Manufacturer shall be a company specializing in distribution transformers with ten years documented experience.

D. Construction

1. The core and copper coil shall be vacuum processed to ensure maximum penetration of insulating fluid into the coil insulation system. While under vacuum, the windings will be energized to heat the coils and drive out moisture, and the transformer will be filled with preheated filtered degassed insulating fluid. The core shall be manufactured from burr-free, grain-oriented silicon steel and shall be precisely stacked to eliminate gaps in the corner joints. The coil shall be insulated with B-stage, epoxy coated, diamond pattern, insulating paper, which shall be thermally cured under pressure to ensure proper bonding of conductor and paper.

2. The dielectric coolant shall be listed less-flammable fluid meeting the requirements of National Electrical Code Section 450-23 and the requirements of the National Electrical Safety Code (IEEE C2-2002), Section 15. The dielectric coolant shall be non-toxic*, non-bioaccumulating and be readily and completely biodegradable per EPA OPPTS 835.3100. The base fluid shall be 100% derived from edible seed oils and food grade performance enhancing additives. The fluid shall not require genetically altered seeds for its base oil. The fluid shall be certified to comply with the US EPA Environmental Technology Verification (ETV) requirements, and tested for compatibility with transformer components. The fluid shall be Factory Mutual Approved, UL Classified Dielectric Medium (UL-EOUV) and UL Classified Transformer Fluid (UL-EOVK), Envirotemp® FR3 fluid.

*(Per OECD G.L. 203)

3. Terminal compartment shall be full height, air-filled, accessed by a hinged door with stainless steel hinged pins and barrels. In addition to the regular pad locking provision, the access door shall be secured by a recessed, captive, penta head bolt.

4. The transformer shall be rated as indicated, self cooled (OA), dead-front loop feed type. Primary and secondary voltages shall be as indicated on drawings, with two 2-1/2 % full capacity taps above normal and two 2-1/2 % taps below normal. The tap changer shall be clearly labeled to reflect that the transformer must be de-energized before operating the tap changer as required by Section 4.3 of ANSI C57.12.34. Impedance shall meet ANSI Standards for transformer size as indicated. Basic impulse level of the primary winding shall be 95 kV at 12 kV and 125 kV at 25 kV. The secondary winding BIL shall be 30 kV.

5. The transformer tank shall be sealed construction with sufficient strength to withstand a pressure of 7 psi without permanent distortion and 15 psi without rupture. The tank shall be provided with an automatic pressure release valve. The cover on single transformers shall be a welded dome assembly. The transformer shall remain effectively sealed for a top oil temperature range of -5 ºC to 105 ºC. Lifting provisions shall be provided. Exterior shall be painted Munsell 7GY3.29/1.5 Green.

6. Bay-O-Net style, dual element, 15kV or 25kV class expulsion fuses with flapper valve shall be used in series with an internally mounted isolation link for primary overcurrent protection. Provide one set of spare fuses.

7. The high voltage terminations and equipment shall be dead front loop feed design with high voltage bushings configured per ANSI Figure 1A for ANSI Type 1 units. The high voltage bushings shall be 15/25 kV 200A bushing wells with loadbreak bushing well inserts installed. Bushing wells and inserts shall be in accordance with ANSI/IEEE Standard 386. Parking stands shall be provided between the high voltage bushings.

8. The secondary voltage insulated bushings shall be a molded epoxy body and with threaded stud-type line and neutral terminals configured per ANSI 1A for ANSI Type 1 units. The neutral shall be grounded to the tank by a removable ground.

9. Additional Accessories

   a. Nameplate in low voltage compartment
   b. Drain/Sampling valve.
   c. Dial-type thermometer
   d. Dial-type oil level gauge
   e. Pressure vacuum gauge
   f. Automatic pressure relief valve.

10. Production Testing

    Tests shall be conducted in accordance with the provisions of ANSI C57.12.90 and shall include, as a minimum, the following tests:

    a. Winding resistance measurement Test
    b. Ratio tests using all tap settings

c. Polarity and phase relationship tests
d. Percent impedance (85ºC) at rated current
e. No-Load (85ºC) at rated current
f. Excitation current (100% voltage) test
g. Total (85ºC) losses at rated current
h. Induced potential tests
i. Full wave and reduce wave impulse test
j. Leak Test

11. EFFICIENCY STANDARD

Minimally, transformers shall conform to efficiency levels for liquid immersed distribution transformers, as specified in Table I.1 of the Department of Energy ruling. "10 CFR Part 431 Energy Conservation Program for Commercial Equipment: Distribution Transformers Energy Conservation Standards; DOE 2016." Manufacturer shall comply with the intent of all regulations set forth in noted ruling.

E. Manufacturers: Cooper Power System "MaxiShrub", or equal Square D or ABB

2.05 CABLE FAULT INDICATORS

A. Type: Test point reset type for use on loadbreak elbows.

B. Construction: Sensor encased in a one-piece conductive EPDM rubber boot with "fault" window display consisting of orange fluorescent flag indicator.

4. Electrical ratings and characteristics:

Power requirements	Min. 5kV L-G
Reset Time	Max. 3 min. at 5kV
Trip Accuracy	+/- 10%
Fault Withstand Capacity	25kV for 10 cycles
Fault Current Trip Rating	400 A
Temperature Range	-40□C to +85□C

5. Manufacture: Cooper Power Systems Apparatus 320-40 or equal.

2.06 SECTIONALIZING CABINET

A. Sectionalizing cabinet shall be produced of fire retardant resin and a combination of chopped glass spray up and hand lay up using woven roving glass reinforcement. Cabinet base shall be one-piece construction containing a molded mounting board and a 3-1/2" flange around the bottom perimeter for firm anchoring. Angle brackets shall be provided for anchoring to concrete pad.

B. The door section shall have stainless steel continuous hinge, locking assembly and props.

C. Aluminum mounting plates shall be provided for mounting of (3) loadbreak junctions (3 or 4 point) and two (2) stainless steel parking stands. The parking stands (2-per phase) shall be located above the loadbreak junctions.

D. A copper grounding system shall be provided consisting of #2 bare wire bonded to the mounting plates and for bonding of field bounding system neutrals.

E. Exterior is covered with a munsell green gel-coat, which contains UV stabilizers in addition to pigments and polyester resin for superior weather ability.

F. Manufacturers: Nordic Fiberglass Inc. Model ND-552436-MG-PA58-W3A or equal.

2.07 CABLE LUBRICANT

A. The cable lubricant shall meet the following performance specs:

1. When subjected to a 100 lbs. /ft. normal force, between cable and galvanized conduit, the lubricated cable system shall have a coefficient of kinetic friction less than .25 (pulling force <25 lbs./ft.).

2. The lubricant shall be UL (or CSA) listed.

3. When used on high voltage cable, the lubricant shall not affect the volume resistivity of any semi-conducting jacket or insulation shield present. The volume resistivity of the semi-conducting material shall at no time increase more than 100% when tested per ICEA standards.

4. The lubricant shall not affect the tensile/elongation properties of the cable jacket more than existing ICEA/NEMA aging specifications allow.

5. The cable lubricant shall be a low solids type whose residue does not melt or support the spread of flame.

B. The cable lubricant shall be Polywater J by American Polywater Corporation or equal by Condux International, Inc.

2.08 GROUNDING

A. Grounding shall be in accordance with the requirements of the National Electrical Code and as hereinafter specified and/or indicated on the drawings. Perforated grounding straps are not acceptable.

B. Ground rods shall be 3/4" diameter by 10' long copper-clad steel in one piece. (ITT Blackburn Catalog No. 7510 or equal). Sectional ground rod shall be 3/4" diameter by 10' long copper-clad steel complete with coupling and driving stud. (ITT Blackburn Catalog No. 7510S/70C/70DS, or equal).

C. Ground rod clamps shall be bronze alloy with silicon bronze bolt and shall comply with UL Standard 467 for underground applications. (Anderson Catalog No. GC-6 or equal.)

D. Provide a ground rod and associated bonding in transformer, sectionalizing cabinet and secondary service enclosure.

2.09 LABELING AND TAGGING

A. Labeling and tagging material shall be the product of Electromark or equal to identify electrical hazards on primary equipment that are not vendor supplied, phase ID labeling of equipment terminations, phase legs of cables and their destination. Refer to paragraphs 3.07 & 3.08 of this section for information and guidelines in the application of labels and tags.

B. Warning and Danger adhesive labels shall be equal to the Electromark “Shock-In-The-Box” products.

C. Phase leg identification adhesive labels shall be equal to Electromark “Phaz/Label products. The Phaz/Label colored tags shall be red for phase A, white for phase B and light blue for phase C.

D. Combination Phase leg and Destination ID tags shall be equal to Electromark “Phaz/2” cable tags. The Phaz/2 colored tags shall be red for phase A, white for phase B and light blue for phase C.

E. Labels and tags shall meet the requirements of ANSI Z535, Series of Standards for Safety Signs and Tags.

PART 3 EXECUTION

3.01 PRIMARY CABLE (25 KV)

A. Cable shall be installed continuous between terminations points without splices. Cable shall be handled carefully at all times to avoid damage, and shall not be dragged across the ground. Care shall be exercised to avoid excessive bending of the cable. The ends of the cable shall be sealed at all times against moisture with suitable end caps. Where it is necessary to cut the cable, the ends shall be terminated or sealed immediately after the cutting operation.

B. Where possible, cable shall be laid out from the reel mounted on a vehicle or trailer. The reel shall be supported so that it can turn easily without undue strain on the cable. All cable placements shall be done under constant supervision to be certain that no damage to the cable occurs.

C. The Contractor shall carefully inspect the cable as it is removed from the reel during pulling operations to be certain that it is free from visible defects. The Owner's representative shall decide upon corrective action when defects are discovered.

D. The minimum-bending radius of primary cable is 12 times the overall diameter of the cable. The minimum radius specified is measured to the surface of the cable on the inside of the bend. No cable bends shall be made within 6.0 inches of a cable terminal base.

E. As the cables are installed they shall be identified and tagged. The phase identification shall be of a permanent type, such as that done with an embossing type tape writer on plastic or on sealable plastic tags. The tag shall be securely attached to the cable. Paper or cloth tags are not acceptable.

F. The cable jacket and/or conduit walls shall be completely lubricated when cable is pulled into conduit. The lubricant shall be applied immediately before or during the pull.

3.02 PRIMARY CABLE TERMINATIONS

A. Terminate primary cable connections in the primary switch, sectionalizing cabinet and in the transformer with the cable terminator as indicated on the primary single line diagram, which generally consist of the following:

1. One (1)-power loadbreak elbow per phase for the primary cables terminating in the sectionalizing cabinet.

2. Bushing insert and power loadbreak elbow per phase for primary cables in the primary switchgear compartments.

3. Insulated protective cap on each unused bushing in the primary distribution system.

4. Insulated standoff bushing with protective cap on each parking stand in the switchgear fuse compartments and in the sectionalizing cabinets.

5. One (1) multi-terminal insulated loadbreak junction per phase in the sectionalizing cabinet.

6. Insulated insert plug in each unused primary bushing well.

7. Insulated surge arrestors where indicated.

8. Preparation and assembly shall comply with procedures specified by the termination manufacturer.

3.03 PRIMARY CABLE ACCEPTANCE

A. Visual and Mechanical Inspections

1. Inspect exposed sections for physical damage.

2. Verify cable is supplied and connected in accordance with the single line diagram and identified with Phase and To: (destination ID) tags.

3. Inspect for shield grounding, cable support, and termination.

4. Inspect for visual jacket and insulation condition.

5. Inspect for proper phase identification and arrangement.

B. Electric Tests

1. Perform an insulation-resistance test utilizing an ohmmeter with a voltage output of at least 25000 volts. Individually test each conductor with all other conductors and shields grounded. Test duration shall be one minute.

2. Perform a shield continuity test on each power cable by ohmmeter method. Record all values.

3. Primary cables shall be D.C. High Potential Tested using the “Step Voltage Method” on all primary cables. Adhere to all precautions and limits as specified in NEMA Standards for EPR cable. Raise the conductor to the specified maximum test voltage and hold for 15 minutes.

4. Current sensing circuits in test equipment shall measure only the leakage current associated with the cable under test and shall not include internal leakage current of the test equipment.

5. Test procedure shall be as follows and the results for each cable test shall be recorded as specified herein.

a. Perform tests in strict accordance with ICEA and IEEE Standards.

b. Perform tests before and after terminations have been installed.

c. A graphic plot shall be made with leakage current (X axis) versus voltage (Y axis) at each increment and submitted to the Owner for review and approval by Owner and Engineer.

1. The step voltage slope should be reasonably linear.

2. Absorption slope should be flat or negative. In no case should slope exhibit a positive characteristic.

d. Record wet and dry bulb temperatures. Do not perform test unless weather is clear and relative humidity is below 70 per cent.

e. Each section of cable must be tested individually. “Daisy chain” tests are not permitted.

f. Each conductor shall be individually tested with all other conductors grounded at both ends. All shields shall be grounded.

g. Terminations shall be properly corona suppressed by guard ring, field reduction sphere, or other suitable methods.

h. Care shall be taken to insure that the maximum test voltage does not exceed the limits for terminators specified in IEEE Standard 48.

i. Grounds shall be applied for a time period adequate to drain all insulation stored potential. Proper notification must be made to all concerned parties if grounds are left in place.

6. A representative of the Owner shall witness test results.

3.04 PAD-MOUNTED TRANSFORMER

A. Preparation

1. Verify transformer dimensions and access areas for underground conduit entry. Particular attention is to be given to required working space clearances in front of terminal compartment doors and to space between transformer and building wall.

2. Verify that required conduits and ground wire are in proper location and ready for use.

B. The transformer shall be installed on new elevated concrete equipment pad in accordance with manufacturer's instructions.

C. Field Quality Control

1. Verify anchorage, alignment, and grounding.

2. Verify settings of level, pressure and temperature instrumentation are set as required.

3. Test dielectric liquid to ASTM D877, using 25,000 volts minimum breakdown voltage, after installation and before energization of system.

4. Test transformer to ANSI/IEEE C57.

D. Adjust primary taps so that secondary voltage is within 2% of rated voltage.

E. Perform all primary and secondary connections.

3.05 PAD MOUNTED SWITCHGEAR

A. Switchgear shall be handled carefully to avoid damage to the finish and shall be set on a new elevated concrete pad positioned in accordance with the site plan and specifications.

B. Switchgear shall be anchored to the concrete pad with expansion type anchors and stainless steel hardware.

3.06 SECTIONALIZING CABINET

A. Cabinet shall be handled carefully to avoid damage to the finish and shall be set on a new concrete pad positioned in accordance with the site plan and specifications.

B. Install multi-point loadbreak junctions in cabinets and provide phase identification label for each junction position. Install parking bushing in each parking stand.

C. Cabinet shall be anchored to the concrete pad with expansion type anchors and stainless steel hardware.

D. Seal perimeter of cabinet with clear RTV sealant. Vary application as required to seal base of cabinet with surface of the concrete pad.

3.07 PRIMARY EQUIPMENT LABELING

A. “WARNING” labels shall be affixed as follows:

1. Sectionalizing Cabinets & Single Phase Pad-Mounted Transformers:
   - Outside front lid surface and centered

2. Three Phase Pad-Mounted Transformers
   - Left door outside surface and centered

B. “DANGER” labels shall be affixed as follows:

1. Sectionalizing Cabinets & Single Phase Pad-Mounted Transformers:
   - Inside surface of equipment door and centered

2. Three Phase Mounted Transformers
   - Inside surface of all equipment doors and centered

C. Phase leg Identification shall be affixed as follows:

1. Sectionalizing Cabinets:
   - Inside surface adjacent the loadbreak junctions

2. Single and Three Phase Mounted Transformers
   - Inside surface adjacent each high voltage insulated bushing.

3. Primary Switchgear:

- Inside surface above high voltage insulated bushings or primary well in switch compartment
- Inside surface above parking standing in the fuse compartments

3.08 PRIMARY PHASE AND DESTINATION ID TAGS

A. Combination “phase” and destination “ID” tags shall be installed vertically on each primary cable with small nylon cable ties with the top edge of the tag even with top edge of elbow’s cable sealing kit.

END OF SECTION 16400 – SERVICE AND DISTRIBUTION

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SECTION 16900 - ELECTRICAL TESTING AND START-UP

PART 1 GENERAL

1.01 DESCRIPTION

A. Work Included: Furnish all labor and materials required for tests, submitting reports, start-up and associated work required to be performed under this Contract as specified below.

B. General:
1. The testing and start-up procedures, where indicated, shall be made by a NETA certified, independent electrical testing company (CIETC). Acceptable testing companies are MET Electrical Testing Company, Inc. or Approved Other NETA Certified Testing Company. All electrical equipment and systems testing shall be performed by the services of the independent testing company. Acceptance testing procedures established by the National Electrical Testing Association (NETA) shall be utilized in establishing test procedures and evaluating results. The Contractor shall provide suitable test forms for all tests conducted and shall submit all testing for review and comment to the Engineer.
2. The Contractor shall coordinate with the independent testing company for their performing all the testing required by this specification. Certified test reports shall be submitted for approval to the Engineer as required by this specification.
3. All equipment shall be demonstrated as operating properly prior to the acceptance of the work.
4. All protective devices shall be operative during all testing of operations.
5. Tests shall be conducted during the construction period, and the completion of records covering such work shall be the responsibility of the Contractor; all such tests and checks shall be made in strict accordance with applicable manufacturer and instructions of the Engineer.
6. Where conditions are found during the work which requires correction or change, the Contractor shall proceed promptly with the necessary work as directed by the Engineer.

1.02 RELATED SECTIONS

A. Division 16 Sections as related to the testing identified herein.

1.03 QUALITY ASSURANCE

A. Regulations, Standards and Publications:
1. NEC - National Electrical Code of National Fire Protection Association, 1999 Edition
2. ASTM - American Society for Testing and Materials
3. UL - Underwriters' Laboratories
4. IPCEA - Insulated Power Cable Engineers Association
5. IEEE - Institute of Electrical and Electronic Engineers
6. ANSI - American National Standards Institute, Inc.
7. NEMA - National Electrical Manufacturers Association
8. BOCA - Building Officials and Code Administrators
9. NETA - National Electrical Testing Association (ATS Current Edition)

PART 2 PRODUCTS

NOT APPLICABLE

PART 3. EXECUTION

1.01 TESTING

A. Tests Performed by Certified Independent Testing Company (CITC)
   1. CITC shall furnish all the necessary labor and equipment for testing in accordance with this specification. The Contractor shall be responsible for all tests and test records. Testing shall be performed by and under the immediate supervision of the Contractor and shall be performed by qualified personnel fully experienced in this type of testing.
   2. CITC shall provide all the necessary test equipment and shall be responsible for setting up all test equipment and other preliminary work in preparation for the tests.
   3. All testing shall be done in the presence of the Owner and/or his designated representative.
   4. Records of all tests and inspections, with completed data of all readings taken, shall be made and incorporated into a report for each piece of equipment tested. Individual reports shall be bound together with all test reports associated with the facility. The reports shall be indexed and grouped in a logical sequence.
   5. The tests specified herein apply to all equipment installed by the Contractor; any mechanical or electrical defects or damage in the Contractor's furnished equipment shall be immediately reported to the Owner or his designated representative and shall be replaced or repaired as soon as practical by the Contractor at no additional cost to the Owner.
   6. Equipment supplied under other Contracts damaged by careless or improper use of testing equipment associated with this Contract, shall be replaced or repaired as soon as practical by the Contractor at no additional cost to the Owner.
   7. No equipment shall be energized without the prior written approval of the Engineer.
   8. Test forms shall be generated by the Contractor to document test results which the forms included with this specification do not cover. These forms shall be standardized for all tests of the specific type. Additional test forms shall be approved by the Engineer.
   9. After the visual inspection of joints and connections and the application of tape and other insulating materials, all sections of the complete system or wiring shall be thoroughly tested for shorts and grounds; the Contractor shall correct all defects.
   10. In addition to the grounding system test described in Section 16050, 3.08, E (Note: Testing to be performed by independent test company), the ground tests shall include the following. If the ground system fails this testing, additional ground rods shall be driven and connected to the system as directed by the Engineer. The system shall then be retested until satisfactory results are obtained.
      a. Ground resistance measurements shall be made between the equipment ground buses or connections listed below and at two alternate points on the facility's external ground grid.
         1) Motors, 20 hp and larger
         2) 480 V motor controllers and variable frequency drives
         3) Power distribution panel(s)
      b. The maximum permissible resistance shall be 0.05 ohm between the ground bus and two ground grid points.
   11. Acceptance Tests for Cables:
      a. Perform wire and cable tests prior to connecting to equipment. All testing to be in accordance with NETA recommendations for acceptance testing.
   12. Phase Rotation:
      a. Phasing and identification of 3 phase, 60 cycle circuits, conductors and terminal shall be:
         1) ABC from top to bottom in vertical arrangement.
         2) ABC from left to right in horizontal arrangement.
            a) Facing front of 3 phase panels.
            b) Facing low voltage side of transformers.
            c) Facing right end of panel or primary control cubicle (right end determined from a) above).
            d) Facing right end of transformer bank (right end determined from b) above).
      b. Phase rotation is to be counterclockwise (this refers to electrical rotation only and not to mechanical rotation of machines).
   13. All Transformers:

a. Transformers shall be given the following visual and mechanical inspections:
   1) Inspect for physical damage; transformers shall be checked for correct connections and proper tap settings in accordance with the specifications and drawings.
   2) Verify proper auxiliary device operation such as fans, indicators and tap changer.
   3) Check tightness of accessible bolted electrical joints.
   4) Perform specific inspections and mechanical tests as recommended by the manufacturer.

b. Dry Transformer Test:
   1) The manufacturer shall submit guaranteed transformer test data covering the following:
      a) Efficiency at 25%, 50%, 75% and full 100% load.
      b) Percent regulation at 100% and 80% power factor.
      c) No load and full load losses in watts.
      d) Impedance based on reference temperature, hot spot and average temperature rise above 40 degrees C ambient.
      e) Sound level in decibels.
   2) The transformer shall meet standards equal to or in excess of those specified by NEMA, IEEE, NEC or ANSI; these tests shall be performed on all transformers including unit substation transformers.

B. Final Installation Check:
   1. Prior to operational testing and after Contractor's test, final checking of equipment, raceways, circuits and connections is required. Such checking will be done under the direction of the Engineer. The Contractor shall provide all necessary labor and, where requested, supervision to accompany, advise and assist the Owner's personnel in making such checks and in recording the results. Improper or defective items discovered during the checking processes shall be listed and shall be corrected as soon as possible.
   2. The requirements for preoperational checking include but are not limited to the following items:
      a. Phase rotation and voltage of power interconnections.
      b. All fuse and circuit breaker ratings correct as specified or shown on drawings.
      c. All panels, power centers and sectionalizing cabinets are correctly wired.
      d. All current transformer secondaries correctly wired to equipment or shorted.
      e. Primary switch and Sectionalizing Cabinet in operating condition, clean, adjusted and tested.
      f. All primary cable indicators are installed on loadbreak elbows.
      g. Transformers tested connected and operable.
      h. Integrity of grounding system verified including all ground connections tight. All equipment properly grounded and bonded in accordance with the Contract requirements. All metal raceway systems electrically continuous and correctly grounded.
      i. Power connections completed and tight.
      j. All tests performed by the Contractor and the independent testing company complete in accordance with this specification.
      k. Conduits properly installed in accordance with applicable documents and drawings.

C. Testing Equipment:
   1. Testing equipment, in sufficient numbers, to be provided by the Contractor shall include but shall not be limited to thermographic test equipment, motor driven meggers, ground test sets, timers, motor rotation indicator and instruments. All equipment shall be in good operating condition and shall be properly maintained and calibrated. The calibrations will be checked at intervals by the Engineer, and recalibration will be done whenever necessary. Submit certified calibration reports for equipment utilized.
   2. Upon completion of testing, checking and preliminary operation of each item of equipment, circuit or system, the Contractor shall be responsible for any necessary maintenance and protection until the item is turned over to and accepted by the Owner's operating personnel; where periodic testing is a part of prescribed maintenance, the

Contractor shall continue to make such tests and to record results according to established procedures.

D. Inspection: The following are mandatory hold points for which prior notification is required.

1. All underground direct buried conduits, cables. grounding systems and other work which will be concealed in concrete or backfilled with earth shall be inspected and released by the Engineer before concrete is poured or backfill is completed.

END OF SECTION 16900 – ELECTRICAL TESTING AND STARTUP

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