



Public Works Commission
Fayetteville, NC

**Demolition and
Decommissioning of Former
WTP at Glenville Lake Dam**

Issued For Bid

February 2022

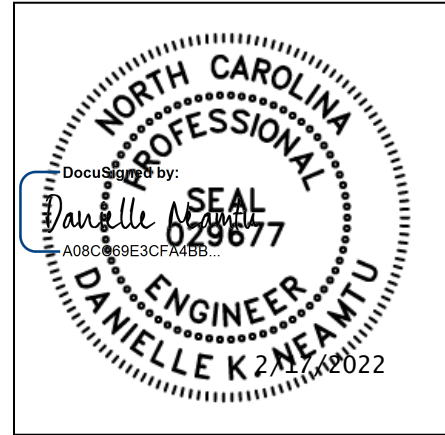


DOCUMENT 000107 - SEALS PAGE

1.1 DESIGN PROFESSIONALS OF RECORD

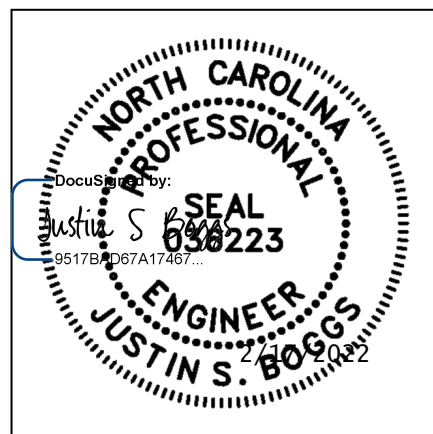
A. General & Civil Engineer:

1. Danielle K. Neamtu.
2. License #029677.
3. Responsible for Divisions 01-40 Sections except where indicated as prepared by other design professionals of record.



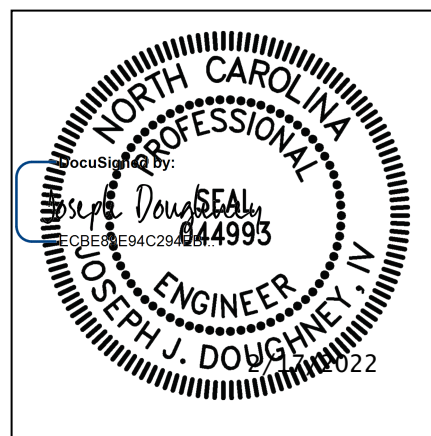
B. Structural Engineer:

1. Justin S. Boggs.
2. License #036223.
3. Responsible for Divisions 03, 05 and 400559.33 Sections.



C. Electrical Engineer:

1. Joseph J. Doughney IV.
2. License #044993.
3. Responsible for Division 26 Sections.



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6384-231131
February 2022

ADVERTISEMENT FOR BIDS

Pursuant to N.C.G.S 143-129, sealed proposals will be received by the Fayetteville Public Works Commission (PWC) in Fayetteville, North Carolina, until **Thursday, March 24, 2022 at 2:00 p.m., (local time)**, PWC Administration Building, outside by the Entrance Doors, 955 Old Wilmington Road, Fayetteville, North Carolina, at which time they will be publicly opened and read for construction of the following:

DEMOLITION AND DECOMMISSIONING OF FORMER WTP AT GLENVILLE LAKE DAM

A **mandatory** pre-bid conference will be held at 10:00 a.m. on Thursday March 3, 2022 at the Glenville WTP site at 628 Filter Plant Road, Fayetteville, North Carolina. All potential bidders must email Nikole Bohannon, PWC Procurement Advisor, at Nikole.Bohannon@faypwc.com of their intent to attend.

The successful bidder shall be required to submit a separate Performance Bond and Payment Bond in an amount equal to 100% of the contract amount.

All bidders are notified that North Carolina Statutory Provisions (NCGS Chapter 87, Article 1) as to licensing of Contractors will be observed in receiving, reading and awarding the Contracts.

Printed plans and Contract Documents will be available upon request on or about Tuesday December 7, 2021 from the Design Engineer, (CDM Smith, Inc., 5400 Glenwood Ave, Suite 400, Raleigh, North Carolina, 27612, 919-325-3500).

PWC reserves the right to reject any or all proposals waive all informalities concerning bid, or award bid to the lowest responsible bidder or bidders, taking into consideration quality, performance, and the time specified in the proposals for the performance of the contract.

Plans and Contract Documents are available for viewing and downloading on PWC's Procurement website (<https://www.faypwc.com/purchasing>). Potential bidders are not required to register and purchase of the documents is not required to bid.

FAYETTEVILLE PUBLIC WORKS COMMISSION

Trent Ensley,
Procurement Manager

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INVITATION TO BID

**DEMOLITION AND DECOMMISSIONING OF FORMER WTP AT GLENVILLE
LAKE DAM**

FAYETTEVILLE PUBLIC WORKS COMMISSION

Cumberland County
North Carolina

Pursuant to N.C.G.S 143-129, sealed proposals are solicited and will be received by PWC until **2:00 p.m., March 24, 2022** at the address specified below, and then publicly opened and read for the demolition of the former Water Treatment Plant (WTP) building at Glenville Lake Dam and associated intake/drainage improvements.

Proposals must be enclosed in a sealed envelope addressed to Fayetteville Public Works Commission, Administration Building, Attn: Nikole Bohannon, Procurement Advisor 955 Old Wilmington Road, Fayetteville, NC 28301. The outside of the envelope must be marked **SEALED BID: DEMOLITION AND DECOMMISSIONING OF FORMER WTP AT GLENVILLE LAKE DAM** and shall indicate the name, address and state license number of the bidder. Proposals shall be submitted on the printed forms, or exact copies thereof, contained in the Contract Documents.

A **Mandatory** pre-bid conference will be held at 10:00 a.m. on Thursday, March 3, 2022 at the Glenville Lake WTP site located at Filter Plant Road in Fayetteville, North Carolina. All potential bidders must email Nikole Bohannon, Procurement Advisor at nikole.bohannon@faypwc.com of their intent to attend, and to be added to the list of attendees. This pre-bid will include project meeting with the Owner and Engineer an agenda followed by a site walk.

Questions will be fielded at the pre-bid conference and all prospective bidders are encouraged to attend the conference. Individual telephone inquiries are prohibited. PWC assumes no responsibility to fully inform absentees of clarifications not issued by addendum.

Each proposal shall be accompanied by a cash deposit or certified check drawn on a bank or trust company insured by Federal Deposit Insurance Corporation, payable to "Fayetteville Public Works Commission" of an amount equal to not less than 5 percent (5%) of the proposal or in lieu thereof a bidder may offer a bid bond of five percent (5%) of the bid executed by a surety company licensed under the laws of North Carolina to execute the contract in accordance with the bid bond and upon failure to forthwith make payment, the surety shall pay the obligee an amount equal to the amount of said bond. Said deposit shall be retained by the Owner as liquidated damages in event of failure of the successful bidder to execute the contract within ten days after the award or give satisfactory surety as required by law.

Performance and Payment Bonds are required in the amount of 100% of the contract amount and shall be furnished by the Contractor.

All Contractors are notified that North Carolina Statutory provisions as to licensing of Contractors will be observed in receiving, reading and awarding the Contracts (Chapter 87 of the North Carolina Statutes).

The License Classification shall be:

Part 1: Public Utilities (Water and Sewer) - Unlimited

6384-231131
December 2021

Building	-	Unlimited
Unclassified	-	Unlimited

Plans and Specifications including Contract Documents will be available online for viewing and downloading on or about Monday, February 21, 2022 on the PWC Procurement website at <https://www.faypwc.com/purchasing>.

In addition, the documents will be available from the Fayetteville State University Construction Resource Office (FSU CRO) at <https://www.uncfsu.edu/academics/collegesschools-and-departments/broadwell-college-of-business-and-economics/outreach-centers/constructionresource-office>.

In collaboration with the North Carolina Institute of Minority Economic Development, the FSU CRO offers services and support to help small, minority, veteran, and women-owned businesses identify and compete for construction-related projects.

At the CRO, potential bidders may:

- Research, view and print project drawings to scale free of charge;
- Use available software to prepare their bid; and
- Receive certification and pre-qualification assistance.

Please email the FSU CRO to make an appointment: fsucro@uncfsu.edu

Plans and specifications will be available upon request on or about Monday, February 21, 2022 from the Design Engineer, (CDM Smith, Inc., 5400 Glenwood Ave, Suite 400, Raleigh North Carolina, 27612, 919-325-3500). Upon requesting plans and specifications via phone, a hard copy of documents may be picked up for \$250 per set. An electronic pdf of the Bidding Documents may be provided at no charge. With request for Bidding Documents, supply the Company name, contact person, street address, phone and fax, and indicate if firm will be a Bidder, Supplier, or Subcontractor.

PWC reserves the right to reject any or all proposals waive all informalities concerning bid, or award bid to the lowest responsible bidder or bidders, taking into consideration quality, performance, and the time specified in the proposals for the performance of the contract.

The bidder to whom the contract may be awarded must comply fully with the requirements of North Carolina General Statutes, Section 143-129, as amended.

No bids may be withdrawn after the scheduled closing time for the receipt of proposals for a period of ninety (90) days.

FAYETTEVILLE PUBLIC WORKS COMMISSION

Trent Ensley,
Procurement Manager

SPECIAL PROVISIONS – PERFORMANCE AND DELIVERY**PROJECT: DEMOLITION AND DECOMMISSIONING OF FORMER WTP AT
GLENVILLE LAKE DAM**

Deadline for Bid Receipt:	<u>2:00 p.m., Thursday, March 24, 2022</u> PWC Administration Building, Outside by the Entrance Doors 955 Old Wilmington Road Fayetteville, NC 28301
Pre-Bid Conference: (MANDATORY)	<u>10:00 a.m., Thursday, December 17, 2021</u> GlenvilleLake WTP site located at Filter Plant Road Fayetteville, North Carolina
Deadline for Questions from Bidders ¹	<u>5:00 p.m., Friday March 11, 2022</u> All Questions must be submitted in writing.
Deadline for Addenda issued by Project Engineer ²	<u>5:00 p.m., Thursday, March 17, 2022</u>
Date of Availability:	Date when the contract is executed by both the successful bidder and the City
Contract Time:	<u>280 Calendar Days</u>
Liquidated Damages:	<u>\$1000 per calendar day</u>
Bid Acceptance Period:	Ninety (90) Calendar Days unless otherwise noted

¹ Questions regarding this bid must be submitted in writing to the attention of Nikole Bohannon, Procurement Advisor, by email to nikole.bohannon@faypwc.com no later than (March 11, 2022)

Bidders are expressly prohibited from contacting any PWC official or employee associated with this Bid, except as noted above. Violation of this prohibition is grounds for the immediate disqualification of the bidder.

² Any addenda to these Contract Documents will be issued by the Project Engineer no later than the date and time stated above.

Work primarily consists of demolishing and removing the above-grade and near-grade portions of the former WTP building and backfilling/abandoning-in-place below-grade portions of the structure, including the pipe gallery. The project will also include the installation of protection measures for the existing intake, storm drain improvements, wet well riser, utility relocation and miscellaneous repairs.

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**GENERAL
00100 INSTRUCTIONS TO BIDDERS****A. DEFINED TERMS**

Terms used in these Instructions to Bidders are defined in Section 00600 Definitions and Terminology of these Contract Documents. The term "Successful Bidder" means the lowest, qualified, responsive and responsible Bidder to whom PWC (on the basis of PWC's evaluation as hereinafter provided) makes an award.

B. GENERAL

1. Sealed Bids, in accordance with the Bidding Documents, will be received in person or via special courier service or U.S. Postal Service, at the offices of the Procurement Department, 1st Floor, PWC Administration Building, 955 Old Wilmington Road, Fayetteville, North Carolina, 28301, no later than the time and date specified in the Invitation to Bid.
2. In the solicitation or awarding of contracts, PWC shall not discriminate because of the race, religion, color, sex, age, disability or national origin of the Bidder.
3. PWC welcomes and encourages the participation of minority-owned businesses (refer to Paragraph S of these Instructions to Bidders) in procurement transactions made by PWC.

C. COPIES OF BIDDING DOCUMENTS

1. Complete sets of Bidding Documents and Supplementary Project Information in the number and for the sum as stated in the Invitation to Bid, and may be obtained from the CDM Smith.
2. Complete sets of Bidding Documents shall be used in preparing Bids. PWC assumes no responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

D. CONTRACTOR'S LICENSE

1. No General Contractor shall engage in contracting work in the State of North Carolina unless it has been licensed under the provisions of the North Carolina Statutes.
2. Bidders are prohibited from contracting for, or bidding upon, the construction, removal, repair or improvements to or upon real property owned, controlled or leased by the City of Fayetteville without a North Carolina Contractor's license.
3. Each bidder shall indicate its North Carolina Contractor's License number on the bid envelope and the Bid Form.
4. License Classification shall be:

Public Utilities Water and Sewer:	Unlimited
Building:	Unlimited
Unclassified:	Unlimited

E. EXAMINATION OF CONTRACT DOCUMENTS AND SITE

1. Before submitting a Bid, each Bidder shall (a) examine the Contract Documents thoroughly, (b) visit the site to familiarize himself with local conditions that may in any manner affect cost, progress or performance of the Work, (c) familiarize himself with federal, state and local laws, ordinances, rules and regulations that may in any manner affect cost, progress or performance of the Work, and (d) study and carefully correlate Bidder's observations with the Contract Documents, and (e) give the PWC Procurement Manager written notice of all conflicts, errors or discrepancies in the Contract Documents.
2. Bidder should consult the Specifications for the identification of those reports of investigations and tests of subsurface and latent physical conditions at the site or reports that otherwise may affect cost, progress, or performance of the Work which may have been utilized in preparation of the Drawings and Specifications. PWC will make copies of such reports if available at the cost (non-refundable) of reproduction to any Bidder requesting them. These reports are not intended to constitute any explicit or implicit representation as to the nature of the subsurface and latent physical conditions, which may be encountered at the site or to constitute explicit or implicit representations as to any other matter, contained in any report. Such reports are not guaranteed as to accuracy or completeness and are not part of the Contract Documents. Before submitting his Bid each Bidder will, at his own expense, make such investigations and tests as the Bidder may deem necessary to determine his Bid for performance of the Work in accordance with the Contract Documents.
3. On request (minimum 48 hours advance notice), PWC will provide each Bidder access to the site to conduct such investigations and tests, as each Bidder deems necessary for submission of his Bid.
4. The lands upon which the Work is to be performed, right-of-way for access thereto, and other lands available for use by the Contractor in performing the Work are identified in these Contract Documents.
5. The submission of a Bid constitutes an incontrovertible representation by the Bidder that he has complied with every requirement of this Section and that the Contract Documents are sufficient in scope and detail to indicate and convey understanding of all terms and conditions for performance of the Work.

F. INTERPRETATIONS AND ADDENDA

1. All questions about the meaning or intent of the bid or Contract Documents shall be submitted in writing to Nikole Bohannon, Procurement Advisor, by email to nikole.bohannon@faypwc.com. In order to receive consideration, questions must be received by Friday, March 11, 2022 at 5:00 p.m. Any interpretations of questions so raised, which in the opinion of Project Engineer require interpretations, will be issued by Addenda mailed or delivered to all parties recorded by Owner and/or Design Engineer as having received the Contract Documents, not later than one (1) day prior to receipt of Bids. An Addendum extending the date for the receipt of Bids or an Addendum withdrawing the Invitation to Bid may be issued any time prior to the date set for the receipt of Bids. Owner and Design Engineer will not be responsible for oral interpretations or clarifications, which anyone presumes to make on their behalf. **Bidders are expressly prohibited from contacting any PWC official or employee associated with this project, except as noted above. Violation of this prohibition is grounds for the immediate disqualification of the bidder.**

2. PWC may issue such additional Addenda as may be necessary to clarify, correct or change the

Contract Documents. Such Addenda, if any, will be issued in the manner and within the time stated in Paragraph 1 of this Section.

3. Each Bidder shall be responsible for determining that all Addenda issued by PWC have been received before submitting a Bid for the Work.
4. Each Bidder shall acknowledge the receipt of each Addendum on the Bid Form.

G. TAXES

1. The Successful Bidder shall pay all county, city, state and federal taxes required by laws in effect at the time Bids are received and resulting from the Work or traceable thereto, under whatever name levied.
2. Said taxes shall not be in addition to the contract price between PWC and the Successful Bidder. The taxes shall be an obligation of the Successful Bidder and not of PWC. PWC shall be held harmless for same by the Successful Bidder.

H. SUBMISSION OF BIDS

1. All Bidders shall use the enclosed Bid Forms, or exact copies thereof, in submitting their bid prices. PWC will not accept oral Bids or Bids received by telephone, or telecopier (FAX machine) for this Bid.
2. All prices must be F.O.B. delivered to the point as indicated by this Bid. PWC will grant no allowance for boxing, crating, or delivery unless specifically provided for in this Bid.
3. The Bid Form must be completed in blue or black ink or by typewriter. Discrepancies between amounts shown in words and amounts shown in figures will be resolved in favor of the amounts shown in words. Discrepancies in the multiplication of units of Work and the unit prices will be resolved in favor of the correct multiplication of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.
4. Proposals sent by mail should be registered mail. The sealed Proposal, marked as indicated above, should be enclosed in an additional sealed envelope similarly marked and addressed to:

Fayetteville Public Works Commission
Attn: Procurement Department
Nikole Bohannon, Procurement Advisor
955 Old Wilmington Road
Fayetteville, North Carolina 28301

5. Mark envelope in the lower left-hand corner with the project title, hour and due date of Bid, and the Bidder's North Carolina contractor registration number.

6. Bids sent by mail and arriving after the time for opening of Bids shall not be considered as valid Bids. In such instances, the Bidders shall have no claim against PWC.
7. All items contained in the Bid Proposal Checklist (Section 00300 Contract Forms) shall be completely filled out and submitted with the bid. Failure to submit any of the items requested with the Bid Form may be just cause for rejection of the Bid by PWC.
8. All erasures, insertions, additions, and other changes made by the Bidder to the Bid Form shall be signed or initialed by the Bidder. Bids containing any conditions, omissions, erasures, alterations, or items not called for in the Bid, may be rejected by PWC as being incomplete or nonresponsive.
9. The Bid Form must be signed in order to be considered. If the Bidder is a corporation, the Bid must be submitted in the name of the corporation, not simply the corporation's trade name. In addition, the Bidder must indicate the corporate title of the individual signing the Bid.
10. The Bid Form, the Bid security, if any, and any other documents required, shall be enclosed in a sealed opaque envelope. Any notation or notations on the exterior of the envelope purporting to alter, amend, modify, or revise the bid contained within the envelope shall be of no effect and shall be disregarded.
11. All Bids received in the Procurement Department by the deadline indicated will be kept in a locked box until the time and date set for the opening of Bids.
12. All late Bids shall be returned unopened to the sender.

I. BID SECURITY

1. Each Bid shall be accompanied by Bid security in the form of either a cashier's or certified check or an acceptable Bid Bond in the amount of five percent (5%) of the Bid amount, and made payable to "Fayetteville Public Works Commission".
2. The Bid security is a guarantee that if the contract is awarded by PWC to the Bidder, the Bidder shall enter into the contract with PWC for the work mentioned in this Bid or forfeit the Bid security to PWC, not as a penalty, but as liquidated damages.
3. No forfeiture under a Bid security shall exceed the lesser of (a) the difference between the Bid for which the Bid security was written and the next low Bid of another Bidder, or (b) the face amount of the Bid security (Code of North Carolina, Section 11-57B).
4. All bonds shall be executed by a surety company selected by the Bidder, which is legally authorized to do business in the State of North Carolina (NCGS Chapter 44 A-26), and the bond shall be the same in both form as well as substance as AIA Document A310, Bid Bond.
5. The Bidder shall require the attorney-in-fact, who executed the required bond on behalf of the surety company, to affix thereto a certified and current copy of the power of attorney.
6. The bond premium shall be paid by the Bidder and the cost shall be included in the Bid price.
7. Any inspection of procurement transaction records shall be subject to reasonable restrictions to ensure the security and integrity of the records.

J. MODIFICATION OF BIDS

1. A Bid may be modified or withdrawn by the Bidder any time prior to the time and date set for the receipt of Bids. The Bidder shall notify the PWC Procurement Department in writing of its intentions.
2. Modified and withdrawn Bids may be resubmitted to the PWC Procurement Department up to the time and date set for the receipt of Bids.

K. SUBSTITUTE MATERIAL AND EQUIPMENT

The Contract, if awarded, will be on the basis of material and equipment described in the Drawings or required in the Specifications without consideration of possible substitute or "or-equal" items. The procedure for submittal of substitute or "or-equal" items for consideration is set forth in the General Conditions.

L. SUBCONTRACTORS

1. Contractor shall subcontract no more than 49 percent of the value of this Contract.
2. Each Bidder shall submit to PWC with his bid the List of Subcontractors, Suppliers, other persons, and organizations proposed for those portions of the Work for which such identification is required. If PWC, after due investigation has reasonable objection to any proposed Subcontractor, Supplier, other person or organization, PWC may, before Notice of Award is given, request apparent Successful Bidder to submit an acceptable substitute without an increase in the Bid.
3. If the apparent Successful Bidder declines to make such a substitution, PWC may award the Contract to the next lowest responsible Bidder that proposes to use acceptable Subcontractors, Suppliers, and other persons, and organizations. The declining to make requested substitutions will not constitute grounds for sacrificing the bid security of any Bidder. If PWC does not make written objection to a Bidder's list of Subcontractors, Suppliers, other persons, or organizations prior to giving Notice of Award, the list will be considered acceptable, subject to revocation as provided in the General Conditions.

M. OPENING OF BIDS

1. Bids will be opened publicly and read aloud on the date set for the receipt of Bids in the Invitation to Bid.
2. Any Bidder, upon request, shall be afforded the opportunity to inspect Bid records within a reasonable time after the opening of all Bids but prior to award, except in the event that PWC decides not to accept any of the Bids and to reopen the contract. Otherwise, Bid records shall be open to public inspection only after award of the Contract.
3. Any inspection of procurement transaction records shall be subject to reasonable restrictions to ensure the security and integrity of the records.

N. WITHDRAWAL OF BID DUE TO ERROR

If the Bidder desires to withdraw his proposal, he must do so before the time fixed for the opening, without prejudice by communicating his purpose in writing to PWC, and when reached it shall be handed to him or to his authorized agent unread. After bids are open, bids may only be withdrawn in strict accordance with N.C.G.S. Section 143-129.1.

O. BIDS TO REMAIN OPEN

All Bids shall remain open for ninety (90) days after the day of the Bid Opening.

P. AWARD OF CONTRACT

1. PWC reserves the right to reject any and all Bids, to waive any and all informalities, and to disregard all nonconforming, nonresponsive or conditional Bids. PWC reserves the right to request additional information from any or all bidders for evaluation purposes. Failure or refusal to furnish additional information as requested may result in rejection of the proposal
2. In case of a tie Bid, the tie shall be decided by lot.
3. It is the intent of the PWC to recommend the award of this contract to the lowest responsive and responsible Bidder provided the Bid has been submitted in accordance with the requirements of the bidding documents and does not exceed the funds available. In determining the lowest responsible Bidder, PWC may consider, among other things, the Bidder's past performance conduct on other contracts, and other information provided by the Bidder as noted below.
4. For the purpose of determining the lowest responsive Bidder, the Basis of Award shall be the total of the Bid Proposal.
5. PWC may consider the operating costs, maintenance considerations, performance date, and guarantees of materials and equipment.
6. PWC may conduct such investigations as deemed necessary to assist in the evaluation of any Bid and to establish the responsibility, qualifications and financial ability of the Bidders, as well as other considerations, to include but not limited to resources available to the Bidder to perform the work effectively, proposed Subcontractors and other persons and organizations to do the work in accordance with the Contract Documents to PWC's satisfaction within the prescribed time.
7. PWC reserves the right to reject the Bid of any Bidder who does not pass any such evaluation to PWC's satisfaction.
8. If the Contract is to be awarded, PWC will give the Successful Bidder a Notice of Award within ninety (90) days after the day of the Bid Opening.
9. The Bidder to whom the contract is awarded shall, within ten (10) days after prescribed documents are presented for signature, execute and deliver the Contract Documents and any other forms or bonds required by the Bid to PWC.
10. The Bidder is required to complete the attached forms that will allow PWC to verify that the Bidder is qualified to perform the Work described in these Contract Documents. All forms shall be

completed and submitted with the Bid. Failure to submit all the required forms shall be considered grounds for PWC to reject the bid.

PWC will review all of the bids and qualification data to determine the lowest responsive, responsible Bidder. PWC reserves the right to not award the Contract to the lowest bidder if the information provided is not complete, does not meet the satisfaction of PWC, or has been falsified. PWC will not request any additional information in order to allow the Contractor to complete bid.

11. During the evaluation phase, bid proposals will be reviewed to ascertain which proposals technically and otherwise address all the requirements of these Contract Documents. Proposals determined to be technically non-responsive or not sufficiently responsive may be disqualified. Once qualified proposals have been determined, PWC may interview selected Bidders to clarify specific matters presented in the proposals. These discussions will allow both the Bidder to elaborate on his/her proposal and for PWC to request other pertinent information. PWC will use information gained during such discussions, if any, together with information presented in the proposal to determine the lowest responsive, responsible bidder.

The Bidder shall address each of the Evaluation Criteria as requested in the Technical Evaluation Criteria Form located within Section 00300 Contract Forms. To be considered substantive, the information must respond to all requirements.

12. PWC may conduct such investigations/verifications as deemed necessary to establish the responsibility, qualification, and financial ability of the Bidder. Should PWC adjudge that the apparent low bidder is not the lowest responsive, responsible bidder by virtue of the information furnished, said apparent low bidder will be so notified and his bid security shall be returned to him without prejudice. Failure or refusal to furnish any items of information requested by PWC shall be considered as non-responsive and therefore basis for rejection of the bid.

Q. PERFORMANCE AND OTHER BONDS

The General Conditions set forth PWC's requirements as to Performance and other Bonds.

R. ESTIMATED QUANTITIES

1. Any estimated quantities contained herein in certain items in the PROPOSAL are for the purpose of comparing bids, and while they are believed to be close approximations, they are not guaranteed, and settlement will be made on the basis of the work as actually executed at the unit prices in the PROPOSAL as accepted. The Commission further reserves the right to delete any single line item or combination of items from the proposal, and cannot guarantee that all quantities listed in the contract documents will be utilized.
2. The Contractor should verify quantities before submitting a bid. Due to conditions which may be found under pavement such as accurate location of existing water lines, sewer lines, gas lines, and structure services of all types, quantities are subject to change during construction, but this contingency shall not be used for a claim to change unit prices submitted in the Proposal.

S. SMALL DISADVANTAGED BUSINESS ENTERPRISE PROGRAM

NCDOT Disadvantaged Business Enterprise (DBE) and Historically NC DOA Underutilized Business (HUB) firms with current certifications are acceptable for listing in the Bidder's submittal of SDBE participation. Firms that are certified through NCDOT are listed at the "Vendor Directory," which can be accessed through at <https://www.ebs.nc.gov/VendorDirectory>. Firms that are certified through NC DOA are listed at the "HUB Vendor Search," which can be accessed through at <https://ncadmin.nc.gov/businesses/hub>.

Bidder shall submit with the Bid the SDBE documentation requested in these specifications. It is strongly recommended that the Bidder attend the Pre-Bid Conference, as important information will be reviewed. Questions regarding SDBE requirements shall be directed to Lexi Hasapis, Local Vendor Procurement Analyst, at (910) 580-6900 / lexi.hasapais@faypwc.com.

T. E-VERIFY REQUIREMENTS

Contractor hereby acknowledges that "E-Verify" is the federal E-Verify program operated by the US Department of Homeland Security and other federal agencies which is used to verify the work authorization of newly hired employees pursuant to federal law and in accordance with Article 2, Chapter 64 of the North Carolina General Statutes. Contractor further acknowledges that all employers, as defined by Article 2, Chapter 64 of the North Carolina General Statutes, must use E-Verify and after hiring an employee to work in the United States, shall verify the work authorization of the employee through E-Verify in accordance with NCGS §64-26(a). Contractor hereby pledges, attests and warrants through execution of this Agreement that Contractor complies with the requirements of Article 2, Chapter 64 of the North Carolina General Statutes and further pledges, attests and warrants that any subcontractors currently employed by or subsequently hired by Contractor shall comply with any and all E-Verify requirements. Failure to comply with the above requirements shall be considered a breach of this Agreement.

U. IRAN DIVESTMENT ACT

1. As mandated by N.C.G.S. 147-86.59(a), Contractor/Vendor hereby certifies that it is not listed on the Final Divestment List created by the North Carolina State Treasurer pursuant to N.C.G.S. 147-86.58. Contractor/Vendor further certifies that in accordance with N.C.G.S. 146-86.58(b) that it shall not utilize any subcontractor found on the State Treasurer's Final Divestment List. Contractor/Vendor certifies that the signatory to this Purchase Order authorized by the Contractor/Vendor to make the foregoing statement.

**SECTION A
PROJECT SPECIFICS
BID SUBMITTAL DOCUMENTS**

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BID PROPOSAL**PROJECT: DEMOLITION AND DECOMMISSIONING OF FORMER WTP AT GLENVILLE LAKE DAM**

Fayetteville, North Carolina

THIS BID IS SUBMITTED TO:Fayetteville Public Works Commission
Administration Building
Attn: Nikole Bohannon, Procurement Advisor
955 Old Wilmington Road
Fayetteville, North Carolina 28301

- A. The undersigned BIDDER proposes and agrees, if this Bid is accepted, to enter into a Contract with OWNER in the form included in the Contract Documents to perform and furnish all Work specified or indicated in the Contract Documents for the Contract Price and within the Contract Time indicated in this Bid and in accordance with the Contract Documents.
- B. BIDDER accepts all of the terms and conditions of the Instructions to Bidders, including, without limitation, those dealing with the disposition of payment and performance bonds, and insurance certificates. This bid will remain open for ninety (90) days after the day of Bid opening. BIDDER will sign the Contract and submit the Contract Security and other documents required by the Contract Documents within ten (10) days after the date of receipt by the BIDDER.
- C. In submitting this Bid, Bidder represents, as more fully set forth in the Contract, that:
1. BIDDER has examined copies of all the Contract Documents and of the following addenda, receipt of all which is acknowledged on the bid summary page:
 2. BIDDER has examined the site and locality where the Work is to be performed, the legal requirements (federal, state, and local laws, ordinances, rules and regulations) and the conditions affecting cost, progress of performance of the work and has made such independent investigations as BIDDER deems necessary.
 3. BIDDER acknowledges that OWNER does not assume responsibility for the accuracy of dimensions or completeness of information and data shown or indicated in the Bidding Documents with respect to existing facilities.
 4. BIDDER has carefully studied all reports of explorations and tests of subsurface conditions at or contiguous to the site of the Work (except underground facilities) and all drawings of physical conditions in or relating to existing surface or subsurface structures, pipelines, and utilities at or contiguous to the site are provided within these Contract Documents. Geotechnical Reports and other information regarding subsurface conditions are identified in the attached appendices and detailed in Article 4 of the General Conditions. BIDDER acknowledges that the OWNER does not assume responsibility for the accuracy or completeness of information and data shown or indicated in the Bidding Documents with respect to underground facilities at or contiguous to the site of Work. BIDDER had obtained and carefully studied (or assumes responsibility for have done so) all such additional or supplementary examinations investigations, explorations, tests, studies, and data that are

- necessary to identify and understand conditions (surface, subsurface, and underground facilities) at or contiguous to the site of Work or otherwise which may affect cost, progress, performance, or furnishing the Work or which relate to any aspect of means, methods, techniques, sequences, and procedures of construction to be employed by Bidder and safety precautions and programs incident thereto. BIDDER waives all rights to claim that any additional examinations, investigations, explorations, tests, studies, or data are necessary for the proper submission of the Bid for the performance and furnishing of the Work in accordance with the Contract Time, Contract Price, and other terms and conditions of the Contract Documents.
5. BIDDER hereby certifies that, if awarded the Contract for construction of the Project, he will take all possible actions to minimize costs to the OWNER which are related to any disruptions in any part of the Work resulting from unforeseeable conditions which may be encountered and work changes or additions which may be made.
 6. BIDDER has correlated the information known to BIDDER, information and observations obtained from visits to the site, reports and drawings identified in the Contract Documents, and all additional examinations, investigations, exploration, tests, studies, and data with the Contract Documents.
 7. BIDDER has given OWNER written notice of all conflicts, errors, ambiguities, or discrepancies that BIDDER has discovered in the Contract Documents and the written resolution thereof by OWNER is acceptable to BIDDER, and the Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work for which this Bid is submitted.
 8. By bidding in response to this invitation, the BIDDER represents that in the preparation and submission of this Bid, said BIDDER did not, either directly or indirectly, enter into any combination or arrangement with any person, firm or corporation or enter into any agreement, participate in any collusion, or otherwise take any action in the restraint of free, competitive bidding in violation of the Sherman Act (15 U.S.C. Section 1).
 9. Bid form must be completed in blue or black ink or by typewriter. The Bid price of each item on the form must be stated in both words and numerals. In case of a conflict, words shall take precedence. Discrepancies in the multiplication of units of work and unit prices will be resolved in favor of the correct multiplication of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.
 10. BIDDER understands that the award of contract will be made on the basis of the total Bid amount which will be determined as the sum of the unit price and lump sum Bid Items.
 11. BIDDER understands that quantities are estimated and are not guaranteed; they are solely for comparing Bids and establishing the total Bid amount. The Contract Price will be modified by Change Order, and final payment will be based on the quantities of work actually furnished and installed by the successful BIDDER.
 12. BIDDER shall complete the Work for the prices indicated on the following pages.

Item No.	Item	Estimated Quantities	Unit	Unit Price	Cost Extension
1	Mobilization/Demobilization	1	L.S.		
2	Erosion and Sedimentation Control	1	L.S.		
3	Lowering and Maintenance of Lake Levels during Construction	1	L.S.		
4	Hazardous Materials Removal	1	L.S.		
5	Demolition of Former WTP	1	L.S.		
6	Pipe Gallery Abandonment	1	L.S.		
7	Storm Drain Improvements	1	L.S.		
8	Waterline relocation/replacement	1	L.S.		
9	Relocation of Electrical Infrastructure	1	L.S.		
10	Pipe cradle and Flowable Fill for Bottom Drain structure	1	L.S.		
11	Floating Debris Barrier	1	L.S.		
12	Asphalt Paving	1	L.S.		
13	Sod and Site restoration	1	L.S.		
14	All work on the Drawings and specified herein; complete as shown except work included above	1	L.S.		
15	Contingency	1	L.S.	\$ 100,000.00	\$ 100,000.00

TOTAL BASE BID

\$ _____

- BID SUMMARY-

TOTAL BASE BID \$ _____

The BIDDER has received, acknowledged, and used the following addenda in completing the Bid. (Initial and Date as appropriate).

Addendum No. 1 _____	Dated _____
Addendum No. 2 _____	Dated _____
Addendum No. 3 _____	Dated _____
Addendum No. 4 _____	Dated _____
Addendum No. 5 _____	Dated _____

The undersigned BIDDER certifies that they are a licensed as a Contractor under the provisions of the Act of North Carolina Legislature, Session 1952 as amended regulating the practice of General Contracting, and that their license number is _____ (License Number).

The undersigned BIDDER hereby agrees to accept an award of the Contract based on the Total Contract Amount as accepted by the OWNER and as indicated on the Notice of Award.

D. BIDDER agrees that Work shall be completed within the time frame indicated in the Agreement as follow:

1. All work described herein to be complete, including restoration and all punch list items within 280 consecutive calendar days from the start date stipulated on the Notice to Proceed.
2. The BIDDER acknowledges that time is of the essence in this Contract and that the OWNER will suffer financial loss if the Work is not complete within the time specified in Paragraph D.1 above plus any extensions thereof allowed in accordance with these Contract Documents. BIDDER also recognizes the delays, expense and difficulties involved in proving in a legal proceeding the actual loss suffered by the OWNER if the Work is not complete on time. Accordingly, instead of requiring any such proof, the OWNER and the CONTRACTOR agree that as liquidated damages for delay (but not as a penalty) the CONTRACTOR shall pay the OWNER \$1,000.00 per calendar day for each day that expires after the time specified in Paragraph D.1, plus any proper time extension, until the Work is finally complete.

E. The following documents are attached to and made part of this bid:

Required Bid Security in the form of either a cashier's check or certified check or Bid Bond in the amount of 5% of maximum Bid price.

F. Communications concerning this Bid shall be addressed to:
(CONTRACTOR's Name, Address and Telephone Number)

G. The terms used in this Bid which are defined in Section 00600 – Definitions and Terminology of these Contract Documents have the meanings assigned to them therein, which are incorporated by reference as if fully set forth herein.

H. An individual contractor is required to furnish his social security number and sole proprietorship, partnership and corporation are required to furnish their employer identification numbers to PWC. Please indicate this information on this Bid Form as follows:

Social Security Number: _____

Federal Employer Identification Number: _____

SUBMITTED ON _____, 20____.

AN INDIVIDUAL

BY _____ (SEAL)
(Individual's Name and Signature)

Doing Business as: _____

North Carolina Contractor Registration Number: _____

Business Address: _____

Phone Number: _____

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

NOTARY PUBLIC

My Commission Expires: _____

A PARTNERSHIP

BY _____ (SEAL)
(Firm Name)

(General Partner and Signature)

North Carolina Contractor Registration Number: _____

Business Address: _____

Phone Number: _____

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

NOTARY PUBLIC

My Commission Expires: _____

A CORPORATION OR OTHER LEGAL ENTITY

BY _____
(Legal Entity Name) (State of Incorporation)

BY _____ (SEAL)
(Name and Title of Person Authorized to Sign and Signature)

ATTEST: _____
(Name and Signature of Person Authorized to Attest)

North Carolina Contractor Registration Number: _____

Business Address: _____

Phone Number: _____

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

NOTARY PUBLIC

My Commission Expires: _____

A JOINT VENTURE

BY _____
(Name and Signature)

North Carolina Contractor Registration Number: _____

Business Address: _____

Phone Number: _____

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

NOTARY PUBLIC

My Commission Expires: _____

(Each joint venturer must sign. The name of signing for each individual, partnership, and corporation that is a party to the joint venture should be in the manner indicated above.)

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BID BOND

This is a Bid Bond that is subject to the provisions of Article 3 of Chapter 44A of the North Carolina General Statutes.

This Bond is Executed on _____, 20_____.

The name of the PRINCIPAL is _____

The name of the SURETY is _____

The Fayetteville Public Works Commission is the OWNER

The amount of the Bond is _____
_____ (Dollars) (\$_____)

KNOW ALL MEN BY THESE PRESENTS, the Principal and Surety above named are hereby held and firmly bound unto the above-named OWNER hereinafter called the OWNER in the penal sum of the amount stated above in lawful money of the United States, for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

The condition of the above obligation is such that whereas the Principal has submitted to the OWNER a certain Bid attached hereto and hereby made a part hereof to enter into a Contract in writing, for the construction of:

DEMOLITION AND DECOMMISSIONING OF FORMER WTP AT GLENVILLE LAKE DAM

NOW, THEREFORE

- A. If said Bid shall be rejected, or in the alternate,

- B. If said Bid shall be accepted and the Principal shall execute and deliver a Contract in the Form of Contract attached hereto (properly completed in accordance with said Bid) and shall furnish a bond for his faithful performance of said Contract, and for the payment of all persons performing labor or furnishing materials in connection herewith, and shall in all other respects perform the agreement created by acceptance of said Bid, then this obligation shall be void, otherwise the same shall remain in force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein state.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its Bond shall in no way be impaired or affected by any extension of time within the OWNER may accept such Bid; and said surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

ATTEST:

(Principal Secretary)
(SEAL)

Principal

BY: _____(3)

(Address)

Witness as to Principal

Surety

(Address)

(Address)

ATTEST:

N.C. Resident Agent
(SEAL)

Witness as to Surety

(Address)

- (1) Correct name of Contractor
- (2) A Corporation, a Partnership or an Individual, as the case may be
- (3) If contractor is a Partnership, all partners should execute bond

LIST OF SUBCONTRACTORS

In compliance with the Instructions to Bidders and the Supplementary Conditions, the undersigned submits the following names of Subcontractors to be used in performing the Work.

The Bidder certifies that all Subcontractors listed are eligible to perform the Work and that all Subcontractors performing more than five (5) percent of the work are listed.

<u>Subcontractor's Work</u>	<u>Subcontractor's Name</u>
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Bidder's Signature

AFFIDAVIT OF ORGANIZATION AND AUTHORITY SWORN STATEMENT

STATE OF _____

COUNTY OF _____

_____ being the first duly sworn on oath deposes and says that the Bidder on the attached Bid Form is organized as indicated below and that all statements herein made are made on behalf of such Bidder and that this deponent is authorized to make them.

(Fill Out Applicable Paragraph)

1. CORPORATION

The bidder is a corporation organized and existing under the laws of the State of _____ and its President is _____, and its Secretary is _____, and does have a corporate seal. The _____ is authorized to sign construction contracts and bids for the company by action of its Board of Directors taken _____, a certified copy of which is hereto attached. (Strike out last sentence if not applicable.)

2. PARTNERSHIP

The Bidder is a Partnership consisting of _____ and _____, partners doing business under the name of _____.

3. SOLE TRADER

The Bidder is an individual and if operating under a trade name, such trade name is as follows: _____

4. OTHER

The bidder is a _____ organized under the laws of _____ and its duly authorized representative(s) is/are _____, who is/are authorized to sign construction contracts and bids on behalf of this legal entity.

5. ADDRESS

The business address of the Bidder is as follows:

Its phone number is _____.

Bidder

By: _____

Subscribed and sworn before me this _____ day of _____, 20_____.

County _____

Notary Public

My Commission Expires: _____

EQUAL EMPLOYMENT OPPORTUNITY ACKNOWLEDGEMENT

During the performance of this Contract the Contractor agrees as follows:

- A. The Contractor will not discriminate against any employee or applicant 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 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 for training including apprenticeship. The Contractor agrees to post in conspicuous of the 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, 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 understanding, a notice to be provided, advising the labor union or worker's representative of the Contractor's commitments under the Equal Employment Opportunity Section of this Contract, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.
- D. In the event of the Contractor's noncompliance with the nondiscrimination clauses of this Contract or with any of such rules, regulations, or orders, this Contract may be canceled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for further OWNER Contracts.
- E. The Contractor will include the provisions of the section in every subcontract or purchase order unless exempted by rules, regulations or orders of the OWNER so that such provisions will be binding upon each Subcontractor or vendor.

(Use the following form for signatures by a LEGAL ENTITY):

Full Legal Name of the EntityBy: _____ (SEAL)

(Printed Name of Signer) (Title of Signer)

(Use the following form for signatures by an INDIVIDUAL):

BY: _____ (Seal)

WITNESS:

(THE ACKNOWLEDGEMENT OF THE ABOVE SIGNATURE MUST BE NOTARIZED USING THE FORM ON THE FOLLOWING PAGE)

State of _____
County of _____

I, the undersigned Notary Public of the County of _____ and State aforesaid, certify that _____ personally came before me this day and acknowledged that he is the _____ of _____, a North Carolina or _____ corporation/limited liability company/general partnership/limited partnership (strike through the inapplicable), and that by authority duly given and as the act of such entity, he signed the foregoing instrument in its name on its behalf as its act and deed. Witness my hand and Notarial stamp or seal, this ____ day of _____, 20__.

_____, Notary Public

My Commission Expires: _____

Notary's Printed or Typed Name: _____
(Affix Seal)

(Use the following form for acknowledgement signature by an individual.)

NORTH CAROLINA (Enter correct State and County if different than shown)

_____ COUNTY

I, the undersigned Notary Public, do hereby certify that _____, personally appeared before me this day and acknowledge the due execution of the foregoing instrument.

WITNESS my hand and notarial seal this _____ day of _____, 20__.

Notary Public

My commission expires _____
(SEAL)

NONDISCRIMINATION CLAUSE

It is specifically agreed as part of the consideration of the signing of this Contract that the parties hereto named, their agents, employees or servants will not discriminate in any manner on the basis of age, handicap, race, color, creed, sexual orientation or national origin with reference to the subject matter of this Contract, no matter how remote.

This provision being incorporated for the benefit of the Fayetteville Public Works Commission and its residents may be enforced as set out in said ordinances, enforcement of this provision shall be by action for specific performance, injunctive relief, or other remedy as by reference to the subject matter of this Contract.

(Use the following form for signatures by a LEGAL ENTITY):

Full Legal Name of the Entity

By: _____ (SEAL)

_____, _____
(Printed Name of Signer) (Title of Signer)

(Seal)

(Use the following form for signatures by an INDIVIDUAL)

BY: _____

(Printed Name)

WITNESS:

(Printed Name)

NON-COLLUSIVE AFFIDAVIT

State of _____)

County of _____)

_____ Being first duly sworn, deposes and says that:

(1) He is the _____ of
(Owner, Partner, Officer, Representative or Agent)
_____ The BIDDER that has submitted the
attached BID;

(2) He is fully informed respecting the preparation and contents of the attached BID and of all pertinent circumstances respecting such Bid;

(3) Such BID is genuine and is not a collusive or sham BID;

(4) Neither the said BIDDER nor any of its officers, partners, owners, agents, representatives, employees, or parties in interest, including this affiant, have in any way colluded, conspired, connived or agreed, directly or indirectly, with any other BIDDER, firm, or person to fix the price or prices in the attached BID or of any other BIDDER, or to fix any overhead, profit, cost elements of the BID price or the BID price of any other BIDDER, or secure through any collusion, conspiracy, connivance, or unlawful agreement any advantage against the Fayetteville Public Works Commission, or any person interested in the proposed Contract;

(5) The price or prices quoted in the attached BID are fair and proper and are not tainted by any collusion, conspiracy, connivance, or unlawful agreement on the part of the BIDDER or any other of its agents, representatives, owners, employees or parties in interest, including this affidavit.

BY: _____

ITS _____
(Title)

Subscribed and sworn before me this _____ day of _____ 20_____.

_____ My Commission expires _____.
(Notary Public)

F.T.A. CERTIFICATION REGARDING LOBBYING

Certification for Contracts, Grants, Loans, and Cooperative Agreements

(To be submitted with each bid or offer exceeding \$100,000)

The undersigned _____ certifies, to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for making lobbying contacts to an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form--LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions [as amended by "Government wide Guidance for New Restrictions on Lobbying," 61 Fed. Reg. 1413 (1/19/96). Note: Language in paragraph (2) herein has been modified in accordance with Section 10 of the Lobbying Disclosure Act of 1995 (P.L. 104-65, to be codified at 2 U.S.C. 1601, *et seq.*.)]

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

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

[Note: Pursuant to 31 U.S.C. § 1352(c)(1)-(2)(A), any person who makes a prohibited expenditure or fails to file or amend a required certification or disclosure form shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such expenditure or failure.]

The Contractor, _____, certifies or affirms the truthfulness and accuracy of each statement of its certification and disclosure, if any. In addition, the Contractor understands and agrees that the provisions of 31 U.S.C. A 3801, *et seq.*, apply to this certification and disclosure, if any.

Signature of Contractor's Authorized Official

Name and Title of Contractor's Authorized Official

Date

POWER OF ATTORNEY
(Attach)

BID SUBMITTAL CHECKLIST

- 1. Enter Contractor's License Number where called for in the Bid Form and on the outside of the sealed envelope containing the Bid.
- 2. Photocopy of Contractor's License
- 3. Bid Bond or other Security
- 4. Bid Forms Section 0300.
- 5. Provide the responsible North Carolina Registered Agent for Insurance Claims. Include contact information.
- 6. Provide the proposed responsible Bonding Company name. Include contact information.
- 7. List of Subcontractors and material suppliers exceeding 5% of the Contract Value
- 8. Non-Collusive Affidavit
- 9. Nondiscrimination Clause
- 10. Affidavit of Organization and Authority and Sworn Statement
- 11. Equal Employment Opportunity Acknowledgment
- 12. Certification of Primary Participant Regarding Debarment, Suspension, and other Responsible Matters
- 13. FTA Certification regarding Lobbying
- 14. The completed Contractor Qualifications Form
- 15. SDBE Contract Provisions Form, Identification of SDBE Participation Form, SDBE Affidavit A or SDBE Affidavit B as appropriate*
- 16. Copy of Contractor's Covid-19 Safety Plan

****FAILURE TO SUBMIT THE ABOVE FORMS WITH THE BID FORM MAY BE JUST CAUSE FOR REJECTION OF THE BID BY THE OWNER****

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**DEMOLITION AND DECOMMISSIONING OF FORMER WTP
AT GLENVILLE LAKE DAM
CONTRACTOR QUALIFICATION FORM**

*****MUST BE COMPLETED AND INCLUDED WITH BID*****

The Fayetteville Public Works Commission reserves the right to request information from the contractor to complete its assessment of the contractor or subcontractors qualifications. Partially complete forms may be considered non-responsive based on the quantity and quality of information provided. Wholly incomplete forms will be considered non-responsive and will result in rejection of the bid.

CONTRACTOR DOCUMENTATION

(1) Name of Prime Contractor and NC License Number:	Name: NC License No.:
a. Within the last five (5) years , has the contractor been involved in any judgments, claims, or arbitration with regard to construction contracts? If so, provide list and describe each event fully. Attach additional information, as necessary.	<input type="checkbox"/> Yes (provide list and describe each event fully) <input type="checkbox"/> No
b. Within the last five (5) years , has any officer or principal of the organization ever been an officer or principal of another organization when it failed to complete a construction contract? If so, provide list and describe each event fully. Attach additional information, as necessary.	<input type="checkbox"/> Yes (provide list and describe each event fully) <input type="checkbox"/> No
(2) Name of Demolition Subcontractor (if applicable) and NC License Number (If Prime Contractor intends to complete all work, skip to Item 3).	Name: NC License No.:
a. Within the last five (5) years , has the subcontractor been involved in any judgments, claims, or arbitration with regard to construction contracts? If so, provide list and describe each event fully. Attach additional information, as necessary.	<input type="checkbox"/> Yes (provide list and describe each event fully) <input type="checkbox"/> No
b. Within the last five (5) years , has any officer or principal of the subcontractor's organization ever been an officer or principal of another organization when it failed to complete a construction contract? If so, provide list and describe each event fully. Attach additional information, as necessary.	<input type="checkbox"/> Yes (provide list and describe each event fully) <input type="checkbox"/> No

DEMOLITION AND DECOMMISSIONING OF FORMER WTP AT GLENVILLE LAKE DAM CONTRACTOR QUALIFICATION FORM

*****MUST BE COMPLETED AND INCLUDED WITH BID*****

The Fayetteville Public Works Commission reserves the right to request information from the contractor to complete its assessment of the contractor or subcontractors qualifications. Partially complete forms may be considered non-responsive based on the quantity and quality of information provided. Wholly incomplete forms will be considered non-responsive and will result in rejection of the bid.

(3) Provide list of other **Subcontractors** and field of specialty (erosion control, access, etc.), if applicable. Additional subcontractors can be attached to the qualifications form, if necessary.

a. Subcontractor Name: Specialty:	
b. Subcontractor Name: Specialty:	
c. Subcontractor Name: Specialty:	
d. Subcontractor Name: Specialty:	

PRIME CONTRACTOR EXPERIENCE AND RESOURCES

- (1) Contractor shall have at least **ten (10) years** of experience in site work and structure/utility installation. Provide not less than **four (4)** completed projects completed in the last **two (2) years**, where the projects were of similar size and scope to the Work described in these Contract Documents. At least **two (2)** of the completed projects must include work at a dam.
- (2) Include the dates of such projects. The client's representative, name, and telephone numbers shall be provided for reference of each project listed. Contractor shall provide references for the Fayetteville Public Works Commission to verify project information. Each project should be from separate references. Additional similar projects may be attached at the Contractor's discretion.

a. Project Name:			
Location:			
Superintendent:			
Cost:			
Structure Size (SF):		Type:	
Start Date:		End Date:	
Client:			
Client Contact Name:		Client Phone:	
Scope/Additional Information:			

b. Project Name:			
Location:			
Superintendent:			
Cost:			
Structure Size (SF):		Length:	
Start Date:		End Date:	
Client:			
Client Contact Name:		Client Phone:	
Scope/Additional Information:			
c. Project Name:			
Location:			
Superintendent:			
Cost:			
Structure Size (SF):		Length:	
Start Date:		End Date:	
Client:			
Client Contact Name:		Client Phone:	
Scope/Additional Information:			
d. Project Name:			
Location:			
Superintendent:			
Cost:			
Structure Size (SF):		Length:	

Start Date:		End Date:	
Client:			
Client Contact Name:		Client Phone:	
Scope/Additional Information:			
e. Project Name:			
Location:			
Superintendent:			
Cost:			
Structure Size (SF):		Length:	
Start Date:		End Date:	
Client:			
Client Contact Name:		Client Phone:	
Scope/Additional Information:			
f. Project Name:			
Location:			
Superintendent:			
Cost:			
Structure Size (SF):		Length:	
Start Date:		End Date:	
Client:			
Client Contact Name:		Client Phone:	
Scope/Additional Information:			

(3) Provide the number of crews qualified and available to perform the work stated in this Proposal:		
(4) Provide the name of the proposed superintendent and proposed crew leaders who are qualified and available to perform the work stated in this proposal:	Proposed Superintendent:	
	Crew leaders/foreman:	
(5) Provide not less than three (3) references within the last three (3) years in the United States to document the proposed superintendent's ability and qualifications on projects of similar size and scope. Each reference shall be from separate projects. Additional similar projects may be attached at the Contractor's discretion.		
a. Project Name:		
Location:		
Start Date:	End Date:	
Client:		
Client Contact Name:	Client Phone:	
Scope/Additional Information:		
b. Project Name:		
Location:		
Start Date:	End Date:	
Client:		
Client Contact Name:	Client Phone:	
Scope/Additional Information:		
c. Project Name:		
Location:		
Start Date:	End Date:	
Client:		
Client Contact Name:	Client Phone:	
Scope/Additional Information:		

d. Project Name:			
Location:			
Start Date:		End Date:	
Client:			
Client Contact Name:		Client Phone:	
Scope/Additional Information:			
DEMOLITION SUBCONTRACTOR EXPERIENCE AND RESOURCES			
<p>*NOTE: The following information shall be completed by Prime Contractor if the demolition activities will be completed with its own forces.</p> <p>(1) The subcontractor shall have at least ten (10) years of experience and provide not less than four (4) references documenting a minimum of 200,000 SF of successful demolition projects within the United States. The project documentation provided shall include at least two (2) projects verifying their experience in controlled building demolition on sites with adjacent infrastructure to be monitored and protected in place. References shall be from projects of similar type, size, scope, nature, and/or costs. A minimum of 100,000 SF shall have been demolished within the last three (3) years.</p> <p>(2) Include the dates of such projects. The client's representative, name, and telephone numbers shall be provided for reference of each project listed. Contractor shall provide references for the Fayetteville Public Works Commission to verify project information. Each project should be from separate references. Additional similar projects may be attached at the Contractor's discretion.</p>			
a. Project Name:			
Location:			
Superintendent:			
Structure Size (SF):		Type:	
Start Date:		End Date:	
Client:			
Client Contact Name:		Client Phone:	
Completed with own equipment and labor forces:			<input type="checkbox"/> Yes <input type="checkbox"/> No
If "No" was checked above, provide name of the Contractor completing work:			
Scope/ Project Cost /Additional Information:			

b. Project Name:			
Location:			
Superintendent:			
Structure Size (SF):		Type:	
Start Date:		End Date:	
Client:			
Client Contact Name:		Client Phone:	
Completed with own equipment and labor forces:			<input type="checkbox"/> Yes <input type="checkbox"/> No
If "No" was checked above, provide name of the Contractor completing work:			
Scope/Project Cost/Additional Information:			
c. Project Name:			
Location:			
Superintendent:			
Structure Size (SF):		Type:	
Start Date:		End Date:	
Client:			
Client Contact Name:		Client Phone:	
Completed with own equipment and labor forces:			<input type="checkbox"/> Yes <input type="checkbox"/> No
If "No" was checked above, provide name of the Contractor completing work:			
Scope/Project Cost/Additional Information:			
d. Project Name:			
Location:			

Superintendent:			
Structure Size (SF):		Type:	
Start Date:		End Date:	
Client:			
Client Contact Name:		Client Phone:	
Completed with own equipment and labor forces:			<input type="checkbox"/> Yes <input type="checkbox"/> No
If "No" was checked above, provide name of the Contractor completing work:			
Scope/Project Cost/Additional Information:			
e. Project Name:			
Location:			
Superintendent:			
Structure Size:		Type:	
Start Date:		End Date:	
Client:			
Client Contact Name:		Client Phone:	
Completed with own equipment and labor forces:			<input type="checkbox"/> Yes <input type="checkbox"/> No
If "No" was checked above, provide name of the Contractor completing work:			
Scope/Project Cost/Additional Information:			

The Fayetteville Public Works Commission may conduct such investigations/verifications as deemed necessary to establish the responsibility, qualification and financial ability of the Bidder. Should the Fayetteville Public Works Commission adjudge that the apparent low bidder is not the lowest responsive, responsible bidder by virtue of the above information furnished, said apparent low bidder will be so notified and his bid security shall be returned to him without prejudice. Failure or refusal to furnish any items of information requested by the Fayetteville Public Works Commission shall be considered as non-responsive and therefore basis for rejection of the bid.

Submitted By (print):

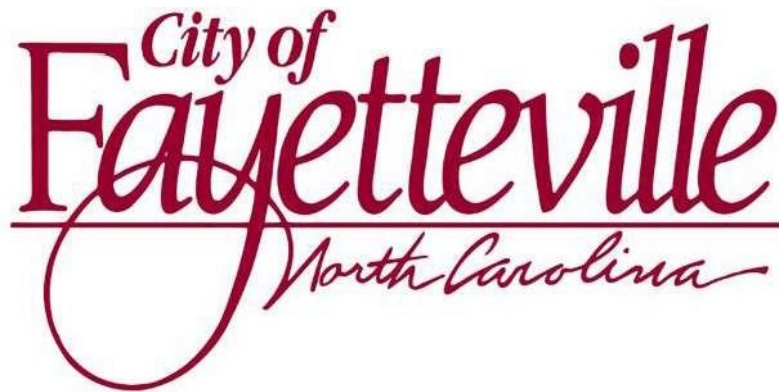
Date:

Title:

Company:

Signature:

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CITY OF FAYETTEVILLE

**SMALL DISADVANTAGED BUSINESS
ENTERPRISE PROGRAM
FOR
CONSTRUCTION, PROCUREMENT, AND
PROFESSIONAL SERVICES**

**FAYETTEVILLE CITY COUNCIL
433 HAY STREET
FAYETTEVILLE, NORTH CAROLINA 28301**

SMALL DISADVANTAGED BUSINESS ENTERPRISE PROGRAM

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SMALL DISADVANTAGED BUSINESS ENTERPRISE PROGRAM

I. Applicability.

(a) This program shall apply to all construction and repair work involving the expenditure of City funds, regardless of the sources of other funds, in the amounts set forth in G.S. 143-129 and G.S. 143-131; this program shall also apply to the procurement of architectural, engineering and surveying services as outlined in G.S. 143-64.31. This program shall not apply to contracts established by the State or any agency of the State.

(b) If any section, subsection, clause or provision of this chapter, including those groups found to be presumptively socially disadvantaged, is held to be invalid by a court of competent jurisdiction, the remainder of the chapter shall not be affected by such invalidity.

II. Definitions.

As used in this part, the following terms shall have the following meanings:

Affiliation - One firm controls or has the power to control the other, or a third party or parties controls or has the power to control both, or an identity of interests exists between such firms. In determining whether firms are Affiliates, the City shall consider all appropriate factors, including common ownership, common management, and contractual relationships. Affiliates must be considered together in determining whether a firm is a Small Business Enterprise.

Bidder/Participant - Any person, firm, partnership, corporation, limited liability company, association or joint venture seeking to be awarded a public contract or subcontract.

Brokering - Filling orders by purchasing or receiving supplies from a third party supplier rather than out of existing inventory, and providing no Commercially Useful Function other than acting as a conduit between a supplier and a customer.

City - The awarding authority for contracts awarded by the City of Fayetteville and the City of Fayetteville Public Works Commission.

City's Marketplace - The geographic and procurement areas in which the City contracts on an annual basis.

Commercially Useful Function - Responsibility for the execution of a distinct element of the work of the contract which is carried out by actually performing, managing, and supervising the work involved, or fulfilling responsibilities as a joint venture.

Contract - A mutually binding legal relationship or any modification thereof obligating the seller to furnish equipment or services and obligating the buyer to pay for them, not including leases or emergency procurements.

Doing Business - Having a physical location from which to engage in for profit activities in the scope(s) of expertise of the firm.

Economically Disadvantaged - An individual whose Personal Net Worth is less than the amount identified in 49 CFR Part 26

Equipment - Materials, supplies, commodities and apparatuses.

Expertise - Demonstrated skills, knowledge, or ability to perform in the field of endeavor in which certification is sought by the firm as defined by normal industry practices, including licensure where required.

Good Faith Efforts - Actions undertaken by a Bidder/Participant to achieve a SDBE goal which, by their scope, intensity, and appropriateness to the objective, can reasonably be expected to fulfill the Program's requirements.

Joint Venture - An association of two or more persons, or any combination of types of business enterprises and persons numbering two or more, proposing to perform a single for profit business enterprise, in which each joint venture partner contributes property, capital, efforts, skill and knowledge, and in which the SDBE is responsible for a distinct, clearly defined portion of the work of the contract and whose share in the capital contribution, control, management, risks, and profits of the joint venture is commensurate with its ownership interest. Joint ventures must have an agreement in writing specifying the terms and conditions of the relationships between the partners and their relationship and responsibility to the contract.

Managers - The City Manager.

Manufacturer - A firm that operates or maintains a factory or establishment that produces, on the premises, the materials, supplies, articles, or equipment required under the contract and of the general character described by the specifications.

Personal Net Worth - The net value of the assets of an individual after total liabilities are deducted. An individual's Personal Net Worth does not include the individual's ownership interest in an applicant or the individual's equity in his or her primary place of residence. An individual's Personal Net Worth includes only his or her share of assets held jointly with the individual's spouse.

Program - The SDBE Program.

Project Specific Goal - The Goal established for a particular project or contract based upon the availability of SDBEs in the scopes of work of the Contract.

Regular Dealer - A firm that owns, operates, or maintains a store, warehouse, or other establishment in which the materials, supplies, articles or equipment of the general character described by the specifications and required under the contract are bought, kept in stock, and regularly sold or leased to the public in the usual course of business. To be a Regular Dealer, the firm must be an established, regular business that engages, as its principal business and under its own name, in the purchase and sale or lease of the products in question. A firm may be a Regular Dealer in such bulk items as petroleum products, steel, cement, gravel, stone, or asphalt without owning, operating, or maintaining a place of business if the firm both owns and operates distribution equipment for the products. Any supplementing of a Regular Dealer's distribution equipment shall be by a long-term lease agreement and not on an *ad hoc* or contract-by-contract basis. Packagers, manufacture representatives, or other persons who arrange or expedite transactions are not Regular Dealers.

Schedule of Participation - The list of SDBEs that the Bidder/Participant commits will be utilized, their scopes of the work, and dollar value or the percentage of the project they will perform.

Socially Disadvantaged - An individual who has been subjected to racial or ethnic prejudice or cultural bias within American society because of his or her identity as a member of a group and without regard to individual qualities. Social disadvantage must stem from circumstances beyond the individual's control. A Socially Disadvantaged individual must be a citizen or lawfully admitted permanent resident of the United States who is either:

- (a) A person whose lifelong cultural and social affiliation is with one of the following groups, which are rebuttably presumed to be Socially Disadvantaged:
 - (i) Blacks/African - Americans (persons having origins in any of the Black racial groups of Africa);
 - (ii) Hispanic - Americans (persons of Mexican, Puerto Rican, Cuban, Dominican, Central or South American, or other Spanish or Portuguese culture or origin, regardless of race);

- (iii) Native - Americans (persons having origins in the original groups of North America);
 - (iv) Asian - Americans (persons having origins in any of the original groups of the Far East, Southeast Asia, the islands of the Pacific or the Indian Subcontinent);
 - (v) Women; or
- (b) Any socially disadvantaged individual as defined by 15 U.S.C. 637.

Small Disadvantaged Business Enterprise (SDBE) - Means a business, including a sole proprietorship, partnership, corporation, limited liability company, joint venture or any other business or professional entity:

- (a) Which is at least 51 percent owned by one or more Socially and Economically Disadvantaged individuals, or in the case of a publicly owned business, at least 51 percent of all classes of the stock of which is owned by one or more Socially and Economically Disadvantaged individuals;
- (b) Whose management, policies, major decisions and daily business operations are independently managed and controlled by one or more such Socially and Economically Disadvantaged individuals;
- (c) Which is a Small Business Enterprise as defined by 13 CFR Part 121;
- (d) Which is Doing Business in the City's Marketplace; and
- (e) Which is certified as a SDBE by the City of Fayetteville.

SDBE Program Coordinator - The person designated by the Managers to administer the Program.

III. SDBE Program Administration.

The Coordinator shall administer the SDBE Program, which duties shall include:

- (a) Formulating, proposing, and implementing rules and regulations for the further development, implementation, and monitoring of the Program.
- (b) Informing SDBEs of City contracting opportunities through outreach activities.
- (c) Providing information and assistance to SDBEs relating to City procurement practices and procedures, and bid specifications, requirements, and prerequisites.
- (d) Certifying businesses as SDBEs, maintaining certification records, and ensuring that all City departments have current certification listings.
- (e) Establishing Project Specific Goals.
- (f) Evaluating Bidder/Participant's achievement of Project Specific Goals or Good Faith Efforts to meet Project Specific Goals.
- (g) Working with City departments to monitor Contracts to ensure prompt payments to SDBEs, compliance with Project Specific Goals and commitments and the Program's operations and objectives.
- (h) Receiving, reviewing, and acting upon complaints and suggestions concerning the Program.

- (i) Collecting data to evaluate the Program.
- (j) Monitoring the Program and reporting to the Managers, the Mayor and the City Council on the administration and operations of the Program.

IV. Race- and Gender-Neutral Measures to Ensure Equal Opportunities for All Bidders/Participants.

The City shall develop and use measures to facilitate the participation of all firms in City contracting activities. These measures shall include, but are not limited to:

- (a) Arranging solicitation times for the presentations of bidding opportunities, which includes quantities, specifications and delivery schedules so as to facilitate the participation of interested firms.
- (b) Dividing requests for bids or proposals into work elements to facilitate the participation of small firms.
- (c) Providing timely information on specific contracting opportunities, contracting procedures, and bid preparation.
- (d) Holding pre-bid conferences, where appropriate, to explain the projects.
- (e) Enforcing prompt payment requirements and procedures, including requiring by contract that prime contractors promptly pay subcontractors.
- (f) Reviewing bonding and insurance requirements to eliminate unnecessary barriers to contracting with the City.
- (g) Maintaining information on all firms bidding on City prime contracts and subcontracts.

V. SDBE Program Eligibility.

- (a) Only businesses that meet the criteria of SDBEs may participate in the Program.
- (b) The City shall apply the certification criteria and procedures of 49 CFR Part 26 to applicants for participation in the Program.
- (c) The City shall certify the eligibility of joint ventures involving SDBEs and non-SDBEs.
- (d) In lieu of conducting its own certifications, the Coordinator may accept formal certifications by other entities as meeting the requirements of the Program, if the eligibility standards of such entities are comparable to those of the City. Certification decisions, including decertification and graduation determinations, by those other entities shall be accepted by the City in its discretion.
- (e) It is the responsibility of the SDBE to notify the Coordinator of any change in its circumstances affecting its continued eligibility for the Program. Failure to do so may result in the firm's decertification.
- (f) A SDBE may be decertified if it submitted inaccurate, false, or incomplete information to the City or failed to comply with requirements of a contract with the City or with the requirements of the Program.
- (g) A third party may challenge the eligibility of a certified firm:
 - (1) The challenge shall be made in writing under oath and shall include all information relied upon by the challenging party.

- (2) The Coordinator shall provide an opportunity to the parties for an informal hearing. The parties may appear and provide documentation or other evidence and be represented by counsel.
 - (3) The Coordinator shall render a written decision within 15 days of the hearing.
 - (4) If the Coordinator determines that the firm is not eligible, it may appeal the determination to the Manager in writing within 7 days of receipt of the written decision. The challenging party shall have no right of appeal from the Coordinator's determination.
 - (5) The Manager shall issue a written decision within 15 days of receipt of the appeal. The Manager's determination shall be final.
- (h) A firm that has been decertified may not reapply for certification for one year from the effective date of its decertification.

VI. SDBE Goal Setting.

The Coordinator shall establish a Project Specific Goal for appropriate Contracts based on normal industry practice as determined in consultation with the appropriate Department, the availability of SDBEs to perform the functions of the Contracts and the City's utilization of SDBEs to date.

VII. Counting Participation of SDBEs.

(a) The entire amount of that portion of a construction Contract that is performed by the SDBE's own forces shall be counted, including the cost of equipment obtained by the SDBE for the work of the Contract, and equipment purchased or leased by the SDBE (except equipment the SDBE subcontractor or Joint Venture partner purchases or leases from the prime contractor or its Affiliate).

(b) The entire amount of fees or commissions charged by a SDBE for providing a *bona fide* service, such as professional, technical, consultant or managerial services, or for providing bonds or insurance specifically required for the performance of the Contract, shall be counted, provided the fee is reasonable and not excessive as compared with fees customarily charged for similar services.

(c) When a SDBE performs as a participant in a Joint Venture, only the portion of the total dollar value of the Contract equal to the distinct, clearly defined portion of the work of the Joint Venture's Contract that the SDBE performs with its own forces and for which it is separately at risk shall be counted.

(d) Only expenditures to a SDBE that is performing a Commercially Useful Function shall be counted. To determine whether a firm is performing a Commercially Useful Function, the City will evaluate the amount of work subcontracted, industry practices, whether the amount the firm is to be paid under the Contract is commensurate with the work it is actually performing and other relevant factors. To perform a Commercially Useful Function, the SDBE must be responsible, with respect to equipment used on the Contract, for negotiating price, determining quality and quantity, ordering the material, installing (where applicable) and paying for the material itself. A SDBE does not perform a Commercially Useful Function if its role is limited to that of an extra participant in the Contract through which funds are passed in order to obtain the appearance of SDBE participation. If a SDBE subcontracts a greater portion of the work of a Contract than would be expected on the basis of normal industry practice, it is presumed not to perform a Commercially Useful Function. When a SDBE is presumed not to be performing a Commercially Useful Function, the SDBE may present evidence to rebut this presumption.

(e) One hundred percent of the cost of the materials or supplies obtained from a SDBE Manufacturer or Regular Dealer shall be counted. One hundred percent of the fees or transportation charges for the delivery of materials or supplies required on a job site shall be counted only if the payment of such fees is a customary industry

practice and are commensurate with fees customarily charged for similar services. The cost of the materials and supplies shall not be counted.

(f) If a firm is decertified during performance of a Contract, the dollar value of work performed under a Contract with that firm after it has been decertified shall not be counted.

(g) In determining achievement of a Project Specific Goal, the participation of a SDBE shall not be counted until that amount has been paid to the SDBE.

VIII. Procurement of Architectural, Engineering and Surveying Services (G.S. 143-64.31)

(a) The City shall use good faith efforts to notify minority firms of the opportunity to submit qualifications for architectural, engineering, surveying and construction management at risk services.

IX. Informal Construction and Repair Work (G.S. 143-131)

(a) The City shall solicit minority participation for construction and repair projects in the amount of five thousand dollars (\$5,000) or more, but less than three hundred thousand dollars (\$300,000). The City shall maintain a record of contractors solicited and shall document efforts to recruit minority business participation in these contracts.

X. Formal Construction and Repair Work (G.S. 143-129)

(a) For all solicitations, the Bidder/Participant shall submit a Schedule of Participation detailing all subcontractors from which the Bidder/Participant solicited bids or quotations, and if a Project Specific Goal has been established, its achievement of the Goal or its Good Faith Efforts to do so. The list of SDBEs provided by the City to a Bidder/Participant establishes the minimum universe from which a Bidder/Participant must solicit SDBEs. The Schedule of Participation shall be due at the time set out in the solicitation documents.

(b) Any agreement between a Bidder/Participant and a SDBE in which the Bidder/Participant requires that the SDBE not provide subcontracting quotations to other bidders/proposers is prohibited.

(c) SDBEs shall respond to relevant requests for quotations.

(d) Where the Bidder/Participant cannot achieve the Project Specific Goal, the Coordinator will determine whether the Bidder/Participant has made Good Faith Efforts. At a minimum, the Bidder/Participant must engage in the following Good Faith Efforts that total at least 50 points for the bid or proposal to be responsive.

(1) Contacting SDBEs from the list provided by the City at least ten days before the bid or proposal date and notifying them of the nature and scope of the work to be performed. The Bidder/Participant shall provide interested SDBEs with timely, adequate information about the plans, specifications, and requirements of the Contract to allow SDBEs to respond to the solicitation. The Bidder/Participant must follow up initial solicitations with interested SDBEs. 10 points.

(2) Providing or making the construction plans, specifications, and requirements available for review by SDBEs at least ten days before the bid or proposals are due. 10 points.

(3) Breaking down or combining elements of work into economically feasible units to facilitate minority participation. 15 points.

(4) Working with SDBE, minority, women, trade, community or contractor organizations identified by the City in the bid documents that provide assistance in recruitment of SDBEs. 10 points.

(5) Attending any prebid meetings scheduled by the City. 10 points.

- (6) Providing assistance in getting required bonding or insurance or providing alternatives to bonding or insurance for subcontractors. 20 points.
- (7) Negotiating in good faith with interested SDBEs and not rejecting them as unqualified without sound reasons based on their capabilities. Evidence of such negotiation includes the names, addresses, and telephone numbers of SDBEs that were contacted; a description of the information provided regarding the plans and specifications for the work selected for subcontracting; and why agreements could not be reached with SDBEs. The Bidder/Participant may not reject SDBEs as being unqualified without sound reasons based on a thorough investigation of their capabilities. Any rejection of a SDBE based on price or lack of qualifications must be documented in writing. 15 points.
- (8) Providing assistance to an otherwise qualified SDBE in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letters of credit, including waiving credit that is ordinarily required. Assisting SDBEs in obtaining the same unit pricing with the bidder's suppliers in order to help minority SDBEs to establish credit. 25 points.
- (9) Negotiating joint venture and partnership arrangements with SDBEs to increase opportunities for SDBE participation. 20 points.
- (10) Providing quick pay agreements and policies to enable SDBEs to meet cash-flow demands. 20 points.

(e) In determining whether a Bidder/Participant has made Good Faith Efforts, the performance of other bidders/proposers in meeting the Project Specific Goal may be considered. For example, when the apparent successful Bidder/Participant fails to meet the Project Specific Goal but others meet it, it may be reasonably questioned whether, with additional reasonable efforts, the apparent successful Bidder/Participant could have met the Goal. Similarly, if the apparent successful Bidder/Participant fails to meet the Goal, but meets or exceeds the average SDBE participation obtained by other bidders/proposers, this may be evidence that the apparent successful Bidder/Participant made Good Faith Efforts.

(f) The Coordinator shall timely review the Schedule of Participation prior to award, including the scope of work and the letters of intent from SDBEs. The Coordinator may request clarification in writing of items listed in the Schedule of Participation, provided such clarification shall not include the opportunity to augment listed SDBE participation or Good Faith Efforts.

(g) The Schedule of Participation and supporting documents shall be reviewed by a Bid Selection Committee, composed of the operating departments, Purchasing Department, Coordinator and other representatives as appropriate. If the Bid Selection Committee initially determines the bid to be responsive, it shall recommend award of the Contract to the Managers. If the Bid Selection Committee determines the bid to be non-responsive, it shall confer with the City Attorney prior to recommending the rejection of the bid.

(h) A Bidder/Participant found to be non-responsive may appeal this determination pursuant to the City's bid protest procedures.

XI. Contract Performance Compliance Procedures.

(a) Upon award of a Contract by the City that includes a Project Specific Goal, the Goal becomes a covenant of performance by the Bidder/Participant in favor of the City.

(b) The Bidder/Participant shall provide a listing of all subcontractors to be used in the performance of the Contract, and subcontractor payment information to the City with each request for payment submitted to the City. The Coordinator and the operating department shall monitor subcontractor participation during the course of the Contract and shall have reasonable access to all Contract-related documentation held by the Bidder/Participant. The Bidder/Participant shall submit reports at such times and in such formats as requested by the City.

- (c) The Bidder/Participant shall cooperate with the City in studies and surveys related to the Program.
- (d) The Bidder/Participant cannot make changes to the Schedule of Participation or substitute subcontractors named in the Schedule of Participation without the prior written approval of the Coordinator. Unauthorized changes or substitutions shall be a violation of this program, and may constitute grounds for rejection of the bid or proposal or cause termination of the executed Contract for breach, the withholding of payment and/or subject the Bidder/Participant to Contract penalties or other sanctions.
 - (1) All requests for changes or substitutions of the subcontractors named in the Schedule of Participation shall be made to the Coordinator in writing, and shall clearly and fully set forth the basis for the request. A Bidder/Participant shall not substitute a subcontractor or perform the work designated for a subcontractor with its own forces unless and until the Coordinator approves such substitution in writing.
 - (2) The facts supporting the request must not have been known nor reasonably should have been known by either party prior to the submission of the Schedule of Participation. Bid shopping is prohibited.
 - (3) Substitutions of the subcontractor shall be permitted only on the following basis:
 - (i) Unavailability after receipt of reasonable notice to proceed.
 - (ii) Failure of performance.
 - (iii) Financial incapacity.
 - (iv) Refusal by the subcontractor to honor the bid or proposal price.
 - (v) Mistake of fact or law about the elements of the scope of work of a solicitation where agreement upon a reasonable price cannot be reached.
 - (vi) Failure of the subcontractor to meet insurance, licensing, or bonding requirements; or
 - (vii) The subcontractor's withdrawal of its bid or proposal.
 - (4) Where the Bidder/Participant has established the basis for the substitution to the satisfaction of the Coordinator, the Bidder/Participant shall make Good Faith Efforts to fulfill the Schedule of Participation if the Project Specific Goals will not otherwise be met. The Bidder/Participant may seek the assistance of the SDBE Office in obtaining a new SDBE subcontractor. If the Project Specific Goal cannot be reached and Good Faith Efforts have been made, the Bidder/Participant may substitute with a non-SDBE.
- (e) If a Bidder/Participant plans to hire a subcontractor on any scope of work that was not previously disclosed in the Schedule of Participation, the Bidder/Participant shall obtain the approval of the Coordinator to modify the Schedule of Participation and must make Good Faith Efforts to ensure that SDBEs have a fair opportunity to bid on the new scope of work.
- (f) The SDBE Compliance Committee, comprised of the Coordinator as the Chair and a representative from the Purchasing Department or any requested representative, shall be responsible for evaluating and reviewing issues and concerns concerning the Program, including whether a Bidder has complied with the GoodFaith Efforts.
- (g) If the Bidder/Participant is found to be in noncompliance with the Program or the Contract and fails to correct such noncompliance within ten working days after written notification, the City will withhold 5

percent of the amount of completed work on all monthly payments until the Bidder/Participant has come into compliance.

XII. Protest Procedure.

A Bidder/Participant may protest a decision regarding the implementation of the Program, including the determination that it has not made Good Faith Efforts, by filing a written grievance with supporting evidence with the Coordinator. The Coordinator shall provide a written response within ten working days of receipt of the grievance. The Bidder/Participant may appeal the Coordinator's determination in writing within ten working days of receipt to the Purchasing Director. The Director shall refer the grievance to the SDBE Compliance Committee, which shall hold a hearing and issue a written recommendation within ten working days. The Manager, upon receipt of the SDBE Compliance Committee's recommendation, shall make a final determination within ten working days.

XIII. Dispute Resolution.

Notwithstanding the protest procedures outlined above, mediation shall be required for all parties involved in a dispute under this program prior to initiating litigation concerning the dispute. The procedures for mediation shall be those adopted by City Council Resolution #2002-066 which is incorporated herein by reference as if fully set forth herein.

XIV. Penalties.

(a) Providing false or misleading information to the City in connection with an application for or challenge to certification, recertification or decertification as a SDBE, submission of a bid, responses to requests for qualifications or proposals, Good Faith Efforts documentation, post-award compliance, or other actions in violation of this program may render any bid award or contract void. A contract that is void under this section may continue in effect until an alternative can be arranged when immediate termination would result in harm to the public health or welfare.

(b) A Bidder/Participant is subject to withholding of payments under the Contract, termination of the Contract for breach, Contract penalties, decertification as a SBDE, or being barred or deemed non-responsive in future City solicitations and Contracts for up to two years, if it is found to have:

- (1) Provided false or misleading information in connection with the submission of a bid or proposal or documentation of Good Faith Efforts, post-award compliance, or other Program operations.
- (2) Failed in bad faith to fulfill the Project Specific Goal, thereby materially breaching the Contract.
- (4) Repeatedly failed to comply in good faith with substantive provisions of this program.

(c) The City reserves the right to pursue all remedies available in law or in equity for violations of this program.

XV. Program Review.

(a) The Managers, the Mayor, and the City Council shall receive an annual report from the Coordinator detailing the City's performance under the Program.

(b) The Managers, the Mayor, and the City Council will review this report, including the City's progress towards eliminating discrimination in its contracting activities and marketplace, and revise the Program as necessary to meet legal and Program requirements.

(c) If the Managers, the Mayor, and the City Council find that the objectives of the Program have been achieved, the City Council shall sunset the Program.

Attach to Bid Attach to Bid Attach to Bid Attach to Bid Attach to Bid

**CITY OF FAYETTEVILLE
AND
PUBLIC WORKS COMMISSION OF THE CITY OF FAYETTEVILLE
SDBE/HUB COMPLIANCE PROVISIONS**

SDBE/HUB CONTRACT PROVISIONS

APPLICATION:

The requirements of the Small Disadvantaged Business Program for participation in the City of Fayetteville's construction contracts are hereby made a part of the Contract Documents. Copies of the Program may be obtained from:

Public Works Commission
Procurement Department/Trent Ensley
P.O. Box 1089 Fayetteville, North Carolina 28302
Phone (910) 223-4333 Fax (910) 483-1429 e-mail: trent.ensley@faypwc.com

NCDOT DBE Directory: www.ebs.nc.gov/VendorDirectory
HUB Directory <https://ncadmin.nc.gov/businesses/hub>

SDBE COMPLIANCE REQUIREMENTS

1. The Bidder shall provide, **with the bid**, the SDBE CONTRACT PROVISIONS (CONSTRUCTION), properly executed which signifies that the Bidder understands and agrees to any incorporated SDBE contract provisions.
2. The Bidder shall provide **with the bid**:

Provide with Bid Form Proposal

Identification of SDBE/HUB Participation Form
AND
Affidavit A – Listing of Good Faith Efforts

OR

Identification of SDBE/HUB Participation Form
AND
Affidavit B – Intent to Self-Perform with Own Workforce

Provided Upon being named apparent low Bidder

Affidavit C – Percentage of SDBE/HUB Participation
OR
Affidavit D – Good Faith Efforts

All written statements, certifications, or intentions made by the Bidder shall become a part of the agreement between the Contractor and the City of Fayetteville for performance of this contract.

SUBCONTRACTOR PAYMENT REQUIREMENTS:

North Carolina General Statutes 143-134.1 (N.C.G.S.) states that the percentage of retainage on payments made by the prime contractor to the subcontractor shall not exceed the percentage of retainage on payments made by the City of Fayetteville to the prime contractor. Failure to comply with this provision shall be considered a breach of the contract, and the contract may be terminated in accordance with the termination provisions of the contract.

The Contractor shall provide an itemized statement of payments to each SDBE subcontractor before final payment is processed.

The Contractor shall provide an itemized statement of payments to each NON-SDBE subcontractor before final payment is processed.

Date: _____

(Name of Company)

(Signature)

Attest: _____

(Above Name Typed or Printed)

(Title)

Attach to Bid Attach to Bid Attach to Bid Attach to Bid Attach to Bid

City of Fayetteville

Affidavit A: Listing of the Good Faith Efforts

Affidavit of _____
(Name of Bidder)

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

(A value of 50 points or greater achieves "good faith efforts")

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

In accordance with GS143-128.2 (d) the undersigned will enter into a formal agreement with the firms listed in the Identification of Small Disadvantaged Business Participation schedule conditional upon execution of a contract with the Owner. Failure to abide by any applicable statutory provision may constitute a breach of the contract. The undersigned hereby certifies that he or she has read the terms of the small disadvantaged business commitment and is authorized to bind the Bidder to the commitment herein set forth.

Date: _____ Name of Authorized Officer: _____



State of North Carolina, County of _____
Subscribed and sworn to before me this _____ day of _____ 20_____
Notary Public _____
My commission expires _____

Attach to Bid Attach to Bid Attach to Bid Attach to Bid Attach to Bid

**CITY OF FAYETTEVILLE
AND
PUBLIC WORKS COMMISSION OF THE CITY OF FAYETTEVILLE
SDBE/HUB COMPLIANCE PROVISIONS**

Affidavit B: Intent to Perform Contract with Own Workforce:

Affidavit of _____
(Name of Bidder)

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

_____ contract. (Name of

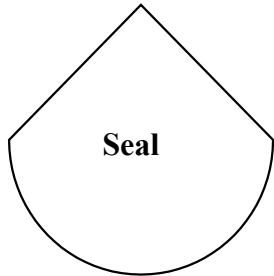
Project)

In making this certification, the Bidder states that the Bidder does not customarily subcontract elements of this type project, and normally performs and has the capability to perform and will perform **all elements of the work** on this project with his/her own current workforces; and will complete all elements of this project **without** the use of subcontractors, material suppliers, or providers of professional services.

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

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

Date: _____ Name of Authorized Officer: _____



Signature: _____

Title: _____

State of North Carolina, County of _____
Subscribed and sworn to before me this ___ day of ___ 20 Notary Public _____

My commission expires _____

Attach to Bid Attach to Bid Attach to Bid Attach to Bid Attach to Bid

CITY OF FAYETTEVILLE
 AND
 PUBLIC WORKS COMMISSION OF THE CITY OF FAYETTEVILLE
 SDBE/HUB COMPLIANCE PROVISIONS

Affidavit C: Percentage of SDBE/HUB Participation

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

\$

(Project Number)

(Dollar Amount of Total Bid)

I will expend a minimum of _____% of the total dollar amount of the contract with small disadvantaged business enterprises. SDBE's will be employed as subcontractors, vendors, or providers of professional services. Such work will be subcontracted to the following firms listed below.

Name, Address and Phone No.	*SDBE HUB Category	Description	Dollar Value	% of Contract

*SDBE categories: Black-African Americans (B), Hispanic-Americans (H), Asian- Americans (A), Native-Americans (I), Women (F), Socially/Economically Disadvantaged (D)

*HUB Statewide Uniform Certification (SWUC)

Pursuant to G.S. 143-128.2(d), the undersigned will enter into a formal agreement with small disadvantaged firms for work listed in this schedule conditional upon execution of a contract with the Owner. Failure to fulfill this commitment may constitute a breach of the contract.

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

Date: _____

Name of Authorized Officer: _____

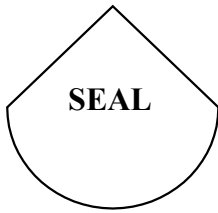
Signature: _____

Title: _____

State of North Carolina, County of _____ Subscribed and sworn to
before me this ____ day of ____ 20

Notary Public _____

My commission expires _____



THIS FORM IS NOT TO BE SUBMITTED WITH THE BID PROPOSAL

**CITY OF FAYETTEVILLE
AND
PUBLIC WORKS COMMISSION OF THE CITY OF FAYETTEVILLE
SDBE/HUB COMPLIANCE PROVISIONS**

Affidavit D: Good Faith Efforts

If Owner determines using reasonable discretion that Affidavit C is insufficient, Bidder agrees to provide the following information regarding any good-faith efforts.

Name, Address and Phone No.	*SDBE/HUB Category	Description	Dollar Value

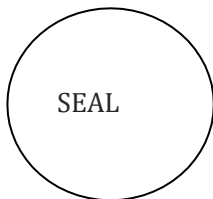
*SDBE categories: Black-African Americans (B), Hispanic-Americans (H), Asian- Americans (A), Native-Americans (I), Women (F), Socially/Economically Disadvantaged (D)

*HUB Statewide Uniform Certification (SWUC)

Bidder may be requested to provide documentation of the Bidder's good-faith efforts. Examples of documentation may include the following:

- A. Copies of solicitations for quotes to small disadvantaged business firms. Each solicitation may include a specific description of the work to be subcontracted, location where bid documents can be reviewed, representative of the Prime Bidder to contact, and location, date and time when quotes must be received.
- B. Copies of quotes or responses received from each firm responding to the solicitation.
- C. A telephone log of follow-up calls to each firm sent a solicitation.
- D. For subcontracts where a small disadvantaged business firm is not considered the lowest responsible sub-bidder, copies of quotes received from all firms submitting quotes for that particular subcontract.
- E. Documentation of any contacts or correspondence to small disadvantaged businesses, community or contractor organizations in an attempt to meet the goal.
- F. Copy of pre-bid roster.
- G. Letter documenting efforts to provide assistance in obtaining required bonding or insurance for small disadvantaged businesses.
- H. Letter detailing reasons for rejection of a small disadvantaged business due to lack of qualification.
- I. Letter documenting proposed assistance offered to small disadvantaged businesses in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letter of credit, including waiving credit that is ordinarily required.

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



Date: _____ Name of Authorized Officer: _____

Signature: _____

Title: _____

State of North Carolina, County of _____

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

My commission expires _____

Attach to Bid Attach to Bid Attach to Bid Attach to Bid Attach to Bid



**CITY OF FAYETTEVILLE
AND
PUBLIC WORKS COMMISSION OF THE CITY OF FAYETTEVILLE
SDBE/HUB COMPLIANCE PROVISIONS**

Identification of Small Disadvantaged Business Participation

I, _____
(Name of Bidder)

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

Firm Name, Address and Phone No.	Description	*SDBE/HUB Category

*SDBE categories: Black-African Americans (B), Hispanic-Americans (H), Asian- Americans (A), Native-Americans (I), Women (F), Socially/Economically Disadvantaged (D)
*HUB Statewide Uniform Certification (SWUC)

The total value of small disadvantaged business contracting will be (\$)_____.

Attach to Bid Attach to Bid Attach to Bid Attach to Bid Attach to Bid

FAYETTEVILLE PUBLIC WORKS COMMISSION

Supplemental PWC Requirement: Subcontractor Disclosure Form

NON- SDBE/HUB DOCUMENTATION FOR CONTRACT PAYMENTS

Prime Contractor: _____
Address & Phone: _____
Project Name: _____
Pay Application #: _____ Period: _____

The following is a list of payments to be made to subcontractors on this project for the above-mentioned period.

Firm Name and Address	Payment Amount	Owner Use Only

Date: _____

Submitted By: _____

Name

Title

Signature

****SUBCONTRACTOR DOCUMENTS:
SUBMIT WITH EACH PAY REQUEST & FINAL PAYMENT**

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February 2022

SECTION B CONTRACT EXECUTION DOCUMENTS

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NOTICE OF AWARD

TO _____

PROJECT DESCRIPTION: DEMOLITION AND DECOMMISSIONING OF FORMER WTP AT GLENVILLE LAKE DAM

The OWNER has considered the BID submitted by you for the above-described work in response to its Advertisement for Bids dated _____ and Instructions to Bidders.

You are hereby notified that your BID has been accepted for items in the amount of \$_____.

You are required by the Instructions to Bidders to execute the Agreement and furnish the required Performance Bond, Payment Bond, and Certificates of Insurance within ten (10) calendar days from the date of this NOTICE to you.

If you fail to execute said Agreement and to furnish said Bonds within ten (10) days from the date of this Notice, said Owner will be entitled to consider all your rights arising out of the OWNER's acceptance of your BID as abandoned and as a forfeiture of your Bid Bond. The Owner will be entitled to such other rights as may be granted by law.

You are required to return an acknowledged copy of this NOTICE OF AWARD to the OWNER.

Dated this _____ day of _____, 20_.

OWNER: FAYETTEVILLE PUBLIC WORKS COMMISSION

BY: _____
Trent Ensley
Procurement Manager

6384-231131
February 2022

ACCEPTANCE OF AWARD

Receipt of the preceding NOTICE OF AWARD is hereby acknowledged this the _____
day of _____, 20__.

CONTRACTOR

By: _____

Title: _____

State of North Carolina
Cumberland County

CONSTRUCTION AGREEMENT

THIS CONSTRUCTION AGREEMENT ("Agreement") is made by and between the City of Fayetteville (the "City"), by and through the Fayetteville Public Works Commission ("PWC"), a North Carolina public authority, and [REDACTED] ("Contractor"), a [REDACTED] (*specify type of legal entity, state of formation, and if not formed in NC, confirm NC registration to do business*) (each of each of PWC and Contractor is a "Party" and both are collectively the "Parties") as of the date of execution last written below (the "Effective Date"). The Parties agree as follows:

1. The Construction Project. Contractor shall furnish and bear solely the entire cost of all labor and materials necessary for the construction and/or renovation of the Project (defined hereinbelow) as specified in the Contract Documents (defined hereinbelow) and complete all Work on the Project in a workmanlike manner in strict accordance with the Contract Documents, schedule delivery of the new materials, furnish and bear solely the entire cost of all supervision, contract administration, equipment, tools, and other means necessary to complete the Project, perform every obligation imposed by the Contract Documents, and be solely responsible for the clean-up and disposal of all materials and debris relating to or arising from the construction and renovation, subject to any exceptions that are specifically set forth in the Contract Documents. Except as otherwise specifically provided in the Contract Documents, Contractor is solely responsible for all construction means, methods, techniques, sequences, procedures, safety precautions or programs, supervising, coordinating, and performing all the Work necessary to complete the Project; provided, however, PWC shall have the right, without incurring any liability to the Contractor, to suspend Contractor's performance when a PWC employee, in his or her opinion, observes a safety violation involving a threat to life or imminent danger of bodily injury, and the suspension shall remain in effect until Contractor remedies the safety violation.

2. Terms. Capitalized terms used in this Agreement have the meaning specified below:

"Business Day" means each calendar day that is not a Saturday, Sunday, holiday observed by the federal government for its employees, or holiday observed by the State of North Carolina for its employees.

"Completion of the Project" means: (i) the Project is completed in accordance with this Agreement, except for punch list items; (ii) PWC has received any required temporary or final certificate of occupancy from the governmental agency with jurisdiction over the Project; and (iii) the registered architects or engineers (the "Designer(s)") who designed portions or components of the Project have issued certificates of Completion of the Project as to those portions or components.

"Contract Documents" means the following documents that were either made available to Contractor by PWC during the bid solicitation process (including Drawings) or executed by the Parties or both, which are all incorporated by reference herein:

- a. This Agreement
- b. Advertisement for Bids

- c. Invitation to Bid
- d. Special Provisions—Performance and Delivery
- e. Instructions to Bidders
- f. Bid Submittal Documents , including but not limited to Technical Evaluation Criteria, Bid Proposal, Bid Summary, Bid Bond, Bidder Agreement, List of Subcontractors, Affidavits, Acknowledgements, Certifications, and Bid Submittal Checklist
- g. Contractor Qualification Form
- h. City of Fayetteville Small Disadvantaged Business Enterprise Program
- i. Notice of Award
- j. Acceptance of Award
- k. Performance Bond
- l. Payment Bond
- m. Power of Attorney
- n. Certificates of Insurance
- o. Notice to Proceed and Acceptance
- p. Definitions and Terminology
- q. General Conditions
- r. Division 01 – General Requirements
- s. Division 03 – Concrete
- t. Division 05 – Metals
- u. Division 26 – Electrical
- v. Division 31 – Earthwork
- w. Division 33 – Utilities
- x. Appendices

The following documents may be delivered or issued on or after the Effective Date of the Agreement and may not be attached to this Agreement, but are considered Contract Documents when executed by the Parties:

- m. Notice to Proceed and Acceptance of Notice
- n. Work Change Directive(s)
- o. Change Order(s)
- p. Field Order(s)

There are no Contract Documents other than those identified in this Agreement. The Contract Documents may only be amended, modified, or supplemented as provided in this Agreement in a writing signed by the Parties.

“Fault” means a breach of contract by Contractor, negligent, reckless, or intentional act(s) or omission(s) constituting a tort under applicable statutes or common law by one or more Responsible Persons, or violation(s) of applicable statute(s) or regulation(s) by a Responsible Person.

“Project” means Demolition and Decommissioning of Former WTP at Glenville Lake Dam, as more specifically set forth in the Contract Documents.

“Responsible Person” means the Contractor and each of its employees, agents, representatives, subcontractors, or other persons and entities for which Contractor may be liable or responsible as a result of any statutory, tort, or contractual duty.

The terms used in this Agreement shall have the meaning as stated herein and in the Definitions and Terminology. In the event of a conflict between the terms of this Agreement and any other component(s) of the Contract Documents, the terms of this Agreement shall govern.

3. Contract Price. PWC shall pay Contractor for Completion of the Project in accordance with the Contract Documents the amount identified in the accepted Bid Form of Contractor, being in the total amount of \$ _____ (the "Price"). Contractor understands and acknowledges that the Price is derived from a specific appropriation of funds provided for the Project. Contractor agrees and acknowledges the Price is equal to the aggregate cost of all Work to be done on the Project, including all labor, materials, equipment, apparatus, and supplies, set in accordance with the amount specified on the Bid Form submitted by Contractor and accepted by PWC.

4. Contract Times. The Parties shall perform their obligations under this Agreement in compliance with all scheduling deadlines set forth in the Contract Documents. The Contractor shall commence the Work to be performed under this Agreement on a date to be specified in accordance with the Notice to Proceed issued by PWC. Contractor shall achieve Completion of the Project no later than _____, plus any modifications thereof allowed in accordance with the General Conditions (the "Completion Date").

5. Payment. PWC shall pay Contractor in installment payments plus a final payment, as set forth in the Contract Documents. For each applicable installment payment, Contractor shall submit an Application for Payment in accordance with the Contract Documents. An Application for Payment will be processed by PWC as provided in the Contract Documents. Such installment payments shall reflect the actual cost of the Work, not to exceed in total the Price, and the allocable portion of the total Price for said installment. PWC shall make payment to the Contractor, less any applicable retainage set forth in the Contract Documents; provided, however, that PWC may withhold all or a portion of a payment on account of (1) incomplete Work, (2) defective or nonconforming Work, (3) claims filed or a reasonable basis to believe that such claims will be filed imminently, (4) failure of the Contractor to make payments properly for labor, services, materials, equipment or subcontracts, (5) damages caused to PWC or another party by one or more Responsible Persons, or (6) failure to comply with the terms and conditions of this Agreement. In the final payment, PWC shall pay the balance of the Price, including all retained amounts, less any Liquidated Damages and other applicable damage and claim amounts, to Contractor; provided, however, that PWC may withhold a reasonable sum from the final payment to ensure correction of any final items or condition on the Project.

6. Retainage. Subject to any restrictions applicable to any federal grant funds that may be utilized for the Project, PWC may, in its discretion, retain up to five percent (5%) of any periodic payment due Contractor; provided, however, when the Project is fifty percent (50%) complete, PWC, with written consent of the surety, shall not retain any further retainage from periodic payments due Contractor if Contractor continues to perform satisfactorily and any nonconforming Work identified in writing prior to that time by PWC or the Designer has been corrected by Contractor and accepted by PWC or the Designer, and provided further that full payment, less authorized deductions, shall also be made for those line item trades that have reached one hundred percent (100%) completion of their contract obligations by or before the Project is fifty percent (50%) complete if Contractor has performed satisfactorily in accordance with G.S. 143-134.1(b2), contingent upon PWC's receipt of an approval or certification from the Designer that the Work performed by the subcontractor is acceptable and in accordance with the Contract Documents. If PWC determines Contractor's performance is unsatisfactory, PWC

may, in its discretion, reinstate retainage for each subsequent periodic Application for Payment as authorized in this Section up to the maximum amount of five percent (5%). The Project shall be deemed fifty percent (50%) complete when Contractor's gross project invoices, excluding the value of materials stored off-site, equal or exceed fifty percent (50%) of the Price, except the value of materials stored on-site shall not exceed twenty percent (20%) of Contractor's gross project invoices for the purpose of determining whether the Project is fifty percent (50%) complete. Within 60 days after the submission of a pay request and one of the following occurs, as specified in the Contract Documents, PWC, with written consent of the surety, shall release to Contractor all retainage on payments held by PWC: (i) PWC receives a certificate of substantial completion from the Designer in charge of the Project; or (ii) PWC receives beneficial occupancy or use of the Project; provided, however, PWC may in its discretion retain sufficient funds to secure Completion of the Project or corrections on any Work. If PWC retains funds, the amount retained shall not exceed two and one-half times the estimated value of the Work to be completed or corrected. Any reduction in the amount of the retainage on payments shall be with the consent of Contractor's surety. The existence of any third-party claims against Contractor or any additive change orders to the Construction Documents shall not be a basis for delaying the release of any retainage on payments. Notwithstanding anything in this Section to the contrary, following fifty percent (50%) completion of the Project, PWC shall be authorized to withhold additional retainage from a subsequent periodic payment, not to exceed five percent (5%), in order to allow PWC to retain two and one-half percent (2.5%) total retainage through the Completion of the Project. In the event that PWC elects to withhold additional retainage on any periodic payment subsequent to release of retainage on a line-item of Work pursuant to G.S. 143-134.1(b2), Contractor may also withhold from the subcontractors remaining on the project sufficient retainage to offset the additional retainage held by PWC, notwithstanding the actual percentage of retainage withheld by PWC of the Project as a whole. Neither PWC's nor Contractor's release of retainage on payments as part of a payment in full on a line-item of work pursuant to G.S. 143-134.1(b2) shall affect any applicable warranties on Work done by Contractor or subcontractor, and the warranties shall not begin to run any earlier than either PWC's receipt of a certificate of substantial completion from the Designer in charge of the Project or PWC receives beneficial occupancy.

7. Liquidated Damages. Time is of the essence with respect to performance of each of the Parties' obligations under this Agreement. Contractor recognizes and acknowledges that PWC will suffer financial and other losses if the Project is not completed by the Completion Date. The Parties recognize and agree that the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by PWC if the Project is not completed by the Completion Date. Accordingly, instead of requiring any such proof, Contractor and PWC agree that in the event Contractor fails to achieve Completion of the Project by the Completion Date, Contractor shall pay to PWC as liquidated damages to compensate PWC for damages related to the delayed Completion of the Project the daily amount specified in the Contract Documents ("Liquidated Damages") for each calendar day Contractor fails to achieve completion of the Work by the Completion Date.

8. Contractor's Representations and Warranties. In order to induce PWC to enter into this Agreement, Contractor makes the following representations and warranties to PWC:

a. Contractor is duly licensed in the State of North Carolina to complete all Work necessary for the Project, is duly organized, validly existing and in good standing and has all requisite powers, rights, and authority to execute, enter into, and perform this Agreement in accordance with the terms and conditions of this Agreement, and this

Agreement constitutes a legal, valid, and binding obligation of Contractor enforceable against it in accordance with its terms.

b. Contractor has read the Contract Documents, and acknowledges and understands all data, materials, specifications, and requirements identified in the Contract Documents.

c. Contractor has visited the site for the Project, conducted a thorough, visual examination of the site and adjacent areas, and become familiar with and is satisfied as to the general, local, and site conditions that may affect cost, progress, and performance in completing the Project.

d. Contractor is familiar with and is satisfied as to all laws and regulations that may affect cost, progress, and performance to complete the Project.

e. Contractor has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the site and all drawings of physical conditions relating to existing surface or subsurface structures at the site that have been identified in the Detail Specifications and any accompanying reports and drawings, and (2) reports and drawings relating to hazardous environmental conditions, if any, at or adjacent to the site that have been identified in the Contract Documents and any accompanying reports and drawings.

f. Contractor has considered the information known to Contractor itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and the Site-related reports and drawings identified in the Contract Documents, if any, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor; and (3) Contractor's safety precautions and programs.

g. Based on the information and observations referred to in subsection e. of this Section, Contractor agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Price commencing on the commencement date and in accordance with the other terms and conditions of the Contract.

h. Contractor is aware of the general nature of work to be performed by PWC and others at the Site that relates to the Work as indicated in the Contract Documents.

i. Contractor has given PWC's Designer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and the written resolution thereof by the Designer is acceptable to Contractor.

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

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

l. Contractor has no business or personal relationship with any PWC Commissioner, officer, director, manager, or supervisor and Contractor covenants to disclose immediately to PWC any such relationship that develops during the performance of Work on the Project.

9. Contractor's Payment Obligations. Contractor shall pay all of its obligations arising out of or in connection with the Project in a timely manner to all persons supplying materials in the prosecution of the Work and to all laborers and others employed thereon.

10. Performance and Payment Bonds. Contractor shall obtain and deliver to PWC a performance bond in the amount of one hundred percent (100%) of the Price, conditioned upon the faithful performance of the Project and all Work in accordance with the Contract Documents, which bond shall be solely for the protection of PWC. Contractor shall obtain and deliver to PWC a payment bond in the amount of one hundred percent (100%) of the Price, conditioned upon the prompt payment for all labor or materials for which the Contractor or one or more of its subcontractors is liable, which payment bond shall be solely for the protection of the persons furnishing materials or performing labor for which the Contractor is liable. The performance bond and the payment bond shall be executed by one or more surety companies legally authorized to do business in the State of North Carolina, shall become effective upon the awarding of the construction contract by PWC to Contractor, and shall at all times comply with the requirements set forth in Article 3 of North Carolina General Statutes Chapter 44A. In the event PWC deems the surety or sureties upon any bond necessary for this Agreement and the completion of the Project, or if for any reason, such bond ceases to be adequate to cover the performance and/or payment of the Work, Contractor shall, at its expense, within ten (10) days after the receipt of notice from PWC, furnish an additional bond or bonds in such form and amount, and with such surety or sureties as shall be satisfactory to PWC. In such event no further payment to Contractor shall be deemed to be due under this Agreement until new or additional security for the performance and payment of the Project shall be furnished in manner and form satisfactory to PWC. Contractor understands and acknowledges that PWC, as a public authority, and the City, as a municipal corporation, are not subject to the provisions of Articles 1 and 2 of Chapter 44A of the General Statutes, in accordance with G.S. 44A-34 and applicable law.

11. Contractor's Damage Repair Obligations. Contractor shall be responsible for all damages to the property of the City and of PWC that may result from the normal procedure of a Responsible Person's actions in the prosecution of the Work or that may be caused by or result from the negligence of a Responsible Person during the progress of or connected with the prosecution of the Work, whether within the limits of the Work or elsewhere. Contractor shall promptly restore all such property so damaged to a condition as good as it was immediately prior to Contractor initiating the Work on the Project.

12. Defective Work. The Project shall be subject to observation and approval by PWC, Designer, and representatives of governmental agencies with jurisdiction over the Project. PWC and Designer shall be entitled to enter at all reasonable times the premises subject to construction or renovation to inspect the Work performed by or on behalf of Contractor, provided that such entry and inspection does not materially interfere with the progress of construction. Contractor shall correct promptly as set forth in the Contract Documents, at no cost to PWC, all Work reasonably rejected by PWC or by its

representatives. Should Contractor fail to correct rejected Work, PWC may, acting in its sole discretion, correct such Work as set forth in the Contract Documents, and the Contractor shall pay PWC's actual costs of correction and any other applicable amounts identified in the General Conditions.

13. As-Built Drawings. Contractor shall maintain during the progress of the Project as-built drawings indicating the current status of the Project as actually performed. Upon Completion of the Project, Contractor shall prepare a final version of such as-built drawings and submit them to PWC for approval.

14. Assignment. This Agreement shall be binding upon and inure to the benefit of the Parties, their legal representatives, successors, and assigns. Contractor may not assign, transfer, convey, or encumber, whether voluntarily or by operation of law, this Agreement or any obligations, rights under, or interests in this Agreement to a third party without the prior written consent of PWC; and, specifically, but without limitation, money that may become due and money that is due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

15. Indemnity. Contractor shall indemnify, defend, and hold harmless PWC and its Commissioners, officers, employees, agents, and representatives and the City and its elected officials, managers, employees, agents, and representatives and Designer (collectively "Indemnitees") from and against all claims, actions, liabilities, damages, losses, costs, and expenses (including, without limitation, injury to or death of any persons and damage to property, economic and consequential damages and attorneys' fees) asserted by one or more third parties against one or more of the Indemnitees if the Fault of one or more Responsible Persons is a proximate cause of the loss, damage, or expense indemnified. Contractor's obligation to indemnify, defend, and hold harmless the Indemnitees shall survive the termination of this Agreement.

16. Insurance. Contractor shall maintain during the completion of the Project and for at least three (3) years thereafter the insurance coverage set forth in the Contract Documents, which insurance shall be placed with insurance companies authorized to do business in the State of North Carolina and rated A minus VII or better by the current edition of Best's Key Rating Guide or otherwise approved in writing by PWC. Prior to initiating any Work on the Project, Contractor shall deliver certificates of insurance confirming each such coverage required by the Contract Documents, and Contractor shall direct its insurers to provide annually to PWC certificates confirming each such coverage during the coverage period. PWC shall be named as an additional insured in the comprehensive automobile and commercial liability insurance policies. Commercial general liability coverage shall be written on an "occurrence" basis. Contractor shall not reduce or allow the required insurance coverages to lapse without PWC's prior written approval. All policies for insurance must be endorsed to contain a provision giving PWC a thirty (30) calendar day prior written notice by certified mail of any cancellation of that policy or material reduction in coverage. Should a notice of cancellation be issued for non-payment of premiums or any part thereof, or should Contractor fail to provide and maintain certificates as set forth herein, PWC shall have the right, but shall not have the obligation, to pay such premium to the insurance company or to obtain such coverage and to deduct such payment from any sums that may be due or become due to Contractor, or to seek reimbursement for said payments from Contractor. Any such sums paid by PWC shall be due and payable immediately by Contractor upon notice from PWC. The insurance provisions of

this Agreement shall not be construed as a limitation on Contractor's responsibilities and liabilities pursuant to the terms and conditions of this Agreement. Contractor's obligation to maintain insurance for three (3) years after Completion of the Project shall survive the termination of this Agreement.

17. Warranty. Contractor's warranties to PWC pursuant to the General Conditions shall be in addition to, and not in derogation of, all other rights and privileges which PWC may have under law, equity, or instrument, and shall survive the Completion Date and the final settlement and shall be binding on Contractor notwithstanding any provision in any other writing executed by PWC heretofore or contemporaneous with the execution of the Agreement or prior to the Completion Date.

18. Waiver. No failure on the part of any party to exercise, and no delay in exercising, any right, power, or privilege hereunder shall operate as a waiver thereof, nor shall any single or partial exercise of any right hereunder preclude any other or further cumulative and not exclusive of any remedies provided by law. This Agreement shall be binding upon and inure to the benefit of the parties, their legal representatives, successors, and assigns. This Agreement may not be assigned, transferred, conveyed, or encumbered, whether voluntarily or by operation of law, by either party without the prior written consent of the other party, which consent shall not be unreasonably withheld.

19. Law. THIS AGREEMENT SHALL BE GOVERNED BY AND INTERPRETED AND ENFORCED IN ACCORDANCE WITH THE LAWS OF THE STATE OF NORTH CAROLINA WITHOUT GIVING EFFECT TO THE CHOICE OF LAW PROVISIONS THEREOF. The Contractor shall at all times comply with all applicable Federal, state, and local laws and building codes in the performance of its obligations under the Agreement.

20. Dispute Resolution. In the event of any dispute, controversy, or claim of any kind or nature arising under or in connection with this Agreement (a "Dispute") and involving any two or more of the following parties, PWC, Designer, Contractor or any subcontractor of Contractor, the party initiating the Dispute shall serve written notice of a Dispute on the party(ies) to the dispute, and those parties shall endeavor to settle the dispute first through direct, informal discussions between the parties' selected representatives. Any such representative(s) shall have binding authority to settle the Dispute. In the event the parties do not settle the Dispute within ten (10) days from the date of written notice of the Dispute, any party to the Dispute may, by written notice to the other party(ies), engage a mediator certified under the laws of the State of North Carolina to mediate the Dispute within thirty (30) days of such notice. The parties to the Dispute shall attend mediation in good faith. In the event mediation is unsuccessful, any party to the dispute may initiate arbitration proceedings. Any controversy or claim arising out of or relating to the Contract Documents, or the breach thereof, shall be settled by binding arbitration administered by the American Arbitration Association under its Construction Industry Arbitration Rules, and judgment on the award rendered by the arbitrator(s) may be entered in any court having jurisdiction thereof. All of the foregoing dispute resolution procedures shall be held in Cumberland County, North Carolina. The costs of the mediator and arbitrator in a dispute resolution process shall be divided equally among the parties to the process; provided, however, PWC shall bear at least one-third of the cost if PWC is a party to the dispute resolution and the remainder of the cost shall be divided equally among the other parties participating in the dispute resolution. PWC shall, in its contractual arrangements with Designer, and Contractor shall, in its contracts with subcontractors and they in their contracts with lower-tier subcontractors authorize and direct such parties to participate in the dispute resolution procedures set forth in this Section. Unless otherwise directed in writing by PWC, Contractor

shall continue the Project and maintain compliance with the scheduling deadlines set forth in the Contract Documents during any dispute resolution proceedings. If Contractor continues to perform, PWC shall make payments due for the continued performance in accordance with this Agreement. The provisions of this Section shall not extend any applicable statutes of limitation or repose.

21. Execution; Modification; Entire Agreement; Severability. This Agreement may be executed in counterparts with the same effect as if the signatures to each counterpart were upon a single instrument, and all such counterparts together shall be deemed an original of this Agreement. For purposes of this Agreement, a facsimile copy or scanned copy or photocopy of a party's signature shall be sufficient to bind such party. This Agreement shall be subject to execution by electronic means in accordance with Article 40 of Chapter 66 of the North Carolina General Statutes. No oral communication, promise, understanding, or agreement before, contemporaneous with, or after the execution of this Agreement shall affect or modify any of the terms and conditions and obligations of the Contract Documents. The Contract Documents shall be modified only by a subsequent writing signed by both Parties. The Contract Documents shall be conclusively considered to contain and express all the terms and conditions agreed upon by the Parties, notwithstanding any prior or contemporaneous written communication, promise, understanding or agreement. Should any provision of this Agreement or any of the Contract Documents at any time be in conflict with any law, statute, rule, regulation, order, or ruling and thus be unenforceable, or be unenforceable for any other reason, then the remaining provisions of this Agreement shall remain in full force and effect and the court or arbitrator shall give the offending provision the fullest meaning and effect permitted by law. The titles of the Sections throughout this Agreement are for convenience only and the words contained therein shall in no way be held to explain, modify, amplify or aid in the interpretation, construction, or meaning of the provisions of this instrument.

22. Notices. Any notice which either Party is required or desires to give the other hereunder shall be deemed sufficiently given if, in writing, it is delivered personally, or sent by certified U.S. mail, return-receipt requested, postage prepaid, to the addresses listed herein below, or such other address as either Party shall give to the other Party by written notice in accordance herewith. Any notice given herein by personal delivery shall be deemed delivered when received. Any properly addressed notice given herein by certified mail shall be deemed delivered on third Business Day after the same is deposited in an official United States Post Office, postage prepaid, or if sooner upon the date when the return receipt therefore is signed, or refusal to accept the mailing by the addressee is noted thereon by the postal authorities.

To PWC:
Fayetteville Public Works Commission
Attn: Elaina L. Ball, CEO/General Manager
PO Box 1089
Fayetteville, NC 28302

To Contractor:
[INSERT MAILING ADDRESS]

23. Termination. This Agreement may be terminated in accordance with the General Conditions.

24. Compliance. Contractor hereby acknowledges that “E-Verify” is the federal E-Verify program operated by the US Department of Homeland Security and other federal agencies which is used to verify the work authorization of newly hired employees pursuant to federal law and in accordance with Article 2, Chapter 64 of the North Carolina General Statutes. Contractor further acknowledges that all employers, as defined by Article 2, Chapter 64 of the North Carolina General Statutes, must use E-Verify and after hiring an employee to work in the United States, shall verify the work authorization of the employee through E-Verify in accordance with N.C.G.S. §64-26(a). Contractor hereby pledges, attests, and warrants through execution of this Agreement that Contractor complies with the requirements of Article 2, Chapter 64 of the North Carolina General Statutes and further pledges, attests, and warrants that all subcontractors currently employed by or subsequently hired by Contractor shall comply with all E-Verify requirements. Failure to comply with the above requirements shall be considered a breach of this Agreement. Contractor hereby further acknowledges that the execution and delivery of this Agreement constitutes Contractor’s certification to PWC and to the North Carolina State Treasurer that, as of the date of the Effective Date of this Agreement, Contractor is not listed on (a) the Final Divestment List created and maintained by the North Carolina Department of State Treasurer pursuant to the Iran Divestment Act of 2015, Chapter 147, Article 6E of the General Statutes of North Carolina (the “Iran Divestment Act”); or (b) the list of companies that the North Carolina State Treasurer determines to be engaged in a boycott of Israel in accordance with Article 6G of Chapter 147 of the General Statutes of North Carolina. Contractor represents and warrants to Commission that Contractor, and all persons and entities owning (directly or indirectly) an ownership interest in it: (i) are not, and will not become, a person or entity with whom a party is restricted from doing business with under regulations of the Office of Foreign Asset Control (“OFAC”) of the Department of the Treasury (including, but not limited to, those named on OFAC’s Specially Designated and Blocked Persons list) or under any statute, executive order (including, but not limited to, the September 24, 2001, Executive Order 13224 Blocking Property and Prohibiting Transactions with Persons Who Commit, Threaten to Commit, or Support Terrorism), or other governmental action; and (ii) are not knowingly engaged in, and will not knowingly engage in, any dealings or transactions or be otherwise associated with such persons or entities described in clause (i) above. Contractor also shall at all times during the term of this Agreement comply with Executive Order 11246, including but not limited to the Equal Opportunity Clause requirements set forth in 41 C.F.R. § 60-1.4. Contractor shall abide by the requirements of 41 CFR 60–300.5(a) and 60–741.5(a) prohibiting discrimination against qualified individuals on the basis of protected veteran status or disability and requiring affirmative action by covered prime contractors and subcontractors to employ and advance in employment qualified protected veterans and individuals with disabilities.

IN WITNESS WHEREOF, the Parties have executed this Agreement by their duly authorized representatives.

The City of Fayetteville, by and through the Fayetteville Public Works Commission

[CONTRACTOR FULL LEGAL NAME]

By: _____
Elaina L. Ball, CEO/General Manager

By: _____
_____, _____
(Printed Name) (Title)

Date: _____

Date: _____

This instrument has been preaudited in the manner required by the Local Government Budget and Fiscal Control Act (N.C. Gen. Stat. § 159-1 et seq.).

By: _____
Rhonda Haskins, Chief Financial Officer

Approved as to form:

James P. West, Chief Legal Officer

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PERFORMANCE BOND

Date of Execution: _____

Name of Principal: _____
(Contractor)

Name of Surety: _____

Name of Contracting
Body: Fayetteville Public Works Commission, N.C.

Amount of Bond: _____

**PROJECT: DEMOLITION AND DECOMMISSIONING OF FORMER WTP AT GLENNVILLE LAKE
DAM**

KNOW ALL MEN BY THESE PRESENTS, That We, the Principal and Surety above named, are held and firmly bound unto the above named Contracting Body, hereinafter called the Contracting Body, in the penal sum of the amount stated above the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these present.

THE CONDITION OF THIS OBLIGATION IS SUCH that whereas the Principal entered into a certain Contract with the Contracting Body, identified as shown above and hereto attached.

NOW, THEREFORE, if the Principal shall well and truly perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of said Contract during the original term of said Contract and any extensions there of that may be granted by the Contracting Body, with or without notice to the Surety, and during the life of any Guaranty required under the Contract, and shall also well and truly perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of any and all duly authorized modifications of said Contract that may hereafter be made, notice of which modifications to the Surety being hereby waived, then, this obligation to be void; otherwise to remain in full force and virtue.

THIS BOND SHALL REMAIN in effect at least one year after the date when final payment became due, except as provided otherwise by Laws or Regulations or by the Contract Documents.

IN WITNESS WHEREOF, the above bounded parties have executed this instrument under the several seals on the date indicated above, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

Witness:

CONTRACTOR:

(Proprietorship of Partnership)

(Trade or Corporate Name)

By:

By:

Title:

Title:

(Corporate Secretary or
Assistant Secretary, Only)

(Owner, Partner, Corporate President or Vice-
President, Only)

(SEAL)

Witness:

SURETY COMPANY:

(Surety Company Name)

By:

Countersigned:

Title:

(N.C. Licensed Resident Agent)

(Attorney in Fact)

(SURETY CORPORATE SEAL)

PAYMENT BOND

Date of Execution: _____

Name of Principal: _____
(Contractor)

Name of Surety: _____

Name of Contracting
Body: Fayetteville Public Works Commission, N.C.

Amount of Bond: _____

**PROJECT: DEMOLITION AND DECOMMISSIONING OF FORMER WTP AT GLENVILLE LAKE
DAM**

KNOW ALL MEN BY THESE PRESENTS, that we, the PRINCIPAL and SURETY above named, are held and firmly bound unto the above named Contracting Body, hereinafter called the Contracting Body, in the penal sum of the amount stated above, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH that whereas the Principal entered into a certain Contract with the Contracting Body, identified as shown above and hereto attached.

NOW, THEREFORE, if the Principal shall promptly make payment to all persons supplying labor and material in the prosecution of the work provided for in said Contract, and any and all duly authorized modifications of said Contract that may hereafter be made, notice of which modifications to the Surety being hereby waived, then, this obligation to be void; otherwise to remain in full force and virtue.

THIS BOND SHALL REMAIN in effect at least one year after the date when final payment became due, except as provided otherwise by Laws or Regulations or by the Contract Documents.

6384-231131
February 2022

IN WITNESS WHEREOF, the above bounded parties have executed this instrument under the several seals on the date indicated above, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

Witness:

CONTRACTOR:

(Proprietorship of Partnership)

(Trade or Corporate Name)

By:

By:

Title:

Title:

(Corporate Secretary or
Assistant Secretary, Only)

(Owner, Partner, Corporate President or Vice-
President, Only)

(SEAL)

Witness:

SURETY COMPANY:

(Surety Company Name)

By:

Countersigned:

Title:

(N.C. Licensed Resident Agent)

(Attorney in Fact)
(SURETY CORPORATE SEAL)

CERTIFICATE(S) OF INSURANCE
(Attach)

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NOTICE TO PROCEED

TO:

Date:

PROJECT: DEMOLITION AND DECOMMISSIONING OF FORMER WTP AT GLENVILLE LAKE DAM

You are hereby notified to commence work in accordance with the Contract dated

_____, 20____, on the _____ day of _____ 20____, and you are to

complete all work within **280 CONSECUTIVE CALENDAR DAYS** thereafter.

The date of final completion therefore is _____.

FAYETTEVILLE PUBLIC WORKS COMMISSION

BY: _____
Trent Ensley
Procurement Manager

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE TO PROCEED

is hereby acknowledged this the _____ day of _____, 2022.

CONTRACTOR

BY: _____

TITLE: _____

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SECTION C
ADMINISTRATIVE PROVISIONS
GENERAL REQUIREMENTS

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DIVISION 1

GENERAL REQUIREMENTS

00600 – DEFINITIONS AND TERMINOLOGY

1.01 Defined Terms

A. The Following Terms will be used throughout these Contract Documents.

1. **Addenda** - Written or graphic instruments issued prior to the opening of Bids, which clarify, correct, or change the Bidding Requirements or the Contract Documents.
2. **Application for Payment** - The form acceptable to OWNER which is to be used by CONTRACTOR during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
3. **Bid** - The offer or proposal of a bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
4. **Bidder** - The person, firm, or corporation who submits a Bid for Work directly to OWNER.
5. **Bidding Documents** - The Bidding Requirements and the proposed Contract Documents (including all Addenda issued prior to receipt of Bids).
6. **Bidding Requirements** - The Advertisement or Invitation to Bid, Instructions to Bidders, Bid security form, if any, and the Bid form with any supplements.
7. **Bonds** – Bid, Performance, and Payment bonds and other instruments of security.
8. **Change In Work Delays** - Delays due to changes in the Work that alters the original scope of the Contract and impacts the critical path (delays the controlling operation).
9. **Change Order** - A document recommended by PROJECT ENGINEER which is signed by CONTRACTOR and OWNER and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Contract.
10. **Change Order Request (COR)** - A written document submitted by the CONTRACTOR requesting an adjustment to the Contract sum or an extension of the Contract time for approval by the OWNER.
11. **Claim** - A demand or assertion by OWNER or CONTRACTOR seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.
12. **Claim (Property Damage)** - Any form of injury or damage caused to the property, either personal or real due to the negligence of the CONTRACTOR as detailed by claimant.

13. **Contract** - The entire and integrated written agreement between the OWNER and CONTRACTOR concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.
14. **Contract Documents** - Contract Documents shall have the meaning set forth in the parties' Construction Agreement.
15. **Contract Price** - The monies payable by OWNER to CONTRACTOR for completion of the Work in accordance with the CONTRACT and all executed Change Orders.
16. **Contract Time** - The number of days or the dates stated in the Contract to complete the Work so that it is ready for final payment as evidenced by PROJECT ENGINEER written recommendation of final payment.
17. **CONTRACTOR** - The individual or entity with whom OWNER has entered into the Contract.
18. **Critical Path** - The sequence of activities in the schedule for which an adjustment in the duration of any activity results in a corresponding adjustment in the overall schedule duration.
19. **Drawings** - The drawings which show the scope, extent and character of the Work to be furnished and performed by CONTRACTOR and which have been prepared or approved by PROJECT ENGINEER and are referred to in the Contract Documents. Shop drawings are not Drawings as so defined.
20. **Day** - The word "day" shall constitute a calendar day of 24 hours measured from midnight to the next midnight.
21. **Defective** - The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it does not conform to the Contract Documents or does not meet the requirements of any inspection, reference standard, test, or approval referred to in the Contract Documents, or has been damaged prior to PROJECT ENGINEER recommendation of final payment (unless responsibility for the protection thereof has been assumed by OWNER at Final Completion in accordance with Section 00700 – General Conditions Article 12).
22. **DESIGN ENGINEER** - The Engineering firm identified on the Contract Drawings and their duly authorized agents, such agents acting within the scope of the particular duties entrusted to them in each case.
23. **DESIGN ENGINEER's Consultant** - An individual or entity having a Contract with DESIGN ENGINEER to furnish services as DESIGN ENGINEER's independent professional associate or consultant with respect to the Project.
24. **Effective Date of the Contract** - The date indicated in the Contract on which it becomes effective.
25. **Excusable Delay** – Any delay beyond the control and without the fault or negligence of CONTRACTOR caused by events or circumstances such as, but not limited to, acts of God or of public enemy, acts of government other than OWNER, fires, floods, epidemics, quarantine restrictions, freight embargoes, hurricanes, tornadoes, unusually severe weather, or new sinkholes. Above average

rainfall or snowfall may be considered an excusable delay in accordance with Section 00700 – General Conditions Article 11.

26. **Free Haul Limit** – area within 2 miles of the project limits, one way.
27. **Hazardous Environmental Condition** - The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto in connection with the Work.
28. **Hazardous Waste** - The term Hazardous Waste shall have the meaning provided in the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.
29. **Inexcusable Delay** - Any delay caused either by (A) events or circumstances within the control of CONTRACTOR, such as inadequate manpower, slow submittals, etc., which might have been avoided by the exercise of care, prudence, foresight, or diligence on the part of CONTRACTOR, or (B) labor disputes.
30. **Laws and/or Regulations** - Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
31. **Liens** - Charges, security interests, or encumbrances upon Project funds.
32. **Milestone** - A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Final Completion of all the Work.
33. **Notice of Award** - The written notice by OWNER to the bidder stating that upon timely compliance by the successful bidder with the conditions precedent listed therein, OWNER will sign and deliver the Contract.
34. **Notice to Proceed** - A written notice given by OWNER to CONTRACTOR fixing the date on which the Contract Times will commence to run and on which CONTRACTOR shall start to perform the Work under the Contract Documents.
35. **Non Compliance Notice (NCN)** – A written notice given by the OWNER to CONTRACTOR indicting a violation in Contract Terms.
36. **OWNER** - The public entity with whom CONTRACTOR has entered into the Contract and for whom the Work is to be provided. OWNER is the City of Fayetteville, acting by and through its Fayetteville Public Works Commission.
37. **Partial Utilization** - Use by OWNER of a completed part of the Work for the purpose for which it is intended (or a related purpose) prior to completion of all the Work.
38. **OWNER's Consultant** - An individual or entity having a Contract with the OWNER to furnish services as the OWNER's independent professional associate or consultant with respect to the Project.
39. **Project** – means Demolition and Decommissioning of Former WTP at Glenville Lake Dam, as more specifically set forth in the Contract Documents.

40. **PROJECT COORDINATOR** - The authorized representative of PROJECT ENGINEER who may be assigned to the Site or any part thereof.
41. **PROJECT ENGINEER** - Person assigned by OWNER, to coordinate, manage, monitor, and shall administer the construction program working with DESIGN ENGINEER on engineering questions concerning the Project. The PROJECT ENGINEER has the authority to approve any changes in scope of Work.
42. **Recovery Plan** - Documentation submitted by the CONTRACTOR describing when a project is anticipated be completed to include revisions to schedule and additional workforce.
43. **Request for Information (RFI)** - A written document from the CONTRACTOR to the PROJECT ENGINEER requesting clarification or information concerning the Contract Documents and/or the Contract Drawings.
44. **Request for Proposal (RFP)** - A written document from the OWNER requesting the CONTRACTOR submit a proposal for work outside the scope of the Contract and its provisions.
45. **Samples** - Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.
46. **Shop Drawings/Submittals** - All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for CONTRACTOR and submitted by CONTRACTOR to illustrate some portion of the Work.
47. **Site** - Lands or areas indicated in the Contract Documents as being furnished by OWNER upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by OWNER which are designated for the use of CONTRACTOR.
48. **Specifications** - That part of the Contract Documents consisting of written technical descriptions of materials, equipment, systems, standards, and workmanship as applied to the Work and certain administrative details applicable thereto.
49. **Subcontractor** - An individual or entity having a direct Contract with CONTRACTOR or with any other Subcontractor for the performance of a part of the Work at the Site.
50. **Special Provisions** - That part of the Contract Documents which amends or supplements the Contract Documents.
51. **Supplier** - A manufacturer, fabricator, supplier, distributor, material man, or vendor having a direct Contract with CONTRACTOR or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by CONTRACTOR or any Subcontractor.
52. **Underground Facilities** - All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other

communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

- 53. Weather Delays** - Delays that affect the standard daily production of the contract 50% or more as established by the submitted baseline schedule, or the accepted amended schedule.
- 54. Work** - The entire completed construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.
- 55. Work Change Directive** - Work initiated in the field affecting Contract Price and/or Contract Times. The PROJECT COORDINATOR and/or PROJECT ENGINEER may give CONTRACTOR a directive to proceed with Work which shall be included in a subsequent Change Order.

1.02 Terminology

A. Intent of Certain Terms or Adjectives

1. Whenever in the Contract Documents the terms “as allowed,” “as approved,” or terms of like effect or import are used, or the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination PROJECT ENGINEER as to the Work, it is intended that such action or determination will be solely to evaluate, in general, the completed Work for compliance with the requirements of and information in the Contract Documents and conformance with the design concept of the completed Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective shall not be effective to assign to PROJECT ENGINEER any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of the Contract Documents.

B. Furnish, Install, Perform, Provide

1. The word “furnish,” when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
2. The word “install,” when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.

4. When “furnish,” “install,” “perform,” or “provide” is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of CONTRACTOR, “provide” is implied.
- C. Unless stated otherwise in the Contract Documents, words or phrases which have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

— END OF SECTION —

**DIVISION 1
GENERAL REQUIREMENTS
00700 – GENERAL CONDITIONS**

PART 1. PRELIMINARY MATTERS

1.01 Scope of Work

- A. The Contractor shall furnish all implements, machinery, tools, equipment, materials, labor, and all other incidentals necessary to perform the Work as required under the terms of these Contract Documents.

1.02 Performance and Payment Bonds

- A. The Contractor, at the time of the execution of the Contract shall be required to furnish a Performance Bond and Payment Bond in an amount equal to at least one-hundred percent (100%) of the Contract price as security for the faithful performance of this Contract and as security for the payment of all persons performing labor and furnishing materials and equipment in connection with this Contract in accordance with N.C.G.S. Chapter 44A, Article 3.
- B. The corporate surety furnishing the bonds shall be authorized to do business in the state of North Carolina, and shall be acceptable to the Commission. All contract payment bonds and contract performance bonds shall be executed on “Performance Bond” and “Payment Bond” forms provided in the Contract Documents (or attached thereto) and be countersigned by a regularly authorized agent of the corporate surety who is resident in North Carolina and who is licensed by the North Carolina Department of Insurance.
- C. In all Performance and Payment Bonds, the provision that no suit, action, or proceeding by reason of any default whatsoever shall be brought on this Bond after a specified number of months shall be fixed at twelve (12) months. The face value of the Bond shall be one-hundred percent (100%) of the Contract price for a period of twelve (12) months following the Day when the last of the labor was performed, or equipment was furnished, or final settlement was made with the Contractor, whichever occurs last.

1.03 Insurance

A. The insurance required for this contract is as follows:

1. Commercial General Liability ISO #CG 00 01 10 93: The Contractor shall take out and maintain during the life of this contract commercial general liability insurance with limits of \$1,000,000 per occurrence; \$2,000,000 aggregate other than products/completed operations; \$2,000,000 aggregate for products/completed.
2. Automobile Liability ISO #CA 00 01 12 93: The Contractor shall take out and maintain during the life of this contract automobile liability insurance in an amount not less than \$1,000,000 combined single limit per accident for bodily injury and property damage from owned, non-owned, and hired automobiles.
3. Workers' Compensation and Employers' Liability Insurance: The Contractor shall take out and maintain during the life of this contract workers' compensation insurance as required by the laws of the State of North Carolina and Employers' Liability with limits of \$100,000 each accident, \$500,000 policy limit and \$100,000 each employee for all employees employed on the project. In case any employee(s) engaged in work under this contract is or are not protected under the Workers' Compensation Statute, the Contractor shall provide adequate coverage for the protection of employees not otherwise protected.
4. Property Insurance: If contracted to construct a building, the Contractor shall purchase and maintain "Builder's Risk" insurance. This insurance shall include the interests of the Fayetteville Public Works Commission, the Contractor and Subcontractors and shall be written on a one hundred percent (100%) completed value basis (full value as of the date that all construction is finished and includes the Contractor's total cost plus profit), and to remain in force until the project is completed and accepted by the Fayetteville Public Works Commission.

Regardless of the nature of the work to be performed, coverage must also be provided for the theft or damage of building materials and supplies, which are not permanently attached and stored on site for any period of time. This coverage shall be an "Installation Floater," and where no building construction is involved, the amount of the coverage shall equal the value of the materials stored on site. It is the responsibility of the Contractor to inform the policy provider of any and all change orders, which increase the building's value. Any penalties or losses incurred due to the Contractor's failure to adequately insure the building during construction will be the Contractor's responsibility. Owner's and Contractor's Protective Liability I.S.O.#CG 00 09 10 93: The Contractor shall secure and maintain during the life of the contract, an Owner's and Contractor's Protective Liability insurance policy for the Fayetteville Public Works Commission, with minimum limits of \$1,000,000 per occurrence/\$2,000,000 aggregate.

B. Acceptability of Insurance

All insurance policies shall be written by insurers licensed to do business in North Carolina. It is realized that certain business activities may not be readily insurable by admitted carriers. If insurance is written by non-admitted carriers whose names appear on the current listing of approved and non-admitted carriers prepared by the North Carolina Department of Insurance, such carriers will be favorably considered assuming they meet all other requirements. Non-admitted carriers should be so identified on the Certificate of Insurance form. The Fayetteville Public Works Commission reserves the right to reject any and all certificates or policies issued by insurers with a Best's rating less than A.

C. Additional Provision

. As an integral part of this agreement, Contractor agrees to purchase and maintain during the life of this contract contractual liability insurance in the amount required in the general liability insurance requirements and to furnish proper evidence thereof.

D. Other Provisions

1. Any deductible or self-insured retention must be declared to and approved by the Fayetteville Public Works Commission.
2. The policies are to contain, or be endorsed to contain, the following provisions:
 - a. Commercial General Liability Coverage
 - i. The Fayetteville Public Works Commission, its officials, employees and volunteers are to be covered as additional insured as respects: liability arising out of activities performed by or on behalf of the Contractor; products and completed operations of the Contractor; premises owned, leased or used by the Contractor; or automobiles owned, leased, hired or borrowed by the Contractor. The coverage shall contain no special limitations on the scope of protection afforded to the Fayetteville Public Works Commission, its officials, employees or volunteers.
 - ii. The Contractor's insurance coverage shall be primary insurance as respects the Fayetteville Public Works Commission, its officials, employees and volunteers. Any insurance or self-insurance maintained by the Fayetteville Public Works Commission, its officials, employees or volunteers shall be excess of Contractor's insurance and shall not contribute with it.

- iii. Coverage shall state that Contractor's insurance shall apply separately to each insured against whom claim is made or suit is brought, except with respect to the limits of the insurer's liability.

b. All Coverages

- i. Each insurance policy required by this clause shall be endorsed to state that coverage shall not be suspended, voided, canceled by either party, reduced in coverage or in limits except after thirty (30) days prior written notice by certified mail, return receipt requested, has been given to:

Fayetteville Public Works Commission
Attn: Trent Ensley, Procurement Manager
P.O. Box 1089
Fayetteville, NC 28302-1089

Any failure to comply with reporting provisions of the policies shall not affect coverage provided to the Fayetteville Public Works Commission, its officials, employees, and volunteers. In the event the Fayetteville Public Works Commission is damaged by the failure of the Contractor to maintain such insurance and to so notify the Fayetteville Public Works Commission, the Contractor shall bear all reasonable costs properly attributable thereto.

c. Subcontractors

Contractor shall include all subcontractors as insurers under its policies OR shall furnish separate certificates and endorsements for each subcontractor. All coverages for subcontractors shall be subject to all of the requirements stated herein.

d. No Waiver of Immunity

Any insurance coverage required by the terms of this contract shall not be deemed a contract of insurance purchased by the Fayetteville Public Works Commission nor a waiver of the Fayetteville Public Works Commission's immunity pursuant to NCGS 160A-485.

1.04 Copies of Documents

- A. OWNER shall furnish to CONTRACTOR up to five (5) copies of the Contract Documents.
- B. Additional copies will be furnished by the DESIGN ENGINEER upon request, at the cost of reproduction.

1.05 Commencement of Contract Times; Notice to Proceed

- A. The Contract Times will commence to run on the date specified in the issued Notice to Proceed.

1.06 Starting the Work

- A. CONTRACTOR shall start to perform the work on the date when the Contract Times commence to run as indicated on the Notice to Proceed. Failure to start work within fifteen (15) calendar days of the commencement of Contract time will be documented as a substantial violation of the Contract Provisions and the following action will be taken:
1. The OWNER will request in writing the CONTRACTOR mobilize personnel, equipment, and material within ten (10) calendar days.
 2. If the CONTRACTOR fails to mobilize as requested within the given timeframe, OWNER will consider the CONTRACTOR in violation of the agreement and terminate for cause in accordance with the provisions of the Contract.
 3. If the CONTRACTOR mobilizes, they shall be required to submit a Recovery Plan detailing the intent to regain any lost time to date and finish the Project by the Final Completion date as listed in the specified time frame detailed in the Contract. This Recovery Plan shall include a new progress schedule and any additional subcontractor submissions for approval.

1.07 Before Starting Construction

- A. CONTRACTOR's Review of Contract Documents: Before undertaking each part of the Work, CONTRACTOR shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. CONTRACTOR shall promptly report in writing to PROJECT ENGINEER any conflict, error, ambiguity, or discrepancy, which CONTRACTOR may discover. The PROJECT ENGINEER shall obtain a written interpretation or clarification from DESIGN ENGINEER and provide CONTRACTOR written clarification. CONTRACTOR cannot proceed until a written response is received. However, CONTRACTOR shall not be liable to the OWNER, PROJECT ENGINEER, or DESIGN ENGINEER for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless CONTRACTOR knew or reasonably should have known thereof.
- B. Interpretations of Contract Documents: On all plans, drawings, etc., the figured dimensions shall govern in case of any discrepancy between the scales and figures. The Contractor shall take no advantage of any error or omission in the Plans or of any discrepancy between the Plans and Specifications, and the PROJECT ENGINEER shall make any such corrections and interpretations as may be deemed necessary for the fulfillment of the intent of the Specifications and of the Plans as construed by him, and any decision by PROJECT ENGINEER shall be final.
- C. Schedules: Five (5) business days prior to the pre-construction conference, CONTRACTOR shall submit to PROJECT ENGINEER schedules as outlined in Section 01310 within these Contract Documents.
- D. Shop Drawings and Samples: Requirements regarding Shop Drawings and Samples as well as submittal procedures are covered under Section 01300 within these Contract Documents.

1.08 Pre-construction Conference

- A. Prior to commencement of Work at the site, a pre-construction conference attended by OWNER, CONTRACTOR, DESIGN ENGINEER, PROJECT ENGINEER, and others shall be held. The OWNER will contact the CONTRACTOR to establish a mutually agreeable date and time to conduct the conference. The purpose of the conference is to discuss general project items, including, but not limited to:
1. CONTRACTOR's responsible person and contact information
 2. Emergency contact information
 3. Submittal schedule
 4. Contract issues
 5. Safety
 6. Project schedule
 7. Progress Meetings
 8. Sales Tax Certificate/Pay Applications
 9. Warranty requirements
 10. Site restoration and clean-up

1.09 Quality of Materials

- A. The source of supply of each of the materials shall be approved by the PROJECT ENGINEER before delivery is started. Representative preliminary samples of the character and quality herein described shall be submitted by the CONTRACTOR when indicated or directed, for examination or test; and written approval of the quality of such materials from the respective sources of supply. Only materials conforming to the requirements of these Contract Documents shall be used in the Work. All materials proposed to be used may be inspected at any time during progress of the preparation and use. All materials shall be approved before being incorporated in the Work.

PART 2. CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE**2.01 Intent**

- A. The Contract Documents are complementary; what is called for by one is as binding as if called for by all.
- B. The approved Drawings and Technical Specifications will show the location, details, and dimensions of the Work, which shall be performed in strict accordance therewith. Any deviation from the Contract Documents will be determined by the PROJECT ENGINEER and authorized in writing.
- C. Any labor, documentation, services, materials, or equipment that is required to produce the intended result shall be provided, whether or not specifically called for, at no additional cost to OWNER.
- D. Should any construction or conditions which are not covered by these Contract Documents be required for any proposed Work, "Special Conditions" for such Work will be provided to the CONTRACTOR and shall be considered a part of these Contract Documents the same as though

printed fully herein. Should any such special provisions or requirements conflict with these Contract Documents, the “Special Conditions” shall take precedence.

2.02 Reference Standards

A. Standards, Specifications, Codes, Laws, and Regulations

1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Contract if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.
2. No provisions of any such standard, specification, manual, code, or instruction shall be effective to change the duties and responsibilities of OWNER, CONTRACTOR, PROJECT ENGINEER or DESIGN ENGINEER, or any of their Subcontractors, consultants, agents, or employees from those set forth in the Contract Documents, nor shall it be effective to assign to OWNER, PROJECT ENGINEER or DESIGN ENGINEER, or any other of PROJECT ENGINEER or DESIGN ENGINEER’s consultants, agents, or employees any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

2.03 Reporting and Resolving Discrepancies

A. Reporting Discrepancies

1. If, during the performance of the Work, CONTRACTOR discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents or between the Contract Documents and any provision of any Law or Regulation applicable to the performance of the Work or of any standard, specification, manual or code, or of any instruction of any Supplier, CONTRACTOR shall report it to PROJECT ENGINEER in writing at once. CONTRACTOR shall not proceed with the Work affected thereby (except in an emergency as required by Part 4) until an amendment or supplement to the Contract Documents has been issued; provided, however, that CONTRACTOR shall not be liable to OWNER for failure to report any such conflict, error, ambiguity, or discrepancy unless CONTRACTOR knew or reasonably should have known thereof.

B. Resolving Discrepancies

1. Except as may be otherwise specifically stated in the Contract Documents, the Special Provisions of these Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:
 - a. The provisions of any standard, specification, manual, code, or instruction (whether or not specifically incorporated by reference in the Contract Documents); or
 - b. The provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

2. Order of Precedence: If conflicts occur between the Technical Specifications, Details, and Drawings, the Technical Specification shall supersede.

2.04 Amending and Supplementing Contract Documents

- A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof in one or more of the following ways:
 1. Addendum, or
 2. Change Order.
- B. The requirements of the Contract Documents may be supplemented and minor variations and deviations in the Work may be authorized, by one or more of the following ways:
 1. PROJECT ENGINEER's approval of a Shop Drawing or Sample; or
 2. PROJECT ENGINEER's written interpretation or clarification.
- C. If CONTRACTOR believes that any variation or deviation authorized under this Paragraph entitles CONTRACTOR to an adjustment in Contract Price or Contract Time, it is CONTRACTOR's obligation to provide written notice to PROJECT ENGINEER in accordance with Parts 9 and 10 prior to proceeding with the work covered by the variation or deviation.

2.05 Reuse of Documents

- A. CONTRACTOR and any Subcontractor or Supplier or other individual or entity performing or furnishing any of the Work under a direct or indirect Contract with OWNER:
 1. shall not have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of DESIGN ENGINEER, DESIGN ENGINEER's Consultant, or PROJECT ENGINEER, including electronic media editions; and
 2. shall not reuse any Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of OWNER and specific written verification or adaptation by DESIGN ENGINEER. This prohibition shall survive final payment, completion, and acceptance of the Work, or termination or completion of the Contract. Nothing herein shall preclude CONTRACTOR from retaining copies of the Contract Documents for record purposes.

PART 3. AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; REFERENCE POINTS

3.01 Availability of Lands

- A. Volume I of these Contract Documents contains a list of easement special conditions that the Contractor shall comply with. OWNER shall be responsible for obtaining all required easements and encroachments necessary to complete the Work, except as provided herein.. If there is any delay in OWNER's furnishing the Site, CONTRACTOR may make a Claim as provided in Part 8.
- B. Upon written request, OWNER shall furnish CONTRACTOR with a current statement of record legal title and legal description of the lands upon which the Work is to be performed and OWNER's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Any and all agreements between the Contractor and individual property owners shall not obligate the City of Fayetteville, Fayetteville Public Works Commission, or the DESIGN ENGINEER. Prior to performing any work on private property, acting on behalf of the Owner, the Contractor shall furnish to the Project Engineer a signed and notarized statement executed by the Property Owner acknowledging the Owner, and Design Engineer are not liable for any agreements between the Property Owner and the Contractor. The document shall hold harmless and defend the Owner and Design Engineer from all claims, damages, etc. The Agreement shall be in a format and content approved by the Project Engineer. All actions by Sub-Contractors shall be the Contractor's responsibility to secure a Property Owner's Agreement as described herein. At the completion of the project, the Contractor shall obtain a signed release from the Property Owner for satisfactory completion and restoration prior to issuance of final payment.
- D. The Contractor(s) and all his subcontractors shall exercise extreme care to avoid damage to residents' private property. Should any such damage to residents' private property occur, it is the Contractor(s)' responsibility to notify the Project Engineer, in writing and on the actual date that the damage occurs, as to the extent of the damage and the Contractor(s) written plan to correct same. Contractor(s) written plan to correct damage shall include a timely settlement date. If Contractor(s) fails to timely correct damage to residents' private property, the Owner reserves the right to withhold progress payments until damage is corrected and/or to correct damage and back-charge Contractor(s) for costs incurred.

3.02 Subsurface and Physical Conditions

- A. Volume II of these Contract Documents include:
 - 1. Reports of explorations and tests of subsurface conditions at or contiguous to the Site that the DESIGN ENGINEER has used in preparing the Contract Documents.

2. Drawings of physical conditions relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) that DESIGN ENGINEER has used in preparing the Contract Documents.
- B. CONTRACTOR may rely upon the general accuracy of these reports and drawings containing subsurface conditions. However, these documents do not take precedence over the Contract Documents. CONTRACTOR may not rely upon or make any Claim against OWNER, DESIGN ENGINEER, or any of DESIGN ENGINEER's Consultants with respect to:
1. The completeness of such reports and drawings for CONTRACTOR's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by CONTRACTOR, and safety precautions and programs incident thereto; or
 2. Other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
 3. Any CONTRACTOR interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information.

3.03 Differing Subsurface or Physical Conditions

- A. If CONTRACTOR believes that any subsurface or physical condition at or contiguous to the Site that is discovered either:
1. Is of such a nature as to establish that any "technical data" on which CONTRACTOR is entitled to rely as provided in these Contract Documents is materially inaccurate; or
 2. Is of such a nature as to require a change in the Contract Documents; or
 3. Differs materially from that shown or indicated in the Contract Documents; or
 4. Is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;
- then CONTRACTOR shall, immediately after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Part 4), notify PROJECT ENGINEER in writing about such condition. CONTRACTOR shall not further disturb such condition or perform any Work in connection therewith until receipt of written order to do so.
- B. Upon receipt of CONTRACTOR's written notice, PROJECT ENGINEER will review the pertinent condition, determine the necessity of obtaining additional information and advise CONTRACTOR in writing.
- C. Possible Price and Time Adjustments

1. The Contract Price and/or Contract Time may be adjusted if the PROJECT ENGINEER determines that the existence of such differing subsurface or physical condition causes an increase or decrease in CONTRACTOR's cost of, or time required for, performance of the Work; subject, to the following:
 - a. Such condition must meet any one or more of the categories described in this Part 3; and
 - b. Any adjustment in Contract Price and/or Contract Time shall be subject to the provisions of these Contract Documents.
2. CONTRACTOR shall not be entitled to any adjustment in the Contract Price or Contract Time as a result of differing subsurface or physical conditions if:
 - a. CONTRACTOR knew of the existence of such conditions at the time of submission of a Bid or becoming bound under a negotiated Contract; or
 - b. The existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for CONTRACTOR prior to submission of a bid; or
 - c. CONTRACTOR failed to give the written notice within the time and as required by these Contract Documents.
3. If OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Time, as a result of differing subsurface or physical conditions or both, a Claim may be made therefore as provided in Part 8. No claim of CONTRACTOR under this paragraph shall be allowed unless;
 - a. CONTRACTOR has given the written noticed required in this Part 3; and
 - b. CONTRACTOR submits to PROJECT ENGINEER a detailed claim setting forth CONTRACTOR's right to recover any additional costs and lost time, including the information required by Part 10.

However, OWNER, PROJECT ENGINEER, DESIGN ENGINEER, DESIGN ENGINEER's Consultants, and OWNER'S Consultants, shall not be liable to CONTRACTOR for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, or other dispute resolution costs) sustained by CONTRACTOR on or in connection with any other project or anticipated project.

3.04 Underground Facilities

A. EXISTING UTILITIES

The Contractor shall locate existing underground utilities in the areas of work. If utilities are to remain in place, the Contractor shall provide protection during construction operations. Additionally, the Contractor will coordinate with utility companies when working in close proximity to their line/services.

Should uncharted or incorrectly charted piping or other utilities be encountered during excavations, the Contractor shall immediately consult the Project Engineer for directions as how to proceed. The Contractor shall fully cooperate with Owner and utility companies in keeping respective services and facilities in operation.

The Owner has, to the best of its ability, made involved utility owners aware of this project. As appropriate, each utility owner will be invited to attend the preconstruction conference to discuss potential conflicts and schedules for relocation where required. All adjustments or relocations will be made at the utility owner's expense unless otherwise indicated in these Contract Documents.

Reasonable care has been used to locate and depict existing underground installation on the construction drawings, but the accuracy cannot be guaranteed and some items may not be shown which exist.

The Contractor shall adhere to the provisions of the 1985 Underground Damage Prevention Act, North Carolina General Statutes, 887 Chapter 785, Senate Bill 168, Article 3. The Contractor shall contact the NC One Call System for locates prior to beginning work in a particular area. For calls originating within North Carolina, the number is 811 or 1-800-632-4949. For calls originating outside of North Carolina, the number is (919) 855-5760. To check the status of a locate ticket the number is 1-877-632-5050. The Contractor shall include the cost of any coordination and cooperation for utilities in his bid.

Actual horizontal and vertical locations have not been verified. As part of the Contract work, the Contractor is required to dig up each utility which may conflict with construction in advance to verify locations. The utilities shall be "dug up" a minimum of fourteen (14) working days in advance of actual installation of new utilities to allow the Project Engineer an opportunity to adjust grades, alignments, etc., to avoid a conflict. Separate payment will not be made to physically verify the utility locations.

If the Contractor fails to schedule locates or perform advance physical locations in advance of the construction and a conflict arises, the Contractor will be required to make corrective measures as instructed by the Project Engineer at the Contractor's expense. The Contractor's failure to advance plan (minimum fourteen (14) working days) by physically uncovering existing utilities in advance of construction shall not be cause for claim of lost time or for additional compensation. No additional payment will be made for re-mobilization required by the utility locator.

When the Contractor's controlling operations are halted due to the failure of a utility owner to relocate or adjust a utility after being properly notified by the Contractor, the contract period may be extended by the amount of time the Contractor's controlling operations have been delayed while awaiting the relocation or adjustment. Contractor shall proceed with work in areas not affected by the relocation or adjustment delay.

The Owner, Project Engineer, Design Engineer, and/or Consultants shall not be liable to the Contractor for any claims, costs, losses, or damages incurred or sustained on or in connection with locating existing underground installations.

The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to OWNER or DESIGN ENGINEER by the owners of such Underground Facilities, unless it is otherwise provided.

OWNER, PROJECT ENGINEER, OWNER's Consultant and DESIGN ENGINEER shall not be responsible for the accuracy or completeness of any such information or data.

The cost of all of the following will be included in the Contract Price, and CONTRACTOR shall have full responsibility for:

1. Reviewing and checking all such information and data,
2. Locating all Underground Facilities shown or indicated in the Contract Documents,
3. Coordination of the Work with the owners of such Underground Facilities, including OWNER, during construction, and
4. The safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

CONTRACTOR shall be responsible for the discovery of existing underground installations, in advance of excavating or trenching as required in these Contract Documents.

If an Underground Facility is discovered at or contiguous to the Site which was not shown or indicated, in the Contract Documents, CONTRACTOR shall, immediately after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Part 4), identify the owner of such Underground Facility and give written notice to PROJECT ENGINEER. Upon receipt of written notice PROJECT ENGINEER will review the pertinent condition, determine the necessity of obtaining additional information, and notify CONTRACTOR in writing. During such time, CONTRACTOR shall be responsible for the safety and protection of such Underground Facility. If PROJECT ENGINEER concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued.

The Contract Price and/or the Contract Time, may be adjusted if PROJECT ENGINEER determines the existence of such differing subsurface or physical condition causes an increase or decrease in CONTRACTOR's cost of, or time required for, performance of the Work; subject, to the following:

1. Facility was not shown or indicated in the Contract Documents, and
2. The CONTRACTOR did not know of or could not anticipate the facility.

If OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, as a result of differing

subsurface or physical conditions or both, a Claim may be made therefore as provided in Part 3. No claim of CONTRACTOR under this paragraph shall be allowed unless;

1. CONTRACTOR has given the written notice required in Part 3, and;
2. CONTRACTOR submits to PROJECT ENGINEER a detailed claim setting forth CONTRACTOR's right to recover any additional costs and lost time, including the information required by Part 10 of these General Conditions.

However, OWNER, PROJECT ENGINEER, DESIGN ENGINEER, OWNER'S CONSULTANTS, and DESIGN ENGINEER's Consultants, shall not be liable to CONTRACTOR for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, or other dispute resolution costs) sustained by CONTRACTOR on or in connection with any other project or anticipated project."

3.05 Reference Points

- A. Construction staking will be performed by the DESIGN ENGINEER who will also prepare and furnish construction cut sheets to the OWNER and CONTRACTOR. The CONTRACTOR shall not install any utilities without a cut sheet. All requests for staking will be made not less than 96 hours in advance.
- B. The Contractor shall be responsible for the preservation of all stakes and marks established by the DESIGN ENGINEER. CONTRACTOR shall report to PROJECT ENGINEER whenever any reference point or property monument is lost or destroyed or, requires relocation or reinstallation. If any of the stakes, marks, or property corners are carelessly or willfully disturbed, the cost of replacing them shall be charged against the CONTRACTOR by the DESIGN ENGINEER.
- C. Utilities shall be installed at the locations and elevations indicated on the Contract drawings unless otherwise approved by the OWNER. The CONTRACTOR shall verify invert elevations by instrument at each manhole.

3.06 Hazardous Environmental Condition at Site

- A. CONTRACTOR shall not resume Work in any affected area until OWNER has provided written notice:
 1. Specifying that any affected area is safe for the resumption of Work; or
 2. Specifying that any special conditions under which such Work may be resumed safely.

If after receipt of written notice, CONTRACTOR does not agree to resume Work based on a reasonable belief it is unsafe, or does not agree to resume work under the special conditions, then OWNER may order the portion of the Work that is in the area affected by the condition to be deleted from the Work. If OWNER and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in the in Contract Price and/or Contract Time, or both, as a result of such Work stoppage, or such special conditions under which Work is agreed to be resumed by CONTRACTOR, then either party may make a Claim, or deleting that portion of the Work, therefore as provided in Part 8.

- B. CONTRACTOR may rely upon the general accuracy of these reports and drawings containing subsurface conditions. However, these documents do not take precedence over the Contract Documents. CONTRACTOR may not rely upon or make any Claim against OWNER, DESIGN ENGINEER, or any of DESIGN ENGINEER's Consultants with respect to:
1. The completeness of such reports and drawings for CONTRACTOR's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by CONTRACTOR, and safety precautions and programs incident thereto; or
 2. Other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
 3. Any CONTRACTOR interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information.
- C. CONTRACTOR shall not be responsible for any Hazardous Environmental Condition uncovered or discovered at the site which was not shown or indicated in Contract Documents. CONTRACTOR shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by CONTRACTOR, Subcontractors, Suppliers, or anyone else for whom CONTRACTOR is responsible.
- D. If CONTRACTOR encounters a Hazardous Environmental Condition or if CONTRACTOR or anyone for whom CONTRACTOR is responsible creates a Hazardous Environmental Condition, CONTRACTOR shall immediately:
1. secure such condition;
 2. stop all Work in connection with such condition and in any area affected (except in an emergency as required by Part 4); and
 3. Notify PROJECT ENGINEER (and confirm such notice in writing within 24 hours of initial notification).
- E. CONTRACTOR shall not resume Work in any affected area until OWNER has provided written notice:
1. Specifying that any affected area is safe for the resumption of Work; or
 2. Specifying that any special conditions under which such Work may be resumed safely.
- If after receipt of written notice, CONTRACTOR does not agree to resume Work based on a reasonable belief it is unsafe, or does not agree to resume work under the special conditions, then OWNER may order the portion of the Work that is in the area affected by the condition to be deleted from the Work. If OWNER and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in the in Contract Price and/or Contract Time, or both, as a result of such Work stoppage, or such special conditions under which Work is agreed to be resumed by CONTRACTOR, then either party may make a Claim, or deleting that portion of the Work, therefore as provided in Part 8.

- F. If OWNER and CONTRACTOR cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefore as provided in Part 8. OWNER may have such deleted portion of the Work performed by OWNER's own forces or others in accordance with Part 5.
- G. To the fullest extent permitted by Laws and Regulations, OWNER shall, indemnify and hold harmless CONTRACTOR, Subcontractors, DESIGN ENGINEER, OWNER's DESIGN Consultants and the officers, directors, partners, employees, agents, other consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition:
1. was not or identified in the Contract Documents to be included within the scope of the Work, and
 2. was not created by CONTRACTOR or by anyone for whom CONTRACTOR is responsible.

Nothing in this paragraph shall obligate OWNER to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

- H. To the fullest extent permitted by Laws and Regulations, CONTRACTOR shall indemnify and hold harmless OWNER, DESIGN ENGINEER, DESIGN ENGINEER's Consultants, and the officers, directors, partners, employees, agents, other consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition created by CONTRACTOR or by anyone for whom CONTRACTOR is responsible. Nothing in this paragraph shall obligate CONTRACTOR to indemnify any individual or CONTRACTOR entity from and against the consequences of that individual's or entity's own negligence.

PART 4. CONTRACTOR'S RESPONSIBILITIES

4.01 Supervision and Superintendence

- A. Superintendent:
1. The CONTRACTOR shall designate a full time competent superintendent, satisfactory to the PROJECT ENGINEER, to supervise the Work and to respond to the PROJECT ENGINEER concerning the OWNER's interest in the construction.
 2. The Superintendent shall have full authority to act on behalf of the CONTRACTOR and all communications, instructions, directions, and notices given to the Superintendent by the PROJECT ENGINEER shall be binding to the CONTRACTOR.

3. The Superintendent shall give the Work his constant attention to facilitate the progress thereof and shall cooperate with the PROJECT ENGINEER in every way possible. The Superintendent shall at all times have a competent and reliable English-speaking representative on site, authorized to receive orders and act for him.
 4. If construction activity stops due to the Superintendent not being available or competent, the CONTRACTOR shall not have recourse against the OWNER.
 5. CONTRACTOR's Superintendent shall be responsible for coordination of the Work with other contractors or subcontractors onsite.
- B. Any Employee of or person associated with the CONTRACTOR shall not:
1. Use profane or abusive language to any person, to the PROJECT ENGINEER or other employees of the OWNER, or;
 2. Interfere with the performance of the Work, or;
 3. Disobey instructions, or;
 4. Be careless, reckless or incompetent, or;
 5. Be objectionable to the OWNER.

Any employee of or person associated with the CONTRACTOR that fails to abide by the above conditions shall be removed from the project site on the request of the PROJECT ENGINEER, and shall not be allowed on the project site except with the PROJECT ENGINEER's written consent.

C. Subcontractors

1. The CONTRACTOR shall submit the names and references of both the Superintendent and all Sub-contractors to the PROJECT ENGINEER for approval prior to construction starting on the project. The CONTRACTOR shall not begin work until receiving written approval. If during the duration of the contract the CONTRACTOR changes Superintendent and Sub-contractors, CONTRACTOR shall submit names and references to PROJECT ENGINEER for approval prior to new personnel starting work.
2. If the CONTRACTOR has a Subcontractor working under this Contract, the CONTRACTOR shall have a Superintendent on the site at all times. Construction activity shall be stopped if the CONTRACTOR's Superintendent is not on site.
3. The CONTRACTOR is and remains fully responsible for his own acts or omission as well as those of any subcontractors or any employee of either. The CONTRACTOR agrees that no contractual relationship exists between the Subcontractor and the OWNER in regard to the Contract, and that the subcontractor acts on his work as an agent or employee of the CONTRACTOR. The CONTRACTOR agrees to bind specifically every subcontractor to the applicable terms and conditions of these Contract Documents.

4.02 Labor; Working Hours

- A. This agreement is subject to the applicable provisions of the Contract Works Hours and Safety Standards Act. No CONTRACTOR or Subcontractor contracting for any part of the Work shall require or permit any laborer or mechanic to be employed on the Work in excess of forty hours in any work week unless such laborer or mechanic receives compensation at a rate not less than one and one-half times that person's basic rate of pay for all hours worked in excess of forty hours in such work week.
- B. CONTRACTOR shall employ only competent persons to do the Work and whenever OWNER shall notify CONTRACTOR, in writing, that any person on the Work appears incompetent, disorderly, or otherwise unsatisfactory, such person shall be removed from the Project and shall not again be employed on it except with written consent of OWNER.
- C. CONTRACTOR and Subcontractors shall agree not to discriminate in the employment of labor because of race, creed, sex, religion or country of origin. CONTRACTOR and Subcontractors shall, give preference in hiring of workers for the Project to qualified local residents.

4.03 Prosecution of Work

- A. The CONTRACTOR shall undertake the Work will all necessary materials, equipment and labor to ensure its completion within the time set forth in the Contract. Should the CONTRACTOR choose to discontinue the Work he shall notify the OWNER in writing a minimum of three (3) business days in advance. The OWNER shall review and respond to the request in writing. If approved, the CONTRACTOR shall notify the OWNER in writing a minimum of 24 hours prior to the resuming operations.

4.04 Services, Materials, and Equipment

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

4.05 Substitutes and "Or-Equals"

- A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent or “or-equal” item or no substitution is permitted, or the equipment is Base Bid equipment, other items of material or equipment of other Suppliers may be submitted (in accordance with Section 01300) to PROJECT ENGINEER for review.
1. Or Equal Items – For the purposes of this paragraph, a proposed item of material or equipment will be considered functionally equal to an item so named if:
- a. In the exercise of reasonable judgment the PROJECT ENGINEER determines that:
 - i. it is equivalent to or better than the product named in form, function, performance, reliability, quality, features, materials of construction, operation and maintenance costs, static and dynamic loads, general dimensional configuration, size, weight, and appearance;
 - ii. it will reliably perform at least equally well in function imposed by the design concept of the completed Project as a functioning whole, and;
 - b. CONTRACTOR certifies that:
 - i. there is no increase in cost to the OWNER; and
 - ii. it will conform substantially to the detailed requirements of the item named in the Contract Documents.

PROJECT ENGINEER may reject the proposed substitution at their sole discretion. No justification shall be necessary for the rejection.

4.06 Concerning Subcontractors, Suppliers, and Others

- A. CONTRACTOR shall not employ any subcontractor, supplier, or other individual or entity (including those acceptable to OWNER as indicated in this Part 4), whether initially or as a replacement, against whom OWNER may have reasonable objection. CONTRACTOR shall not be required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom CONTRACTOR has reasonable objection.
- B. If the Contract Documents require the identity of certain subcontractors, suppliers, or other individuals or entities to be submitted to OWNER by OWNER by a specified date prior to the Effective Date of the Contract, and if CONTRACTOR has submitted a list thereof in accordance with the Contract Documents, OWNER’s acceptance of any Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. CONTRACTOR shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity at no additional cost to the OWNER. No acceptance by OWNER of any Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of any right of OWNER to reject defective Work.

- C. CONTRACTOR shall be fully responsible to OWNER for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work. Nothing in the Contract Documents shall create any contractual relationship between OWNER, and any Subcontractor, Supplier or other individual or entity, nor shall it create any obligation on the part of OWNER to pay or to see to the payment of any moneys due any Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.
- D. CONTRACTOR shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect Contract with CONTRACTOR.
- E. All Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work shall communicate with OWNER through CONTRACTOR.
- F. The Contract Documents shall not control CONTRACTOR in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.
- G. All Work performed by a Subcontractor or Supplier shall be pursuant to an agreement between CONTRACTOR and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents. Whenever any agreement is with a Subcontractor or Supplier who is listed as an additional insured on the insurance provided in the Instructions to Bidders, the agreement between the CONTRACTOR and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against OWNER, CONTRACTOR, DESIGN ENGINEER, and all other individuals or entities identified in the Contract Documents to be listed as insured or additional insurers (and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other insurance applicable to the Work. If the insurers on any policies require separate waiver forms to be signed by any Subcontractor or Supplier, CONTRACTOR will obtain the same.
- H. The CONTRACTOR shall not subcontract more than 49% of the value of this Contract. Violation of this provision of the contract may be deemed to be a breach of the Contract. CONTRACTOR's failure to remedy after notice shall entitle OWNER to any and all remedies as set forth in the Contract Documents applicable to OWNER'S rights in the event of breach.

4.07 Patent Fees and Royalties

- A. CONTRACTOR shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in these Contract Documents for use in the performance of the Work and if to the actual knowledge of OWNER its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by OWNER in the Contract Documents. To the fullest extent permitted by Laws and Regulations, CONTRACTOR shall indemnify and hold harmless OWNER, DESIGN ENGINEER, and the officers, directors, partners, employees or agents, and other consultants of each and any of them from and against all claims, costs, losses, and damages (including

but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

4.08 Permits

- A. Unless otherwise provided in these Contract Documents, CONTRACTOR shall obtain and pay for all construction permits and licenses. OWNER shall assist CONTRACTOR, when necessary, in obtaining such permits and licenses. CONTRACTOR shall pay all charges and inspection fees necessary to complete the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Contract. OWNER shall pay all charges of utility owners for connections to provide permanent service to the Work.

4.09 Laws and Regulations

- A. CONTRACTOR shall give all notices and comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, OWNER and DESIGN ENGINEER shall not be responsible for monitoring CONTRACTOR's compliance with any Laws or Regulations.
- B. If CONTRACTOR performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, CONTRACTOR shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work. It shall not be CONTRACTOR's primary responsibility to make certain that the Contract Documents are in accordance with Laws and Regulations, but this shall not relieve CONTRACTOR of their obligations set forth under Part 2.
- C. Changes in Laws or Regulations not known at the time of opening of Bids having an effect on the cost or time of performance of the Work may be the subject of an adjustment in Contract Price or Contract Time. If OWNER and CONTRACTOR are unable to agree on any adjustment a Claim may be made as provided in Part 8.

4.10 Taxes

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

4.11 Use of Site and Other Areas

- A. Limitation on Use of Site and Other Areas: CONTRACTOR shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas

with construction equipment or other materials or equipment. CONTRACTOR shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.

- B. Removal of Debris During Performance of the Work: During the progress of the Work CONTRACTOR shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations as well as the terms in the Special Provisions.
- C. Cleaning: Prior to Final Completion of the Work CONTRACTOR shall clean the Site and make it ready for utilization by OWNER. At the completion of the Work CONTRACTOR shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.
- D. Sanitary Provision: The CONTRACTOR shall provide and maintain in a neat and sanitary condition such accommodations for the use of his employees as may be necessary to comply with the requirements and regulations of the Department of Health, or of the other bodies or tribunals, having jurisdiction thereof. He shall commit no public nuisance. The CONTRACTOR shall at all times keep the site of the work free from accumulations of waste material or rubbish caused by his employees or work. Upon the completion of the work and before final acceptance can be made, all evidence of construction shall be removed, all property restored to its original condition, all manholes, and any other items of construction, shall be clean and neat in appearance; any other necessary items of clean-up shall be performed.
- E. Loading Structures: CONTRACTOR shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall CONTRACTOR subject any part of the Work or adjacent property to stresses or pressures that will endanger it.
- F. The Contractor shall carefully protect from disturbance or damage all private property and property corners. Property corners shall not be removed until the Project Coordinator has witnessed or otherwise referenced their location. Any damage to property corners shall be repaired/replaced at no additional cost to the OWNER. If any markers, identified or not, are disturbed, removed, or destroyed through the construction process, the CONTRACTOR shall retain the services of a Professional Land Surveyor, licensed in the State of North Carolina, and have those markers replaced. The CONTRACTOR shall further submit a drawing identifying the locations of those markers, signed and sealed by the licensed Professional Land Surveyor. At the CONTRACTOR's discretion, and without additional cost to the Contract, the surveyor may contact the DESIGN ENGINEER and have the markers offset prior to the commencement of construction.
- G. The CONTRACTOR shall not enter upon private property for any purpose without obtaining permission. He shall use suitable precautions to prevent damage to pipes, conduits, and other underground structures, and shall protect carefully from disturbance or damage all land monuments and property marks until an authorized agent has witnessed or otherwise referenced their location and shall not remove them until directed. When or where direct or indirect damage or injury is done to public or private property by or on account of any act, omission, neglect, or misconduct, in the execution of work, or in consequence of the non-execution thereof on the part of the CONTRACTOR, he shall restore at his own expense, such property to a condition similar or equal to that existing before such damage or injury was done, by repairing, rebuilding or otherwise restoring, as may be directed, or he shall make good such damage or injury in an acceptable manner.

- H. When any direct or indirect damage or injury is done to public or private property, by or on account of any act, omission, neglect or misconduct in the execution of the Work, or in consequence of the non-execution thereof on the part of the Contractor, he shall restore, at his own expenses, such property to a condition equal or better than existing before such damage or injury was done or he shall make good damage or injury in an acceptable manner.

4.12 Safety and Protection

- A. CONTRACTOR shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. CONTRACTOR shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:
1. All persons on the Site or who may be affected by the Work;
 2. All the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
 3. Other property at the Site or adjacent thereto not designated for removal, relocation, or replacement in the course of the Work.
- B. CONTRACTOR shall comply with all applicable State and Federal Laws and Regulations relating to the safety and protection of persons or property, from damage, injury, or loss. The Contractor shall erect and maintain all necessary safeguards for safety and protection. In the event a conflict arises between agencies, the stricter regulation shall apply. CONTRACTOR shall notify owners of adjacent property and other utility owners when the Work may affect them. The Contractor shall cooperate in the protection, removal, relocation, and replacement of their property. All damage, injury, or loss to any property referred to in this paragraph caused, directly or indirectly, in whole or in part, by CONTRACTOR, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by CONTRACTOR (except damage or loss attributable to the fault of the Contract Documents or to the acts or omissions of OWNER or DESIGN ENGINEER or DESIGN ENGINEER's Consultant, or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of CONTRACTOR or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them). CONTRACTOR's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and OWNER has issued a notice to CONTRACTOR in accordance with Part 12 that the Work is acceptable.
- C. The CONTRACTOR shall comply with the OWNER's Safety Manual, Latest Edition. Where conflicts arise between OWNER and other regulations, the more stringent shall apply. A copy of the OWNER's Safety Manual will be made available to the CONTRACTOR. Any interpretation and enforcement made by the OWNER shall be binding upon the CONTRACTOR. The OWNER may visit the CONTRACTOR's work areas to verify that safety procedures are in accordance with applicable regulations. If the CONTRACTOR's personnel are observed creating a hazardous environment, corrective action shall be initiated immediately to reduce the possibility of injury. Corrective action by the OWNER will consist of advising the Contractor, of compliance and could

result in the OWNER issuing notices of non-compliance for repeat violations for failure to take corrective measures. Inspection by the OWNER shall not constitute an acceptance of the CONTRACTOR's practices, methods, techniques, procedures, nor release the CONTRACTOR of the responsibility for safety and health of the job site.

- D. Neither the professional responsibilities of the OWNER, PROJECT ENGINEER or DESIGN ENGINEER, nor the presence of the OWNER or DESIGN ENGINEER's employees and/or consultants at the construction site, shall relieve the CONTRACTOR or any other entity of their obligations, duties and responsibilities including but not limited to, construction means, methods, sequences, techniques or procedures necessary for performing, superintending or coordinating all portions of the Work in accordance with the Contract Documents and any health or safety precautions required by any regulatory agencies. The OWNER or DESIGN ENGINEER's their employees, representatives, and sub-consultants shall have no responsibility for site safety.
- E. The OWNER's or DESIGN ENGINEER's personnel have no authority to exercise any control over any construction contractor or other entity or their employees in connection with any health and/or safety precautions. The CONTRACTOR is solely and exclusively responsible for job site safety and shall include the OWNER and DESIGN ENGINEERS as additional insured for primary protection under the CONTRACTOR's general liability policy.

4.13 Safety Representative

- A. CONTRACTOR shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.
- B. All crews that operate in and around trenches shall have their own Competent Person as defined by OSHA standards.

4.14 COVID-19

- A. As North Carolina and the nation continues to deal with the COVID-19 pandemic, we must all take necessary steps to ensure the health and safety of employees, coworkers, family, friends, associates and people that we come in contact with on a daily basis. At PWC we implemented measures including requiring our employees to conduct temperature and wellness checks, wear a face covering or mask, whenever possible, maintain proper social distancing (minimum of 6 feet) and take other actions such as washing their hands, using approved sanitizer and wiping down surfaces, especially commonly shared equipment or tools. This applies to employees working in our facilities, working in public or at field sites. For firms who are under contract with PWC or working under purchase orders, those firms are expected to comply with all OSHA/EPA guidelines, CDC recommendations including any applicable North Carolina Executive Orders regarding the

performance of work under COVID-19 conditions. Examples of such guidance can be found at the following:

OSHA COVID-19 Overview

<https://www.osha.gov/SLTC/covid-19/>

OSHA COVID-19 – Control and Prevention / Construction Work

[https://www.osha.gov/SLTC/covid19/construction.html#:~:text=Keep%20in%2Dperson%20meetings%20\(including,Fill%20hand%20sanitizer%20dispensers%20regularly.](https://www.osha.gov/SLTC/covid19/construction.html#:~:text=Keep%20in%2Dperson%20meetings%20(including,Fill%20hand%20sanitizer%20dispensers%20regularly.)

<https://www.osha.gov/Publications/OSHA4000.pdf>

North Carolina COVID-19 Executive Orders

<https://www.nc.gov/covid-19/covid-19-executive-orders>

Centers for Disease Control

<https://www.cdc.gov/coronavirus/2019-ncov/index.html>

Implementing Safety Practices for Critical Infrastructure Workers

<https://www.cdc.gov/coronavirus/2019-ncov/community/critical-workers/implementing-safetypractices.html>

Essential Staff – Do's & Dont's

https://www.cdc.gov/coronavirus/2019-ncov/downloads/Essential-Critical-Workers_Dos-andDonts.pdf

NC Licensing Board for General Contractors

<https://www.nclbnc.org/2020/07/02/board-buzz-summer/>

NC Association of General Contractors

<https://www.cagc.org/CAGC/SafetyHR/CAGC/Safety/SafelyHomeInitiative.aspx?hkey=e3439388-0c36-4755-91bd-4c8fc6d22a41>

NC Department of Health and Human Services

<https://covid19.ncdhhs.gov/>

Cumberland County Health Department

<https://www.co.cumberland.nc.us/departments/public-health-group/public-health>

Department of Homeland Security

<https://www.ready.gov/pandemic>

Cape Fear Valley – What to do if you have COVID symptoms

https://www.youtube.com/watch?time_continue=1&v=tD0D7Apa_vw&feature=emb_logo

FAYPWC COVID Response

<https://www.faypwc.com/covid-19-update/>

Small Business Administration

<https://www.sba.gov/page/coronavirus-covid-19-small-business-guidance-loan-resources>

As an additional step to ensure the health and safety of contractor employees and PWC employees, should a contractor's employee test positive for COVID-19 the contractor must immediately inform the PWC project manager/supervisor or their primary point of contact at PWC and the employee should be performing work at PWC facilities or field sites until medically cleared. This is necessary so PWC can inform our employees, conduct or own method of contact tracing for our employees and take any measures necessary such as quarantining PWC employees who may have been in contact with the individual who tested positive.

These actions are necessary to ensure the health and safety of all and to ensure that contract performance can be achieved under the conditions of this pandemic.

Contractor must provide a plan with their proposal that describes their plan for working under COVID-19 conditions. The plan should address the Contractor's approach to protect their employees, PWC employees, along with any other Contractor's working on PWC's locations. This may include the Contractor's approach towards employee use of PPE, such as face masks, sanitizing commonly shared tools or equipment, practicing social distancing as work conditions permit, and working within close proximity of others. The plan may also address any other actions that the Contractor will be taking, such as conducting daily temperature checks, conducting symptom checks and trackers, and any other actions the Contractor deems appropriate to protect the health and safety of their employees, PWC employees, and any other Contractor's working on PWC's locations.

4.15 Hazard Communication Programs

- A. CONTRACTOR shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information in accordance with Laws or Regulations. The Contractor shall be responsible to provide and maintain Material Safety Data Sheets (MSDS) sheets at the job site at all times. The sheets shall be located in an easily accessible and prominently located area.
- B. CONTRACTOR shall comply with the applicable North Carolina Occupational Safety and Health Standards and regulations while performing services contracted by OWNER.
- C. The OWNER is subject to Hazard Communication Standard 29 CFR 1910 (Standard). The Contractor shall provide MSDS required under the standard for all hazardous materials. The MSDS shall be provided with all hazardous materials. Container labeling meeting all requirements of the Standard shall be appropriately affixed to the shipping or internal containers. The Owner reserves the right to refuse shipments of hazardous materials not appropriately labeled or when MSDS have not been received prior to or concurrent with receipt of the shipment, or whenever the material is delivered in a manner inconsistent with any applicable Law and/or Regulation. The CONTRACTOR further certifies that all material supplied under this Contract meets all OSHA requirements, both Federal and those of the State of North Carolina, and further certifies that, if the material delivered is found to be in non-compliance with the applicable State or Federal OSHA requirements all costs necessary to bring the material into compliance shall be borne by the Contractor.
- D. Additional OWNER's safety programs, if applicable, are covered in the OWNER's Safety Manual.

4.16 Emergencies

- A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, CONTRACTOR is obligated to act to prevent threatened damage, injury, or loss. CONTRACTOR shall give the PROJECT ENGINEER prompt written notice if CONTRACTOR believes that any significant changes in the Work or variations from the Contract Documents have been caused or are required as a result of the emergency. If the PROJECT ENGINEER determines that a change in the Contract Documents is required because of the action taken by CONTRACTOR in response to such an emergency, a Work Change Directive or Change Order will be issued.

4.17 Continuing the Work

- A. CONTRACTOR shall continue the Work and adhere to the progress schedule during all disputes or disagreements with OWNER. The CONTRACTOR's refusal to continue the Work during disputes and disagreements with OWNER, the pending of claims, or the pending of change order requests shall be a violation of the Contract Documents.
- B. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by Part 13 or as OWNER and CONTRACTOR may otherwise agree in writing.

4.18 Contractor's General Warranty and Guarantee

- A. CONTRACTOR warrants and guarantees to OWNER, PROJECT ENGINEER, and DESIGN ENGINEER that all Work shall be in accordance with the Contract Documents and shall not be defective. CONTRACTOR's warranty and guarantee hereunder excludes defects or damage caused by:
1. Abuse, modification, or improper maintenance or operation by persons other than CONTRACTOR, Subcontractors, Suppliers, or any other individual or entity for whom CONTRACTOR is responsible; or
 - a. Normal wear and tear under normal usage.
- B. CONTRACTOR's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following shall constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of CONTRACTOR's obligation to perform the Work in accordance with the Contract Documents:
1. Observations by PROJECT ENGINEER;
 2. Recommendation by PROJECT ENGINEER or payment by OWNER of any progress or final payment;
 3. The issuance of a certificate of Final Completion by PROJECT ENGINEER or any payment related thereto by OWNER;
 4. Use or occupancy of the Work or any part thereof by OWNER;
 5. Any acceptance by OWNER or any failure to do so;
 6. Any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by PROJECT ENGINEER;

7. Any inspection, test, or approval by others; or
8. Any correction of defective Work by OWNER.

4.19 Indemnification

- A. In any and all claims against OWNER or DESIGN ENGINEER or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of CONTRACTOR, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for CONTRACTOR or any Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.
- B. The indemnification obligations of CONTRACTOR shall not extend to the liability of DESIGN ENGINEER and DESIGN ENGINEER's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:
 1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Contract Documents; or
 2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

4.20 Access to Records

- A. CONTRACTOR and all Subcontractors shall maintain books, records, documents, and other evidence directly pertinent to performance of the Work under the Contract Documents in accordance with generally accepted and consistently applied accounting principles and practices. OWNER shall have access during normal business hours to books, records, documents, and evidence for the purposes of inspection, audit, and copying. CONTRACTOR shall provide suitable facilities for access and inspection. All books, records, and evidence shall be maintained and made available for a period of three (3) years after the date of final payment or until the final settlement of any disputes, claims, and litigation, whichever shall occur later. CONTRACTOR shall provide to OWNER, when requested, copies of all purchase orders issued or sub-agreements executed, complete with all amendments, for Work under the Contract Documents. CONTRACTOR shall include this provision in all subcontracts.

PART 5. OTHER WORK

5.01 Related Work at Site

- A. OWNER may perform other work related to the Project at the Site by OWNER's employees, other contractors, or have other work performed by utility owners. If other work is not noted in the Contract Documents, then:
 1. OWNER shall provide written notice to CONTRACTOR prior to starting any other work; and

2. If OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Time that should be allowed as a result of other work, a Claim may be made as provided in Part 8.
- B. CONTRACTOR shall provide proper and safe access to the Site for all contractors, utility owners, and OWNER's employees performing other work. Contractor shall provide a reasonable opportunity for the mobilization and storage of materials and equipment and the performance of such other work. The Contractor shall properly coordinate the other work with theirs. Unless otherwise provided in the Contract Documents, CONTRACTOR shall perform all work that may be required to properly integrate with other work. CONTRACTOR shall not endanger or alter any work of others without the expressed written consent of PROJECT ENGINEER. The duties and responsibilities of CONTRACTOR under this paragraph are for the benefit of utility owners and other contractors to the extent that there are comparable provisions for the benefit of CONTRACTOR in direct Contracts between OWNER, and utility owners, and other contractors.
- C. If any part of CONTRACTOR's Work depends upon work performed by others under this Part 5, CONTRACTOR shall notify PROJECT ENGINEER in writing of any delays, defects, or deficiencies in the other work that may prevent the CONTRACTOR from performing the Work. CONTRACTOR's failure to report will constitute an acceptance of the other work as fit and proper for integration with CONTRACTOR's Work except for latent defects and deficiencies in the other work.

5.02 Coordination

- A. If OWNER intends to contract with others for the performance of other work on the Project at the Site, the PROJECT ENGINEER shall provide the following:
1. The individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;
 2. The specific matters to be covered by such authority and responsibility will be itemized; and
 3. The extent of such authority and responsibilities will be provided.
- B. Unless otherwise specified by the PROJECT ENGINEER, OWNER shall have sole authority and responsibility for such coordination.

PART 6. OWNER'S RESPONSIBILITIES

6.01 Project Engineer

- A. PROJECT ENGINEER shall be the OWNER's representative during the construction period. The duties and responsibilities and the limitations of authority of PROJECT ENGINEER as OWNER's representative during construction are set forth in the Contract Documents and shall not be extended without written consent of OWNER and PROJECT ENGINEER. The assignment of any authority, duties, or responsibilities to PROJECT ENGINEER under the Contract Documents, or any undertaking, exercise, or performance thereof by PROJECT ENGINEER, is intended to be for the sole and exclusive benefit of OWNER and not for the benefit of CONTRACTOR, Subcontractor, Supplier, or any other person or organization, or for any surety or employee or agent of any of them.

6.02 Roles and Responsibilities

A. Authorities and Duties of PROJECT ENGINEER

1. The PROJECT ENGINEER shall in no case act as foreman, direct the CONTRACTOR's personnel, subcontractor personnel or direct or perform duties for the CONTRACTOR, nor interfere with the management of the Work by the CONTRACTOR.
2. The PROJECT ENGINEER may make changes in grades and quantities when necessary to keep Work in progress.
3. To prevent disputes and litigation, the PROJECT ENGINEER shall in all cases determine the amount, quality, and acceptability of the Work and materials which are to be paid for under the Contract. The PROJECT ENGINEER shall in all cases decide every question which may arise relative to the fulfillment of the Contract. The PROJECT ENGINEER's opinion of the costs and decisions shall be final and conclusive.
4. The PROJECT ENGINEER will not decide disputes between the CONTRACTOR and person or entities other than the OWNER.
5. Clarifications and interpretations of the Contract Documents shall be issued by PROJECT ENGINEER.

B. Authorities and Duties of the PROJECT COORDINATOR

1. The PROJECT COORDINATOR employed by the OWNER shall be authorized to inspect all Work performed and all materials furnished. Their inspection shall extend to all parts of the Work, and to preparation or manufacture of the materials to be used.
2. The PROJECT COORDINATOR shall report to the PROJECT ENGINEER as to the progress and performance of the Work. The PROJECT COORDINATOR shall report whenever the materials furnished and/or the work performed by the CONTRACTOR fails to fulfill the requirements of the Contract Documents. The PROJECT COORDINATOR shall notify the CONTRACTOR of any failure to meet requirements. However, such observation shall not relieve the CONTRACTOR of any obligation to perform all the Work strictly in accordance with the Contract Documents.
3. In case of any dispute arising between the CONTRACTOR and the PROJECT COORDINATOR as to the materials furnished or the performance of the Work, the PROJECT COORDINATOR shall have the authority to reject materials or refer the issue to the PROJECT ENGINEER. Any suspension or work stoppage for rejected materials or performance of the Work shall not be the basis of a claim by the CONTRACTOR for additional Contract time or costs. Such rejection shall also not be the basis of a future claim by the CONTRACTOR for adjustment in Contract unit price or lump sum price or any work item contained in the Contract.
4. Where special inspection or testing is required by the State laws or local ordinances, instruction of the PROJECT ENGINEER, specification or codes, the CONTRACTOR shall give adequate notice to the PROJECT COORDINATOR of the time set for such inspection or test, if the inspection or test will be conducted by a party other than the PROJECT ENGINEER. Such section tests or inspections shall be made in the presence of the PROJECT ENGINEER or his authorized representative, and it shall be the CONTRACTOR's responsibility to serve ample notice of such test.

5. The PROJECT COORDINATOR shall inspect the Work for the purposes of payment approval and monitoring progress of the Work. However, the PROJECT COORDINATOR shall not have any responsibility for the Work performed by the CONTRACTOR or its subcontractors, for the Safety of the work site, nor for any deficiency in the Work, whether discovered during the construction or after acceptance.
6. Regardless of the of the inspections by the PROJECT COORDINATOR or the PROJECT ENGINEER, the CONTRACTOR is responsible for performing and completing the Work in accordance with the Contract Documents. The OWNER has no liability or responsibility to the CONTRACTOR or Surety for work performed by the CONTRACTOR which is not in accordance with the Contract Documents, regardless of whether discovered during construction or after acceptance.

6.03 Communications to Contractor

- A. Except as otherwise provided in these Contract Documents, OWNER shall issue all communications to CONTRACTOR through PROJECT ENGINEER.

6.04 Clarifications and Interpretations

- A. Requests for clarification from the CONTRACTOR shall be directed to the PROJECT ENGINEER. The PROJECT ENGINEER, in coordination with the DESIGN ENGINEER (as the PROJECT ENGINEER deems necessary) will review the request for clarification and issue written clarifications or interpretations as necessary, which shall be consistent with the intent of and reasonably inferable from the Contract Documents. Any written clarifications and interpretations shall be binding on OWNER and CONTRACTOR. If OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Time, or both, that should be allowed as a result of a written clarification or interpretation; a Claim may be made as provided in Part 8.

6.05 Replacement of DESIGN ENGINEER

- A. In case of termination of the employment of DESIGN ENGINEER, OWNER shall appoint an engineer whose status under the Contract Documents shall be that of the former DESIGN ENGINEER.

6.06 Furnish Data

- A. OWNER shall furnish the data required of OWNER in accordance with the Contract Documents.

6.07 Decisions on Requirements of Contract Documents and Acceptability of Work

- A. If PROJECT COORDINATOR and CONTRACTOR cannot agree to the acceptability of the Work or the interpretation of the requirements of the Contract Documents pertaining to the performance and furnishing of the Work, the matter will be referred to PROJECT ENGINEER for final decision. Written notice (to include supporting documentation) of each such claim, dispute, or other matter shall be delivered by the CONTRACTOR to the PROJECT ENGINEER no later than thirty (30) days calendar days after the start of the occurrence. Failure to file a claim within the allowed time frame shall waive the CONTRACTOR's ability to make future claims for that particular instance.

PROJECT ENGINEER will render a formal decision in writing within thirty (30) calendar days after receipt of the CONTRACTOR's submittal, in accordance with Contract Documents.

- B. The rendering of a decision by PROJECT ENGINEER with respect to any claim, dispute, or other matter (except any which have been waived by the making or acceptance of final payment as provided in Part 12) shall be a condition precedent to any exercise by OWNER or CONTRACTOR of such rights or remedies as either may otherwise have under the Contract Documents or by Laws and Regulations in respect to any such claim, dispute, or other matter.

6.08 Rejecting Defective Work

- A. PROJECT ENGINEER shall have authority to reject Work that is not in accordance with the Contract Documents. PROJECT ENGINEER shall also have authority to require special inspection or testing as provided in Part 11, whether or not the Work is fabricated, installed, or completed.

6.09 Determinations for Unit Price Work

- A. PROJECT COORDINATOR shall determine the actual quantities and classifications of Work performed. PROJECT COORDINATOR shall review with CONTRACTOR the actual quantities and classifications for payment prior to CONTRACTOR submitting an Application for Payment.

6.10 Pay When Due

- A. OWNER shall make payments to CONTRACTOR in accordance with these Contract Documents.

6.11 Limitations on Owner's Responsibilities

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

6.12 Limitations on PROJECT ENGINEER and PROJECT COORDINATOR Responsibilities

- A. PROJECT ENGINEER and PROJECT COORDINATOR shall not be responsible for the acts or omissions of CONTRACTOR or of any Sub-contractor, any Supplier, or of any other individual or entity performing any of the Work.
- B. PROJECT ENGINEER and PROJECT COORDINATOR shall not supervise, direct, control, or have authority over or be responsible for CONTRACTOR's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws and Regulations applicable to the performance of the Work. PROJECT ENGINEER and PROJECT COORDINATOR shall not be responsible for CONTRACTOR's failure to perform the Work in accordance with the Contract Documents.
- C. The limitations upon authority and responsibility set forth in this paragraph shall also apply to OWNER's Consultants, Agents, Officers, and Employees.

6.13 Non Compliance Notices

- A. Failure to comply with any terms of this Contract shall result in the issuance of a Non-Compliance Notice (NCN). This notice shall be issued by the PROJECT ENGINEER and will outline the violation of the Contract. In the notice, a timeframe for resolution will be established. If the issue is not resolved and a written response is not received within the given timeframe, pay applications shall, at the PROJECT ENGINEER's discretion, not be processed.
- B. After two (2) NCN's have been issued for the same violation, the project may be shut down until the issue is resolved to the OWNER's satisfaction. If Work is stopped due to a Contract violation, no consideration will be given for an extension of Contract Time. The issuance of any NCN may influence the OWNER's decision to award the CONTRACTOR future work.

PART 7. DESIGN ENGINEER'S STATUS DURING CONSTRUCTION

7.01 Limitations on DESIGN ENGINEER's Authority and Responsibilities

- A. Except for the negligence of DESIGN ENGINEER, its agents, officers, and employees neither DESIGN ENGINEER's authority or responsibility under the provisions of the Contract Documents nor any decision made by DESIGN ENGINEER in good faith either to exercise or not exercise such authority or responsibility or the undertaking, or performance of any authority or responsibility by DESIGN ENGINEER shall create, impose, or give rise to any duty in Contract, tort, or otherwise owed by DESIGN ENGINEER to CONTRACTOR, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

7.02 Visits to Site

- A. DESIGN ENGINEER will make visits to the Site at intervals appropriate to the various stages of construction, as DESIGN ENGINEER deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of CONTRACTOR's executed Work. DESIGN ENGINEER will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. DESIGN ENGINEER efforts will be directed toward providing for OWNER a greater degree of confidence that the completed Work will conform generally to the Contract Documents.
- B. DESIGN ENGINEER shall not supervise, direct, control, or have authority over or be responsible for CONTRACTOR's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incidental thereto, or for any failure of CONTRACTOR to comply with Laws and Regulations applicable to the performance of the Work.

PART 8. CHANGES IN THE WORK; CLAIMS

8.01 Authorized Changes in the Work

- A. Without invalidating the Contract and without notice to any surety, OWNER may, at any time order additions, deletions, or revisions in the Work by a Change Order or a Work Change Directive. Upon

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receipt of the notification from PROJECT ENGINEER, CONTRACTOR shall proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).

- B. At any time PROJECT ENGINEER may request CONTRACTOR to submit a proposal for a proposed change in the Work. Within ten (10) business days after receipt of a Request for Proposal, CONTRACTOR shall submit, to PROJECT ENGINEER, a written detailed proposal for the change. The detailed proposal shall include an itemized estimate of all costs that will result directly or indirectly from the proposed change and include an assessment of the impact on the overall project schedule. Unless otherwise directed, itemized estimates shall be in accordance with Part 9. Proposals shall be of sufficient detail to permit an analysis by PROJECT ENGINEER of all material, labor, equipment, subcontracts, overhead costs, and fees. The proposal shall cover all Work involved in the change, whether such Work was deleted, added, changed, or impacted. Each cost category shall be supported with substantiating documentation which may include, but is not limited to, quantity takeoffs, quotations, invoices, cost records, certified payrolls and identification of estimating guidelines and resources. The subcontract portions of each proposal shall be similarly supported. Itemized schedule adjustments shall be in sufficient detail to permit an analysis of impact. If OWNER elects to proceed with the change covered by the Request for Proposal, such change will be authorized by execution of proper documentation in accordance with this Part 8. Notwithstanding the Request for Proposal, CONTRACTOR shall continue to perform the Work and maintain the progress schedule. PROJECT ENGINEER and OWNER shall have twenty (20) business days after receipt of the detailed proposal to respond in writing. Delays in the submittal of the written and detailed proposal will be considered non-prejudicial.
- C. The adjustment in Contract Price and/or Contract Time stated in a Change Order shall comprise the total price and/or time adjustment due or owed CONTRACTOR for the Work or changes defined in the Change Order. Signing of the Change Order constitutes full and mutual accord by OWNER and CONTRACTOR for the adjustment in the Contract Price and/or Time as a result of increases or decreases in costs and time of performance caused directly and indirectly by the change. By approving the Change Order the CONTRACTOR waives all rights to claim further adjustments related to the Change Order.
- D. CONTRACTOR is obligated, in the performance of changes in the Work, to mitigate all cost and time related to any changes and shall identify in writing, when requested by OWNER, the actions taken in that regard.
- E. In the event that OWNER and CONTRACTOR are unable to agree as to the cost and time to perform the change (deletions or additions) in the Work, OWNER and PROJECT ENGINEER may make a unilateral determination of the reasonable cost and time to perform the change in the Work, based upon their own estimates, CONTRACTOR's submission, or a combination thereof, and issue a unilateral Change Order for the amounts of cost and time so determined, which shall become binding upon CONTRACTOR. The unilateral Change Order shall enable OWNER to make payments for Work performed thereunder, and CONTRACTOR shall be paid for work completed, based on costs determined by OWNER. CONTRACTOR may appeal the unilateral Change Order within fifteen (15) business days of receipt, as provided in Part 14. Failure of the parties to reach an agreement regarding the cost and time of performing the change in the Work shall not relieve CONTRACTOR from performing the change in the Work.
- F. Should unforeseen circumstances arise which, in the opinion of the PROJECT ENGINEER, require work to be done upon which no price can be agreed, the PROJECT ENGINEER may require that the work be accomplished under negotiated contract with another contractor or with the OWNER's own forces, or on a force account basis as follows:

1. All Costs shall be in accordance with Part 9.
2. All activities shall be documented daily (time, material tickets, invoices, etc.) by the PROJECT COORDINATOR, agreed upon with the CONTRACTOR, and submitted to the PROJECT ENGINEER.
3. No claims for force account work will be accepted where the PROJECT ENGINEER had not specifically directed the CONTRACTOR.
4. Skilled and common labor shall be paid for in accordance with the approved "Labor & Equipment Rates" submittal. Labor classifications shall be approved by the PROJECT ENGINEER prior to beginning force account work.
5. Materials and supplies used are to be listed on invoices. Copies of invoices which show all the materials, quantities, costs, etc. utilized in the force account work shall be submitted to the PROJECT COORDINATOR within two (2) business days of the date of the activity.
6. Equipment shall be paid for in accordance with the approved "Labor & Equipment Rates" submittal. Equipment shall be approved by the PROJECT ENGINEER prior to beginning force account work.
7. The PROJECT ENGINEER shall determine the total cost of the force account work, including 15% overhead and profit.
8. Force account work shall be authorized by the PROJECT ENGINEER in writing.

8.02 Unauthorized Changes in the Work

- A. CONTRACTOR shall not be entitled to an increase in the Contract Price or an extension of the Contract Time with respect to any work performed that is not required by the Contract Documents as amended, modified, or supplemented as provided in Part 2, except in the case of an emergency as provided in Part 4 or in the case of uncovering Work as provided in Part 11.
- B. Work performed without staking and/or approved cut sheets, and/or work performed beyond the Project limits shall be considered as unauthorized and at the expense of the CONTRACTOR. Any unauthorized work may be ordered removed and/or replaced by the PROJECT ENGINEER at the CONTRACTOR's sole expense.

8.03 Execution of Change Orders

- A. OWNER and CONTRACTOR shall execute Change Orders as recommended by PROJECT ENGINEER authorizing:
 1. Changes in the Work, including but not limited to: changes requested by OWNER, changes required due to acceptance of defective work as outlined in Part 11, OWNER's correction of defective work as outlined in Part 11, and changes requested by CONTRACTOR and approved by PROJECT ENGINEER;
 2. Changes in the Contract Price and/or Contract Time which are agreed to by the Parties, including any undisputed costs and/or time for Work actually performed in accordance with a Work Change Directive, and;

3. Changes in the Contract Price and/or Contract Time incorporating the written decision of the PROJECT ENGINEER resolving any claims or disputes. CONTRACTOR reserves the right to delay signing the Change Order while appealing the PROJECT ENGINEER's written decision regarding the claim or dispute. However, CONTRACTOR shall continue to perform the Work and adhere to the project schedule, as provided in Part 4.

8.04 Notification to Surety

- A. If notice of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Time) is required by the provisions of any Bond to be given to a surety, the giving of any such notice will be OWNER's responsibility. The amount of each applicable Bond will be adjusted to reflect the effect of any such change. OWNER shall simultaneously provide CONTRACTOR with a copy of such notice. Surety shall furnish OWNER proof of such adjustment.

8.05 Claims and Disputes

- A. Written notice stating the general nature of each Claim, dispute, or other matter shall be delivered by the CONTRACTOR to PROJECT ENGINEER no later than thirty (30) calendar days after the start of the event. CONTRACTOR shall provide PROJECT ENGINEER with supporting data within sixty (60) calendar days after the start of the event (unless the PROJECT ENGINEER allows additional time for submittal of additional or more accurate data). A Claim for an adjustment in Contract Price and/or Contract Time shall be prepared in accordance with the provisions of Part 10. Each Claim shall be accompanied by a written statement that the adjustment claimed is the entire adjustment to which the CONTRACTOR believes it is entitled.
- B. PROJECT ENGINEER will render a formal decision in writing within thirty (30) calendar days after receipt of the last submittal of the CONTRACTOR unless additional time is required. PROJECT ENGINEER's written decision on such Claim, dispute, or other matter will be final and binding upon OWNER and CONTRACTOR unless:
 1. The CONTRACTOR submits a written appeal within 15 calendar days of receipt of PROJECT ENGINEER's written decision. Upon receipt of the written appeal, PROJECT ENGINEER shall coordinate discussions between OWNER, CONTRACTOR, and PROJECT ENGINEER in an attempt to reach resolution. Failure to reach resolution will result in the claim being settled in accordance with the dispute resolution procedures set forth in the Agreement; or
 2. If PROJECT ENGINEER does not issue a formal decision in writing within 30 calendar days a decision denying the Claim in its entirety shall be deemed to have been issued.
- C. No Claim for an adjustment in the Contract Price or Contract Time shall be valid if not submitted in accordance with this section.

PART 9. COST OF THE WORK; CASH ALLOWANCES; UNIT PRICE WORK**9.01 Cost of the Work**

- A. The term “Cost of the Work” means the sum of all costs necessarily incurred and paid by CONTRACTOR in the proper performance of the Work. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to CONTRACTOR shall be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by PROJECT ENGINEER, such costs shall be in amounts no higher than those prevailing in the locality of the Project, and shall include only the following items:
1. Payroll costs for employees in the direct employ of CONTRACTOR in the performance of the Work under schedules of job classifications agreed upon by PROJECT ENGINEER and CONTRACTOR. Such employees include without limitation superintendents, foremen, and other personnel employed full time at the Site. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers’ compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by PROJECT ENGINEER.
 2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers’ field services required in connection therewith. All cash discounts shall accrue to CONTRACTOR unless OWNER deposits funds with CONTRACTOR with which to make payments, in which case the cash discounts shall accrue to OWNER. Should the OWNER deposit funds with the CONTRACTOR, the CONTRACTOR shall provide copies of invoices for rental equipment and agreements. Further, all trade discounts, rebates, refunds, and returns from sale of surplus materials and equipment shall accrue to OWNER, and CONTRACTOR shall make provisions so that they may be obtained.
 3. Payments made by CONTRACTOR to Subcontractors for Work performed. If required by OWNER, CONTRACTOR shall obtain competitive bids from subcontractors acceptable to OWNER and CONTRACTOR and shall deliver such bids to OWNER, who will then determine, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor’s Cost of the Work and fee shall be determined in the same manner as CONTRACTOR’s Cost of the Work and fee as provided in this paragraph.
 4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.

5. Supplemental costs including the following:
- a. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remains the property of CONTRACTOR.
 - b. Rentals of all construction equipment and machinery, and the parts thereof whether rented from CONTRACTOR or others in accordance with the rental agreements and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.
 - c. Sales, consumer, use, and other similar taxes related to the Work, and for which CONTRACTOR is liable, imposed by Laws and Regulations.
 - d. Deposits lost for causes other than negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
 - e. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by CONTRACTOR in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with the Contract Documents), provided such losses and damages have resulted from causes other than the negligence of CONTRACTOR, any subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of OWNER. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining CONTRACTOR's fee.
 - f. The cost of utilities, fuel, and sanitary facilities at the Site.
 - g. The cost of premiums for all Bonds and insurance CONTRACTOR is required by the Contract Documents to purchase and maintain.

B. The term "Cost of the Work" shall not include any of the following items:

1. Payroll costs and other compensation of CONTRACTOR's officers, executives, principals (of partnerships and sole proprietorships), general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by CONTRACTOR, whether at the Site or in CONTRACTOR's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications, all of which are to be considered administrative costs.
2. The proportion of necessary transportation, travel, and subsistence expenses of CONTRACTOR's employees incurred in discharge of duties connected with the Work.

3. Expenses of CONTRACTOR's principal and branch offices other than CONTRACTOR's office at the Site.
 4. Any part of CONTRACTOR's capital expenses, including interest on CONTRACTOR's capital employed for the Work and charges against CONTRACTOR for delinquent payments.
 5. Costs due to the negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
 6. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly in this Part.
 7. Extended office overhead (except office and temporary facilities at the site) or lost profit associated with delays of any type. Minor expenses such as long distance telephone calls, telephone service at the Site, expressage, and similar petty cash items in connection with the Work. Such costs are considered to be administrative costs covered by CONTRACTOR's fee.
 8. Any and all costs, which arise from any suspension, delay, or interruption to a Work activity or the Work as a whole, to the extent that performance would have been so suspended, delayed, or interrupted for reasons beyond the control and without the fault or negligence of OWNER. Examples of such situations include, but are not limited to, instances where compensable delays occur concurrently with either excusable or inexcusable delays and instances where such combinations of delays, even when not concurrent, individually give rise to similar impacts on the completion of the Work.
- C. When all the Work is performed on the basis of cost-plus, CONTRACTOR's fee shall be determined as set forth in the Contract Documents. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, CONTRACTOR's fee shall be determined as set forth in Part 10.

9.02 Cash Allowances

- A. It is understood that CONTRACTOR has included in the Contract Price all allowances described in the Contract Documents and shall cause the Work covered to be performed for such sums as may be acceptable to OWNER. CONTRACTOR agrees that:
1. The allowances include the cost to CONTRACTOR (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and
 2. CONTRACTOR's costs for unloading and handling on the Site, labor, installation costs, overhead, profit, and other expenses contemplated for the allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.
- B. Prior to final payment, an appropriate Change Order will be issued as recommended by PROJECT ENGINEER to reflect actual amounts due CONTRACTOR on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

9.03 Unit Price Work

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Bid Form. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by CONTRACTOR shall be made by PROJECT ENGINEER subject to the provisions of Part 6.
- B. Each unit price shall include an amount to cover the CONTRACTOR's overhead and profit for each separately identified item.
- C. All unit prices submitted with the CONTRACTOR's bid proposal shall be held firm against any increase for the duration of Contract.
- D. OWNER or CONTRACTOR may make a Claim for an adjustment in the Contract Price in accordance with Part 8:
 - 1. The quantity of any item of Unit Price Work performed by CONTRACTOR differs materially and significantly plus or minus fifty (50) percent from the estimated quantity of such item indicated in the Bid Form; and
 - 2. There is no corresponding adjustment with respect any other item of Work; and
 - 3. If CONTRACTOR believes that CONTRACTOR is entitled to an increase in Contract Price as a result of having incurred additional expense or OWNER believes that OWNER is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

PART 10. CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES

10.01 Change of Contract Price

- A. The Contract Price may only be change by a Change Order. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price shall be determined as follows:
 - 1. Where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of Part 9); or
 - 2. Where the Work involved is not covered by unit prices contained in the Contract Documents, by mutually agreed unit prices or lump sum (which may include an allowance for overhead and profit); or

3. Where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a unit price or lump sum is not reached, on the basis of the Cost of the Work (subject to provisions of Part 9) plus a CONTRACTOR's fee for overhead and profit.
 - A. CONTRACTOR shall establish and maintain records in accordance with generally accepted accounting practices and submit in a form acceptable to OWNER an itemized cost breakdown together with supporting data. OWNER may audit CONTRACTOR's records related to such costs during normal business hours.
 - B. The CONTRACTOR's total fee for overhead and profit shall not exceed 15% of the value of the additional work.
 - C. No increase in Contract Price shall be granted for Inexcusable Delays, unless otherwise agreed to by OWNER.

10.02 Change of Contract Time

- A. The Contract Time may only be changed by a Change Order. Any adjustment in the Contract Time shall be based on the following:
 1. Additional Work requested by OWNER,
 2. Work deleted from Contract by OWNER,
 3. Excusable delay, as approved by the Project Engineer, or
 4. Approved written request submitted by CONTRACTOR.
- B. Excusable Delays in the completion of the entire Work or specified part thereof shall not give rise to default under the Contract by either party. Any such delays shall not entitle CONTRACTOR to any additional compensation. The sole remedy of CONTRACTOR shall be an extension of Contract Time pursuant to this Part 10.
- C. No extensions of Contract Time shall be granted for Inexcusable Delays, unless otherwise agreed to by OWNER.
- D. Except as otherwise provided herein CONTRACTOR shall not be entitled to recover damages due to delays of any type.
- E. In presenting justification for any adjustment of Contract Time, CONTRACTOR shall not rely on their initial sequencing of the Work but shall rely on the updated schedule resulting from the delay or change in Work. The PROJECT ENGINEER may request the CONTRACTOR submit an updated schedule prior to approval of the request. The schedule shall be submitted in accordance with Section 01310 of these Contract Documents. CONTRACTOR shall demonstrate a reasonable effort to reschedule any Work which is delayed by changes or unforeseeable conditions so as to minimize any additional time and cost to OWNER.

10.03 Delays Beyond Contractor's Control

- A. Where CONTRACTOR is prevented from completing any part of the Work within the Contract Time due to delay beyond the control of CONTRACTOR, the Contract Time will be extended in an amount equal to the time lost due to such delay if a Claim is made in accordance with Part 8. Delays beyond the control of CONTRACTOR shall include, but not be limited to, acts of neglect by OWNER, acts of neglect of utility owners or other contractors performing other work, fires, floods, epidemics, weather delays, or acts of God.

10.04 Delays Within Contractor's Control

- A. The Contract Time will not be extended due to delays within the control of CONTRACTOR. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of CONTRACTOR. Should the CONTRACTOR choose to relocate to an alternate area within the project to continue the Work, it shall be deemed as a delay within the CONTRACTOR's control and shall be at no cost to the OWNER.

10.05 Delays Beyond Owner's and Contractor's Control

- A. Where CONTRACTOR is prevented from completing any part of the Work within the Contract Time due to delay beyond the control of both OWNER and CONTRACTOR, an extension of the Contract Time in an amount equal to the time lost due to such delay shall be CONTRACTOR's sole remedy for such delay.

10.06 Delay Damages

- A. In no event shall OWNER be liable to CONTRACTOR, any Subcontractor, any Supplier, or any other person or organization, or to any surety for or employee or agent of any of them, for damages arising out of or resulting from:
1. Delays caused by or within the control of CONTRACTOR; or
 2. Delays beyond the control of both OWNER and CONTRACTOR.
- B. Nothing in this section bars a change in Contract Price pursuant to this Part 10 to compensate CONTRACTOR due to delay, interference, or disruption directly attributable to actions or inactions of OWNER or anyone for whom OWNER is responsible.

10.07 Computation of Time

- A. Extensions to the Contract Time shall be granted in calendar days. If at the end of the project the final completion date falls on a non-work day, the PROJECT ENGINEER may, at their sole discretion, grant additional time so that the final completion date is a work day.

PART 11. TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

11.01 Notice of Defects

- A. Notice of all defects shall be given to CONTRACTOR upon discovery. All defective Work may be rejected, corrected, or accepted as provided in this Part 11.

11.02 Access to Work

- A. OWNER, DESIGN ENGINEER, DESIGN ENGINEER's Consultants, other representatives and personnel of OWNER, independent testing laboratories, and governmental agencies with jurisdictional interests shall have access to the Site and the Work for their observation, inspecting, and testing. CONTRACTOR shall provide proper and safe conditions for access and advise them of CONTRACTOR's Site safety procedures and programs so that they may comply.

11.03 Uncovering Work

- A. If any Work requiring inspection is covered prior to OWNER's approval, it shall be uncovered for OWNER's inspection at CONTRACTOR's expense, unless otherwise authorized by OWNER.
- B. If PROJECT ENGINEER considers it necessary that covered Work be inspected or tested, CONTRACTOR, at PROJECT ENGINEER's request, shall uncover or otherwise make available for inspection or testing that portion of the Work in question. The CONTRACTOR shall furnish all necessary labor, material, and equipment. If it is found that such Work is defective, CONTRACTOR shall pay all Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and OWNER may be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, OWNER may make a Claim as provided in Part 8. If such Work is not found to be defective, CONTRACTOR may be allowed an increase in the Contract Price or an extension of the Contract Time or both, directly attributable to such uncovering, exposure, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, CONTRACTOR may make a Claim therefore as provided in Part 8.

11.04 Owner May Stop the Work

- A. If the Work is defective, or if CONTRACTOR's operations endanger or cause unapproved disruptions to the general public or facility, or CONTRACTOR fails to supply sufficient skilled workers or suitable materials or equipment, or fails to furnish or perform the Work in such a way that the completed Work will conform to the Contract Documents, OWNER may order CONTRACTOR to stop the Work or any portion thereof, until the cause for such order is eliminated, and CONTRACTOR shall have no basis for making a claim thereof; however, this right

of OWNER to stop the work shall not give rise to any duty on the part of OWNER to exercise this right for the benefit of CONTRACTOR or any other party.

11.05 Temporary Suspension of Work

- A. The PROJECT ENGINEER shall have the authority to suspend the work, wholly or in part, for such period or periods as deemed necessary, due to conditions as are considered unfavorable for the proper continuation of the Work. If it should become necessary to stop all work for an indefinite period, the CONTRACTOR shall store all materials in such manner that they will not deteriorate or become damaged in any way, and he shall take every precaution to prevent damage or deterioration of the Work performed, provide suitable drainage by opening ditches, shoulder drains, etc., and erect structures where necessary. The CONTRACTOR shall not suspend work without authority. Neither the failure of the PROJECT ENGINEER to notify the CONTRACTOR to suspend work on account of unfavorable conditions nor permission by the PROJECT ENGINEER to continue work during unfavorable conditions shall be a cause for the acceptance of any work which does not comply in every respect with these Contract Documents.

11.06 Correction or Removal of Defective Work

- A. CONTRACTOR shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by PROJECT ENGINEER, remove it from the Project and replace it with Work that is not defective. CONTRACTOR shall pay all Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others).

11.07 Correction Period

- A. All work completed under these Contract Documents shall be guaranteed by the CONTRACTOR for a period of one (1) year from the date of final completion. During that period, all defects discovered in the work (to include land or other areas made available to the CONTRACTOR), as determined by the OWNER, shall be removed and replaced by the CONTRACTOR at no cost to the OWNER. All work shall be done in accordance with OWNER's standards. The OWNER may conduct an independent inspection, at their sole expense, of the completed work prior to the completion of the one (1) year warranty period.

Should the OWNER's inspection determine that the work is not in accordance with these Contract Documents; the CONTRACTOR shall mobilize and make all necessary repairs at no expense to the OWNER. The CONTRACTOR will receive written notification from the OWNER, and be allowed the chance to review any available inspection pictures or other documentation. The CONTRACTOR shall respond to the OWNER with a plan of action within 30 calendar days of receiving notification. The CONTRACTOR shall mobilize and begin to complete the work within 60 calendar days of receiving notification. The CONTRACTOR shall:

1. Repair such defective land or areas.

2. Correct such defective Work or, if the defective Work has been rejected by the PROJECT ENGINEER, remove it from the project and replace it with Work that is not defective.
3. Satisfactorily correct, repair, remove, or replace any damage to other Work, damage to the work of others, and damage to other land or areas.

If the CONTRACTOR does not promptly comply with the terms of such instructions, or in an emergency where delay would cause serious risk of loss or damage, the OWNER reserves the right to contract with another party to complete the warranty work, at the sole expense of the CONTRACTOR. All claims, costs, losses, and damages (including but not limited to all fees and charges or design professionals, attorneys, and other professionals and all court, arbitration or other dispute resolution costs arising out of or relating to such correction or repair or such removal and replacement of work of others) shall be paid by the CONTRACTOR.

The warranty period stated is specifically for the work installed by the CONTRACTOR. Any collateral damage discovered during the warranty period will be investigated and the CONTRACTOR will be required to respond if the damage is determined to have occurred during the construction process.

- B. In special circumstances where a portion of the Work is placed in service before Final Completion of all the Work, the correction period for that portion may start from an earlier date if so provided in the Contract Documents or by written authorization from the Project Engineer.
- C. Where defective Work including restoration (and damage to other Work resulting therefrom) has been corrected, the correction period with respect to such Work shall be extended for an additional period of one year after such correction has been satisfactorily completed.
- D. CONTRACTOR's obligations under this Part 11 are in addition to any other obligation or warranty. The provisions of this Part 11 shall not be construed as a substitute for, a waiver of, the provisions of any applicable statute of limitation or repose.

11.08 Acceptance of Defective Work

- A. If, instead of requiring correction of defective Work to include restoration, OWNER may elect to accept the work. CONTRACTOR shall pay all Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) attributable to OWNER's evaluation of and determination to accept such defective Work (such costs to be approved by PROJECT ENGINEER) and the diminished value of the Work to the extent not otherwise paid by CONTRACTOR pursuant to this sentence. If any such acceptance occurs prior to final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and OWNER may be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work so accepted. If the parties are unable to agree as to the amount thereof, OWNER may make a Claim therefore as provided in Part 8. If the acceptance occurs after final payment, an appropriate amount will be paid by CONTRACTOR to OWNER.

11.09 Owner May Correct Defective Work

- A. If CONTRACTOR fails to correct defective Work or to remove and replace rejected Work as required by PROJECT ENGINEER in accordance with Part 11. A within the time frame provided in the written notification, or if CONTRACTOR fails to perform the Work in accordance with the Contract Documents, or if CONTRACTOR fails to comply with any other provision of the Contract Documents, OWNER may, after seven (7) calendar days written notice to CONTRACTOR, correct and remedy any such deficiency.
- B. In connection with such corrective and remedial action, the OWNER may exclude CONTRACTOR from all or part of the Site, take possession of all or part of the Work and suspend CONTRACTOR's services related thereto, and incorporate in the Work all materials and equipment for which OWNER has paid CONTRACTOR. CONTRACTOR shall allow OWNER's agents and employees, OWNER's other contractors, and DESIGN ENGINEER access to the Site to enable OWNER to exercise the rights and remedies under this Part 11.
- C. All Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred or sustained by OWNER in exercising the rights and remedies under this Part 11 shall be charged against CONTRACTOR, and a Change Order shall be issued incorporating the necessary revisions in the Contract Documents with respect to the Work. The OWNER shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, OWNER may make a Claim therefore as provided in Part 8. Such claims, costs, losses and damages shall include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of CONTRACTOR's defective Work.
- D. CONTRACTOR shall not be allowed an extension of the Contract Time because of any delay in the performance of the Work attributable to the exercise by OWNER of OWNER's rights and remedies under this Part 11.

PART 12. PAYMENTS TO CONTRACTOR AND COMPLETION**12.01 Progress Payments**

- A. Applications for Payments
 - 1. The CONTRACTOR shall verify and coordinate monthly quantities with the PROJECT COORDINATOR. Quantities shall be based on the work completed as of the last Friday of the month (or the previous business day, should that Friday be a legal Holiday).
 - 2. The CONTRACTOR shall prepare and submit a completed pay application to the PROJECT ENGINEER, including the following documentation:
 - a) Completed sales tax certificate, documenting the sales tax paid and the County paid, for all materials consumed or to be consumed as part of the Work,
 - b) Affidavit E as required by the Disadvantaged Business Enterprise program, and

- c) Copies of all invoices of materials claimed on the sales tax certificate.

The CONTRACTOR shall furnish three (3) copies of the pay application and all supporting documentation.

3. There shall be no payment for stored materials.

B. Sales Tax - The following procedure shall be followed relative to the North Carolina Sales Tax applicable to this Project. CONTRACTOR shall comply fully with the requirements outlined hereinafter, in order that the OWNER may recover the amount of the tax permitted under the law.

1. It shall be the CONTRACTOR's responsibility to furnish the OWNER documentary evidence showing the material used, sales tax paid, and County paid (County of sale) by the CONTRACTOR and each of his Subcontractors. Such evidence shall be transmitted with each pay estimate.
2. The documentary evidence shall consist of a certified statement by the CONTRACTOR and each of his Subcontractors individually showing total purchases of materials from each separate vendor and total sales taxes paid each vendor. The CONTRACTOR shall submit a certified statement with each pay request, for sales taxes paid during that pay request period. A certified form is required even if no sales tax was paid for pay request period.
3. Materials used from CONTRACTOR or Subcontractor's warehouse stock shall be shown in a certified statement at warehouse stock prices and amount of County of Use Tax paid.
4. The CONTRACTOR shall not be required to certify the Subcontractor's statements but must obtain the Subcontractor's certification.
5. CONTRACTOR shall furnish to OWNER invoices or copies of invoices for all materials purchased for said work within pay request period, and such invoices shall state the amount of North Carolina Sales Tax paid for materials, etc.
6. CONTRACTOR shall not include any tax paid on supplies, tools, and equipment, which they use to perform their contracts and should include only those building materials, supplies, fixtures, and equipment which actually become a part of the Work.

C. Review of Applications

1. PROJECT ENGINEER will, within ten (10) business days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to OWNER or return the Application to CONTRACTOR indicating in writing PROJECT ENGINEER's reasons for refusing to recommend payment. In the latter case, CONTRACTOR shall make the necessary corrections and resubmit the Application.
2. PROJECT ENGINEER's recommendation of any payment requested in an Application for Payment will constitute a representation by PROJECT ENGINEER to OWNER, that to the best of PROJECT ENGINEER's knowledge, information and belief:
 - a. The Work has progressed to the point indicated;

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- b. The quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Final Completion, to the results of any subsequent tests called for in the Contract Documents, to a final determination of quantities and classifications for Unit Price Work under Part 7, and to any other qualifications stated in the recommendation); and
 - c. The conditions precedent to CONTRACTOR being entitled to such payment appears to have been fulfilled.
3. By recommending any such payment PROJECT ENGINEER shall not be deemed to have represented that:
 - a. Inspections made to check the quality and/or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to PROJECT ENGINEER in the Contract Documents; or
 - b. There may not be other matters or issues between the parties that might entitle CONTRACTOR to be paid additionally by OWNER or entitle OWNER to withhold payment to CONTRACTOR.
4. Neither PROJECT ENGINEER's review of CONTRACTOR's Work for the purposes of recommending payments, nor PROJECT ENGINEER's recommendation of any payment, including final payment, will impose responsibility on PROJECT ENGINEER to supervise, direct, or control the Work or for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for CONTRACTOR's failure to comply with Laws and Regulations applicable to CONTRACTOR's performance of the Work. Additionally, said review or recommendation will not impose responsibility on PROJECT ENGINEER to make any examination to ascertain how or for what purposes CONTRACTOR has used the moneys paid on account of the Contract Price, or to determine that title to any of the Work, materials, or equipment has passed to OWNER free and clear of any liens.
5. PROJECT ENGINEER may refuse to recommend the whole or any part of any payment if, in PROJECT ENGINEER's opinion, it would be incorrect to make the representations to OWNER referred to in Part 12. PROJECT ENGINEER may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in PROJECT ENGINEER's opinion to protect OWNER from loss because:
 - a. The Work is defective, or completed Work has been damaged, requiring correction or replacement;
 - b. The Contract Price has been reduced by Change Orders;
 - c. OWNER has been required to correct defective Work or complete Work in accordance with Part 11;
 - d. Any reason(s) set forth in Section 5 of the Construction Agreement; or
 - e. PROJECT ENGINEER has actual knowledge of the occurrence of any of the events enumerated in Part 13.

D. Payment Becomes Due

1. Ten (10) business days after presentation of the Application for Payment to OWNER with PROJECT ENGINEER's recommendation, the amount recommended will (subject to the provisions of this paragraph) become due, and when due will be paid by OWNER to CONTRACTOR.

E. Reduction in Payment

1. OWNER may refuse to make payment of the full amount recommended by the PROJECT ENGINEER because:
 - a. Liens have been filed in connection with the Work, except where CONTRACTOR has delivered a specific Bond satisfactory to OWNER to secure the satisfaction and discharge of such liens;
 - b. There are other items entitling OWNER to a reduction of the amount recommended; or
 - c. OWNER has actual knowledge of the occurrence of any of the events outlined in Part 13.
2. If OWNER refuses to make payment of the full amount recommended by PROJECT ENGINEER, OWNER must give CONTRACTOR written notice stating the reasons for such action and pay CONTRACTOR any amount remaining after deduction of the amount so withheld. OWNER shall promptly pay CONTRACTOR the amount so withheld, or any adjustment thereto agreed to by OWNER and CONTRACTOR, upon satisfactory resolution of the issue.

12.02 Contractor's Warranty of Title

- A. CONTRACTOR warrants and guarantees that title to all Work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to OWNER no later than the time of payment free and clear of all liens.

12.03 Partial Utilization

- A. Use by OWNER of any completed part of the Work which has specifically been identified in the Contract Documents or as authorized in writing by Project Engineer, and is a separately functioning and usable part of the Work that can be used by OWNER for its intended purpose without significant interference with CONTRACTOR's performance of the remainder of the Work, may be accomplished prior to Final Completion of all the Work subject to the following conditions;
 1. OWNER and CONTRACTOR shall make an inspection of that part of the Work to determine its status of completion. If PROJECT ENGINEER does not consider that part of the Work to be complete, PROJECT ENGINEER will notify CONTRACTOR in writing. If PROJECT ENGINEER considers that part of the Work to be complete, the PROJECT ENGINEER will notify the CONTRACTOR in writing that the OWNER will begin partial utilization of that Work.
 2. The CONTRACTOR remains responsible for completing or fulfilling all contractual obligations remaining to the Work being utilized.

3. No occupancy or separate operation of part of the Work will be accomplished prior to CONTRACTOR's compliance with the requirements of these Contract Documents pertaining to insurance.

12.04 Final Completion

- A. Completed work is pipe that has been installed, tested, inspected, disinfected, backfilled, paved, all above ground restoration has been performed, and CONTRACTOR has completed all the Work in an acceptable manner in accordance with the terms of the Contract. ***All work outlined in these Contract Documents shall be completed, prior to the Contractor requesting an inspection by the Project Coordinator.***
- B. When the PROJECT COORDINATOR deems the project complete and ready for final inspection, the PROJECT COORDINATOR shall notify the PROJECT ENGINEER. The PROJECT ENGINEER shall schedule a final inspection between the OWNER and CONTRACTOR. During the final inspection any items documented shall be compiled in a final punch list and provided to the CONTRACTOR within five (5) business days. The Contractor shall be required to complete each item in the final inspection punch list within 30 calendar days of receipt. Failure to complete the punch list in that time may result in liquidated damages being assessed. The project will not be considered complete until all punch list items are completed and accepted, unless otherwise determined by the PROJECT ENGINEER. All punch list items shall be completed prior to release of final payment. Once PROJECT ENGINEER considers the Work to be complete a written notice of acceptance will be issued.

12.05 Warranty Period

- A. The warranty period will cover a corrections period of one full year after the Final Completion date. The CONTRACTOR shall submit a warranty agreement form which guarantees to the PROJECT ENGINEER/OWNER that all work has been completed in accordance with the Contract Documents and will not be defective. The CONTRACTOR shall address all defective work in accordance with Part 11.
- B. Neither the final certificate of completion, final payment, acceptance of the premises by the OWNER, nor any provisions of the Contract, nor any other act or instrument of the OWNER or PROJECT ENGINEER shall relieve the CONTRACTOR from responsibility for negligence, or faulty materials, or workmanship, or failure to comply with these Contract Documents.

12.06 Final Payment

- A. Application for Final Payment
 1. After CONTRACTOR has, in the opinion of PROJECT ENGINEER, satisfactorily completed all items identified during the final inspection and has provided all completion documents required in accordance with the Contract Documents the CONTRACTOR may make application for final payment.
 2. The final Application for Payment shall be accompanied by:
 - a. All documentation called for in the Contract Documents;
 - b. AIA document G707, "Consent of Surety Company to Final Payment;"

- c. Complete and legally effective releases or waivers of all Lien rights arising out of or Liens filed in connection with the Work, (AIA document G706A, "Contractor's Affidavit or Release of Liens" and AIA document G706, "Contractor's Affidavit of Payments of Debts & Claims", or similar form) in accordance with Chapter 44A of the North Carolina General Statutes.
3. Notwithstanding any other provision of these Contract Documents to the contrary, the OWNER is under no duty or obligation whatsoever to any Subcontractor, laborer, or other party to ensure that payments due and owed by CONTRACTOR to any of them are or will be made. Such parties shall rely only on CONTRACTOR's surety bonds for remedy of nonpayment by CONTRACTOR.

B. Review of Application

1. Once the PROJECT ENGINEER is satisfied that the Work has been completed and CONTRACTOR's obligations under the Contract Documents have been fulfilled, PROJECT ENGINEER will, within ten (10) business days indicate in writing PROJECT ENGINEER's recommendation of payment and present the Application for Payment to OWNER for payment. Otherwise, PROJECT ENGINEER will return the Application for Payment to CONTRACTOR, indicating in writing the reasons for refusing to recommend final payment, in which case CONTRACTOR shall make the necessary corrections and resubmit the Application for Payment.

C. Payment Becomes Due

1. Thirty (30) calendar days after the presentation to OWNER of the Final Application for Payment the amount recommended by PROJECT ENGINEER will become due and, when due, will be paid by OWNER to CONTRACTOR.

12.07 Final Completion Delayed

- A. If, through no fault of CONTRACTOR, final completion of the Work is significantly delayed, and if PROJECT ENGINEER so confirms, OWNER shall, upon receipt of CONTRACTOR's final Application for Payment and recommendation of PROJECT ENGINEER, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted.

12.08 Liquidated Damages

- A. For each consecutive calendar Day of delay beyond the time specified for the Contract Completion date, the CONTRACTOR shall be assessed liquidated damages as indicated in the Bid Form. Liquidated damages will be withheld from amounts which may be or may become payable to the CONTRACTOR by the OWNER. Should the cost of these sustained damages exceed the amounts owed by the OWNER, the CONTRACTOR shall pay the difference to the OWNER.
- B. If the progress of completion of the Work is delayed by any fault, neglect, act or failure to act, on the part of the CONTRACTOR or anyone acting for or on the behalf of the CONTRACTOR so as to cause any additional costs, expense, liability or damage to the OWNER or any damage or additional cost or expense for which the OWNER may or shall become liable, the CONTRACTOR

shall and does hereby agree to compensate the OWNER for, and to indemnify the OWNER against all such costs, expenses, liabilities and damages.

12.09 Waiver of Claims

- A. The making and acceptance of final payment will constitute:
 - 1. A waiver of all Claims by OWNER against CONTRACTOR, except Claims arising from unsettled Liens, from defective Work appearing after final inspection from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from CONTRACTOR's continuing obligations under the Contract Documents.
- B. A waiver of all Claims by CONTRACTOR against OWNER, other than those previously made in writing which are still unsettled.

PART 13. SUSPENSION OF WORK AND TERMINATION

13.01 Owner May Suspend Work

- A. At any time and without cause, OWNER may suspend the Work or any portion thereof by providing written notice to CONTRACTOR. CONTRACTOR shall resume the Work as directed by OWNER. CONTRACTOR may be allowed an adjustment in the Contract Price or an extension of the Contract Time, or both, directly attributable to any such suspension if CONTRACTOR makes a Claim therefore as provided in Part 8. An adjustment to the Contract shall only be considered if the CONTRACTOR was delayed for a time period greater than twenty-four (24) hours.
- B. If OWNER stops work under Part 11, or excludes CONTRACTOR from the Site, suspends CONTRACTOR's services, or suspends the Work or any portion thereof because of CONTRACTOR's failure to perform the Work in accordance with the Contract Documents, CONTRACTOR shall not be entitled to an extension of Contract Time.

13.02 Owner May Terminate for Cause

- A. The occurrence of any one or more of the following events will justify termination for cause:
 - 1. CONTRACTOR's persistent failure to perform the Work in accordance with the Contract Documents;
 - 2. CONTRACTOR's disregard of Laws or Regulations of any public body having jurisdiction;
 - 3. CONTRACTOR's disregard of the authority of OWNER; or
 - 4. CONTRACTOR's violation in any substantial way of any provisions of the Contract Documents.

- B. If one or more of the events identified above occur, OWNER may, after giving CONTRACTOR and the surety seven (7) calendar days written notice, terminate the services of CONTRACTOR, exclude CONTRACTOR from the Site, take possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which OWNER has paid CONTRACTOR but which are stored elsewhere, and finish the Work. In such case, CONTRACTOR shall not be entitled to receive any further payment.
- C. If all claims, costs, losses, and damages (including but not limited to all the fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other disputed resolution costs) exceeds the unpaid balance of the Contract, CONTRACTOR shall pay the difference to OWNER. Such claims, costs, losses, and damages incurred by OWNER will be reviewed by PROJECT ENGINEER and, when so approved, by PROJECT ENGINEER, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, OWNER shall not be required to obtain the lowest price for the Work performed.
- D. Where OWNER has terminated CONTRACTOR's services, the termination will not affect any rights or remedies of OWNER against CONTRACTOR then existing or which may thereafter accrue. Any retention or payment of moneys due CONTRACTOR by OWNER will not release CONTRACTOR from liability.
- E. CONTRACTOR shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or from such termination.

13.03 Owner May Terminate For Convenience

- A. Upon seven (7) calendar days written notice to CONTRACTOR the OWNER may, without cause and without prejudice to any other right or remedy of OWNER, elect to terminate the Contract. In such case, CONTRACTOR shall be paid (without duplication of any items):
 - 1. For completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
 - 2. For expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;
 - 3. For all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and
 - 4. For reasonable expenses directly attributable to termination as approved by OWNER.

13.04 Contractor May Stop Work or Terminate

- A. If, through no act or fault of CONTRACTOR, the Work is suspended for more than ninety (90) consecutive calendar days by OWNER or under an order of court or other public authority, or PROJECT ENGINEER fails to act on any Application for Payment within thirty (30) calendar days after it is submitted, or OWNER fails for thirty (30) calendar days to pay CONTRACTOR any sum finally determined to be due, then CONTRACTOR may, upon seven (7) calendar days written notice to OWNER, and provided OWNER does not remedy such suspension or failure within that time, terminate the Contract and recover from OWNER payment on the same terms as provided in Part 13. In lieu of terminating the Contract and without prejudice to any other right or remedy, if PROJECT ENGINEER has failed to act on an Application for Payment within thirty (30) calendar days after it is submitted, or OWNER has failed for thirty (30) calendar days to pay CONTRACTOR any sum finally determined to be due, CONTRACTOR may, seven (7) calendar days after written notice to OWNER, stop the Work until payment is made of all such amounts due CONTRACTOR, including interest thereon. The provisions of this paragraph are not intended to preclude CONTRACTOR from making a Claim under Part 8 for an adjustment in Contract Price or Contract Time or otherwise for expenses or damage directly attributable to CONTRACTOR's stopping the Work as permitted by this paragraph.
- B. The words "suspended" and "suspension" in Part shall not refer to the legal doctrine known as "constructive suspension" but shall only refer to a stoppage of the Work by express order of OWNER without cause.

PART 14. [Intentionally omitted]

PART 15. MISCELLANEOUS**15.01 Cumulative Remedies**

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

15.02 Survival of Obligations

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

15.03 Historical or Archaeological Deposits

- A. If, during the course of construction, evidence of deposits of historical or archaeological interest are found, CONTRACTOR shall immediately cease operations affecting the find and shall notify OWNER, who shall notify the State Historic Preservation Officer. No further disturbance of the deposits shall ensue until CONTRACTOR has been notified by OWNER that he may proceed. OWNER will issue a Notice to Proceed only after the state official has surveyed the find and made a determination to OWNER. Compensation to CONTRACTOR, if any, for lost time or changes in construction to avoid the find, shall be determined in accordance with changed conditions or Change Order provisions of the Contract Documents. (Reference: 80 Stat 915, 16 USC 470, and Executive Order No. 11593 of May 31, 1971.)

15.04 Antitrust

- A. By entering into a Contract, CONTRACTOR conveys, sells, assigns, and transfers to OWNER all rights, title, and interest in and to all causes of action CONTRACTOR may now have or hereafter acquire under the antitrust laws of the United States and the State of North Carolina relating to the particular goods or services purchased or acquired by OWNER under the said Contract.

15.05 Lien

- A. It is expressly agreed that after any payment has been made by OWNER to CONTRACTOR for work done, or labor or material supplied as required and described in the Contract, OWNER will have a lien upon all material delivered to the site by or for CONTRACTOR or any Subcontractor.

15.06 Employment Discrimination

- A. During the performance of this Contract, CONTRACTOR agrees as follows:
1. CONTRACTOR will not discriminate against any employee or applicant for employment because of race, religion, color, sex, disability, or national origin, except where religion, sex, disability, or national origin is a bona fide occupational qualification reasonably necessary to the normal operation of CONTRACTOR. CONTRACTOR agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this nondiscrimination clause.
 2. CONTRACTOR, in all solicitations or advertisements for employees placed by or on behalf of CONTRACTOR, will state that such CONTRACTOR is an equal opportunity employer.
 3. Notices, advertisements, and solicitations placed in accordance with federal law, rule, or regulation shall be deemed sufficient for meeting the requirements of this section.
- B. CONTRACTOR will include the provisions of the foregoing Paragraphs 1, 2, and 3 in every subcontract or purchase order of over \$10,000, so that the provisions will be binding upon each Subcontractor or vendor.

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Division 01

General Requirements

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SECTION 011000 - SUMMARY

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. While this section provides a summary, detailed specifications are indicated in Divisions 03-44, as included in these contract documents.

1.2 SUMMARY

- A. Section Includes:
 - 1. Project information.
 - 2. Work covered by Contract Documents.
 - 3. Contractor's use of site and premises.
 - 4. Coordination with Occupants
 - 5. Work restrictions.
 - 6. Specification and Drawing conventions.

1.3 PROJECT INFORMATION

- A. Project Identification: Demolition and Decommissioning of Former WTP at Glenville Lake Dam.
 - 1. Project Location: Filter Plant Drive, Fayetteville, NC.
- B. Owner: Fayetteville Public Works Commission.
- C. Engineer: CDM Smith Inc.
- D. Engineer's Consultants: Engineer has retained the following design professionals who have prepared designated portions of the Contract Documents:
 - 1. Survey: Joyner Keeny, PLLC
- E. Web-Based Project Software: Project software will be used for purposes of managing communication and documents during the construction stage.
 - 1. See Section 013100 "Project Management and Coordination." for requirements for using web-based Project software.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and includes, but is not limited to, the following:
 - 1. Controlled demolition of former WTP superstructure, flowfill and abandonment of below grade facilities, relocation of electrical infrastructure and raw water main, wetwell riser, replacement of downstream stormdrain system, and replacement of auxiliary bottom drain structure and gate..
- B. Type of Contract:
 - 1. Project will be constructed under a single prime contract.

1.5 WORK PERFORMED BY OWNER

- A. Cooperate fully with Owner, so work may be carried out smoothly, without interfering with or delaying Work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.
- B. Concurrent Work: Owner will perform portions of the electrical infrastructure relocation as indicated on the Electrical Contract Documents.

1.6 CONTRACTOR'S USE OF SITE

- A. Limits on Use of Site: Limit use of Project site to limits of clearing as indicated on the Drawings. Do not disturb portions of Project site beyond areas in which the Work is indicated.
- B. Where Work is to occur within public rights-of-ways as indicated on the Drawings, comply with permit requirements related to maintenance of vehicle traffic.

1.7 COORDINATION WITH OCCUPANTS

- A. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.
 - 1. Engineer will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to Owner acceptance of the completed Work.
 - 2. Obtain a Certificate of Occupancy from authorities having jurisdiction before limited Owner occupancy.
 - 3. Before limited Owner occupancy, mechanical training and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.
 - 4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work.

1.8 WORK RESTRICTIONS

- A. Comply with restrictions on construction operations.
 - 1. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of authorities having jurisdiction.
- B. On-Site Work Hours: Limit work to between 7:00 a.m. to 5:00 p.m., Monday through Friday, unless otherwise indicated. Work hours may be modified to meet Project requirements if approved by Owner and authorities having jurisdiction.
- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging for temporary utility services according to requirements indicated:
 - 1. Notify Owner not less than two days in advance of proposed utility interruptions.
 - 2. Obtain Owner's written permission before proceeding with utility interruptions.
- D. Noise, Vibration, Dust, and Odors: Coordinate operations that may result in high levels of noise and vibration, dust, odors, or other disruption to Owner occupancy with Owner.
 - 1. Notify Owner not less than two days in advance of proposed disruptive operations.
 - 2. Obtain Owner's written permission before proceeding with disruptive operations.
- E. Smoking and Controlled Substance Restrictions: Use of alcoholic beverages, and other controlled substances on Project site is not permitted.
- F. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.
- G. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.
 - 1. Maintain list of approved screened personnel with Owner's representative.

1.9 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - 1. Imperative mood and streamlined language are generally used in the Specifications. 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.
 - 2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.

- C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- D. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
 - 1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
 - 2. Abbreviations: Materials and products are identified by abbreviations defined on Drawings.
 - 3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 011000

SECTION 012000 - PRICE AND PAYMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Progress Payments.

1.2 MEASUREMENT AND PAYMENT

- A. Payment of the lump sum price bid for Bid Item No. 1 shall constitute full compensation for all labor, materials, tools, equipment and incidentals necessary for constructing the WORK complete, as shown on Contract Drawings and as specified in Divisions 01 through 46, except for work specified to be paid under other bid items. Progress payments under this bid item shall be in accordance with the approved Schedule of Values as specified in Section 012900 – Payment Procedures.
- B. Payment of the lump sum price bid for Bid Item No. 2 shall constitute full compensation for all labor, materials, tools, equipment and incidentals necessary installation, maintenance, and removal of erosion control devices as specified in the Contract Documents and shown on the Contract Drawings and as required to satisfy the conditions of the NCDEQ Permit.
- C. Payment of the lump sum price bid for Bid Item No. 3 shall constitute full compensation for all labor, materials, tools, equipment and incidentals necessary to lower and maintain lake levels as specified in the Contract Documents throughout the entire construction period by utilization of the 30-inch bottom drain gate in the primary spillway and supplemental surface water pumping.
- D. Payment of the lump sum price bid for Bid Item No. 4 shall constitute full compensation for all labor, materials, tools, equipment and incidentals necessary to perform abatement, removal, and proper disposal of hazardous materials as specified in the Contract Documents.
- E. Payment of the lump sum price bid for Bid Item No. 5 shall constitute full compensation for all labor, materials, tools, equipment and incidentals necessary to perform controlled demolition of the former WTP building as specified in the Contract Documents.
- F. Payment of the lump sum price bid for Bid Item No. 6 shall constitute full compensation for all labor, materials, tools, equipment and incidentals necessary to design and install temporary bracing for the pipe gallery, remove the top slab, remove existing piping and debris, and backfill with flowable fill as shown/specified in the Contract Documents.
- G. Payment of the lump sum price bid for Bid Item No. 7 shall constitute full compensation for all labor, materials, tools, equipment and incidentals necessary to perform storm drain improvements including, but not limited to flushing/cleaning of existing system, pumping or bypass of storm flows as necessary, installation of new storm drain system components and removal of existing storm drain system components as shown on the Contract Drawings. This item shall also include the new gate structure, new gate, new drain pipe between gate structure

and auxiliary bottom drain opening, filter drain and outlet, headwall, and riprap apron as shown on the Contract Drawings.

- H. Payment of the lump sum price bid for Bid Item No. 8 shall constitute full compensation for all labor, materials, tools, equipment and incidentals necessary to complete installation of new raw water line and abandonment/removal of the existing raw water line as shown on the Contract Drawings.
- I. Payment of the lump sum price bid for Bid Item No. 9 shall constitute full compensation for all labor, materials, tools, equipment and incidentals necessary to relocate and provide improvements to the electrical infrastructure as shown on the Contract Drawings.
- J. Payment of the lump sum price bid for Bid Item No. 10 shall constitute full compensation for all labor, materials, tools, equipment and incidentals necessary to construct the pipe cradle for the new outlet pipe from the opening in the wall to the new gate structure and backfilling of the entire area between the wall and new gate structure with flowable fill as shown on the Contract Drawings.
- K. Payment of the lump sum price bid for Bid Item No. 11 shall constitute full compensation for all labor, materials, tools, equipment and incidentals necessary to design and install a new floating debris barrier as specified in the Contract Documents.
- L. Payment of the lump sum price bid for Bid Item No. 12 shall constitute full compensation for all labor, materials, tools, equipment and incidentals necessary to install asphalt paving as shown on the Contract Drawings.
- M. Payment of the lump sum price bid for Bid Item No. 13 shall constitute full compensation for all labor, materials, tools, equipment and incidentals necessary to install and maintain topsoil and sod and complete site restoration as shown on the Contract Drawings.
- N. Payment of the lump sum price bid for Item No. 14 shall constitute full compensation for all labor, materials, tools, equipment and incidentals associated with Mobilization and Demobilization as specified herein. Payment for Mobilization and Demobilization shall not exceed 2 percent of the sum of the amounts bid for Bid Items 1 through 13.
- O. Payment from the allowance included under Bid Item 15 shall be for changes in the WORK authorized in accordance with the General Conditions and requiring additional compensation. The methods for determination for amounts to be paid from the allowance shall be determined on a case-by-case basis as specified in the General Conditions.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 012000

SECTION 012500 - SUBSTITUTION PROCEDURES

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 substitutions.
- B. Related Requirements:
 - 1. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.3 DEFINITIONS

- A. Substitutions: Changes in products, materials, and equipment, or installation method from those required by the Contract Documents.
 - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
 - 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

- A. Substitution Requests: Submit documentation identifying product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified product or fabrication, or installation method cannot be provided, if applicable.
 - b. Coordination of information, including a list of changes or revisions 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 substitutions with those of the Work specified. Include annotated copy of applicable Specification Section.

Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.

- d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. Certificates and qualification data, where applicable or requested.
 - g. List of similar installations for proposed substitutions on completed projects, with project names and addresses as well as names and addresses of Engineers and owners.
 - h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
 - i. Detailed comparison of Contractor's construction schedule using proposed substitutions 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 date of receipt of purchase order, 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, except as indicated in substitution request, is compatible with related materials 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.
2. Engineer's Action: If necessary, Engineer will request additional information or documentation for evaluation within seven (7) days of receipt of a request for substitution. Engineer will notify Contractor of acceptance or rejection of proposed substitution within fifteen (15) days of receipt of request, or seven (7) days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, Construction Change Directive, or Engineer's Supplemental Instructions for minor changes in the Work.
 - b. Use product specified if Engineer does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

- A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

1.7 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than fifteen (15) days prior to time required for preparation and review of related submittals.
1. Conditions: Engineer will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Engineer will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - b. Substitution request is fully documented and properly submitted.
 - c. Requested substitution will not adversely affect Contractor's construction schedule.
 - d. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - e. Requested substitution is compatible with other portions of the Work.
 - f. Requested substitution has been coordinated with other portions of the Work.
 - g. Requested substitution provides specified warranty.
 - h. 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.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 012500

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SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

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 handling and processing Contract modifications.
- B. Related Requirements:
 - 1. Section 012500 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.
 - 2. Section 013100 "Project Management and Coordination" for requirements for forms for contract modifications provided as part of web-based Project management software.

1.3 MINOR CHANGES IN THE WORK

- A. Engineer will issue Field Orders authorizing minor changes in the Work, not involving adjustment to the Contract Price or the Contract Time, on form included in Project Manual.

1.4 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Engineer will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Price or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Requests For Proposal (RFP) issued by Engineer are not instructions either to stop work in progress or to execute the proposed change.
 - 2. Within ten (10) days after receipt of RFP, submit a quotation estimating adjustments to the Contract Price and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and

finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Engineer.
1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Price and the Contract Time.
 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 4. Include costs of labor and supervision directly attributable to the change.
 5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.

1.5 ADMINISTRATIVE CHANGE ORDERS

- A. Unit-Price Adjustment: See Section 012000 "Price and Payment" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit-price work.

1.6 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Change Order Request, Engineer will issue a Change Order for signatures of Owner and Contractor on form included in Project Manual [form provided as part of web-based Project management software].

1.7 WORK CHANGE DIRECTIVE

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

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

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 012600

SECTION 012900 - PAYMENT PROCEDURES

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 necessary to prepare and process Applications for Payment.
- B. Related Requirements:
 - 1. Section 012000 "Price and Payment."
 - 2. Section 012600 "Contract Modification Procedures."
 - 3. Section 013200 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.3 DEFINITIONS

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

1.4 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
 - 1. Coordinate line items in the schedule of values with items required to be indicated as separate activities in Contractor's construction schedule.
 - 2. Submit the schedule of values to Engineer at earliest possible date, but no later than ten days before the date scheduled for submittal of initial Application for Payment.
 - 3. Subschedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values coordinated with each phase of payment.
 - 4. Subschedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide subschedules showing values coordinated with each element.
 - 5. Subschedules for Separate Design Contracts: Where the Owner has retained design professionals under separate contracts who will each provide certification of payment requests, provide subschedules showing values coordinated with the scope of each design services contract, as described in Section 011000 "Summary."

- B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
1. Identification: Include the following Project identification on the schedule of values:
 - a. Project name and location.
 - b. Owner's name.
 - c. Owner's Project number.
 - d. Name of Engineer.
 - e. Engineer's Project number.
 - f. Contractor's name and address.
 - g. Date of submittal.
 2. Arrange schedule of values consistent with format of EJCDC Document C-620.
 3. Arrange the schedule of values in tabular form, with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or division.
 - b. Description of the Work.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers) that affect value.
 - g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent. Round dollar amounts to whole dollars, with total equal to Contract Sum.
 - 1) Labor.
 - 2) Materials.
 - 3) Equipment.
 4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
 5. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 6. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
 7. Purchase Contracts: Provide a separate line item in the schedule of values for each Purchase contract. Show line-item value of Purchase contract. Indicate Owner payments or deposits, if any, and balance to be paid by Contractor.
 8. Overhead Costs, Proportional Distribution: Include total cost and proportionate share of general overhead and profit for each line item.
 9. Overhead Costs, Separate Line Items: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
 10. Temporary Facilities: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.

11. Closeout Costs. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
12. Schedule of Values Revisions: Revise the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Include at least one separate line item for each Change Order and Construction Change Directive.

1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Engineer and paid for by Owner.
- B. Payment Application Times: The date for each progress payment is indicated in the Owner/Contractor Agreement. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.
- C. Payment Application Times: Submit Application for Payment to Engineer by the fifteenth of the month. The period covered by each Application for Payment is one month, ending on the last day of the previous month.
 1. Submit draft copy of Application for Payment seven calendar days prior to due date for review by Engineer.
- D. Application for Payment Forms: Use EJCDC Document C-620 as form for Applications for Payment.
 1. Other Application for Payment forms proposed by the Contractor may be acceptable to Engineer and Owner. Submit forms for approval with initial submittal of schedule of values.
- E. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Engineer will return incomplete applications without action.
 1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
 2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
 3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
 4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.
- F. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed.
 1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment.

2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
 3. Provide summary documentation for stored materials indicating the following:
 - a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
 - b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
 - c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.
- G. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Engineer by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- H. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 2. When an application shows completion of an item, submit conditional final or full waivers.
 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
 5. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.
- I. Maintain an updated set of drawings to be used as record drawings in accordance with Section 017839. As a prerequisite for monthly progress payments, exhibit the updated record drawings for review by Owner and Engineer for completeness and accuracy.
- J. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
 2. Schedule of values.
 3. Contractor's construction schedule.
 4. Combined Contractor's construction schedule incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
 5. Products list (preliminary if not final).
 6. Submittal schedule.
 7. List of Contractor's staff assignments.
 8. List of Contractor's principal consultants.
 9. Copies of building permits.

10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 11. Initial progress report.
 12. Report of preconstruction conference.
- K. Application for Payment at Substantial Completion: After Engineer issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 - a. Complete administrative actions, submittals, and Work proceeding this application, as described in Section 017700 “Closeout Procedures.”
 2. Include initial submittal of closeout record drawings in accordance with Section 017839.
 3. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- L. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
 2. Certification of completion of final punch list items.
 3. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 4. Final submittal of closeout record drawings in accordance with Section 017839.
 5. Updated final statement, accounting for final changes to the Contract Sum.
 6. Evidence that claims have been settled.
 7. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
 8. Final liquidated damages settlement statement.
 9. Proof that taxes, fees, and similar obligations are paid.
 10. Waivers and releases.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 012900

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SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

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 provisions for coordinating construction operations on Project, including, but not limited to, the following:
 - 1. General coordination procedures.
 - 2. Coordination drawings.
 - 3. RFIs.
 - 4. Digital project management procedures.
 - 5. Web-based Project management software package.
 - 6. Project meetings.
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.
- C. Related Requirements:
 - 1. Section 013200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
 - 2. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
 - 3. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

- A. RFI: Request for Information. Request from Contractor seeking information required by or clarifications of the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

- A. 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, telephone number, and email address 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.

- B. Key Personnel Names: At least fifteen (15) days prior to starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities, list cellular telephone numbers, and e-mail addresses. Provide names and cellular telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
1. Post copies of list in Project, temporary field office and in web-based Project software directory. Keep list current at all times.

1.5 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different 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 to ensure maximum performance and accessibility for required maintenance, service, and repair.
 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. 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 and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities 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. Startup and adjustment of systems.
 8. Project closeout activities.

1.6 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely indicated on Shop

Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
 - a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
 - b. Coordinate the addition of trade-specific information to coordination drawings in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
 - c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
 - e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
 - f. Indicate required installation sequences.
 - g. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative sketches to Engineer indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
2. Review: Engineer will review coordination drawings to confirm that, in general, the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Engineer determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Engineer will so inform Contractor, who shall make suitable modifications and resubmit.
3. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 013300 "Submittal Procedures."
4. Engineer will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.
 - a. Engineer makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
 - b. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Owner and Engineer.

1.7 REQUEST FOR INFORMATION (RFI)

- A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
 1. Engineer will return without response those RFIs submitted to Engineer by other entities controlled by Contractor.

2. Coordinate and submit RFIs in a prompt manner to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
1. Project name.
 2. Owner name.
 3. Owner's Project number.
 4. Name of Engineer
 5. Engineer's Project number.
 6. Date.
 7. Name of Contractor.
 8. RFI number, numbered sequentially.
 9. RFI subject.
 10. Specification Section number and title and related paragraphs, as appropriate.
 11. Drawing number and detail references, as appropriate.
 12. Field dimensions and conditions, as appropriate.
 13. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 14. Contractor's signature.
 15. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
 - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Engineer.
1. Attachments shall be electronic files in PDF format.
- D. Engineer's Action: Engineer will review each RFI, determine action required, and respond. Allow fifteen (15) working days for Engineer's response for each RFI. RFIs received by Engineer after 1:00 p.m. will be considered as received the following working day.
1. The following Contractor-generated RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for approval of Contractor's means and methods.
 - d. Requests for coordination information already indicated in the Contract Documents.
 - e. Requests for adjustments in the Contract Time or the Contract Sum.
 - f. Requests for interpretation of Engineer's actions on submittals.
 - g. Incomplete RFIs or inaccurately prepared RFIs.
 2. Engineer's action may include a request for additional information, in which case Engineer's time for response will date from time of receipt by Engineer of additional information.

3. Engineer's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Engineer in writing within 5 calendar days of receipt of the RFI response.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Use software log that is part of web-based Project management software.
 1. Project name.
 2. Name and address of Contractor.
 3. Name and address of Engineer.
 4. RFI description.
 5. Date the RFI was submitted.
 6. Date Engineer's response was received.
 7. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
 8. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.
- F. On receipt of Engineer's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Engineer within seven calendar days if Contractor disagrees with response.

1.8 DIGITAL PROJECT MANAGEMENT PROCEDURES

- A. Use of Engineer's Digital Data Files: Digital data files of Engineer's drawings will be provided by Engineer for Contractor's use during construction.
 1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project Record Drawings.
 2. Engineer makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.
 3. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Owner and Engineer.
 - a. Subcontractors, and other parties granted access by Contractor to Engineer's digital data files shall execute a data licensing agreement in the form of Agreement acceptable to Owner and Engineer.
- B. Web-Based Project Management Software Package: Use Engineer's web-based Project management software package for purposes of hosting and managing Project communication and documentation until Final Completion. Contractor shall be responsible for the full cost for the project team including costs for Contractor, subcontractors and suppliers.
 1. Web-based Project management software includes, at a minimum, the following features:

- a. Compilation of Project data, including Contractor, subcontractors, Engineer, Engineer's consultants, Owner, and other entities involved in Project. Include names of individuals and contact information.
 - b. Access control for each entity for each workflow process, to determine entity's digital rights to create, modify, view, and print documents.
 - c. Document workflow planning, allowing customization of workflow between project entities.
 - d. Include a scheduling component (see Section 013200).
 - e. Creation, logging, tracking, and notification for Project communications required in other Specification Sections, including, but not limited to, RFIs, submittals, Minor Changes in the Work, Construction Change Directives, and Change Orders.
 - f. Track status of each Project communication in real time, and log time and date when responses are provided.
 - g. Procedures for handling PDFs or similar file formats, allowing markups by each entity. Provide security features to lock markups against changes once submitted.
 - h. Processing and tracking of payment applications.
 - i. Processing and tracking of contract modifications.
 - j. Creating and distributing meeting minutes.
 - k. Document management for Drawings, Specifications, and coordination drawings, including revision control.
 - l. Management of construction progress photographs.
 - m. Mobile device compatibility, including smartphones and tablets.
2. At completion of Project, provide digital archive in format that is readable by common desktop software applications in format acceptable to Engineer. Provide data in locked format to prevent further changes.
- C. PDF Document Preparation: Where PDFs are required to be submitted to Engineer, prepare as follows:
1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 2. Name file with submittal number or other unique identifier, including revision identifier.
 3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

1.9 PROJECT MEETINGS

- A. General: Participate in project 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. Agenda: Engineer will prepare the meeting agenda.
 3. Minutes: Engineer will conduct meeting and will record significant discussions and distribute the meeting minutes.
- B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Engineer, but no later than 15 days after execution of the Agreement.
1. Attendees: Authorized representatives of Owner, Engineer, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Responsibilities and personnel assignments.
 - b. Tentative construction schedule.
 - c. Phasing.
 - d. Critical work sequencing and long lead items.
 - e. Designation of key personnel and their duties.
 - f. Lines of communications.
 - g. Use of web-based Project software.
 - h. Procedures for processing field decisions and Change Orders.
 - i. Procedures for RFIs.
 - j. Procedures for testing and inspecting.
 - k. Procedures for processing Applications for Payment.
 - l. Distribution of the Contract Documents.
 - m. Submittal procedures.
 - n. Preparation of Record Documents.
 - o. Use of the premises.
 - p. Work restrictions.
 - q. Working hours.
 - r. Construction waste management.
 - s. Parking, temporary offices, staging and storage areas.
 - t. Equipment deliveries and priorities.
 - u. First aid.
 - v. Security.
 - w. Progress cleaning.
 - x. List of major subcontractors and suppliers.
 3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.

- C. **Project Closeout Conference:** Schedule and conduct a project closeout conference, at a time convenient to Owner and Engineer, but no later than 60 days prior to the scheduled date of Substantial Completion.
1. Conduct the conference to review requirements and responsibilities related to Project closeout.
 2. Attendees: Authorized representatives of Owner, Engineer, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
 - a. Preparation of Record Documents.
 - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
 - c. Procedures for completing and archiving web-based Project software site data files.
 - d. Submittal of written warranties.
 - e. Submittal of operations and maintenance data.
 - f. Requirements for delivery of spare parts.
 - g. Requirements for startup, testing, and training.
 - h. Preparation of Contractor's punch list.
 - i. Procedures for processing Applications for Payment at Substantial Completion and for final payment including final change order.
 - j. Owner's partial occupancy requirements including certificate of occupancy and closeout of permits.
 4. Minutes: Entity conducting meeting will record and distribute meeting minutes.
- D. **Progress Meetings:** Conduct progress meetings at **monthly** intervals.
1. Attendees: In addition to representatives of Owner and Engineer, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting 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.
 - 1) Review schedule for next period.

- b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of construction.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site use.
 - 8) Quality and work standards.
 - 9) Status of correction of deficient items.
 - 10) Field observations.
 - 11) Status of RFIs.
 - 12) Status of Proposal Requests.
 - 13) Pending changes.
 - 14) Status of Change Orders.
 - 15) Pending claims and disputes.
 - 16) Documentation of information for payment requests.
- 3. Minutes: Contractor will record and distribute the meeting minutes to each party present and to parties requiring information.
 - a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting, where revisions to the schedule have been made or recognized, issue revised schedule concurrently with the report of each meeting.
- E. Coordination Meetings: Conduct Project coordination meetings when needed to address specific coordination issues. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.

Attendees: In addition to representatives of Owner and Engineer, each contractor, subcontractor, supplier, and other entity concerned with the specific coordination issues to be addressed.

 - 1. Agenda: As appropriate based on the specific coordination issues to be addressed.
 - 2. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 013100

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SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

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 documenting the progress of construction during performance of the Work, including the following:
 - 1. Startup construction schedule.
 - 2. Contractor's Construction Schedule.
 - 3. Construction schedule updating reports.
 - 4. Daily construction reports.
 - 5. Material location reports.
 - 6. Site condition reports.
 - 7. Unusual event reports.
- B. Related Requirements:
 - 1. Section 014000 "Quality Requirements" for schedule of tests and inspections.
 - 2. Section 012900 "Payment Procedures" for schedule of values and requirements for use of cost-loaded schedule for Applications for Payment.

1.3 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction Project. Activities included in a construction schedule consume time and resources.
 - 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
 - 2. Predecessor Activity: An activity that precedes another activity in the network.
 - 3. Successor Activity: An activity that follows another activity in the network.
- B. Cost Loading: The allocation of the schedule of values for completing an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum.
- C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine the critical path of Project and when activities can be performed.

- D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- E. Event: The starting or ending point of an activity.
- F. Float: The measure of leeway in starting and completing an activity.
 - 1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
 - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
 - 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- G. Resource Loading: The allocation of manpower and equipment necessary for completing an activity as scheduled.

1.4 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
 - 1. Working electronic copy of schedule file.
 - 2. PDF file.
 - 3. Two paper copies, of sufficient size to display entire period or schedule, as required.
- B. Startup construction schedule.
 - 1. Submittal of cost-loaded, startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.
- C. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.
- D. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
 - 1. Submit a working digital copy of schedule, using software indicated, and labeled to comply with requirements for submittals.
- E. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, latest allowable start date, latest allowable finish date, status (where critical) and total float and free float in calendar days.
 - 1. Activity Report: List of activities sorted by activity number and then early start date, or actual start date if known.

2. Logic Report: List of preceding and succeeding activities for each activity, sorted in ascending order by activity number and then by early start date, or actual start date if known.
 3. Total Float Report: List of activities sorted in ascending order of total float.
 4. Earnings Report: Compilation of Contractor's total earnings from the Notice to Proceed until most recent Application for Payment.
- F. Construction Schedule Updating Reports: Submit with Applications for Payment.
- G. Daily Construction Reports: Submit at weekly intervals.
- H. Material Location Reports: Submit at monthly intervals.
- I. Site Condition Reports: Submit at time of discovery of differing conditions.
- J. Unusual Event Reports: Submit at time of unusual event.
- K. Qualification Data: For scheduling consultant.

1.5 QUALITY ASSURANCE

- A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Engineer's request.
- B. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's Construction Schedule, including, but not limited to, the following:
1. Review software limitations and content and format for reports.
 2. Verify availability of qualified personnel needed to develop and update schedule.
 3. Discuss constraints.
 4. Review delivery dates for Owner-furnished products.
 5. Review schedule for work of Owner's separate contracts.
 6. Review submittal requirements and procedures.
 7. Review time required for review of submittals and resubmittals.
 8. Review requirements for tests and inspections by independent testing and inspecting agencies.
 9. Review time required for Project closeout and Owner startup procedures.
 10. Review and finalize list of construction activities to be included in schedule.
 11. Review procedures for updating schedule.
 12. Submit at this conference a preliminary network defining the planned operation during the first 60 calendar days after the Notice to Proceed.

1.6 COORDINATION

- A. Coordinate Contractor's Construction Schedule with the schedule of values, submittal schedule, progress reports, payment requests, and other required schedules and reports.
 - 1. Secure time commitments for performing critical elements of the Work from entities involved.
 - 2. Coordinate each construction activity in the network with other activities, and schedule them in proper sequence.

1.7 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Program Description
 - 1. A Critical Path Method (CPM) construction schedule shall be used to control the Work and to provide a basis for determining job progress. The construction schedule shall be prepared and maintained by the Contractor. All work shall be done in accordance with the established CPM schedule. The Contractor and all subcontractors shall cooperate fully in developing the construction schedule and in executing the work in accordance with the CPM schedule.
 - 2. The construction schedule shall consist of a computerized CPM network (diagram of activities) presented in a time-scaled graphic (print-out) with reports, as specified herein.
- B. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.
 - 1. Use Scheduling component of Project management software package specified in Section 013100 "Project Management and Coordination."
- C. Qualifications:
 - 1. The Contractor shall have the capability of preparing and utilizing the specified CPM schedule or engage the services of a specialized scheduling professional to do so. Within seven calendar days of the award of contract, provide a résumé or qualifications statement for the individual within the Contractor's organization, or the outside consultant, who is being proposed as the responsible party for development and maintenance of the CPM schedule. The résumé or qualifications statement shall demonstrate that the proposed responsible party has successfully developed and maintained CPM schedules for at least three construction projects of the same size or greater than this project. The proposed responsible party for the CPM schedule is subject to approval by the Engineer and Owner. If the proposed responsible party for the CPM schedule is not approved by the Engineer and/or Owner, Contractor shall resubmit a more-appropriate candidate for approval.
- D. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Final Completion.
 - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

- E. Activities: Treat each floor or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Engineer.
 2. Temporary Facilities: Indicate start and completion dates for the following as applicable:
 - a. Securing of approvals and permits required for performance of the Work.
 - b. Temporary facilities.
 - c. Construction of mock-ups, prototypes and samples.
 - d. Owner interfaces and furnishing of items.
 - e. Interfaces with Separate Contracts.
 - f. Regulatory agency approvals.
 - g. Punch list.
 3. Procurement Activities: Include procurement process activities for the following long lead-time items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 4. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with submittal schedule.
 5. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
 6. Commissioning Time: Include no fewer than 15 days for commissioning.
 7. Substantial Completion: Indicate completion in advance of date established for Substantial Completion and allow time for Engineer's administrative procedures necessary for certification of Substantial Completion.
 8. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and Final Completion.
- F. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule and show how the sequence of the Work is affected.
1. Phasing: Arrange list of activities on schedule by phase.
 2. Work under More Than One Contract: Include a separate activity for each contract.
 3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
 4. Products Ordered in Advance (if applicable): Include a separate activity for each product. Include delivery.
 5. Owner-Furnished Products (if applicable): Include a separate activity for each product. Include delivery date.
 6. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.
 - b. Limitations of continued occupancies.
 - c. Uninterruptible services.
 - d. Partial occupancy before Substantial Completion.
 - e. Use-of-premises restrictions.
 - f. Provisions for future construction.
 - g. Seasonal variations.
 - h. Environmental control.

7. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
 - a. Subcontract awards.
 - b. Submittals.
 - c. Purchases.
 - d. Mockups.
 - e. Fabrication.
 - f. Sample testing.
 - g. Deliveries.
 - h. Installation.
 - i. Tests and inspections.
 - j. Adjusting.
 - k. Curing.
 - l. Building flush-out.
 - m. Startup and placement into final use and operation.
 - n. Commissioning.

8. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
 - a. Structural completion.
 - b. Yard piping.
 - c. Ground Storage Tank.
 - d. Completion of mechanical installation.
 - e. Completion of electrical installation.
 - f. Substantial Completion.

9. Other Constraints:
 - G. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.

 - H. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.
 1. See Section 012900 "Payment Procedures" for cost reporting and payment procedures.

 - I. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
 1. Unresolved issues.
 2. Unanswered Requests for Information.
 3. Rejected or unreturned submittals.
 4. Notations on returned submittals.
 5. Pending modifications affecting the Work and the Contract Time.

J. Acceptability

1. Submit the CPM schedule submittals, as specified, and resubmit as needed, until they are in compliance with Contract requirements.
2. The Engineer review of the Contractor's construction schedule submittals will only be for conformance with the Contract requirements – including but not limited to contract time and work sequences specified in the contract documents. The Engineer review of the schedule shall not include the Contractor's means and methods of construction or safety. The Engineer's concurrence, acceptance, or approval of the Contractor's schedule submittals will not relieve the Contractor from responsibility for complying with the Contract Scope, Contract Time or any other contract requirement. Any indication of concurrence, acceptance, or approval of the Contractor's schedule will only indicate a general conformance with the Contract Requirements.
3. Engineer's review of the Contractor's construction schedule submittals shall not relieve the Contractor from responsibility for any deviations from the Contract Documents unless the Contractor has in writing called Engineer attention to such deviations at the time of submission and Engineer has given written concurrence to the specific deviations, nor shall any concurrence by the Engineer relieve Contractor from responsibility for errors and omissions in the submittals. Concurrence of the CPM Activity Network by the Engineer is advisory only and shall not relieve the Contractor of responsibility for accomplishing the Work within the Contract completion date(s).
4. Concurrence, acceptance, or approval of the Contractor's CPM schedule by the Engineer in no way makes the Engineer an insurer of the CPM schedule's success, nor liable for time or cost overruns resulting therefrom.
5. Failure to include any element of work required for the performance of this Contract will not excuse the Contractor from completing all Work required within the Contract completion date(s), notwithstanding the review of the network by the Engineer.
6. CPM schedules that contain activities with negative float, or which extend beyond the contract completion date, will not be acceptable.
7. Except where earlier completions are specified, CPM schedules which show completion of all work prior to the contract completion date may be indicated; however, in no event shall they constitute a basis for claim for delay by the Contractor.

K. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate Final Completion percentage for each activity. Activities shall not be considered to be complete until they are in fact 100 percent complete.
4. Submit a narrative report based on the CPM schedule evaluation, in a format agreed upon by the Contractor and the Engineer. The report shall include a description of the progress during the previous period in terms of completed activities, an explanation of each activity which is showing a delay, a description of problem areas, current and anticipated delaying factors and their estimated impact on performance of other activities and completion dates and an explanation of corrective action taken or proposed.

- L. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, equipment required to achieve compliance, and date by which recovery will be accomplished.
- M. The contract completion time will be adjusted only for causes specified in this Contract. In the event the Contractor requests an extension of any contract completion date, the Contractor shall furnish such justification and supporting evidence as the Engineer may deem necessary to determine whether the Contractor is entitled to an extension of time under the provisions of this Contract. The Engineer will, after receipt of such justification and supporting evidence, make findings of fact and will advise the Contractor in writing thereof. If the Engineer finds that the Contractor is entitled to any extension of any contract completion date, the Engineer's determination as to the total number of days extension shall be based upon the currently approved CPM schedule and on all data relevant to the extension. Such data shall be included in the next updating of the schedule. Actual delays in activities which, according to the CPM schedule, do not affect any contract completion date shown by the critical path in the network will not be the basis for a change therein.
- N. Distribution: Distribute copies of approved schedule to Engineer, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
 - 1. Post copies in Project meeting rooms and temporary field offices.
 - 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

1.8 STARTUP CONSTRUCTION SCHEDULE

- A. Gantt-Chart Schedule: Submit startup, horizontal, Gantt-chart-type construction schedule within seven days of date established for the Notice to Proceed.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

1.9 GANTT-CHART SCHEDULE REQUIREMENTS

- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's Construction Schedule within 30 calendar days of date established for the Notice to Proceed.
 - 1. Base schedule on the startup construction schedule and additional information received since the start of Project.

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

1.10 CPM SCHEDULE REQUIREMENTS

- A. Prepare network diagrams using AON (activity-on-node) format.
- B. Startup Network Diagram: Submit diagram within 14 days of date established for the Notice to Proceed. Outline significant construction activities for the first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.
- C. CPM Schedule: Prepare Contractor's Construction Schedule using a cost and resource-loaded and time-scaled CPM network analysis diagram for the Work.
 - 1. Develop network diagram in sufficient time to submit CPM schedule, so it can be accepted for use no later than 60 days after date established for the Notice to Proceed.
 - a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates.
 - 2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
 - 3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
 - 4. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule to coordinate with the Contract Time.
- D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.
 - 1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
 - a. Preparation and processing of submittals.
 - b. Mobilization and demobilization.
 - c. Purchase of materials.
 - d. Delivery.
 - e. Fabrication.
 - f. Utility interruptions.
 - g. Installation.
 - h. Work by Owner that may affect or be affected by Contractor's activities.
 - i. Testing and inspection.
 - j. Commissioning.

- k. Punch list and Final Completion.
 - l. Activities occurring following Final Completion.
 - m. Maintenance of existing facilities.
 - n. Contract milestones.
 2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
 3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
 4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
 - a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.
 5. Cost- and Resource-Loading of CPM Schedule: Assign cost to construction activities on the CPM schedule. Do not assign costs to submittal activities. Obtain Engineer's approval prior to assigning costs to fabrication and delivery activities. Assign costs under main subcontracts for testing and commissioning activities, operation and maintenance manuals, punch list activities, Project record documents, and demonstration and training (if applicable), in the amount of 5 percent of the Contract Sum.
 - a. Each activity cost shall reflect an appropriate value subject to approval by Engineer.
 - b. Total cost assigned to activities shall equal the total Contract Sum.
- E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall Project schedule.
- F. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:
 1. Contractor or subcontractor and the Work or activity.
 2. Description of activity.
 3. Main events of activity.
 4. Immediate preceding and succeeding activities.
 5. Early and late start dates.
 6. Early and late finish dates.
 7. Activity duration in workdays.
 8. Total float or slack time.
 9. Average size of workforce.
 10. Dollar value of activity (coordinated with the schedule of values).
- G. Schedule Updating: Concurrent with revising schedule, prepare tabulated reports showing the following:
 1. Identification of activities that have changed.

2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity durations in workdays.
5. Changes in the critical path.
6. Changes in total float or slack time.
7. Changes in the Contract Time.

H. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.

1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.
 - a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
 - b. Submit value summary printouts one week before each regularly scheduled progress meeting.

1.11 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions, including presence of rain or snow.
7. Testing and inspection.
8. Accidents.
9. Meetings and significant decisions.
10. Unusual events.
11. Stoppages, delays, shortages, and losses.
12. Meter readings and similar recordings.
13. Emergency procedures.
14. Orders and requests of authorities having jurisdiction.
15. Change Orders received and implemented.
16. Work Change Directives received and implemented.
17. Services connected and disconnected.
18. Equipment or system tests and startups.
19. Partial completions and occupancies.
20. Substantial Completions authorized.

- B. **Material Location Reports:** At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:
1. Material stored prior to previous report and remaining in storage.
 2. Material stored prior to previous report and since removed from storage and installed.
 3. Material stored following previous report and remaining in storage.
- C. **Site Condition Reports:** Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.
- D. **Unusual Event Reports:** When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, responses by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.
1. Submit unusual event reports directly to Owner within one calendar day of an occurrence. Distribute copies of report to parties affected by the occurrence.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 013200

SECTION 013233 - PHOTOGRAPHIC DOCUMENTATION

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. Preconstruction photographs.
 - 2. Concealed Work photographs.
 - 3. Periodic construction photographs.
 - 4. Final Completion construction photographs.
- B. Related Requirements:
 - 1. Section 017700 "Closeout Procedures" for submitting photographic documentation as Project Record Documents at Project closeout.
 - 2. Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.
 - 3. Section 311000 "Site Clearing" for photographic documentation before site clearing operations commence.

1.3 INFORMATIONAL SUBMITTALS

- A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.
- B. Digital Photographs: Submit image files within three days of taking photographs.
 - 1. Submit photos by uploading to web-based Project management software site. Include copy of key plan indicating each photograph's location and direction.
 - 2. Identification: Provide the following information with each image description:
 - a. Name of Project.
 - b. Name and contact information for photographer.
 - c. Name of Engineer.
 - d. Name of Contractor.
 - e. Date photograph was taken.
 - f. Description of location, vantage point, and direction.
 - g. Unique sequential identifier keyed to accompanying key plan.

1.4 FORMATS AND MEDIA

- A. Digital Photographs: Provide color images in JPG format, produced by a digital camera with minimum sensor size of 12 megapixels, and at an image resolution of not less than 3200 by 2400 pixels. Use flash in low light levels or backlit conditions.
- B. Submit digital media as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
- C. Metadata: Record accurate date and time from camera.
- D. File Names: Name media files with date, Project area and sequential numbering suffix.
- E. Usage Rights
 - 1. If applicable, obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation.

1.5 CONSTRUCTION PHOTOGRAPHS

- A. Photographer: Engage a qualified photographer to take construction photographs.
- B. General: Take photographs with maximum depth of field and in focus.
 - 1. Maintain key plan with each set of construction photographs that identifies each photographic location.
- C. Preconstruction Photographs: Before commencement of the Work take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Engineer.
 - 1. Flag construction limits before taking construction photographs.
 - 2. Take 20 photographs to show existing conditions adjacent to property before starting the Work.
 - 3. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.
- D. Concealed Work Photographs: Before proceeding with installing work that will conceal other work, take photographs sufficient in number, with annotated descriptions, to record nature and location of concealed Work, including, but not limited to, the following:
 - 1. Underground utilities.
 - 2. Underslab services.
 - 3. Piping.
 - 4. Electrical conduit.
 - 5. Waterproofing and weather-resistant barriers.
- E. Periodic Construction Photographs: Take minimum 20 photographs weekly. Select vantage points to show status of construction and progress since last photographs were taken.

- F. Final Completion Construction Photographs: Take 50 photographs after date of Substantial Completion for submission as Project Record Documents. Engineer will inform photographer of desired vantage points.
- G. Additional Photographs: Engineer may request photographs in addition to periodic photographs specified.
 - 1. Three days' notice will be given, where feasible.
 - 2. In emergency situations, take additional photographs within 24 hours of request.
 - 3. Circumstances that could require additional photographs include, but are not limited to, the following:
 - a. Special events planned at Project site.
 - b. Immediate follow-up when on-site events result in construction damage or losses.
 - c. Photographs shall be taken at fabrication locations away from Project site
 - d. Substantial Completion of a major phase or component of the Work.
 - e. Extra record photographs at time of final acceptance.
 - f. Owner's request for special publicity photographs.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 013233

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SECTION 013300 - SUBMITTAL PROCEDURES

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:

- 1. Submittal schedule requirements.
- 2. Administrative and procedural requirements for submittals.

- B. Related Requirements:

- 1. Section 012900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
- 2. Section 013100 "Project Management and Coordination" for submitting coordination drawings and subcontract list and for requirements for web-based Project software.
- 3. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
- 4. Section 013233 "Photographic Documentation" for submitting preconstruction photographs, periodic construction photographs, and Final Completion construction photographs.
- 5. Section 014000 "Quality Requirements" for submitting test and inspection reports, and schedule of tests and inspections.
- 6. Section 017700 "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.
- 7. Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
- 8. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
- 9. Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Engineer's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Engineer's responsive action. Submittals may be rejected for not complying with

requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

- C. Mass Submittals: Six or more submittals or items in one day or 15 or more submittals or items in one week.

1.4 SUBMITTAL SCHEDULE

- A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Engineer and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal Schedule: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal Schedule: Submit concurrently with the first complete submittal of Contractor's construction schedule.
 - a. Submit revised submittal schedule as required to reflect changes in current status and timing for submittals.
4. Format: Arrange the following information in a tabular format:
 - a. Scheduled date for first submittal.
 - b. Specification Section number and title.
 - c. Submittal Category: Action; informational.
 - d. Name of subcontractor.
 - e. Description of the Work covered.
 - f. Scheduled date for Engineer's final release or approval.
 - g. Scheduled dates for purchasing.
 - h. Scheduled date of fabrication.
 - i. Scheduled dates for installation.
 - j. Activity or event number.

1.5 SUBMITTAL FORMATS

- A. Numbering System: Utilize the following example submittal identification numbering system to identify submittals and as file names for PDF submissions:
1. First Identifier - Alphabet Character: D, S, M or I which represents Shop Drawing (including working drawings and product data), Sample, Manual (Operating & Maintenance) or Informational, respectively.
 2. Second Identifier - Next 6 or 8 Digits: Applicable Specification Section Number. Do not mix submittals from different specification sections into a single submittal.

3. Third Identifier - Next Three Digits: Sequential number of each separate item or drawing submitted under each Specification Section, in chronological order submitted, starting at 001.
 4. Fourth Identifier - Last Alphabet Character: A to Z, indicating the submission (or resubmission) of the same submittal, i.e., "A" = 1st submission, "B" = 2nd submission, "C" = 3rd submission, etc.
 5. EXAMPLE: D-033000.13-008-B.
 - a. D = Shop Drawing.
 - b. 03 30 00.13 = Section; use only 6 digits for sections that do not include 8 digits.
 - c. 008 = the eighth different submittal under this Section.
 - d. B = the second submission (first resubmission) of that particular shop drawing.
- B. Submittal Information: Include the following information in each submittal:
1. Project name.
 2. Date.
 3. Name of Engineer.
 4. Retain first subparagraph below if a construction manager has been retained for Project.
 5. Name of Contractor.
 6. Name of firm or entity that prepared submittal.
 7. Names of subcontractor, manufacturer, and supplier.
 8. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier and alphanumeric suffix for resubmittals.
 9. Category and type of submittal.
 10. Submittal purpose and description.
 11. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
 12. Drawing number and detail references, as appropriate.
 13. Indication of full or partial submittal.
 14. Location(s) where product is to be installed, as appropriate.
 15. Other necessary identification.
 16. Remarks.
- C. Options: Identify options requiring selection by Engineer.
- D. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Engineer on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.
- E. Electronic Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.
- F. Submittals Utilizing Web-Based Project Software: Prepare submittals as PDF files or other format indicated by Project management software.

1.6 SUBMITTAL PROCEDURES

- A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
1. Email: Prepare submittals as PDF package and transmit to Engineer by sending via email. Include PDF transmittal form. Include information in email subject line as requested by Engineer.
 - a. Engineer will return annotated file. Annotate and retain one copy of file as a digital Project Record Document file.
 2. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project management software website. Enter required data in web-based software site to fully identify submittal.
 3. Paper: Prepare submittals in paper form and deliver to Engineer.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
 4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections, so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Engineer's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 30 calendar days for initial review of each submittal (and 45 calendar days for multi-discipline reviews). Allow additional time if coordination with subsequent submittals is required. Engineer will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Resubmittal Review: Allow 15 working days for review of each resubmittal.
- D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
 2. Note date and content of revision in label or title block and clearly indicate extent of revision.

3. Resubmit submittals until they are marked with approval notation from Engineer's action stamp.
 4. Repetitive Reviews: Shop drawings, O&M manuals, and other submittals will be reviewed no more than twice at the Owner's expense. All subsequent reviews will be performed at the Contractor's expense. Reimburse the Owner for all costs invoiced by Engineer for the third and subsequent reviews.
- E. 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.
- F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Engineer's action stamp.

1.7 SUBMITTAL REQUIREMENTS

- A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams that show factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 5. Submit Product Data before Shop Drawings, and before or concurrently with Samples.

- B. 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 unless submittal based on Engineer's digital data drawing files is otherwise permitted.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
- C. Samples: Submit Samples for review of type, color, pattern, and texture for a check of these characteristics with other materials.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 2. Identification: Permanently attach label on unexposed side of Samples that includes the following:
 - a. Project name and submittal number.
 - b. Generic description of Sample.
 - c. Product name and name of manufacturer.
 - d. Sample source.
 - e. Number and title of applicable Specification Section.
 - f. Specification paragraph number and generic name of each item.
 3. Email Transmittal: Provide PDF transmittal. Include digital image file illustrating Sample characteristics and identification information for record.
 4. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project software website. Enter required data in web-based software site to fully identify submittal.
 5. Paper Transmittal: Include paper transmittal, including complete submittal information indicated.
 6. 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.
 7. 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. Engineer will return submittal with options selected.
8. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
- a. Number of Samples: Submit three sets of Samples. Engineer will retain two 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 three sets of paired units that show approximate limits of variations.
- D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
 2. Manufacturer and product name, and model number if applicable.
 3. Number and name of room or space.
 4. Location within room or space.
- E. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.
- G. Certificates:
1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.
 2. Contractor's Certification: Each shop drawing, working drawing, product data, and sample shall have affixed to it the following Certification Statement:

- a. "Certification Statement: by this submittal, I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data and I have checked and coordinated each item with other applicable approved shop drawings and all Contract requirements. "
3. Installer Certificates: Submit written statements on manufacturer's letterhead, certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
4. Manufacturer Certificates: Submit written statements on manufacturer's letterhead, certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
5. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
6. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
7. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of AWS B2.1/B2.1M on AWS forms. Include names of firms and personnel certified.
8. Contractor's Professional Engineer's signed and sealed certifications.

H. Test and Research Reports:

1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for substrate preparation and primers required.
2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - a. Name of evaluation organization.
 - b. Date of evaluation.
 - c. Time period when report is in effect.
 - d. Product and manufacturers' names.
 - e. Description of product.
 - f. Test procedures and results.

g. Limitations of use.

1.8 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Engineer.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

1.9 PROPOSED PRODUCT LIST

- A. Within 15 days after date of Owner-Contractor Agreement, submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
- B. For products specified only by reference standards, indicate manufacturer, trade name, model or catalog designation, and reference standards.

1.10 CONTRACTOR'S REVIEW

- A. Action Submittals and Informational Submittals: 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 Engineer.
- B. Contractor Responsible for:
1. Determination and verification of materials including manufacturer's catalog numbers.
 2. Determination and verification of field measurements and field construction criteria.
 3. Checking and coordinating information in submittal with requirements of Work and of Contract Documents.
 4. Determination of accuracy and completeness of dimensions and quantities.
 5. Confirmation and coordination of dimensions and field conditions at Site.
 6. Construction means, techniques, sequences, and procedures.
 7. Safety precautions.
 8. Coordination and performance of Work of all trades.
 9. Other requirements enumerated in Contract Documents.

- C. Contractor's Approval: Indicate Contractor's approval for each submittal. Include 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.
 - 1. Engineer will not review submittals received from Contractor that do not have Contractor's review and approval.

1.11 ENGINEER'S REVIEW

- A. Do not make mass submittals to Engineer. If mass submittals are received, Engineer's review time stated above will be extended as necessary to perform proper review. Engineer will review mass submittals based on priority determined by Engineer after consultation with Owner and Contractor.
- B. Action Submittals: Engineer will review each submittal, and indicate corrections or revisions required.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Engineer.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Engineer will not review submittals received from sources other than Contractor.
- F. Submittals not required by the Contract Documents will be returned by Engineer without action.
- G. Shop drawings will be returned to the Contractor with one of the following codes.
 - 1. "APPROVED" - This code is assigned when there are no notations or comments on the submittal. When returned under this code the Contractor may release the equipment and/or material for manufacture.
 - 2. "APPROVED AS NOTED" - This code is assigned when a confirmation of the notations and comments IS NOT required by the Contractor. The Contractor may release the equipment or material for manufacture; however, all notations and comments must be incorporated into the final product.
 - 3. "APPROVED AS NOTED/RESUBMIT" - This combination of codes is assigned when notations and comments are extensive enough to require a resubmittal of the package. The Contractor may release the equipment or material for manufacture; however, all notations and comments must be incorporated into the final product. The resubmittal is to address all comments, omissions and non-conforming items that were noted. An additional box is checked to indicate whether the resubmission is for the complete package, or for parts of the package. If no box is checked, a complete resubmittal shall be provided. Review code may designate if a partial or full submittal is required. If full submittal is required, a complete resubmittal package addressing all comments shall be provided. If a partial submittal is designated, resubmittal shall only include information pertaining to those items noted in review comments requiring clarification and any portions of submittal impacted as a result of the response. Resubmittal is to be received by the Engineer within 30 calendar days of the date of the Engineer's transmittal requiring the resubmittal.

4. "REJECTED" - This code is assigned when the submittal does not meet the intent of the Contract Documents. The Contractor must resubmit the entire package revised to bring the submittal into conformance. It may be necessary to resubmit using a different manufacturer/vendor to meet the requirements of the Contract Documents.
5. "RECEIPT ACKNOWLEDGED (Not subject to Engineer's Approval)" - This code is assigned to acknowledge receipt of a submittal that is not subject to the Engineer's approval. This code is generally used with submittals involving the Contractor's means and methods of construction work plans, and health and safety plans.

1.12 ELECTRONIC CAD FILES OF PROJECT DRAWINGS

- A. Electronic CAD Files of Project Drawings: May only be used to expedite production of Shop Drawings for the Project. Use for other Projects or purposes is not allowed.
- B. Electronic CAD Files of Project Drawings: Distributed only under the following conditions:
 1. Use of files is solely at receiver's risk. Engineer does not warrant accuracy of files. Receiving files in electronic form does not relieve receiver of responsibilities for measurements, dimensions, and quantities set forth in Contract Documents. In the event of ambiguity, discrepancy, or conflict between information on electronic media and that in Contract Documents, notify Engineer of discrepancy and use information in hard-copy Drawings and Specifications.
 2. CAD files do not necessarily represent the latest Contract Documents, existing conditions, and as-built conditions. Receiver is responsible for determining and complying with these conditions and for incorporating addenda and modifications.
 3. User is responsible for removing information not normally provided on Shop Drawings and removing references to Contract Documents. Shop Drawings submitted with information associated with other trades or with references to Contract Documents will not be reviewed and will be immediately returned.
 4. Receiver shall not hold Engineer responsible for data or file clean-up required to make files usable, nor for error or malfunction in translation, interpretation, or use of this electronic information.
 5. Receiver shall understand that even though Engineer has computer virus scanning software to detect presence of computer viruses, there is no guarantee that computer viruses are not present in files or in electronic media.
 6. Receiver shall not hold Engineer responsible for such viruses or their consequences, and shall hold Engineer/Engineer harmless against costs, losses, or damage caused by presence of computer virus in files or media.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 013300

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SECTION 014000 - QUALITY REQUIREMENTS

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

1.3 DEFINITIONS

- A. Experienced: When used with an entity or individual, "experienced." unless otherwise further described, means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.
- B. Field Quality-Control Tests and Inspections: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, subcontractor, or sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.
 - 1. Use of trade-specific terminology in referring to a Work result does not require that certain construction activities specified apply exclusively to specific trade(s).
- D. Mockups: Full-size physical assemblies that are constructed on-site either as freestanding temporary built elements or as part of permanent construction. Mockups are constructed to

verify selections made under Sample submittals; to demonstrate aesthetic effects and qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

- E. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria. Unless otherwise indicated, copies of reports of tests or inspections performed for other than the Project do not meet this definition.
- F. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- G. Source Quality-Control Tests and Inspections: Tests and inspections that are performed at the source (e.g., plant, mill, factory, or shop).
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. The term "testing laboratory" shall have the same meaning as the term "testing agency."
- I. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work, to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- J. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work, to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Engineer.

1.4 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Engineer.
- B. Delegated-Design Services Statement: Submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.5 CONFLICTING REQUIREMENTS

- A. **Conflicting Standards and Other Requirements:** If compliance with two or more standards or requirements is specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, inform the Engineer regarding the conflict and obtain clarification prior to proceeding with the Work. Refer conflicting requirements that are different, but apparently equal, to Engineer for clarification before proceeding.
- B. **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 requirements. Refer uncertainties to Engineer for a decision before proceeding.

1.6 INFORMATIONAL SUBMITTALS

- A. **Contractor's Quality-Control Plan:** For quality-assurance and quality-control activities and responsibilities.
- B. **Qualification Data:** For Contractor's quality-control personnel and Delegated-Designer.
- C. **Contractor's Statement of Responsibility:** When required by authorities having jurisdiction, submit copy of written statement of responsibility submitted to authorities having jurisdiction before starting work on the following systems:
 - 1. Seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections.
 - 2. Primary wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.
- D. **Testing Agency Qualifications:** For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- E. **Schedule of Tests and Inspections:** Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Entity responsible for performing tests and inspections.
 - 3. Description of test and inspection.
 - 4. Identification of applicable standards.
 - 5. Identification of test and inspection methods.
 - 6. Number of tests and inspections required.
 - 7. Time schedule or time span for tests and inspections.
 - 8. Requirements for obtaining samples.
 - 9. Unique characteristics of each quality-control service.
- F. **Reports:** Prepare and submit certified written reports and documents as specified.

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

1.7 CONTRACTOR'S QUALITY-CONTROL PLAN

- A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to Engineer. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities and to coordinate Owner's quality-assurance and quality-control activities. Coordinate with Contractor's Construction Schedule.
- B. Quality-Control Personnel Qualifications: Engage qualified personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
1. Project quality-control manager may also serve as Project superintendent.
- C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
- D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:
1. Contractor-performed tests and inspections, including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections. Distinguish source quality-control tests and inspections from field quality-control tests and inspections.
 2. Special inspections required by authorities having jurisdiction and indicated on the Statement of Special Inspections.
 3. Owner-performed tests and inspections indicated in the Contract Documents.
- E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring the Work into compliance with standards of workmanship established by Contract requirements and approved mockups.
- F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include Work Engineer has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming Work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.8 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
1. Date of issue.
 2. Project title and number.
 3. Name, address, telephone number, and email address of testing agency.
 4. Dates and locations of samples and tests or inspections.
 5. Names of individuals making tests and inspections.
 6. Description of the Work and test and inspection method.
 7. Identification of product and Specification Section.
 8. Complete test or inspection data.
 9. Test and inspection results and an interpretation of test results.
 10. Record of temperature and weather conditions at time of sample--taking and testing and inspection.
 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 12. Name and signature of laboratory inspector.
 13. Recommendations on retesting and reinspecting.
- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, telephone number, and email address of technical 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 of whether conditions, products, and installation will affect warranty.
 7. Other required items indicated in individual Specification Sections.
- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, telephone number, and email address of factory-authorized service representative making report.
 2. Statement that equipment complies with requirements.
 3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 4. Statement of whether conditions, products, and installation will affect warranty.
 5. Other required items indicated in individual Specification Sections.

1.9 QUALITY ASSURANCE

- A. Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. **Manufacturer Qualifications:** A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.
- C. **Fabricator Qualifications:** A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. **Installer Qualifications:** A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. **Professional Engineer Qualifications:** A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that is similar in material, design, and extent to those indicated for this Project.
- F. **Specialists:** Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged in the activities indicated.
 - 1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- G. **Testing and Inspecting Agency Qualifications:** An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented in accordance with ASTM E329, and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
- H. **Manufacturer's Technical Representative Qualifications:** An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect, demonstrate, repair and perform service on installations of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. **Factory-Authorized Service Representative Qualifications:** An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- J. **Preconstruction Testing:** Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following: Contractor responsibilities include the following:

1. Provide test specimens representative of proposed products and construction.
2. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
3. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
4. First subparagraph below attempts to ensure that tested assemblies will be representative of actual construction. This requirement may complicate testing and add cost.
5. Build site-assembled test assemblies and mockups, using installers who will perform same tasks for Project.
6. Build laboratory mockups at testing facility, using personnel, products, and methods of construction indicated for the completed Work.
7. When testing is complete, remove test specimens and test assemblies. Do not reuse products on Project.
8. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Engineer with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected Work complies with or deviates from the Contract Documents.

1.10 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.
 2. Payment for these services will be made from testing and inspection allowances specified in Section 012100 "Allowances," as authorized by Change Orders.
 3. Costs for retesting and reinspecting construction that replaces or is necessitated by Work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.
1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 2. Engage a qualified testing agency to perform quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.
 4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 5. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.

6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- D. Testing Agency Responsibilities: Cooperate with Engineer and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Engineer and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.
 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected Work complies with or deviates from requirements.
 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 6. Do not perform duties of Contractor.
- E. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."
- F. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- G. Contractor's Associated Requirements and Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspection. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Delivery of samples to testing agencies.
 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspection equipment at Project site.

- H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.
 - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's Construction Schedule. Update and submit with each Application for Payments.
 - 1. Schedule Contents: Include tests, inspections, and quality-control services, including Contractor- and Owner-retained services, commissioning activities, and other Project-required services paid for by other entities.
 - 2. Distribution: Distribute schedule to Owner, Engineer, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.11 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Owner will engage a qualified testing agency or special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:
 - 1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
 - 2. Notifying Engineer and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 - 3. Submitting a certified written report of each test, inspection, and similar quality-control service to Engineer with copy to Contractor and to authorities having jurisdiction.
 - 4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
 - 5. Interpreting tests and inspections and stating in each report whether tested and inspected Work complies with or deviates from the Contract Documents.
 - 6. Retesting and re-inspecting corrected Work.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

- A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
 - 1. Date test or inspection was conducted.
 - 2. Description of the Work tested or inspected.

3. Date test or inspection results were transmitted to Engineer.
 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Engineer's. Reference during normal working hours.
1. Submit log at Project closeout as part of Project Record Documents.

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspection, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

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 requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.

1.3 USE CHARGES

- A. Installation and removal and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to, Owner's personnel, Engineer, testing agencies, and authorities having jurisdiction.
- B. Sewer Service: Pay sewer-service use charges for sewer usage by all entities for construction operations.
- C. Water Service: Pay water-service use charges for water used by all entities for construction operations. However, Owner will pay for water needed to fill wire-wrapped ground storage tank per Section 434163.
- D. Electric Power Service: Pay electric-power-service use charges for electricity used by all entities for construction operations.
- E. Water and Sewer Service from Existing System: Water from Owner's existing water system adjacent to the is available for use with metering. Provide connections and extensions of services and metering as required for construction operations. Sewer service is not available at the site.
- F. Electric Power Service: Coordinate with the power company and provide connections and extensions of services and metering as required for construction operations.

1.4 INFORMATIONAL SUBMITTALS

- A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.
- B. Implementation and Termination Schedule: Within 15 days of date established for commencement of the Work, submit schedule indicating implementation and termination dates of each temporary utility.
- C. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.
- D. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
- E. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold. Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.

1.5 QUALITY ASSURANCE

- A. Temporary facilities shall comply with all applicable state and local ordinances, codes and regulations.
- B. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- C. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- D. Accessible Temporary Egress: Comply with applicable provisions in the United States Access Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

PART 2 - PRODUCTS

2.1 TEMPORARY FACILITIES

- A. Field Offices: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

- B. Engineer's Field Office: Of sufficient size, but minimum 12-ft by 24-ft, to accommodate needs of Engineer office activities and to accommodate Project meetings specified in other Division 01 Sections for duration of project. Keep office clean and orderly. Furnish and equip offices as follows:
1. Field office trailer shall have at least one office, one conference room, one bathroom, one closet, and two exterior doors.
 2. The bathroom shall include toilet, sink and faucet, medicine cabinet, and exhaust fan.
 3. The conference room shall include plan table.
 4. The Engineer's field office shall be weather-tight construction with floor, walls, and ceiling completely insulated. Each room shall have at least one operating window. Each window shall have a venetian blind and full insect screen. Furnish two sets of keys for each exterior door. Provide fully insulated skirting on all sides of the field office trailer. Provide steps, platforms, handrails, and boot scrapers for each exterior door.
 5. Field office trailer shall be Mobile Mini, ModSpace, Williams Scotsman, or equal. Converted storage or box containers will not be acceptable.
 6. Furnishings:
 - a. Provide the following furnishings for the Engineer's temporary field office for the duration of the project. All furnishings shall be new – or in very good condition – subject to approval of the Engineer.
 - 1) Two 60-in by 30-in desks with file drawer and 5 drawers, all lockable one upholstered swivel type chair with arms for each desk.
 - 2) One 30-in by 84-in conference table.
 - 3) Eight armless side chairs (stacking type).
 - 4) Two file cabinets, 4 drawer, legal size, Hon No. HN-315C, or equal.
 - 5) Four wastebaskets.
 - 6) One rolling plan storage rack, 10-stick capacity.
 - 7) One lockable storage cabinet, 72-in high, 36-in wide, and 18-in deep.
 - 8) **Two** steel bookcase units, 4 shelves high, Hon No. HN-S48 ABC, or equal.
 - 9) One digital telephone answering machine.
 - 10) 24 painted steel coat hangers.
 - 11) One electric bottled water dispenser with hot and cold outlets and refrigerator unit. Adequate water bottles shall be provided (and paid for by the Contractor) until Final Completion.
 - 12) One wall-mounted first aid kit, McMaster-Carr 9501T1 or equal.
 - 13) Two smoke detectors, with batteries.
 - 14) Two dry erase boards, aluminum frame, 36-in by 60-in, markers and eraser, Quartet Model No. TS-S 535 or equal.
 - 15) One 1000-watt minimum 1.4-cuft microwave oven.
 - 16) One 6-cf refrigerator.
 - 17) Commercial duty cross-cut shredder with basket, designed for 3 to 5 users, Fellowes Powershred SB-125i, or equal.
 - 18) One first aid kit, OSHA (1910.151.b) and ANSI (Z308.1-2003) compliant, suitable for ten people.
 - b. Contractor shall provide the following equipment for the Engineer's temporary field office for the duration of the project. All equipment shall be new.
 - 1) A multifunction Photocopier, printer, facsimile and scanner.

- c. With 50-sheet auto-feeder, capable of copying and printing
 - d. Letter-sized, legal-sized, and 11x17-inch documents.
 - e. Contractor to provide paper and ink cartridges, as required, for the duration of the project.
 - f. Four 8-outlet surge protectors with six-foot cord and minimum 1800-joule energy rating or greater; as manufactured by Belkin, or equal.
 - g. One 12-cup coffeemaker with timer, by Krups, or equal.
7. Services:
- a. Provide the following services for the duration of the project. Services shall include all costs for installation, use, maintenance, and removal of all products, services and equipment billed by each provider for each service specified herein.
 - b. Field office shall have complete and fully functional electrical, plumbing, and HVAC systems. Provide at least two smoke detectors hard-wired into the electrical system. Perform all scheduled and unscheduled maintenance for all systems and as directed by the Engineer.
 - c. Electrical System: Provide connection to temporary electric service. Comply with the electrical requirements of the furnished office trailer. Provide main circuit panel, sufficient GFCI outlets and lighting in each room, exterior lights at each exterior door, and proper grounding of entire electrical system.
 - d. Plumbing system: Connect to existing potable water supply. Provide hot water heater and hot and cold water to each fixture. Connect waste pipes to existing sanitary system or a waste holding tank. Heat trace and insulate exterior piping to prevent freezing. Where potable water service is not available, Contractor shall provide bottle water service with water chiller/dispenser.
 - e. HVAC System: Provide central heating and air conditioning system with programmable thermostat. System shall be capable of maintaining an interior temperature of 70°F when the exterior temperature is 0°F and an interior temperature of 75°F when the exterior temperature is 100°F.
 - f. Bottled water service: Provide bottled water service complete with dispenser with hot and cold water taps and regular bottle and cup replenishment as directed by the Engineer.
 - g. Janitorial service: Provide janitorial services (at least weekly) that include dusting, sweeping, vacuuming, mopping, disinfection, and trash removal.
 - h. Sanitary service: Provide regular pumping of waste holding tank, if applicable, as needed.
 - i. Internet Access:
 - 1) Provide a high-speed DSL data line or T1 cable line with internet access for the duration of the project.
 - j. Pay all costs for installation, maintenance, and removal of the telephone and internet service and instruments, including cellular phone service. The monthly cost of all calls made and received by the Engineer, including toll and long-distance calls, shall be paid for by the Contractor for the duration of the project.
8. Supplies: Provide the following supplies for the duration of the project: copy paper, toner, toilet paper, paper towels, soap, light bulbs, and other consumables as required by the Engineer.

- 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.

2.2 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Locate facilities where shown on the Drawings or where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
- B. Do not remove until approved by Engineer or are replaced by authorized use of completed permanent facilities.

3.2 ENGINEER'S OFFICE

- A. Engineer's trailer shall be set up and ready for occupancy within 30 days of the Notice to Proceed and prior to commencement of Work at the site. All systems, furnishings, equipment, and services specified herein shall be furnished, installed, and completely operational for the field office to be considered established.
 - 1. Provide regular office cleaning services for the duration of the project.
 - 2. Provide supplies including, but not limited to restroom supplies (toilet tissue paper, paper towel, and soap), as well as light bulbs, air conditioner filters, etc.
 - 3. Provide office supplies for printers and fax machines, etc.
 - 4. Supply all fuel for heating and pay all utility bills.
- B. Install field office plumb and level.
- C. Engineer's trailer shall be removed, and the site shall be cleaned up and restored before Final Completion of the project.

3.3 CONTRACTOR'S FIELD OFFICE

- A. Provide a temporary field office(s) for the Contractor's use for the duration of the project. An authorized representative of the Contractor shall be present at all times while the Work is in progress. Instructions received at the Contractors field office from the Engineer shall be considered delivered to the Contractor.
- B. Locate field office(s) in accordance with approved shop drawings and as directed by the Owner.

- C. Establish and occupy field office within 30 days of the Notice to Proceed, unless otherwise approved by the Engineer or Owner.

3.4 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service, if approved by Owner.
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.
- C. Sanitary Facilities: Provide temporary toilets, wash facilities, safety shower and eyewash 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.
- D. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful affect on completed installations or elements being installed.
 - 1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.
- E. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
- F. Lighting: 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.
- G. Electronic Communication Service: Provide secure WiFi wireless connection to internet with provisions for access by Engineer and Owner.

3.5 SUPPORT FACILITIES INSTALLATION

- A. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations.
 - 1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.
- B. Traffic Controls: 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.
- C. Parking: Provide parking areas for construction personnel.
- D. Storage and Staging: Provide areas for storage and staging needs.
- E. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
 - 1. Identification Signs: Provide Project identification signs as indicated on Drawings. Signs shall be constructed of A-A Ext – APA grade plywood, 1-in thick. Posts and braces shall be of pressure treated lumber.
 - 2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
 - a. Provide temporary, directional signs for construction personnel and visitors.
 - 3. Maintain and touch up signs, so they are legible at all times.
- F. Waste Disposal Facilities: Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."
- G. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
 - 1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- H. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.
- I. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

3.6 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
- C. Site Enclosure Fence: Furnish and install temporary site enclosure fence in a manner that will prevent people from easily entering site except by entrance gates to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.
 1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel.
- D. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- E. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
 1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.
 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition in accordance with requirements of authorities having jurisdiction.
 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
 4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign, stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.7 MOISTURE AND MOLD CONTROL

- A. Moisture and Mold Protection: Protect stored materials and materials installed Work through final completion.

- B. Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
1. Protect porous materials from water damage.
 2. Protect stored and installed material from flowing or standing water.
 3. Keep porous and organic materials from coming into prolonged contact with concrete.
- C. Partially Enclosed Construction Period: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
 2. Keep interior spaces reasonably clean and protected from water damage.
 3. Periodically collect and remove waste containing cellulose or other organic matter.
 4. Discard or replace water-damaged material.
 5. Do not install material that is wet.
 6. Discard and replace stored or installed material that begins to grow mold.
 7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.
- D. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
 2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
 3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
 - a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective and require replacing.
 - b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Engineer.
 - c. Remove and replace materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.8 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

2. Clear snow and ice from all drives, walks and stairs to maintain safe vehicle and pedestrian access to the site and facilities as directed by the Engineer.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Final Completion.
- D. Termination and Removal: 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 Final 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. Just prior to Final Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000

SECTION 016000 - PRODUCT REQUIREMENTS

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 selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Related Requirements:
 - 1. Section 012500 "Substitution Procedures".
 - 2. Section 017700 "Closeout Procedures".

1.3 DEFINITIONS

- A. Products: Items obtained 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. Salvaged items or items reused from other projects are not considered new products. Items that are manufactured or fabricated to include recycle contract materials are considered new products, unless indicated otherwise.
 - 3. Comparable Product: Product by named manufacturer that is demonstrated and approved through the comparable product submittal process described in Part2 "Comparable Products" Article, 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. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. Published attributes and characteristics of basis-of-design product establish salient characteristics of products.
 - 1. Evaluation of Comparable Products: In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight,

dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification. Manufacturer's published attributes and characteristics of basis-of-design product also establish salient characteristics of products for purposes of evaluating comparable products.

- C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications; submit a comparable product request or substitution request, if applicable.
- D. Comparable Product Request Submittal: An action submittal requesting consideration of a comparable product, including the following information:
 - 1. Identification of basis-of-design product or fabrication or installation method to be replaced, including Specification Section number and title and Drawing numbers and titles.
 - 2. Data indicating compliance with the requirements specified in Part 2 "Comparable Products" Article.
- E. Basis-of-Design Product Specification Submittal: An action submittal complying with requirements in Section 013300 "Submittal Procedures." Show compliance with requirements.
- F. Substitution: Refer to Section 012500 "Substitution Procedures" for definition and limitations on substitutions.

1.4 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
 - 1. Resolution of Compatibility Disputes between Multiple Contractors:
 - a. Contractors are responsible for providing products and construction methods compatible with products and construction methods of other contractors.
 - b. If a dispute arises between the multiple contractors over concurrently selectable but incompatible products, Engineer will determine which products shall be used.
- B. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.
 - 1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is not conspicuous.

2. Equipment Nameplates: Provide a permanent nameplate on each item of service- or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:
 - a. Name of product and manufacturer.
 - b. Model and serial number.
 - c. Capacity.
 - d. Speed.
 - e. Ratings.
3. See individual identification Sections in Divisions 21 through 46 for additional equipment identification requirements.

1.5 COORDINATION

- A. Modify or adjust affected work as necessary to integrate work of approved comparable products and approved substitutions.

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 and vandalism. 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 determine compliance with the Contract Documents and that products are undamaged and properly protected.
- C. Storage:
 1. Provide a secure location and enclosure at Project site for storage of materials and equipment.
 2. Store products to allow for inspection and measurement of quantity or counting of units.
 3. Store materials in a manner that will not endanger Project structure.
 4. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation and with adequate protection for wind.
 5. Protect 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:** Written standard warranty form furnished by individual manufacturer for a particular product and issued in the name of the Owner or endorsed by manufacturer to Owner.
 2. **Special Warranty:** Written warranty required by the Contract Documents to provide specific rights for Owner and issued in the name of the Owner or endorsed by manufacturer to Owner.
- B. **Special Warranties:** Prepare a written document that contains appropriate terms and identification, ready for execution.
 1. **Manufacturer's Standard Form:** Modified to include Project-specific information and properly executed.
 2. **Specified Form:** When specified forms are included in the Project Manual, prepare a written document, using indicated form properly executed.
 3. See other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. **Submittal Time:** Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. **General Product Requirements:** Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, 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 meeting requirements of the Contract Documents.
 4. Where products are accompanied by the term "as selected," Engineer will make selection.

5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
6. Or Equal: For products specified by name and accompanied by the term "or equal," "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
 - a. Submit additional documentation required by Engineer in order to establish equivalency of proposed products. Unless otherwise indicated, evaluation of "or equal" product status is by the Engineer, whose determination is final.

2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration of Comparable Products: Engineer will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Engineer may return requests without action, except to record noncompliance the following requirements:
 1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work.
 2. Detailed comparison of significant qualities of proposed product with those of the named basis-of-design product. Significant product qualities include attributes, such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
 3. Evidence that proposed product provides specified warranty.
 4. List of similar installations for completed projects, with project names and addresses and names and addresses of Engineers and owners, if requested.
 5. Samples, if requested.
- B. Engineer's Action on Comparable Products Submittal: If necessary, Engineer will request additional information or documentation for evaluation, as specified in Section 013300 "Submittal Procedures."
 1. Form of Approval of Submittal: As specified in Section 013300 "Submittal Procedures."
 2. Use product specified if Engineer does not issue a decision on use of a comparable product request within time allocated.
- C. Submittal Requirements: Approval by the Engineer of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.
- D. Submittal Requirements, Single-Step Process: When acceptable to Engineer, incorporate specified submittal requirements of individual Specification Section in combined submittal for comparable products. Approval by the Engineer of Contractor' request for use of comparable product and of individual submittal requirements will also satisfy other submittal requirements.

PART 3 - EXECUTION (NOT USED)

END OF SECTION 016000

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SECTION 017300 - EXECUTION

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 administrative and procedural requirements governing execution of the Work, including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Progress cleaning.
6. Starting and adjusting.
7. Protection of installed construction.

- B. Related Requirements:

1. Section 011000 "Summary" for limits on use of Project site.
2. Section 013300 "Submittal Procedures" for submitting surveys.
3. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, replacing defective work, and final cleaning.

1.3 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

1.4 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Professional Engineer Qualifications: Refer to Section 014000 "Quality Requirements."

- C. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
1. Structural Elements: When cutting and patching structural elements, or when encountering the need for cutting and patching of elements, whose structural function is not known, notify Engineer of locations and details of cutting and await directions from Engineer before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
 2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
 3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
 4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Engineer's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- D. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of specified products and equipment.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, and other construction affecting the Work.
1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, water-service piping, and other utilities.
 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.

2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
1. Description of the Work, including Specification Section number and paragraphs, and Drawing sheet number and detail, where applicable.
 2. List of detrimental conditions, including substrates.
 3. List of unacceptable installation tolerances.
 4. Recommended corrections.
- D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Engineer in accordance to requirements in Section 013100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks and existing conditions. If discrepancies are discovered, notify Engineer promptly.
- B. Engage a land surveyor experienced in laying out the Work, using the following accepted surveying practices.
1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 2. Establish limits on use of Project site.

3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 4. Inform installers of lines and levels to which they must comply.
 5. Check the location, level and plumb, of every major element as the Work progresses.
 6. Notify Engineer when deviations from required lines and levels exceed allowable tolerances.
 7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Engineer.

3.4 FIELD ENGINEERING

- A. Identification: Owner will identify existing benchmarks, control points, and property corners.
- B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
1. Do not change or relocate existing benchmarks or control points without prior written approval of Engineer. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Engineer before proceeding.
 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

- D. Certified Survey: 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.

3.5 INSTALLATION

- A. Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
 - 4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces, unless otherwise indicated on Drawings.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure satisfactory results as judged by Engineer. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy of type expected for Project.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items onsite and placement in permanent locations.
- F. Tools and Equipment: Select tools or equipment that minimize production of excessive noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for Work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions with manufacturer.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Engineer.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

- I. Joints: Make joints of uniform width. Where joint locations in exposed Work are not indicated, arrange joints for the best visual effect, as judged by Engineer. Fit exposed connections together to form hairline joints.
- J. Repair or remove and replace damaged, defective, or nonconforming Work.
 - 1. Comply with Section 017700 "Closeout Procedures" for repairing or removing and replacing defective Work.

3.6 CUTTING AND PATCHING

- 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 in-place 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. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of Work to be cut.
- D. Protection: Protect in-place 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.
- E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements in Section 011000 "Summary."
- F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.
- G. Cutting: Cut in-place 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 neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 - 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 - 4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.

5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 6. Proceed with patching after construction operations requiring cutting are complete.
- H. 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 practicable, as judged by Engineer. Provide materials and comply with installation requirements specified in other Sections, where applicable.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical 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.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
 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 in-place 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, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch, corner to corner of wall and edge to edge of ceiling. Provide additional coats until patch blends with adjacent surfaces.
 4. Ceilings: Patch, repair, or rehang in-place 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 and ensures thermal and moisture integrity of building enclosure.
- I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 PROGRESS CLEANING

- A. Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.

3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Use containers intended for holding waste materials of type to be stored.
 4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where Work is in progress to the level of cleanliness necessary for proper execution of the Work.
1. Remove liquid spills promptly.
 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 017419 "Construction Waste Management and Disposal."
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 STARTING AND ADJUSTING

- A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 019113 "General Commissioning Requirements."
- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

- C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.9 PROTECTION AND REPAIR OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Repair Work previously completed and subsequently damaged during construction period
Repair to like-new condition.
- C. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.
- D. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 017300

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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.
- B. Related Requirements:
 - 1. Section 311000 "Site Clearing" for disposition of waste resulting from site clearing and removal of above- and below-grade improvements.

1.3 DEFINITIONS

- A. Construction Waste: Building, structure, and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building, structure, and site improvement materials resulting from demolition operations.
- C. Disposal: Removal of demolition or construction waste and subsequent salvage, sale, recycling, or deposit in landfill, incinerator acceptable to authorities having jurisdiction, or designated spoil areas on Owner's property.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 MATERIALS OWNERSHIP

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

- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

- 1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with transportation and disposal regulations of authorities having jurisdiction.
- B. Establish procedures for periodic waste collection and transportation to recycling and disposal facilities.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 GENERAL

- A. General: Provide handling, containers, storage, signage, transportation, and other items as required during the entire duration of the Contract.
- B. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.
- C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

3.2 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged or recycled, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
 - 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn waste materials, except as stated in Section 311000.

END OF SECTION 017419

SECTION 017700 - CLOSEOUT PROCEDURES

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 Contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Warranties.
 - 4. Final cleaning.
- B. Related Requirements:
 - 1. Section 012900 "Payment Procedures" for requirements for Applications for Payment for Substantial Completion and Final Completion.
 - 2. Section 013233 "Photographic Documentation" for submitting Final Completion construction photographic documentation.
 - 3. Section 017823 "Operation and Maintenance Data" for additional operation and maintenance manual requirements.
 - 4. Section 017839 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
 - 5. Section 017900 "Demonstration and Training" for requirements to train the Owner's maintenance personnel to adjust, operate, and maintain products, equipment, and systems.

1.3 DEFINITIONS

- A. List of Incomplete Items: Contractor-prepared list of items to be completed or corrected, prepared for the Engineer's use prior to Engineer's inspection, to determine if the Work is substantially complete.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of cleaning agent.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.5 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest-control inspection.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items required by other Sections.

1.7 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's "punch list"), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction, permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 2. Submit closeout submittals specified in other Division 01 Sections, including Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
 - 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Engineer. Label with manufacturer's name and model number.
 - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Engineer's signature for receipt of submittals.
 - 5. Submit testing, adjusting, and balancing records.
 - 6. Submit sustainable design submittals not previously submitted.
 - 7. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Advise Owner of pending insurance changeover requirements.
 2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 3. Complete startup and testing of systems and equipment.
 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."
 6. Advise Owner of changeover in utility services.
 7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
 8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 9. Complete final cleaning requirements.
 10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Engineer, that must be completed or corrected before certificate will be issued.
1. 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.

1.8 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining Final Completion, complete the following:
1. Submit a final Application for Payment in accordance with Section 012900 "Payment Procedures."
 2. Certified List of Incomplete Items: Submit certified copy of Engineer's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Engineer. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Submit pest-control final inspection report.
 5. Submit Final Completion photographic documentation.

- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.9 LIST OF INCOMPLETE ITEMS

- A. Organization 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, proceeding from lowest floor to highest floor, listed by room or space number.
 2. Organize items applying to each space by major element, including categories for ceilings, 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 Engineer.
 - d. Name of Contractor.
 - e. Page number.
 4. Submit list of incomplete items in the following format:
 - a. MS Excel Electronic File. Engineer will return annotated file.
 - b. PDF Electronic File. Engineer will return annotated file.
 - c. Web-Based Project Software Upload: Utilize software feature for creating and updating list of incomplete items (punch list).
 - d. Three Paper Copies. Engineer will return two copies.

1.10 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Engineer for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.

- D. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
1. Submit on digital media acceptable to Engineer.
- E. Warranties in Paper Form:
1. Bind warranties and bonds in heavy-duty, three-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.
- F. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Perform 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 designated portion of Project:
 - a. Clean Project site of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are not planted, mulched, or paved to a smooth, even-textured surface.

- d. Remove tools, construction equipment, machinery, and surplus material from Project site.
- e. Remove snow and ice to provide safe access to building.
- f. 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.
- g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
- h. Clean flooring, removing debris, dirt, and staining: clean according to manufacturer's recommendations.
- i. Vacuum and mop concrete.
- j. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
- k. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
- l. Remove labels that are not permanent.
- m. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
- n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
- o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
- p. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
 - 1) Clean HVAC system in compliance with NADCA ACR. Provide written report on completion of cleaning.
- q. Clean luminaires, lamps, globes, and reflectors to function with full efficiency.
- r. Clean strainers.
- s. Leave Project clean and ready for occupancy.

C. Pest Control: Comply with pest control requirements in Section 015000 "Temporary Facilities and Controls." Prepare written report.

D. Construction Waste Disposal: Comply with waste disposal requirements in Section 017419 "Construction Waste Management and Disposal."

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations required by Section 017300 "Execution" before requesting inspection for determination of Substantial Completion.

END OF SECTION 017700

SECTION 017839 - 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for Project Record Documents, including the following:
1. Record Drawings.
 2. Record Product Data.
 3. Miscellaneous record submittals.
- B. Related Requirements:
1. Section 012900 "Payment Procedures" for maintaining and exhibiting project record documents as a prerequisite for progress payments.
 2. Section 017300 "Execution" for final property survey.
 3. Section 017700 "Closeout Procedures" for general closeout procedures.
 4. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.3 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
1. Number of Copies: Submit one set of marked-up record prints.
 2. Number of Copies: Submit copies of Record Drawings as follows:
 - a. Initial Submittal:
 - 1) Submit one paper-copy set of marked-up record prints.
 - 2) Submit PDF electronic files of scanned record prints and one set of file prints.
 - 3) Submit Record Digital Data Files and one set of plots.
 - 4) Engineer will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
 - b. Final Submittal:
 - 1) Submit three paper-copy set(s) of marked-up record prints.

- 2) Submit PDF electronic files of scanned Record Prints and three set(s) of file prints.
 - 3) Print each drawing, whether or not changes and additional information were recorded.
- c. Final Submittal:
- 1) Submit one paper-copy set of marked-up record prints.
 - 2) Submit Record Digital Data Files and three set(s) of Record Digital Data File plots.
 - 3) Plot each drawing file, whether or not changes and additional information were recorded.
- B. Record Product Data: Submit annotated PDF electronic files and directories and three paper copies of each submittal.
1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.
- C. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories and three paper copies of each submittal.
- D. Reports: Submit written report weekly indicating items incorporated into Project Record Documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

1.4 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
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 provide information for preparation of corresponding 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 acceptable drawing technique.
 - c. Record data as soon as possible after obtaining it.
 - d. Record and check the markup before enclosing concealed installations.
 - e. Cross-reference record prints to corresponding photographic documentation.
 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.
 - 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 Work Change Directive.
 - k. Changes made following Engineer'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 and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
 4. Mark record prints with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at 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 Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Engineer. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
1. Format: Same digital data software program, version, and operating system as for the original Contract Drawings.
 2. Format: DWG, Microsoft Windows operating system.
 3. Format: Annotated PDF electronic file with comment function enabled.
 4. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
 5. Refer instances of uncertainty to Engineer for resolution.
 6. Engineer will furnish Contractor with one set of digital data files of the Contract Drawings for use in recording information.
 - a. See Section 013100 "Project Management and Coordination" for requirements related to use of Engineer's digital data files.
 - b. Engineer will provide data file layer information. Record markups in separate layers.
- C. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 2. Format: Annotated PDF electronic file with comment function enabled.
 3. Record Digital Data Files: Organize digital data 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 digital data file.

4. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Engineer.
 - e. Name of Contractor.

1.5 RECORD PRODUCT DATA

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and revisions to Project Record Documents as they occur; do not wait until end of Project.
- B. 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 Specifications, and Record Drawings where applicable.
- C. Format: Submit Record Product Data as scanned PDF electronic file(s) of marked-up paper copy of Product Data.
 1. Include Record Product Data directory organized by Specification Section number and title, electronically linked to each item of Record Product Data.

1.6 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.
- B. Format: Submit miscellaneous record submittals as scanned PDF electronic file(s) of marked-up miscellaneous record submittals.
 1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

1.7 MAINTENANCE OF RECORD DOCUMENTS

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

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payments, exhibit the updated record documents for review by Owner and Engineer for accuracy and completeness.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 017839

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Division 02
Existing Conditions

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SECTION 024116 - STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Demolition and removal of buildings.
- 2. Abandoning in-place below-grade construction.
- 3. Disconnecting, capping or sealing, and removing site utilities.

- B. Related Requirements:

- 1. Section 011000 "Summary" for use of the premises and phasing requirements.
- 2. Section 013200 "Construction Progress Documentation" for preconstruction photographs taken before building demolition.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged.
- B. Remove Hazardous Materials: Isolate and remove hazardous materials from existing construction and properly dispose as required by existing regulations.
- C. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for storage. Include fasteners or brackets needed for reattachment elsewhere.

1.4 MATERIALS OWNERSHIP

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

1.5 COORDINATION

- A. Arrange demolition schedule so as not to interfere with Owner's on-site operations or operations of adjacent occupied buildings.

1.6 PREINSTALLATION MEETINGS

- A. Pre-demolition Conference: Conduct conference at Project site.
 - 1. Inspect and discuss condition of construction to be demolished.
 - 2. Review and finalize building demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - 3. Review and finalize protection requirements.
 - 4. Review procedures for dust control.
 - 5. Review procedures for protection of adjacent buildings.
 - 6. Review waste management plan.
 - 7. Review safety plan.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For refrigerant recovery technician.
- B. Engineering Survey: Submit engineering survey of condition of building including hazardous materials information.
- C. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, and for dust control. Indicate proposed locations and construction of barriers.
 - 1. Adjacent Infrastructure: Detail special measures proposed to protect adjacent buildings and infrastructure including the wet well, raw water line, earthen dam, etc. to remain including means of access.
- D. Schedule of Building Demolition Activities: Indicate the following:
 - 1. Detailed sequence of demolition work, with starting and ending dates for each activity.
 - 2. Temporary interruption of utility services.
 - 3. Shutoff and capping of utility services.
- E. Predemolition Photographs or Video: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by salvage and demolition operations. Comply with Section 013233 "Photographic Documentation." Submit before the Work begins.
- F. 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.

1.8 CLOSEOUT SUBMITTALS

- A. Complete waste management forms.

1.9 QUALITY ASSURANCE

- A. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

1.10 FIELD CONDITIONS

- A. Buildings to be demolished will be vacated and their use discontinued before start of the Work.
- B. Buildings immediately adjacent to demolition area will be occupied. Conduct building demolition so operations of occupied buildings will not be disrupted.
 - 1. Provide not less than 72 hours' notice of activities that will affect operations of adjacent occupied buildings.
 - 2. Maintain access to existing walkways, driveways, exits, and other facilities used by occupants of adjacent buildings.
 - a. Do not close or obstruct walkways, driveways, exits, or other facilities used by occupants of adjacent buildings without written permission from authorities having jurisdiction.
- C. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- D. Hazardous Materials: Present in buildings and structures to be demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present
 - 1. Hazardous materials should be handled with care and disposed of properly. as required by existing regulations.
- E. On-site storage or sale of removed items or materials is not permitted.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

2.2 SOIL MATERIALS

- A. Satisfactory Soils: Comply with requirements in Section 312000 "Earthwork."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting demolition operations.
- B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.
- C. Engage a professional engineer to perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during building demolition operations.

3.2 PREPARATION

- A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Utilities to be Disconnected: Locate, identify, disconnect, and seal or cap off utilities serving buildings and structures to be demolished.
 - 1. Arrange to shut off active utilities with utility companies.
 - 2. Cut off pipe or conduit a minimum of 24 inches below grade. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing according to requirements of authorities having jurisdiction.
 - 3. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.4 PROTECTION

- A. Existing Facilities: Protect adjacent walkways/roadways, and other building facilities during demolition operations. Maintain access to existing buildings including maintenance sheds.
- B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
 - 1. Strengthen or add new supports when required during progress of demolition.
- C. Existing Utilities to Remain: Maintain utility services to remain and protect from damage during demolition operations.
 - 1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.

- D. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated. Comply with requirements in Section 015000 "Temporary Facilities and Controls."
1. Protect adjacent buildings and facilities from damage due to demolition activities.
 2. Protect existing site improvements, appurtenances, and landscaping to remain.
 3. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 4. Provide protection to ensure safe passage of people around building demolition area and to and from occupied portions of adjacent buildings and structures.
 5. Protect walls, windows, roofs, and other adjacent exterior construction that are to remain and that are exposed to building demolition operations.
- E. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.

3.5 DEMOLITION, GENERAL

- A. General: Demolish and remove indicated building as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
 2. Maintain fire watch during and for at least 2 hours after flame-cutting operations.
 3. Maintain adequate ventilation when using cutting torches.
 4. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
- B. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed trafficways if required by authorities having jurisdiction.
 2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.
- C. Explosives: Use of explosives is not permitted.

3.6 DEMOLITION BY MECHANICAL MEANS

- A. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete building demolition operations above each floor or tier before disturbing supporting members on the next lower level.

- B. Remove debris from elevated portions of the building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
 - 1. Remove structural framing members and lower to ground by method suitable to minimize ground impact and dust generation.
- C. Below-Grade Construction: Demolish foundation walls and other below-grade construction.
 - 1. Remove below-grade construction, including basements, foundation walls, slabs, and footings, to at least 24 inches below grade.
- D. Existing Utilities: Demolish existing utilities and below-grade utility structures that are within 5 feet outside footprint of demolished structure. Abandon utilities outside this area.

3.7 SITE RESTORATION

- A. Below-Grade Areas: Completely fill below-grade areas and voids resulting from building demolition operations as indicated.
- B. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

3.8 REPAIRS

- A. Promptly repair damage to adjacent buildings caused by demolition operations.

3.9 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and recycle or dispose of them according to Section 017419 "Construction Waste Management and Disposal."
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Do not burn demolished materials.

3.10 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by building demolition operations. Return adjacent areas to condition existing before building demolition operations began.
 - 1. Clean roadways of debris caused by debris transport.

END OF SECTION 024116

Division 03
Concrete

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SECTION 030100.61 - CONCRETE REPAIRS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes concrete repair consisting of the following:
1. Removal of existing concrete.
 2. Bonding new concrete.
 3. Repair mortar.
 4. Crack and leaking construction joint repair (polyurethane chemical grout injection).
 5. Crack repair (epoxy adhesive injection).
 6. Spalled, deteriorated, and disintegrated concrete repair.
- B. Related Requirements:
1. Section 024116 "Structure Demolition" for complete structure demolition.
 2. Section 033000 "Cast-in-Place Concrete for ground and elevated cast concrete.
 3. Section 050519 "Post-Installed Anchors and Reinforcing Bars" for testing of drilled in injection adhesive anchor system.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
1. Including manufacturers printed performance criteria, product life, working time after mixing, surface preparation and application requirements and procedures, curing, and volatile organic compound data.
 2. Storage requirements including temperature, humidity, and ventilation.
 3. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for:
 - a. Polyurethane chemical grout.
 - b. Crack repair epoxy adhesive.
 - c. Epoxy bonding agent.
 - d. .
 - e. Repair mortars.
 4. Include rated capacities, operating characteristics, and accessories.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: Notarized certificate for each repair material stating that product meets requirements of this Section and has manufacturer's current printed literature on product package or container.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company with a minimum of 10 years' documented experience and having an ongoing program to train, certify, and technically support installers.
- B. Contractor's Supervisor: Having attended a training program sponsored by manufacturer supplying project approved materials.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery of Materials: Deliver materials in original, new, and unopened packages and containers clearly labeled with information referenced in Division 01 and the following information:
 - 1. Manufacturer's stock number and batch number.
 - 2. Date of manufacture.
 - 3. Expiration or use-by date.
- B. Storage of Materials:
 - 1. Store only approved materials on site.

1.7 FIELD CONDITIONS

- A. Conform to temperatures and other environmental factors as stated within manufacturer's published installation instructions for storage, substrate conditions, application, curing, and other procedures required by work of this Section.

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

- A. Use materials in compliance with state and local regulations.

2.2 MATERIALS

A. Polyurethane Chemical Grout:

1. Single component, expanding, moisture reactive polyurethane grout designed to seal cracks and open joints in concrete. Provide cured chemical grout that forms a compressed closed cell urethane foam that completely fills the crack or joint.
2. Accelerator: May be used if recommended by approved polyurethane chemical grout manufacturer.
3. Provide injection packers for application of polyurethane chemical grout.
4. Acceptable Manufacturers and Products: Provide one of the following or equal:
 - a. BASF Corporation: Concrecive 1210 IUG.
 - b. Sika Corporation: SikaFix HH.
 - c. W. R. Grace & Co.: HA Multigel NF, by De Neef.

B. Crack Repair Epoxy Adhesive:

1. ASTM C 881/ C 881M, Type V, Grade 2, Class C; two-component, solvent-free, moisture insensitive epoxy resin material suitable for repairing cracks in concrete by injection or gravity feed; formulated for specific size of opening or crack being injected.
2. Acceptable Manufacturers and Products: Provide one of the following or equal:
 - a. Euclid Chemical Company: EUCO #452.
 - b. Five Star Products Inc.: Bonding Adhesive.
 - c. Sika Corporation: Sikadur 32, Hi Mod.

C. Epoxy Bonding Agent:

1. Two-component, solvent-free, asbestos-free moisture insensitive epoxy resin material used to bind plastic concrete to hardened concrete and complying with requirements of ASTM C 881, Type V, Grade 2, Class C.
2. Acceptable Manufacturers and Products: Provide one of the following or equal:
 - a. Euclid Chemical Company: Dural 452 MV.
 - b. Sika Corporation: Sikadur 32, Hi Mod.
 - c. Simpson Strong-Tie Company Inc.: FX-762.

D. Vertical and Overhead Repair Mortars - Polymer-Modified Portland Cement Mortar:

1. Two-component polymer-modified, portland cement based, fast setting, non-sag mortar used to repair vertical and overhead surfaces with a migrating corrosion inhibitor and having a minimum compressive strength of 5,000 psi at 28 days tested in accordance with ASTM C 881 or ASTM C109.
2. Acceptable Manufacturers and Products: Provide one of the following or equal:
 - a. Euclid Chemical Company: DuralTop Gel.
 - b. Sika Corporation: SikaTop 123 Plus.
 - c. US MIX Company: US SPEC H2.

2.3 ACCESSORY MATERIALS

A. Backer Rods:

1. Open Cell Backer Rod: Extruded, open cell polyurethane foam. Diameter shall not be less than 200 percent of the joint width dimension.
2. Closed Cell Backer Rod: Extruded, non-staining, resilient closed cell polyethylene foam, compatible with sealant. Diameter shall not be less than 25 percent greater than the joint width. Sealant shall not adhere to backer rod.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions for compliance with requirements for maximum moisture content, installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Manufacturer's Representative: Be present for first three days of installation to give instructions to installation crew and then make periodic site visits to ensure products are being installed in accordance with published instructions.

3.3 GENERAL

- A. Store, mix, apply, and cure materials for each repair system in strict compliance with manufacturer's installation instructions. Make repairs necessary, without additional compensation, so completed work complies with Contract Document work scopes.
- B. Where concrete is repaired near an expansion joint or control joint, preserve isolation between components on either side of the joint.
- C. Identify reinforcing locations prior to drilling using reinforcing bar locators so that drill hole locations may be adjusted to avoid reinforcing interference. When drilling holes for dowels and bolts, stop drilling if reinforcing is encountered. Relocate hole to avoid reinforcing as approved by the Engineer. Do not cut reinforcing without prior approval by the Engineer.
- D. Concrete designated to be removed to specific limits indicated or directed by the Engineer, shall be done by saw cutting (1 inch deep) at limits of removal followed by line drilling, chipping, sandblasting, or air blasting, as appropriate in areas where deteriorated, damaged, or unsound concrete is to be removed. Remove concrete such that surrounding concrete and existing reinforcing to be left in place and existing in place equipment are not damaged.
 1. Perform full thickness saw-cutting at limits of concrete to be removed only if indicated, specified, or after obtaining written approval from the Engineer.

- E. Saw-cut edges straight for vertically and horizontally repair areas. Make intersecting cuts perpendicular to each other.
 - F. Stop saw cutting if reinforcing is encountered. Do not cut reinforcing without prior approval by the Engineer. Identify reinforcing locations within one foot of saw cut locations in any direction prior to saw cutting using reinforcing bar locators.
 - G. Clean concrete surfaces of efflorescence, deteriorated concrete, dirt, laitance, and existing repair materials such as liners, adhesives, and epoxies. Remove foreign matter and deleterious films by sandblasting, air blasting, scarifying or other mechanical means to sound original concrete.
 - H. Thoroughly clean repair area with oil-free compressed air, then install bonding agent. Place repair materials within open time of epoxy bonding agent.
 - I. Consolidate repair material, completely filling all portions of area to be filled.
 - J. Bring finished repair surfaces into alignment with adjacent existing surfaces to provide a uniform, flush, and even surface. Match repair surfaces to adjacent existing surfaces in texture, including any coatings or surface treatments that had been provided for existing surface.
 - K. Remove excess material from faces of materials being repaired and adjacent walls, floors, and slabs. Leave exposed faces of surface materials clean and ready to accept subsequent work.
 - L. Repair or replace concrete indicated or specified to be left in place, but that is damaged because of the work of this Section. Perform work by approved means and methods.
- 3.4 CRACK REPAIR (POLYURETHANE CHEMICAL GROUT INJECTION REPAIR TYPE "A")
- A. Apply polyurethane chemical grout to leaking cracks, joints, and voids in existing concrete.
 - B. Install polyurethane chemical grout through drilled-in injection ports installed as recommended by polyurethane chemical grout manufacturer. Install and cure polyurethane repair materials in accordance with manufacturer's requirements.
 - C. Remove injection ports and seal with grout. Leave repair area flush with surrounding concrete surfaces.
- 3.5 CRACK REPAIR (EPOXY ADHESIVE INJECTION REPAIR TYPE "B")
- A. Repair cracks on horizontal surfaces by gravity feeding crack repair epoxy adhesive into cracks. Pressure inject cracks less than 1/16 inch in thickness.
 - B. Repair cracks on vertical surfaces by pressure injecting crack repair epoxy adhesive through injection ports sealed to surface with crack repair epoxy adhesive.

- C. Clean cracks by sandblasting, water jet, or high-pressure oil free air to remove loose matter, dirt, laitance, oil, grease or other contaminants. Prior to injection of the crack apply a surface seal of epoxy paste to crack faces.
1. Establish openings in surface seal (injection ports) along the crack. Do not allow distance between injection ports to be greater than slab or wall thickness.
 2. Begin injection at first port at one end of the crack. For vertical or inclined surfaces begin injection at lowest point of the crack. Continue injection at first port until injected epoxy begins to flow out of second port in line.
 3. Plug first port and continue injection from second port. Inject entire crack following same sequence. Continue injecting crack and do not stop until crack is completely injected.
 4. After injected epoxy has cured, remove or cut off ports and grind flush with adjacent concrete surface. Do not allow indentations or protrusions caused by port placements.
- 3.6 SPALLED/DETERIORATED CONCRETE REPAIR (REPAIRS TYPE "C", "E", AND "F")
- A. Only use polymer-modified cementitious repair mortar for surface repair of spalled or deteriorated concrete.
- B. Comply with manufacturer's recommendations for concrete removal, surface preparation, mixing, application, lift thickness, finishing, moist curing, and form removal.
- C. Saw cut perimeter of deteriorated concrete to form a rectangle with straight edges to depth indicated. Remove fractured, loose, broken, softened, and deteriorated concrete by abrasive blasting, chipping, or other appropriate means to sound concrete. Chip concrete substrate to obtain a surface profile with a new fractured aggregate surface.
- D. Remove dirt, oil, grease, and other bond inhibiting materials from surface by dry mechanical means such as sand blasting, chipping, or wire brushing. Thoroughly clean surface of loose or weakened material and dust by dry mechanical means such as oil-free air blast. Follow recommendations of repair mortar manufacturer for additional surface preparation.
- E. Do not damage reinforcing steel that is to be incorporated into new concrete. Where reinforcing steel with active corrosion is encountered, use following procedure:
1. Use dry mechanical means to remove loose material, contaminants and rust from exposed reinforcing steel.
 2. When more than half of reinforcing bar diameter is exposed, chip out behind reinforcing steel, 1 inch minimum.
 3. Make distance chipped behind a reinforcing bar equal to or exceed minimum placement depth of material being used, 1 inch minimum.
 4. If existing reinforcing steel has lost more than 15 percent of its original cross-sectional area, splice in new reinforcing as shown on Drawings.
- F. Repair cracks encountered in substrate area of spalled or deteriorated concrete repair as specified directed by the Engineer.

G. Repair Mortar Placement:

1. Follow procedures recommended by manufacturer for mixing and placement of repair mortar.
2. After initial mixing of repair mortar, do not add water to change the consistency, should the mix begin to stiffen.
3. Saturate substrate surface dry (SSD) with no standing water during application.
4. Apply scrub coat to substrate, filling all pores and voids.
5. While scrub coat is still plastic, apply polymer-modified repair mortar. Place repair mortar to an even, uniform plane to restore the member to its original surface.
6. For applications greater than 1 inch in depth, apply repair mortar in lifts. Score exposed surface of each lift to produce a roughened surface before applying the next lift. Allow lift to reach final set before proceeding with subsequent lift.

H. Finishing:

1. Apply repair mortar with a smooth, steel trowel finish, unless otherwise noted.
2. Have no sharp edges when repair is completed. Make exterior corners, such as at penetrations, with a 1 inch radius. Make interior corners square.

- I. Curing: Perform as recommended by repair mortar manufacturer, except that cure period shall be at least 24 hours and done by means of a continuous fog spray or moist cure with wet burlap.

3.7 CRACK REPAIR (EPOXY ADHESIVE THROUGH BOLTS)

- A. After completion of crack injection and spall repairs, install stainless steel straps where shown on the contract drawings.
- B. Drill anchor holes where shown
- C. Remove dirt, oil, grease, and other bond inhibiting materials from surface by dry mechanical means such as sand blasting, chipping, or wire brushing. Thoroughly clean hole of loose or weakened material and dust by dry mechanical means such as oil-free air blast.
- D. Install epoxy adhesive and stainless steel through bolts following procedure recommended by epoxy adhesive anchor manufacturer.

END OF SECTION 030100.61

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SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.
- B. Related Requirements:
 - 1. Section 030100 "Concrete Repairs" for concrete repairs.
 - 2. Section 312000 "Earthwork" for drainage fill under slabs-on-grade.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.
- B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials change, source of cement or aggregate change or test results do not meet specification requirements, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement. Include bar sizes, spacing, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement. Reference bars to be the same identification marks shown on the bar bending details.
- D. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.

2. Admixtures.
3. Form materials and form-release agents.
4. Steel reinforcement and accessories.
5. Fiber reinforcement.
6. Curing compounds.

E. Material Test Reports: For the following, from a qualified testing agency:

1. Aggregates: Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.
2. Mill Test Reports:
 - a. Cementitious materials.
 - b. Steel Reinforcing.
 - c. Reinforcing Splicing Devices.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer, detailing fabrication, assembly, and support of formwork. Formwork shop drawings shall be stamped and sealed by a professional engineer registered in the State of North Carolina.
- C. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- B. Testing Agency Qualifications: An independent agency, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
 2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Provide reinforcement free from mill scale, rust, mud, dirt, grease, oil, ice, or other foreign matter that will reduce or destroy bond. Deliver, store, and handle steel

reinforcement to prevent bending and damage. Store reinforcement off the ground, protect from moisture, and keep out of standing water, and free from rust, mud, dirt, grease, oil, ice, or other contaminants and deleterious films that will reduce or destroy bond.

- B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

1.8 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1, and as follows:
 - 1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301.
 - 2. ACI 117.

2.2 FORM-FACING MATERIALS

- A. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- B. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- C. Form Ties: Factory-fabricated, removable or snap-off glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
1. Furnish units that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
 2. Furnish ties that, when removed, leave holes no larger than 1 inch in diameter in concrete surface.
 3. Furnish ties with integral water-barrier plates to below grade walls.

2.3 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Reinforcing bars to be welded or field bent: Low-Alloy-Steel Reinforcing Bars, ASTM A 706/A 706M, deformed.
- C. Plain-Steel Wire: ASTM A 1064/A 1064M.
- D. Deformed-Steel Wire: ASTM A 1064/A 1064M.
- E. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, plain, fabricated from as-drawn steel wire into flat sheets.
- F. Deformed-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, flat sheet.

2.4 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
1. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
 2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.
 3. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.
- B. Tie wires for reinforcement: 16 gauge or heavier black annealed wire to tie uncoated reinforcing. Use zinc coated wire to tie galvanized reinforcing. Use epoxy coated wire to tie epoxy coated reinforcing.

2.5 CONCRETE MATERIALS

- A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- B. Cementitious Materials:
 - 1. Portland Cement: ASTM C 150/C 150M, Type I/II,.
 - 2. Fly Ash: ASTM C 618, Class F.
 - 3. Slag Cement: ASTM C 989/C 989M, Grade 100 or 120.
- C. Normal-Weight Aggregates: ASTM C 33/C 33M. Provide aggregates from a single source.
 - 1. Maximum Coarse-Aggregate Size: ASTM C33 Size Number 67 nominal.
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- D. Air-Entraining Admixture: ASTM C 260/C 260M.
- E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
- F. Water: ASTM C 94/C 94M and potable.

2.6 FIBER REINFORCEMENT

- A. Synthetic Micro-Fiber: Fibrillated polypropylene micro-fibers engineered and designed for use in concrete, complying with ASTM C 1116/C 1116M, Type III, 1 to 2-1/4 inches long.

2.7 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating

2.8 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
1. Cement Binder: ASTM C 150/C 150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
 4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.

2.9 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials
1. Fly Ash: 25 percent.
 2. Combined Fly Ash and Pozzolan: 25 percent.
 3. Slag Cement: 50 percent.
 4. Combined Fly Ash or Pozzolan and Slag Cement: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.
- C. Admixtures: Use admixtures according to manufacturer's written instructions.
1. Use water-reducing admixture in concrete, for placement and workability.
 2. High-range water-reducing admixture in concrete, may be used, for placement and workability.

2.10 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Pipe Encasements: Normal-weight concrete.
1. Minimum Compressive Strength: 2500 psi at 28 days.
 2. Maximum W/C Ratio: 0.62 .
 3. Slump Limit: 8 inches for concrete with verified slump of 1 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture plus or minus 1 inch.
 4. Air Content: **4.5** percent, plus or minus 1 percent at point of delivery.

2.11 FABRICATING REINFORCEMENT

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

2.12 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.
 - 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
 - 1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
 - 2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.
 - 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
 - 1. Class B, 1/4 inch for rough-formed finished surfaces.
- D. Construct forms tight to prevent loss of concrete mortar.
- E. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Install reglets, recesses, and the like, for easy removal.
 - 2. Do not use rust-stained steel form-facing material.

- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Do not chamfer exterior corners and edges of permanently exposed concrete.
- I. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, ice, snow and other debris just before placing concrete.
- J. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- K. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEM INSTALLATION

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

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of encasements and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material are not acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Engineer.

3.4 STEEL REINFORCEMENT INSTALLATION

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

- B. Clean reinforcement of loose mill scale, rust, mud, dirt, grease, oil, ice, and other foreign materials that reduce or destroy the bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded-wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing, 1.3 times the development length, or 8 inches, whichever is greater. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.
- F. Splicing:
 - 1. Lap splices in welded wire fabric in accordance with the requirements of ACI 318 but not less than 12 inches. Tie the spliced fabrics together with wire ties spaced not more than 24 inches on center and lace with wire of the same diameter as the welded wire fabric. Offset splices in adjacent widths to prevent continuous splices.
 - 2. Reinforcing Splicing Devices: Use only where indicated. Offset splices in adjacent bars by at least 30 bar diameters. Use only for special splice and dowel conditions indicated or approved by the Engineer.
 - 3. If not indicated on Drawings, locate reinforcement splices at point of minimum stress.

3.5 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Engineer.
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid “cold” joints.
 - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

3.6 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 305.1 for hot-weather protection during curing.
- B. Formed Surfaces: Cure formed concrete surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.
- C. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- D. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies does not interfere with bonding of floor covering used on Project.
 - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer.

3.7 CONCRETE SURFACE REPAIRS

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

- B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit sawcut at the perimeter of the area to a depth of 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 - 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar matches surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 - 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Engineer.
- D. Perform structural repairs of concrete, subject to Engineer's approval, using epoxy adhesive and patching mortar.
- E. Repair materials and installation not specified above may be used, subject to Engineer's approval.

3.8 FIELD QUALITY CONTROL

- A. Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Notify the Owner when the reinforcing is complete and ready for inspection, at least six working hours prior to the proposed concrete placement. Do not cover reinforcing steel with concrete until the installation of the reinforcement, including the size, spacing and position of the reinforcement has been inspected by the Owner's inspection agency and the Owner's inspection agency release to proceed with the concreting has been obtained. Keep forms open until the Owner's inspection agency has completed inspection of the reinforcement.
- C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements by the Owner's testing agency:
 - 1. Testing Frequency: One composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.

2. Testing Frequency: One composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.
 - a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
3. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests will be performed when concrete consistency appears to change.
4. Air Content: ASTM C 231/C 231M, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
5. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.
6. Unit Weight: ASTM C 567/C 567M, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
7. Compression Test Specimens: ASTM C 31/C 31M.
 - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
 - b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.
8. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
 - a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
 - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
10. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
11. Test results shall be reported in writing to Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
12. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Engineer. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Engineer.

13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
14. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

END OF SECTION 033000

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Division 05
Metals

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SECTION 050519 - POST-INSTALLED ANCHORS AND REINFORCING BARS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Post-installed adhesive anchors for concrete substrates.
- 2. Post-installed reinforcing bar dowels using adhesive anchoring system.

- B. Related Requirements:

- 1. Section 033000 "Cast-In-Place Concrete" and related Sections for concrete, reinforcement, and accessories.
- 2. Section 030100.61 "Concrete Repairs" for concrete repairs and modification.
- 3. Section 055000 "Metal Fabrication" for metal fabrication and miscellaneous metals.
- 4. Section 055313 "Bar Gratings" for bar grating.
- 5. Section 400559.33 "Cast Iron Slide Gates" for slide gates and process mechanical equipment.

1.3 ACTION SUBMITTALS

- A. Submit in accordance with Section 013300.

- B. Post-Installed Expansion Anchors:

- 1. Design Data: Submit manufacturer's specifications and data including recommended design values and physical characteristics for expansion anchors.
- 2. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, materials and finishes for post-installed expansion anchors installed into cracked concrete.
- 3. Installation Procedures: Submit procedures stating product proposed for use, and complete installation method.

- C. Post-Installed Adhesive Anchoring System:

- 1. Design Data: Submit manufacturer's specifications and data including recommended design values and physical characteristics, including temperature, humidity, and moisture limitations for adhesive anchoring system.

2. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, materials and finishes for post-installed adhesive anchoring system installed into cracked concrete.
3. Installation Procedures: Submit procedures stating method of drilling, product proposed for use, and complete installation method.

1.4 INFORMATIONAL SUBMITTALS

- A. Installation procedure: Submit installation procedure for post-installed adhesive anchoring system; including method of drilling.
- B. Certificates:
 1. Installer Qualifications for Adhesive Anchoring System: Submit installer and testing agency qualifications as stated in following Paragraph of this Article.
- C. Qualification Data:
 1. Installer: Indicate manufacturer's training date and a list of personnel trained on installation of adhesive anchoring system.
 2. Testing Agency:
 - a. Laboratory: Meet requirements of ASTM E329. Prior to testing, submit qualifications of proposed testing laboratory for approval that includes:
 - 1) Name and address.
 - 2) Names and positions of principal officers and name, position, and qualifications of responsible registered professional engineer in charge.
 - 3) List technical services provided, indicating external technical services to be provided by other organizations.
 - 4) Names and qualifications of the supervising laboratory technicians.
 - 5) Provide report prepared by laboratory evaluations authority when requested by The Engineer.
 - 6) Submit as required above for other organizations that will provide external technical services.
 - b. Include in submittal a list of five projects in which the laboratory has performed testing in accordance with ASTM E488. Include following information for each project:
 - 1) Project name and location.
 - 2) Project Owner.
 - 3) Owner's representative including address and phone number.
 - 4) Brief description of work.
 3. Submit qualifications of other laboratory or laboratories until approved.
- D. Evaluation Reports: From ICC-ES for adhesive anchoring system, for installation of post-installed anchors into cracked concrete, as applicable, indicating conformance with current ICC ES Acceptance Criteria.

1.5 QUALITY ASSURANCE

- A. General: Coordinate with the work of other Sections, field verifying dimensions and work of other trades adjoining items of work before installing items specified in this Section.
- B. Adhesive Anchoring System:
 - 1. Installer Training: Conduct thorough training by the manufacturer or the manufacturer's representative. Training shall consist of the complete installation process for post-installed anchors and reinforcing bar dowels, including but not limited to:
 - a. Tool selection.
 - b. Hole drilling procedure.
 - c. Hole preparation and cleaning techniques.
 - d. Adhesive injection technique and dispenser training and maintenance.
 - e. Anchor preparation and installation.
 - f. Reinforcing bar dowels preparation and installation.
 - g. Proof loading and torquing.
 - h. Temperature, humidity, and moisture limitations.
 - i. Working time limitations.
 - j. Setting time.
 - 2. Include training for anchors and reinforcing bar dowels installed horizontally or upwardly inclined to support sustained tension loads. Install horizontally or upwardly inclined anchors and reinforcing bar dowels by personnel certified by an applicable certification program. Certification shall include written and performance tests in accordance with the ACI/CRSI Adhesive Anchor Installer Certification program, or equivalent.
 - 3. Manufacturer's Certificate of Proper Installation: Submit upon completion of work, for the post-installed anchors and reinforcing bar dowels, including non-production and production anchors and reinforcing bar dowels.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver items to be incorporated into the work of other trades in sufficient time to be checked prior to installation.
- B. Handle materials with cranes or derricks. Do not dump material off transportation vehicles or handle in ways that will cause damage.
- C. Store materials elevated above grade and block up so they will not become bent or otherwise damaged.
- D. Repair items that have become damage or corroded to satisfaction of the Engineer prior to incorporating them into the work.

PART 2 - PRODUCTS

2.1 ADHESIVE ANCHORING SYSTEM

- A. Fastening to Concrete Substrate: Manufactured system consisting of post installed threaded rods, nuts, washers, other anchoring hardware, and chemical dispenser for installation in hammer drilled holes.
1. Anchors: Meet ICC ES AC308.
 2. Injection Adhesive: Two-component epoxy system consisting of a hardener and a resin, furnished in pre-measured side-by-side cartridges which keep both components separate.
 3. Adhesive Cartridge: Side-by-side design to accept a static mixing nozzle which thoroughly blends both components and allows injection directly into a drilled hole.
 4. Anchor: Type 316 stainless steel as indicated consisting of an all-thread anchor rod with nut and washer, of matching material to anchor rod.
 - a. Basis-of-Design:
 - 1) Anchorage designs indicated are based on Hilti HIT- RE 500 V3, unless otherwise noted.
 - 2) Acceptable Manufacturers: Hilti HIT- RE 500 V3; Simpson Strong Tie SET-XP; ITW Ramset Red Head Epcon G5; or equal.
 5. Reinforcing Bar Dowels: Reinforcing bar, per Section 033000.
 - a. Basis-of-Design:
 - 1) Anchorage designs indicated are based on Hilti HIT- RE 500 V3, unless otherwise noted.
 - 2) Acceptable Manufacturers: Hilti HIT- RE 500 V3; Simpson Strong Tie SET-XP; ITW Ramset Red Head Epcon G5; or equal.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General:
1. Install anchoring system in strict compliance with manufacturer's published installation instructions and approved Shop Drawings. Comply with recommended surface preparation, temperature, and moisture of substrate and ambient conditions.
 2. Coordinate installation with Special Inspector.
 3. Use drill bit of correct diameter and drill to required depth using rotary impact type hammer drills with carbide-tipped bits.
 4. Drill holes perpendicular to concrete surface, unless otherwise indicated.
 5. Use oil free compressed air to blast out loose particles and dust from drilled holes.

B. Adhesive anchoring system:

1. Perform installation only by personnel trained in anchor installation and having certification required in PART 1 - GENERAL.
2. Inject adhesive and install anchors and/or reinforcing bar dowels that are clean and free of dirt, oil, grease, ice or other deleterious material which would reduce bond.

END OF SECTION 050519

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SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Miscellaneous items fabricated from aluminum or stainless steel.
 - 2. Metal bollards.

- B. Products furnished, but not installed, under this Section include the following:

- 1. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.

- C. Related Requirements:

- 1. Section 036000 "Grouting" for non-shrink grout.
 - 2. Section 050519 "Post-Installed Anchors and Reinforcing Bars" for anchors in various substrates.
 - 3. Section 055313 "Bar Gratings" for various types of bar grating assemblies.

1.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

- B. Coordinate installation of metal fabrications that are anchored to or that receive other work.

1.4 ACTION SUBMITTALS

- A. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:

- 1. Metal bollards.
 - 2. Miscellaneous aluminum items.
 - 3. Miscellaneous stainless steel items.

1.5 INFORMATIONAL SUBMITTALS

- A. Mill Certificates: Signed by aluminum and stainless steel manufacturers, certifying that products furnished comply with requirements.
- B. Welding certificates.
 - 1. Certify that welders have been qualified under AWS, within previous 12 months, to perform welds required under this Section.

1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
 - 2. AWS D1.6/D1.6M, "Structural Welding Code - Stainless steel."
- B. Evaluation Reports: Post-installed concrete anchors, from ICC-ES for adhesive anchor system, for installation into cracked concrete, as applicable, indicating conformance with current ICC ES Acceptance Criteria.

1.7 FIELD CONDITIONS

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

PART 2 - PRODUCTS

2.1 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Stainless steel Sheet, Strip, and Plate: ASTM A 240/A 240M or ASTM A 666, Type 316 or Type 316L for welded components.
- C. Stainless steel Bars and Shapes: ASTM A 276, Type 316 or Type 316L for welded components.
- D. Aluminum Plate and Sheet: ASTM B 209, Alloy 6061-T6.
- E. Aluminum Extrusions: ASTM B 221, Alloy 6061 T6.
- F. Stainless steel Bolts: ASTM F593, Type 316.
- G. Stainless steel Nuts: ASTM F594, Type 316.
- H. Welding electrodes, steel: AWS A5.1 E70xx.

2.2 FASTENERS

- A. Unless otherwise noted, provide steel machine bolts for the connection of carbon steel or iron; galvanized steel or stainless-steel machine bolts for the connection of galvanized steel or iron; and stainless steel machine bolts for the connection of aluminum or stainless-steel.
- B. General: Unless otherwise indicated, provide Type 316 stainless steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
 - 1. Provide stainless steel fasteners for fastening aluminum.
 - 2. Provide stainless steel fasteners for fastening stainless steel.
- C. Stainless steel Bolts and Nuts: Regular hexagon-head annealed stainless steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers; Alloy Group 2.

2.3 MISCELLANEOUS ALUMINUM

- A. Miscellaneous Aluminum: Formed true to detail, with clean, straight, sharply defined profiles and smooth surfaces of uniform color and texture and free from defects impairing strength or durability. Drill or punch holes. Smooth edges without burrs. Fabricate supplementary pieces necessary to complete each item though such pieces are not definitely shown or specified.
- B. Connections and Accessories: Sufficient strength to safely withstand the stresses and strains to which they will be subjected. Close fitting exposed joints and jointed where least conspicuous. Conceal threads on threaded connections where practical. Provide continuous welds or intermittent welds on welded connections as specified or shown. Dress face of welds flush and smooth. Weld on unexposed side as much as possible in order to prevent pitting or discoloration of the aluminum exposed surface. Grind smooth continuous welds that will be exposed. Provide holes for temporary field connections and for attachment of the work of other trades.
- C. Miscellaneous Aluminum Items: miscellaneous aluminum indicated and not otherwise specified.
- D. Angle Frames for Grates and Similar Items: Complete with welded strap anchors attached.
- E. Aluminum Finishes:
 - 1. Mill Finish: Have a cleaned and degreased mill finish on other aluminum items.

2.4 MISCELLANEOUS STAINLESS-STEEL

- A. Miscellaneous Stainless-Steel Work: Formed true to detail, with clean, straight, sharply defined profiles and smooth surfaces of uniform color and texture and free from defects impairing strength or durability. Drill or punch holes. Smooth edges without burrs. Fabricate supplementary pieces necessary to complete each item though such pieces are not definitely shown or specified.
- B. Connections and accessories: Sufficient strength to safely withstand the stresses and strains to which they will be subjected. Close fitting exposed joints, jointed where least conspicuous.

Conceal threads on threaded connections where practical. Provide continuous welds or intermittent welds on welded connections as specified or shown. Dress face of welds flush and smooth. Grind smooth continuous welds that will be exposed. Provide holes for temporary field connections and for attachment of the work of other trades.

2.5 MISCELLANEOUS MATERIALS

- A. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.6 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

- J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/4 by 1 inch, with a minimum 6 inch embedment and 1 1/2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.7 METAL BOLLARDS

- A. Fabricate metal bollards from Schedule 40 steel pipe.
 - 1. Cap bollards with round off top.
- B. Galvanize bollards.

2.8 WIRE ROPE PARKING GARAGE GUARDS

- A. Wire Rope Parking Garage Guards: 3/4-inch-diameter, zinc-coated steel wire ropes with wire rope fittings for securing to parking garage columns and walls and for tightening wire rope.

2.9 FINISHES, GENERAL

- A. Finish metal fabrications after assembly.
- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.10 ALUMINUM FINISHES

- A. As-Fabricated Finish: AA-M12.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Install all items except those to be embedded in concrete which shall be installed under Division 03 respectively. Install items to be attached to concrete or masonry after such work is completed in accordance with the details shown. Fastening to wood plugs in masonry will not be permitted.
- B. Clean and repair, after installation, zinc coating which has been burned by welding, abraded, or otherwise damaged. Thoroughly clean damaged area and remove all traces of welding flux and loose or cracked zinc coating prior to painting. Paint the cleaned area per the requirements of ASTM A780.
- C. Install specialty products in accordance with the manufacturer's recommendations.

- D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- E. Field Welding: Comply with the following requirements:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- G. Corrosion Protection: Coat concealed surfaces of aluminum and steel that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
1. Aluminum Contacting a Dissimilar Metal: Apply a heavy brush coat of zinc-chromate primer followed by two coats of aluminum metal and masonry paint to the dissimilar metal.
 2. Aluminum Contacting Masonry or Concrete: Apply a heavy coat of approved alkali resistant paint to the masonry or concrete.
 3. Aluminum Contacting Wood: Apply two coats of aluminum metal and masonry paint to the wood.
 4. Steel Contacting Exposed Concrete or Masonry: Apply heavy bitumastic troweling mastic.
 5. Between aluminum stair treads, and steel supports, insert 1/4 inch thick neoprene isolator pads, 85 plus or minus 5 Shore A durometer, sized for full width and length of bracket or support.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

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

3.3 INSTALLING METAL BOLLARDS

- A. Fill bollards solidly with concrete, mounding top surface to shed water.
1. Do not fill removable bollards with concrete.

3.4 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION 055000

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SECTION 055313 - BAR GRATINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes metal bar gratings.
- B. Related Requirements:
 - 1. Section 055000 “Metal Fabrications” for grating supports.

1.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of grating with installation of related items. Deliver such items to Project site in time for installation.

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Clips and anchorage devices for gratings.
 - 2. Paint products.
 - 3. Manufacturers' published load tables.
- B. Shop Drawings: Include plans, sections, details, and attachments to other work. Identify size, material, and location of supporting members and forward requirements to Section 055000 “Metal Fabrications”.

1.5 INFORMATIONAL SUBMITTALS

- A. Mill Certificates: Signed by manufacturers of aluminum certifying that products furnished comply with requirements.
- B. Welding certificates, qualified in the previous 12 months.

- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.6 QUALITY ASSURANCE

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

1.7 FIELD CONDITIONS

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Harsco Industrial IKG, a division of Harsco Corporation.
 - 2. Ohio Gratings, Inc.

2.2 PERFORMANCE REQUIREMENTS

- A. Provide grating conforming to ANSI/NAAMM MBG 531, Type P-19-4, size of grating as shown on Drawings. Do not exceed fabricator's maximum recommended grating span.
- B. Limit grating deflection to 1/4 inch maximum for a uniform live load of 100 psf on maximum span.

2.3 METAL BAR GRATINGS

- A. Metal Bar Grating Standards: Comply with NAAMM MBG 532, "Heavy-Duty Metal Bar Grating Manual."
- B. Pressure-Locked, Rectangular-Bar Aluminum Grating ANSI/NAAMM MBG 531 Type P-19-4: Fabricate by pressing rectangular flush-top crossbars into slotted bearing bars or swaging crossbars between bearing bars.
 - 1. Traffic Surface: Plain.
 - 2. Aluminum Finish: Mill finish.

2.4 ALUMINUM

- A. General: Provide alloy and temper recommended by aluminum producer for type of use indicated, with not less than the strength and durability properties of alloy, and temper designated below for each aluminum form required.
- B. Extruded Bars and Shapes: ASTM B 221, alloys as follows:
 - 1. Grating Bearing Bars: 6061-T6 or 6063-T6.
 - 2. Grating Crossbars: 6061-T1.
- C. Aluminum Sheet: ASTM B 209, Alloy 5052-H32.
- D. Welding electrode, aluminum: 5356 filler alloy.

2.5 FASTENERS

- A. General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
 - 1. Provide stainless-steel fasteners for fastening aluminum.
 - 2. Provide stainless-steel fasteners for fastening stainless steel.
- B. Grating clamps, nuts, bolts, washers and other fastening devices for grating shall be Type 316 stainless steel. Anchor grating to supporting system using plank clips, saddle clips, or countersunk lands.

2.6 MISCELLANEOUS MATERIALS

- A. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

2.7 FABRICATION

- A. Shop Assembly: Fabricate grating sections in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch material cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form from materials of size, thickness, and shapes indicated, but not less than that needed to support indicated loads.
- D. Fit exposed connections accurately together to form hairline joints.
- E. Welding: Comply with AWS recommendations and the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.

F. Additional Fabrication:

1. Do not notch bearing bars at supports to maintain elevation.
2. Band ends of grating panels
3. Fabricate metal frames and supports for grating of same material as grating, unless otherwise indicated.

2.8 ALUMINUM FINISHES

- A. Mill finish.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordinate locations and elevations of grating supports provided under provisions of Section 055000 "Metal Fabrications." Verify that members are properly installed to support bar gratings specified in this Section.
- B. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions and directions for installation of anchorages, including concrete inserts, sleeves, anchor bolts and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install assemblies in accordance with manufacturer's installations instructions. Install products plumb, level, and square, unless otherwise required by the design.
- B. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing gratings to in-place construction and grating supports.
- C. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing gratings. Set units accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
- D. Provide additional supports at penetrations through grating in order to meet design criteria.
- E. Fit exposed connections accurately together to form hairline joints.

1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

3.3 INSTALLING METAL BAR GRATINGS

- A. General: Install gratings to comply with recommendations of referenced metal bar grating standards that apply to grating types and bar sizes indicated, including installation clearances and standard anchoring details.
- B. Attach units to supporting members with type and size of clips and fasteners as specified.

END OF SECTION 055313

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Division 26
Electrical

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SECTION 260510 – LIMITED ELECTRICAL FOR SMALL PROJECTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Copper power and control wire rated 600V or less.
2. Low-voltage instrumentation cable.
3. Connectors, splices, and terminations.
4. Grounding and bonding components.
5. Support systems for raceways, boxes, and electrical equipment.
6. Metal conduits and fittings.
7. Nonmetallic conduit and fittings.
8. Boxes, enclosures, and cabinets.
9. Wiring Devices.
10. Handholes and boxes for exterior underground cabling.
11. Identification requirements.

1.3 DEFINITIONS

- A. ARC: Aluminum rigid conduit. See also RAC.
- B. Direct Buried: Duct or a duct bank that is buried in the ground, without any additional casing materials such as concrete.
- C. Duct: A single duct or multiple ducts. Duct may be installed singly or as a component of a duct bank.
- D. Duct Bank:
 1. Two or more ducts installed in parallel, with or without additional casing materials.
 2. Multiple duct banks.
- E. EMI: Electromagnetic interference.
- F. GFCI: Ground-fault circuit interrupter.
- G. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50V or for remote-control and signaling power-limited circuits.

- H. RAC: Rigid aluminum conduit. See also ARC.
- I. RoHS: Restriction of Hazardous Substances.
- J. Trafficways: Locations where vehicular or pedestrian traffic is a normal course of events.
- K. National Electrical Code (NEC) / NFPA conduit types:
 - 1. RMC – rigid metal conduit
 - 2. LFMC – liquidtight flexible metal conduit
 - 3. PVC – rigid polyvinyl chloride conduit
 - 4. LFNC – liquidtight flexible nonmetallic conduit
 - 5. RNC – rigid nonmetallic conduit

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product used on this project.
- B. Shop Drawings:
 - 1. Precast Handholes: Include plans, elevations, sections, and details.
- C. Installation Working Drawings: For underground conduit routing.

1.5 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 ELECTRICAL MATERIALS

- A. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with associated UL Standards as applicable and listed in this specification.

2.2 WIRE

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Alpha Wire Company.
 - 2. Encore Wire Corporations.
 - 3. General Cable Technologies Corporation.
 - 4. Okonite Company (The).
 - 5. Service Wire Co.

6. Southwire Company.

- B. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V.
- C. Standards:
 - 1. RoHS compliant.
 - 2. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- D. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.
- E. Size: Minimum No. 12 AWG for power circuits, minimum No. 14 AWG for control circuits.
- F. Stranding: Refer to Part 3 "Conductor Applications" Article.
- G. Conductor Insulation: Refer to Part 3 "Conductor Applications" Article.
 - 1. Type RHW-2: Comply with UL 44.
 - 2. Type TC-ER: Comply with NEMA WC 70/ICEA S-95-658 and UL 1277.
 - 3. Type XHHW-2: Comply with UL 44.

2.3 INSTRUMENTATION CABLE

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Belden.
 - 2. General Cable Technologies Corporation.
 - 3. Okonite Company (The).
- B. Single or Multiple Paired Cable: NEC type ITC (Instrumentation Tray Cable), UL Type TC for 4-20mA process instrumentation signals and use under NEC Article 72.
 - 1. One or Multi-pair, twisted, shielded, No. 16 AWG, stranded (19x29) tinned-copper conductors.
 - 2. XLPE insulation, 600V.
 - 3. Shield: 100 percent aluminum/polyester foil with drain wire. Pairs individually shielded with overall shield.
 - 4. PVC jacket with manufacturer's identification.
 - 5. Standards: UL 1277 Type TC, UL 1581

2.4 CONNECTORS, SPLICES, AND TERMINATIONS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. 3M Electrical Products.

2. Ideal Industries, Inc.
 3. TE Connectivity Ltd.
 4. Thomas & Betts Corporation; A Member of the ABB Group.
- B. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- C. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.
1. Material: Tin-plated copper.
 2. Type:
 - a. Locking spade with insulated sleeve for No. 10 AWG and smaller.
 - b. One hole with long barrels for No. 8 AWG to No. 4/0 AWG.
 - c. Two holes with long barrels for 250 kcmil and larger.
 3. Termination: Compression for No. 8 AWG and larger.
- D. Connectors:
1. Solderless pressure type (wirenuts) for No. 10 AWG and smaller.
 2. Pre-filled with silicone-based sealant for exterior, wet, or corrosive locations.
 3. Split bolt type for No. 8 AWG and larger splices.
- E. Motor Terminations: Mechanical compression ring type, secured with bolt, nut, and spring washer. Insulated with Raychem type RVC, roll-on stub insulator or equal.
- F. Industrial Ethernet Cable Terminations: Match conductor count, RJ45 type, intended for shielded cable. Rockwell Automation Bulletin 1585J or equal.

2.5 GROUNDING AND BONDING MATERIALS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. ERICO; a brand of nVent.
 2. Hubbell Incorporated (Construction and Energy Group).
 3. O-Z/Gedney; a brand of Emerson Industrial Automation.
 4. Thomas & Betts Corporation; A Member of the ABB Group.
- B. Standard: Comply with UL 467 for grounding and bonding materials and equipment.
- C. Grounding Conductors:
1. Insulated conductors to match corresponding 600V phase conductor insulation requirements.
 2. Bare copper conductors: tin-plated.
- D. Ground rods: Copper-clad steel, sectional type; 3/4-inch diameter by 10-foot; minimum copper thickness 0.25 mm (10 mil).

- E. Grounding conduit hubs: Malleable iron type, mechanical type, terminal with threaded hub, sized for the associated conduit.
- F. Waterpipe ground clamps: cast bronze saddle type, sized for the associated water pipe.
- G. Exothermic weld: CADWELD process, or equal. Molds and powder furnished by same manufacturer and selected for specific combination of conductors and connected items. Use low emission type, CADWELD EXOLON or equal for welds used indoors in occupied buildings or confined spaces.

2.6 SUPPORT SYSTEMS

- A. Aluminum Channel:
 - 1. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
 - 2. Channel Material: 6063-T5 aluminum alloy.
 - 3. Fittings and Accessories Material: 5052-H32 aluminum alloy.
- B. Stainless Steel Channel:
 - 1. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
 - 2. Material for Channel, Fittings, and Accessories: Stainless steel, Type 316.
- C. Accessories: conduit clamps, straps, hangers, rods, backplates, anchors, nuts, washers, etc. shall match channel material.
- D. Threaded rod: 3/8-inch minimum diameter.
- E. Expansion anchors: 3/8-inch minimum diameter.

2.7 METAL CONDUITS AND FITTINGS

- A. Rigid Aluminum Conduit: Comply with ANSI C80.5 and UL 6A.
- B. LFMC: Sealtite®, Type UA, continuously interlocked flexible steel conduit with sunlight and chemical resistant PVC jacket and complying with UL 360.
- C. Metallic Fittings: Comply with NEMA FB 1 and UL 514B.
 - 1. Use cast aluminum fittings with RAC.
 - 2. Use malleable iron, three-piece screw in type with LMFC.
 - 3. Use Myers Electric Products, Inc. or equal, grounding type for conduit hubs.

2.8 NONMETALLIC CONDUIT AND FITTINGS

- A. RNC: Schedule 40 or Schedule 80 PVC based on application; comply with NEMA TC 2 and UL 651.
- B. LFNC-B: Comply with UL 1660, Type B.

C. Nonmetallic Fittings:

1. RNC: Comply with NEMA TC 3; match conduit type and material.
2. LFNC: Comply with UL 514B; dust-tight, liquid-tight, chemical resistant thermoplastic/nylon construction with tapered thread hub and neoprene O-ring gasket. Push-on fittings are prohibited.

D. Solvents and Adhesives: As recommended by conduit manufacturer.

2.9 BOXES, ENCLOSURES, AND CABINETS

A. Sheet Metal Outlet and Device Boxes: Pressed steel. Comply with NEMA OS 1 and UL 514A.

B. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, aluminum, Type FD, with gasketed cover.

C. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

D. NEMA 1 and NEMA 12 Pull and Junction Boxes:

1. Material: Sheet steel, minimum 14 gauge, without knockouts.
2. Construction: flanged box, galvanized with continuous weld seams that are ground smooth.
3. Cover: Gasketed, hanged, fastened with quick connect door clamp.

E. NEMA 4X Pull and Junction Boxes:

1. Material: Type 316 stainless steel, minimum 14 gauge, without knockouts.
2. Construction: flanged box, continuous weld seams that are ground smooth.
3. Cover: Gasketed, hanged, fastened with quick connect door clamp.

F. Wiring Devices:

1. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. Comply with NFPA 70.
3. RoHS compliant.
4. Device Color: White unless otherwise indicated or required by NFPA 70 or device listing.
5. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.
6. Tamper- and Weather-Resistant, GFCI Duplex Receptacles, 125 V, 20 A:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Eaton (Arrow Hart).
 - 2) Hubbell Incorporated; Wiring Device-Kellems.
 - 3) Leviton Manufacturing Co., Inc.
 - 4) Pass & Seymour/Legrand (Pass & Seymour).

- b. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two-pole, three-wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
 - b. Configuration: NEMA WD 6, Configuration 5-15R.
 - c. Type: Feed through.
 - d. Standards: Comply with UL 498 and UL 943 Class A.
 - e. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" and "Receptacles in Damp or Wet Locations" articles.
- G. Handholes and Boxes for Exterior Underground Cabling: Comply with details as indicated on the Drawings.

2.10 IDENTIFICATION

- A. Factory applied insulation color for No. 8 AWG conductors and smaller. Factory applied insulation color or field applied colored electrical tape for No. 6 AWG conductors and larger:
- 1. Color for 208/120V Circuits:
 - a. Phase A: Black.
 - b. Phase B: Red.
 - c. Phase C: Blue.
 - d. Neutral: White.
 - 2. Color for 240/120V Circuits (Single Phase):
 - a. Phase A: Black.
 - b. Phase B: Red.
 - c. Neutral: White.
 - 3. Color for 240 Δ /120V Circuits (Three Phase, Four Wire, high leg, center tap):
 - a. Phase A: Black.
 - b. Phase B: Orange (high leg).
 - c. Phase C: Blue.
 - Neutral: White.
 - 4. Color for 480/277V Circuits:
 - a. Phase A: Brown.
 - b. Phase B: Orange.
 - c. Phase C: Yellow.
 - d. Neutral: Gray.
 - 5. Color for Equipment Grounds: Green.
 - 6. Color of Individual Control Conductors:
 - a. AC: Red.
 - b. DC: Blue.

B. Nameplates and Labels:

1. Equipment Identification and Source Nameplates:
 - a. Black letters on a white field.
 - b. Engraved, laminated plastic, 3/16-inch-high lettering.
 - c. Provide for all electrical equipment. Match Drawing designation.
 - d. Include power source information, i.e., "FED FROM MCC-2" or provide separate nameplate.
2. Device Identification Labels:
 - a. Black letters on a white field.
 - b. Machine generated, self-adhesive, 1/4-inch-high lettering.
 - c. Provide for all receptacles, wall switching, lighting fixtures, photocells, exit lights, instruments, etc.
 - d. Include power source and branch circuit information, i.e., "LP-2/15" indicates panelboard LP-2, branch circuit 15.
3. Wire and Cable Labels:
 - a. Black letters on a white field.
 - b. Wraparound or sleeve type.

C. Detectable Underground-Line Warning Tape:

1. Foil-backed, detectable buried utility tape with black lettering on a bright background.
2. Width: 6 inches.
3. Overall Thickness: 5 mils.
4. Background Color / Description:
 - a. Red / Electric: electrical power, control, or instrumentation.
 - b. Orange / Fiber: fiber optic cables.

PART 3 - EXECUTION**3.1 GENERAL**

- A. Comply with the applicable National Electrical Contractors Association (NECA) documents for installation requirements except where requirement on Drawings or in this specification are stricter.
 1. NECA 1: Standard for Good Workmanship in Electrical Construction.
 2. NECA 101: Standard for Installing Steel Conduits.
 3. NECA 102: Standard for Installing Aluminum Rigid Metal Conduit.
 4. NECA 111: Standard for Installing Nonmetallic Raceways.
 5. NECA 331: Standard for Installing Building and Service Entrance Grounding and Bonding.

6. NECA / NEMA 605: Recommended Practice for Installing Underground Nonmetallic Utility Duct.

3.2 CONDUCTOR APPLICATIONS

- A. Wires and Cables: Copper, stranded, except for lighting and receptacle wiring which may be solid.
- B. Wire shall be NEC type XHHW-2 for sizes No. 4/0 AWG and smaller, and shall be NEC type RHW-2 for sizes 250 kcmil and larger.
- C. Equipment grounding conductors shall be the same NEC type as the phase conductors described previously, green and sized per NEC Table 250.122.
- D. Bare copper ground wire shall be stranded, tinned soft drawn annealed copper wire.
- E. Ground grid conductors shall be uninsulated unless shown otherwise on the Drawings.
- F. Wire for control, status, and alarm shall be NEC type XHHW-2.
- G. Multi-conductor power cable shall be stranded, 600V, cross-linked polyethylene insulated with PVC jacket, Type TC (XLP) with ground.

3.3 CONDUCTOR INSTALLATION

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- B. Complete raceway installation between conductor and cable termination points prior to pulling conductors and cables.
- C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway. Use of steel fish tapes and/or steel pulling cables in PVC conduit or raceways that terminate into energized enclosures is prohibited.
- E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- F. Adequately support cables.
- G. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- H. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors. Do not splice service or feeder cables without prior written approval of Engineer.

Instrumentation and Ethernet cables may not be spliced and shall be continuous from terminal to terminal.

I. Wiring at Outlets:

1. Install conductor at each outlet, with at least 6 inches of slack.
2. Form solid wire into loop to fit around device terminal screw. Do not overlap wire.

J. Identify and color-code conductors and cables.

K. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

L. Identify circuit number associated with lights, receptacles, and other miscellaneous loads to panelboards. Identify phase and neutral conductors with circuit number.

M. Install instrumentation and Ethernet cabling in separate raceway from control or power wiring.

N. Separation from EMI Sources:

1. Separation between instrumentation cables and unshielded power or control conductors and electrical equipment shall be as follows:
 - a. Minimum 12 inches.

3.4 GROUNDING

A. Comply with NEC Article 250.

B. Install insulated green equipment grounding conductor in all power and control raceways.

C. For instrumentation wiring, ground shield at one end only as recommended by instrument manufacturer and in accordance with Owner's standard.

D. Install grounding conductors in conduit or sleeves when passing through floor slabs.

E. Use exothermic welding process for all underground connections, connections to structural steel, connections to ground rods, or other connections which will become inaccessible at project completion.

3.5 SUPPORT MATERIALS APPLICATION

A. Dry, indoor, conditioned, non-process space: Aluminum.

B. Outdoor, process areas, or areas shown on the drawings as "DUST", "DAMP", or "WET": Aluminum and/or stainless-steel channel, depending upon load requirements.

3.6 RACEWAY APPLICATIONS

- A. Refer to Appendix Table 260510-1 for specific raceway application requirements.
- B. Minimum Raceway Size: 3/4-inch trade size.

3.7 BOX APPLICATIONS

- A. All boxes shall be metallic unless specified herein or indicated on the Drawings.
- B. Use cast aluminum for boxes and conduit fittings for switch, receptacle, and lighting outlets.
- C. Pull boxes, junction boxes, cabinets, etc. shall be suitable for the location and conform to the NEMA enclosure rating and material descriptions as indicated on the Drawings.
- D. Where no size is indicated for junction boxes, pull boxes, or terminal cabinets, size in accordance with NEC Article 314.

3.8 RACEWAY INSTALLATIONS

- A. Complete raceway installation before starting conductor installation.
- B. Tightly plug ends of conduits during construction to exclude dust and moisture.
- C. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- D. Arrange conduit system to allow liquids such as water, condensation, etc. will drain away from equipment served. If conduit drainage is not possible, plug conduits using conduit seals.
- E. Install no more than the equivalent of three 90-degree bends in any conduit run. Support within 12 inches of changes in direction.
- F. Make bends in raceway using large-radius preformed ells. Field bending shall be according to NFPA 70 minimum radii requirements. Use only equipment specifically designed for material and size involved.
- G. Support conduit within 12 inches of enclosures to which attached.
- H. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- I. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- J. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits. Install Meyers grounding type hubs when conduits terminate at gasketed enclosures.

- K. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
- L. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.
- M. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
- N. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- O. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.
- P. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways using “Duxseal” or seal fitting at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where an underground service raceway enters a building or structure.
 - 3. Conduit extending from interior to exterior of building.
 - 4. Conduit extending into pressurized duct and equipment.
 - 5. Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
 - 6. Where otherwise required by NFPA 70.
- Q. Comply with manufacturer's written instructions for solvent welding RNC and fittings.
- R. Install expansion joint fittings where necessary to compensate for thermal expansion and contraction.
- S. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for equipment subject to vibration, noise transmission or movement; and for transformers and motors.
- T. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
- U. A maximum continuous run of conduit shall not exceed 300 feet and shall be reduced by 75 feet for each 90-degree elbow.
- V. Provide a 4-inch concrete housekeeping pad at all slab and grade penetrations. Provide a 45 degree, 3/4-inch chamfer at all exposed edges.

- W. Protect metallic finish conduit installed in contact with concrete or below grade with heat shrink tubing. Extend protection on riser conduits to 12 inches above concrete pad.
- X. In hazardous locations, seal conduits terminating at boxes enclosing circuit opening equipment at the entrance to the enclosure with approved compound filled sealing fittings to prevent passage of explosive or combustible gases through the conduits. Similarly seal all conduits leading from or entering hazardous locations at points of exit or entrance. Seal exposed conduits passing through hazardous locations at both the entrance to and the exit from the hazardous locations.

3.9 UNDERGROUND SYSTEM INSTALLATION

- A. Coordinate final arrangement with other underground utilities, site grading, and surface features.
- B. Comply with Division 31 specifications for earthwork, excavation, trenching, backfill, and compaction.
- C. Raceway Drainage:
 - 1. Drain away from buildings.
 - 2. Drain towards manholes or handholes.
 - 3. Slope raceway not less than 3-inches per 100-feet.
- D. Restoration: Restore surface features and re-establish grade, paving, and vegetation to original unless otherwise indicated.
- E. Separate underground copper signal conduits (instrumentation and telecommunication) from power conduits by a minimum of 12 inches unless noted otherwise. Keep crossing of these conduits to a minimum; cross at 90-degree angles.
- F. Transition to Metal Conduit:
 - 1. Use fittings manufactured for RNC to metal conduit transition.
 - 2. Make transition from underground duct to metal conduit at least 5 feet from the stub-up location, without reducing duct line slope away from structure and without forming a trap in the line.
- G. Minimum Cover and Additional Detail: As indicated per details on Drawings.
- H. Where Drawings call for concrete encased duct bank, color concrete red.

3.10 ELECTRICAL PENETRATIONS

- A. Provide and place all sleeves for conduits penetrating floors, walls, partitions, etc.
- B. Locate all slots and concealed conduits and stub-ups for electrical work and place and form as required before concrete is poured.
- C. Make weathertight and restore finishes on exterior penetrations.

- D. Use conduit wall seals where underground conduits penetrate walls or at other locations indicated on the Drawings.
- E. Seal openings where conduits pass through walls or floors to prevent passage of flame and smoke. Maintain fire rating of walls.
- F. Patch and paint interior wall penetrations to match original.

3.11 Device Installation:

- A. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
- B. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
- C. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
- D. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
- E. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
- F. Use a torque screwdriver when a torque is recommended or required by manufacturer.
- G. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
- H. Tighten unused terminal screws on the device.
- I. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.
- J. Device boxes installed in unfinished, damp, wet, or corrosive locations shall be installed exposed. Device boxes shall be embedded in walls in dry, finished spaces only.

3.12 IDENTIFICATION INSTALLATION

- A. Self-Adhesive Identification Products: Before applying identification product, prepare and clean attachment surface with manufacturer recommended product to allow for effective bond.
- B. Verify and coordinate identification names and other features.
- C. Nameplate Attachment:
 - 1. Screw mounted for NEMA 1 enclosures.
 - 2. Epoxy or similar waterproof adhesive for all other enclosure types.

- D. Install identification and power source nameplates for electrical equipment. Refer to Part 2 “Identification” Article for requirements.
- E. Install circuit identification labels for cables and conductors at each termination location and within pull boxes and handholes. Refer to PART 2 “Identification” Article for color code and additional requirements.
- F. Install device identification labels for receptacles, light switches, etc. Refer to Part 2 “Identification” Article for requirements.
- G. Install underground warning tape during backfilling of trenches for underground conduits and duct banks in accordance with details on the Drawings.
- H. Panelboard Identification
 - 1. Provide equipment and power source nameplates as previously described.
 - 2. Label branch circuit phase and neutral wires with associated pole number.
 - 3. Install typed as built circuit directory giving location and nature of load served.

3.13 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections for conductors and cables.
 - 1. Visually inspect for correct installation.
 - 2. Perform continuity test.
 - 3. Perform insulation-resistance test for power and control conductors in accordance with NETA standards.
 - 4. Verify uniform resistance of parallel conductors.
- B. Cable will be considered defective if it does not pass tests and inspections.
- C. Conduct fall-of-potential grounding electrode system test in accordance with IEEE 81.
- D. Tests for Receptacles:
 - 1. Test Instrument for Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.
 - a. Test Instruments: Use instruments that comply with UL 1436.
 - 2. Line Voltage: Acceptable range is 105 to 132 V.
 - 3. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
 - 4. Ground Impedance: Values of up to 2 ohms are acceptable.
 - 5. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
 - 6. Using the test plug, verify that the device and its outlet box are securely mounted.
 - 7. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault-current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.
 - 8. Wiring device will be considered defective if it does not pass tests and inspections.

- E. Prepare test and inspection reports.

3.14 CLEANING / PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration. Repair damage as recommended by manufacturer.
- B. Remove all rubbish and construction debris from inside electrical equipment and enclosures.

3.15 APPENDICES

- A. Table 260510-1: Raceway Application Guidelines

Table 260510-1 Raceway Application Guidelines	
Raceway Type	Location / Application
Aluminum Rigid Conduit (ARC)	All indoor and outdoor applications, except where other types are listed. All exposed, non-corrosive areas. All concealed, non-corrosive areas. Under slabs in slab on grade construction with heat shrink tubing. Stub-ups through slabs with heat shrink tubing. Use LFMC for flexible connections. When installed underground or in contact with concrete, apply heat shrink tubing.
PVC Schedule 40	Concrete encased duct banks. Embedded in concrete slabs or structures. Elbows: ARC with heat shrink tubing.
PVC Schedule 80	Direct buried. Corrosive areas. Protection of grounding electrode conductors. Protection of lightning conductors. Where exposed, use LFNC for flexible connections. Elbows: ARC with heat shrink tubing.

END OF SECTION 260510

Division 31
Earthwork

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SECTION 310515 - SOILS AND AGGREGATES FOR EARTHWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Soils: Soil materials and topsoil materials.
- 2. Aggregates: Coarse aggregate materials and fine aggregate materials.

- B. Related Sections:

- 1. Section 312000 "Earthwork" for excavation, backfilling, and compaction procedures.
- 2. Section 312333 "Trenching and Backfilling" for excavation, backfilling, and compaction of utility trenches.
- 3. Section 312500 "Erosion and Sedimentation Control" for erosion and sedimentation control devices.
- 4. Section 321123 "Aggregate Base Courses" for subbase and base course for placement under paving.
- 5. Section 321216 "Asphalt Paving" for flexible paving system.
- 6. Section 329113 "Soil Preparation"
- 7. Section 329119 "Landscape Grading" for placing, leveling, and compacting topsoil materials prior to final landscaping.
- 8. Section 329200 "Turfs and Grasses"
- 9. Section 330510 "Temporary Bypass Pumping"
- 10. Section 330513 "Manholes and Structures"
- 11. Section 330519 "Ductile-Iron Utility Pipe for Water Service"

1.3 ACTION SUBMITTALS

- A. Section 013300 "Submittal Procedures" for requirements of submittals.
- B. Samples - Soils: Submit in 5-gallon air-tight containers, 50 lbs. representative sample of each type of soil and topsoil material fill to testing laboratory.
- C. Samples - Aggregates: Submit, in 5-gallon air-tight containers, 50 lbs. representative sample of each type of aggregate fill to ENGINEER at least 15 days prior to placement of backfill or fill.
- D. Quality Control Testing: Submit conformance testing performed by a certified independent laboratory engaged by Contractor for all fill materials. Verify maximum density, gradation, Atterberg limits, sand equivalent, and other applicable criteria at least 72 hours prior to

importing or placing any fill. Perform additional conformance testing at a minimum frequency of 1 per every 1000 cubic yards or change in material.

1.4 INFORMATIONAL SUBMITTALS

- A. Materials Source: Submit name and location of imported materials suppliers.
- B. Source's Certificate: Certify materials meet or exceed specified requirements.
- C. Material Test Reports: For each on-site and borrow soil and aggregate material proposed for fill and backfill as follows:
 - 1. Classification according to ASTM D2487.
 - 2. Laboratory compaction curve according to ASTM D698.
 - 3. Test Reports: Submit any test reports required by this Section to the Engineer.

1.5 QUALITY ASSURANCE

- A. Furnish each soil and topsoil material from single source throughout the Work, unless an alternate source is approved by the Engineer.
- B. Furnish each coarse and fine aggregate material from single source throughout the Work, unless an alternate source is approved by the Engineer.
- C. Perform Work according to State of North Carolina Department of Transportation standards.
- D. Quality Control and Quality Assurance consists of laboratory conformance testing of samples supplied from each coarse and fine aggregate source and quality control during installation.
 - 1. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E 329 and ASTM D 3740 for testing indicated.

1.6 FIELD CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- B. Tree and Plant Protection Zones: Comply with requirements and measures specified in Section 015639 "Temporary Tree and Plant Protection."

PART 2 - PRODUCTS**2.1 SOIL MATERIALS****A. Common Fill**

1. Common fill shall be approved on site excavated material or imported fill material that is composed of durable soil free of debris, topsoil, organic materials, highly micaceous and elastic silt, or other deleterious materials which will deteriorate in time or which cannot be properly compacted. Common fill shall not contain stones larger than 6 inches in largest diameter, a maximum of 75 percent passing the No. 200 sieve, a maximum liquid limit of 50, and a maximum plasticity index of 30. Common fill shall not contain granite blocks, broken concrete, masonry rubble, or other similar materials and shall have physical properties such that it can be readily spread and compacted during filling.
2. Common fill shall be placed in maximum 12-inch-thick loose horizontal lifts and compacted to 92% of the standard Proctor (ASTM D698) maximum dry density, or as otherwise shown in the Drawings. Since these soils are moisture sensitive with respect to achieving proper compaction, particular care should be taken to control the moisture content during placement and compaction. The soils shall be wetted or dried as necessary so that the moisture content during compaction is within three percent of the optimum moisture content to consistently achieve specified compaction. Moisture conditioning and compaction will likely be difficult during rainy or freezing weather due to the high fines content of the material.

B. Select Common Fill

1. Select common fill shall consist of mineral soil free from organic materials, topsoil, highly micaceous or elastic silt, loam, wood, trash or other objectionable materials which may be compressible or which cannot be properly compacted. It shall contain no stones larger than two inches and shall have a minimum of 80% passing the No. 4 sieve, a minimum of 20% passing the No. 200 sieve, a maximum liquid limit of 50 percent, and a plasticity index between 5 and 30 percent.
2. Select common fill shall be placed in maximum 8-inch-thick loose horizontal lifts and compacted to 95% of the standard Proctor (ASTM D698) maximum dry density, or as otherwise shown in the Drawings.

- C. Structural Fill – Structural fill shall consist of granular soil free of organic material, loam, trash, snow, ice, frozen soil or other deleterious material which may be compressible, or which cannot be properly compacted. Structural fill should consist of materials with the following gradation:

Sieve Size Percent Finer by Weight

3-in	100
No. 4	20 to 90
No. 40	5 to 75
No. 200	0 to 40

Structural fill should have a maximum liquid limit of 40 percent, maximum plasticity index of 10 percent, and a maximum dry density of at least 95 pcf as determined by ASTM D698.

2.2 TOPSOIL MATERIALS

A. Topsoil:

1. Excavated and reused material.
2. Graded.
3. Free of roots, rocks larger than 2 inch, subsoil, debris, large weeds, and foreign matter.
 - a. Screening: Single screened.
4. Conforming to ASTM D 2487 Group Symbol OH.
5. Acidity range (pH) of 5.5 to 7.5.
6. Containing minimum of 4 percent and maximum of 25 percent inorganic matter.

2.3 COARSE AGGREGATE MATERIALS

A. Coarse Aggregate - Crushed Stone: Natural stone; free of clay, shale, organic matter; conforming to NCDOT standards.

1. Coarse Aggregate Designation: No. 57.

B. Coarse Aggregate - Screened Gravel: Natural stone; washed, hard, durable, rounded, or sub-angular particles of proper size and gradation, and shall be free from sand, loam, clay, excess fines, and other deleterious materials; to the following limits:

1. Percent Passing per Sieve Size:
 - a. 5/8- inch: 100 percent.
 - b. 1/2-inch: 40 to 100 percent.
 - c. 3/8-inch: 15 to 45 percent.
 - d. No. 10: 0 to 5 percent.

C. Coarse Aggregate - Pea Gravel): Natural stone; free of clay, shale, organic matter; graded according to ASTM C 136

2.4 FINE AGGREGATE MATERIALS

A. Fine Aggregate - Sand: Natural river or bank sand; free of silt, clay, loam, friable or soluble materials, and organic matter; graded according to ASTM C 33.

2.5 SOURCE QUALITY CONTROL

- A. Section 014000 "Quality Requirements": Testing and inspection services. Submit test result reports to the Engineer.
- B. Soil Material - Testing and Analysis: Perform in accordance with ASTM D698.
- C. Coarse Aggregate Material - Testing and Analysis: Perform according to ASTM D698.

- D. Fine Aggregate Material - Testing and Analysis: Perform according to ASTM D698.
- E. When tests indicate materials do not meet specified requirements, change material and retest.
- F. Furnish materials of each type from same source throughout the Work.

PART 3 - EXECUTION

3.1 EXCAVATION - SOILS

- A. Excavate soil and topsoil materials from areas designated. Strip topsoil to full depth of topsoil in designated areas.
- B. Stockpile excavated material meeting requirements for soil and topsoil materials.
- C. Remove excess excavated soil and topsoil materials not intended for reuse, from site.
- D. Remove excavated materials not meeting requirements for soil and topsoil materials from site.

3.2 STOCKPILING

- A. Stockpile materials on site at locations designated by Engineer.
- B. Stockpile in sufficient quantities to meet Project schedule and requirements.
- C. Separate different soil and aggregate materials with dividers or stockpile individually to prevent mixing. Prevent intermixing of soil types or contamination.
- D. Stockpile topsoil 8 feet high maximum.
- E. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

3.3 STOCKPILE CLEANUP

- A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION 310515

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SECTION 310519.13 - GEOTEXTILES FOR EARTHWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Non-woven geotextile material.

- B. Related Requirements:

- 1. Section 310515 “Soils and Aggregates for Earthwork” for earthwork fill and grading materials.
 - 2. Section 312000 “Earthwork” for excavation, backfilling, and compaction procedures.
 - 3. Section 312333 “Trenching and Backfilling” for excavation, backfilling, and compaction of utility trenches.
 - 4. Section 312500 “Erosion and Sedimentation Controls” for erosion and sedimentation control devices.
 - 5. Section 321123 “Aggregate Base Courses” for subbase and base course for placement under paving.
 - 6. Section 329119 “Landscape Grading” for placing, leveling, and compacting topsoil materials prior to final landscaping.

1.3 ACTION SUBMITTALS

- A. Section 013300 “Submittal Procedures”: Requirements for submittals. Submit items in this Article at least 30 days prior to installation.
- B. Product Data: Submit certified test results from the manufacturer including tensile strength, elongation, thickness, UV resistance, and other material properties.
- C. Shop Drawings: Indicate fabric layout, seam locations, and overlap details in installation drawings. Provide installation schedule.

1.4 INFORMATIONAL SUBMITTALS

- A. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- B. Manufacturer Instructions: Submit detailed instructions on installation requirements, including storage and handling procedures and quality control and quality assurance.

- C. Manufacturer's quality control program and manual, including a description of laboratory facilities.
- D. Source Quality-Control Submittals: Provide results of factory tests and inspections, including test results that indicate materials meet the requirements of PART 2.
- E. Field Quality-Control Submittals: Provide results of Contractor-furnished tests and inspections.
- F. Qualifications Statements:
 - 1. Submit qualifications for manufacturer and installer.
 - 2. Submit manufacturer's approval of installer.

1.5 CLOSEOUT SUBMITTALS

- A. Section 017300 "Execution" for requirements of submittals.
- B. Project Record Documents: Record actual locations of geotextile material, including placement depth.

1.6 QUALITY ASSURANCE

- A. Perform Work according to ASTM standards and the recommendations of the Manufacturer.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' experience.
- B. Installer: Company specializing in performing Work of this Section with minimum three years' experience.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Section 016000 "Product Requirements" for requirements of transporting, handling, storing, and protecting products.
- B. Inspection: Accept materials on Site in manufacturer's original packaging that identifies the manufacturer/supplier's name, style, and roll number. Inspect for damage.
- C. Comply with ASTM D4873.
- D. Store materials according to manufacturer instructions.

E. Protection:

1. Protect materials from moisture, dust, chemicals, UV radiation or other environmental conditions that might damage the geotextile by storing at least 3 inches off the ground in a clean, dry location remote from construction operations areas.
2. Provide additional protection according to manufacturer instructions.

PART 2 - PRODUCTS

2.1

2.1 MATERIALS – NON-WOVEN GEOTEXTILES

A. Manufacturers:

1. Mirafi, Synthetic Industries, Gundle/SLT Environmental, or equal.
2. Substitutions: As specified in Section 016000 “Product Requirements”.

B. Description:

1. Non-biodegradable, non-reactive (for pH of three to eleven), UV-resistant, insect/rodent-resistant non-woven needle punched material consisting of filaments formed into a stable network.
2. Edges: Selvaged or finished to prevent separation of outer material.

C. Performance and Design Criteria:

1. When tested in accordance with ASTM D4759, test results from any sampled roll in the lot shall meet or exceed the values listed in Table 1. Strength values are in the weaker principal direction.

TABLE 1: NONWOVEN GEOTEXTILE MINIMUM AVERAGE ROLL VALUES

PROPERTIES	TEST METHOD	UNIT	6 oz
Mass per Unit Area	ASTM D5261	oz/yd ²	6
Thickness	ASTM D5199	mils	75
Grab Strength	ASTM D4632	lbs	160
Grab Elongation	ASTM D4632	percent	50
Trapezoid Tear Strength	ASTM D4533	lbs	60
Puncture Strength	ASTM D4833/ D 6241	lbs	90
Water Flow Rate	ASTM D4491	gpm/ft ²	110
Permittivity	ASTM D4491	sec-1	1.5
Apparent Opening Size (Max)	ASTM D4751	inch US Std. Sieve	0.008 70
UV Resistance	ASTM D4355	percent strength retained	70

2.2 MATERIALS - ACCESSORIES

- A. Use products to secure geotextile fabrics as recommended by geotextile manufacturer.

2.3 SOURCE QUALITY CONTROL

- A. Section 014000 “Quality Requirements” for requirements of testing, inspection, and analysis.
- B. If requested by the Owner, provide materials for Quality Assurance Laboratory (QAL) testing by an independent GRI accredited laboratory to confirm conformance testing results.
- C. Certificate of Compliance:
 - 1. If manufacturer is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at manufacturer's facility conforms to Contract Documents.
 - 2. Specified shop tests are not required for Work performed by approved manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

- A. Section 017300 “Execution” for requirements of installation examination.
- B. The Engineer shall inspect subgrade to verify that underlying surface is smooth and free of ruts or protrusions that could damage geotextile material and that subgrade has been properly prepared.
- C. Subgrade Material and Compaction Requirements: As specified in Section 312333 “Trenching and Backfilling” and 312000 “Earthwork”.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's published installation instructions. Do not install damaged materials.
- B. Geotextile Material:
 - 1. Lay and maintain smooth and free of tensile stresses, folds, wrinkles, or creases.
 - 2. Ensure that material is in direct contact with subgrade.
 - 3. Orientate with long dimension of each sheet parallel to direction of slope and in accordance with the manufacturer’s recommendations and approved shop drawings.
 - 4. Minimum Unseamed Joints Overlap: 18 inches (450 mm).

C. Securement Pins or Staples:

1. Insert through geotextile midway between edges of overlaps and minimum 6 inches from free edges.
2. Minimum Spacing:
 - a. Slopes Steeper than 3 Horizontal on 1 Vertical: 24 inches o.c.
 - b. Slopes 3 Horizontal on 1 Vertical to 4 Horizontal on 1 Vertical: 3 feet o.c.
 - c. Slopes Flatter than 4 Horizontal on 1 Vertical: 5 feet o.c.
3. Ensure that washer bears against geotextile.

D. Field Seams:

1. Minimum Seamed Joints Overlap: 12 inches at longitudinal and transverse joints.
2. Seams across Slope: Lap upper panel over lower panel.

E. Penetrations: As indicated on Drawings.

F. Repairing Damaged Geotextiles:

1. Repair torn or damaged geotextile by placing patch of same type of geotextile over damaged area minimum of 12 inches beyond edge of damaged area and fasten as recommended by geotextile manufacturer.
2. Remove and replace geotextile rolls which cannot be repaired.

G. Fill and Cover:

1. Place fill to prevent tensile stress or wrinkles in geotextile.
2. Place fill from bottom of side-slopes upward.
3. Do not drop fill from height greater than 3 feet.

3.3 FIELD QUALITY CONTROL

A. Section 014000 "Quality Requirements" for requirements of inspecting and testing.

B. Section 017300 "Execution" for requirements of testing, adjusting, and balancing.

C. Acceptance:

1. The Engineer will inspect installation and identify repairs or modifications necessary to perform as specified and rerun tests.
2. Make final adjustments and repairs under direction of The Engineer or manufacturer's representative.

3.4 PROTECTION

A. Section 017300 "Execution" for requirements of protecting finished Work.

- B. Ballast: Adequate to prevent uplift of material by wind.
- C. UV Exposure: Do not leave material uncovered for more than 14 days after installation.
- D. Do not use staples or pins to hold geotextiles in place where located adjacent to other geosynthetic layers that could be damaged.
- E. Do not operate equipment directly on top of geotextile.

END OF SECTION 310519.13

SECTION 310900 - GEOTECHNICAL INSTRUMENTATION AND MONITORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes performing pre-construction surveys and installing and monitoring geotechnical instrumentation and survey markers to measure.
 - 1. Groundwater levels inside and outside excavation limits.
 - 2. Vertical and horizontal deformation of existing utilities and structures adjacent to and over the Work.
 - 3. Ground vibration levels at adjacent facilities due to Contractor activities, including but not limited to demolition..
- B. Related Requirements:
 - 1. Section 312000 "Earthwork" for excavation, backfilling, and compaction procedures.
 - 2. Section 312319 "Dewatering" for dewatering and drainage.
 - 3. Section 312333 "Trenching and Backfilling" for excavation, backfilling, and compaction of utility trenches.
 - 4. Section 315000 "Excavation Support and Protection" for temporary excavation support and protection of existing dam and other structures/utilities.
 - 5. Section 024116 "Structure Demolition" for procedures related to demolition of existing structures.
 - 6. Section 024119 "Selective Demolition" for procedures related to XXXX.

1.3 DEFINITIONS

- A. Crack Gauges: Transducers mounted across cracks identified on existing structures during the pre-construction survey to monitor the crack width.
- B. Deformation Monitoring Points (DMPs): Fixed markers placed on existing utilities and structures to measure both vertical and horizontal movement. Initial coordinate locations and vertical controls are determined by optical survey methods.
- C. Groundwater Observation Wells: Screened or slotted pipe with solid riser pipe installed in a drilled hole with the annulus around the pipe backfilled with sand. Near surface groundwater levels are measured in the well.
- D. Seismographs: Electronic recording device with vibration transducer capable of monitoring and recording ground vibrations induced by construction activity.

1.4 ACTION SUBMITTALS

- A. Submit in accordance with Section 013300.
- B. Submit for the Engineer's review four weeks prior to instrument installation:
 - 1. Installation Plan and Schedule: Full details and plan/layout of proposed instruments/points, schedule for installing and monitoring instruments/points, equipment types, installation methods, reference points, and monitoring and data reporting schedule for instruments/points, and instrumentation protection.
 - 2. Description of methods for installing and protecting all instrumentation including but not limited to seismographs, observation wells, crack gauges, monitoring points, and reference points.
 - 3. Groundwater observation well construction details including casing type, filter gradation, screen interval, grout mix, drilling methods, and well depths.
 - 4. For instrumentation installed in borings, submit a detailed procedure for installation, including post-installation acceptance test, together with a sample installation record sheet that include:
 - a. Method to be used for cleaning inside of casing or augers.
 - b. Drill casing or auger type and size.
 - c. Depth increments for backfilling boreholes with sand and bentonite.
 - d. Method for overcoming buoyancy of instrumentation components during grouting.
 - e. Method of sealing joints in pipe casing to prevent ingress of grout.
- C. Installations Records: Within five working days of installing each instrument, submit to the Engineer, specified as-built instrument location and its corresponding installation record sheet.
 - 1. Include in installation record sheet, location with instrument identification numbers, established elevations, initial elevations and coordinates (baseline readings), boring log, installation, and monitoring date and time.
 - 2. Furnish details of installed instruments showing dimensions, materials used, and as-built drawings of each instrument.
 - 3. Submit field calibrations.
- D. Reports and Records: Provide reports of monitoring data to the Engineer. include following minimum information:
 - 1. Pre-construction survey.
 - 2. As-installed location plan, installation records, and baseline values for instrumentation.
 - 3. Monitoring data for instruments with plots against threshold values.
 - 4. Weekly records of crack monitors and including photographs with readings.
 - 5. Event reports and summary from vibration monitoring.
 - 6. Discussion and associated action related to results exceeding threshold values.
- E. Submit proposed remedial measures to the Engineer of action to be taken in event that instrument Threshold Values are reached.

1.5 INFORMATIONAL SUBMITTALS

- A. Submit names, qualifications, and experience of personnel who will install instruments, perform optical level survey and vibration monitoring, read instruments, and report data to the Engineer demonstrating compliance with “Quality Assurance” Article in this Section.
- B. Certificates: Submit for each seismograph or other necessary instrument that manufacturer has inspected and tested each instrument before it leaves the factory confirming that it is working correctly without defects or missing parts and current calibration records.

1.6 QUALITY ASSURANCE

- A. Geotechnical Instrumentation Engineer Qualifications: Professional engineer licensed in the State of North Carolina with at least 5 years’ experience in installation of specified instrumentation and will supervise and direct technicians and be responsible for instrument installation. Be present at installation sites to direct and supervise installations, oversee instrumentation reading, and supervise geotechnical instrumentation data interpretations.
- B. Surveyor Qualifications: Professional Land Surveyor licensed in the State of North Carolina with at least 3 years’ experience in surveying of similar instruments. Establish Deformation Monitoring Points and take baseline readings.
- C. Manufacturer Qualifications: Provide instruments and components from an approved manufacturer currently engaged in manufacturing specified geotechnical instrumentation hardware.
- D. Preconstruction Survey Engineer Qualifications: Professional engineer licensed in the State of North Carolina is performed with at least 5 years’ experience in structural evaluations and condition surveys.
- E. Monitoring Technicians Qualifications: Minimum 3 years’ experience for personnel responsible for optical level surveys, instrument readings, and report data.
- F. Vibration Monitoring Qualifications: Persons trained in use of a seismograph along with reporting results of analyzing and reporting frequency content of a seismograph record.
- G. Instrument Installation Technicians: Experienced in installation and reading of specified geotechnical instrumentation and equipment.
- H. Factory Calibration: Conduct factory calibration on instruments prior to shipment with certification submitted to indicate that test equipment used for this purpose is calibrated and maintained in accordance with test equipment manufacturer's calibration requirements and that, where applicable, calibrations are traceable to U.S. National Institute of Standards and Technology.
 - 1. Include a calibration curve with data points clearly indicated and a tabulation of data. Mark each instrument with a unique identification number.
- I. Perform instrument installations in presence of the Engineer.

- J. Be responsible for installation, maintenance, and monitoring of geotechnical instrumentation.

PART 2 - PRODUCTS

2.1 DESIGN AND PERFORMANCE REQUIREMENTS

A. Project Requirements:

1. Install geotechnical instrumentation to monitor ground conditions, ground response, and facilities to achieve specified project requirements and prevent damage to facilities potentially affected.
2. Install instrumentation in accordance with approved Instrumentation Schedule.
3. Engineer's monitoring of installed instruments does not relieve Contractor of its obligation to complete project within the requirements specified herein taking necessary additional measurements.

B. Pre-Construction Survey:

1. Prior to start of demolition, excavation work, installation of excavation support and dewatering work, engage the services of an independent licensed professional engineer, to conduct a pre-construction survey of the existing retaining wall, dam, structures and conditions within 100 feet of the anticipated demolition, excavation work, installation of excavation support, and dewatering work.
 - a. Coordinate activities, issue notices, obtain clearances and provide photographic and secretarial assistance necessary to accomplish the survey.
 - b. Give notice in writing, to property owners and representatives of local authorities required to be present at such survey. Notify in writing the dates on which surveys are planned so that representatives are present during the examination. Provide copies of notices to Owner and the Engineer
2. Record observations of the existing conditions for residences, buildings and other structures, which are affected.
 - a. Provide the survey consisting of a description of interior and exterior conditions. Locate cracks, damage or other defects existing and include information to make it possible to determine the effect, if any, of the construction operations on the defect. Where significant cracks or damage exists, or for defects too complicated to describe in words, photographs shall be taken and made part of the record.
 - b. Records of each property examined must be signed by the representatives present and, if practicable, by property owners, whether or not they are present at the examinations.
3. Record of the pre-construction survey shall consist of written documentation, video and photographs of the conditions identified. At the completion of the survey, submit copies of the documentation to Owner.
4. Upon completion of all excavation work, installation of excavation support and dewatering work, complete a similar examination of properties and structures where complaints of damage have been received or damage claims have been filed. Give notice

- to interested parties so that they may be present during the final examinations. Records of the final examination shall be signed and distributed as the original pre-construction survey.
5. Retain records in Contractor's file for at least 3 years after completion of the Contract. In the event of damage claims, prepare a report on the particular structures as requested by the Engineer from those notes and photographs and submitted to Owner. Repair damage attributed to Contractor's activity promptly and completely to property owners' satisfaction to restore the conditions of the property to that existing prior to work.
- C. Secure required permits prior to the installation or removal of observation wells.
 - D. Provide and facilitate safe access to the instruments at all times. Engineer may perform additional monitoring in a manner that will minimize unnecessary work delays. Allow and facilitate instrument monitoring as required by the Engineer. No claim for lost production time due to this activity will be allowed.
 - E. Maintain instrumentation. Report damaged or non-functional instrumentation to the Engineer within 24 hours. Replace damaged instruments within 24 hours.
 - F. Availability of Data:
 1. Instrumentation readings shall be collected by the Contractor's Geotechnical Instrumentation Monitoring Firm. Contractor may take their own supplementary readings in addition to those specified.
 2. Monitoring data is the property of Owner and is not to be disclosed or published to third parties without Owner's written permission.
 3. Contractor is expected to make their own interpretations for their own purposes without additional compensation.
 4. Coordinate with the Engineer to verify consistency of collected data.

2.2 INSTRUMENTATION - GENERAL

- A. Instruments and materials, including readout units, installation tools, materials, and miscellaneous instrumentation components.
- B. Provide surface protection for instruments flush with surface in paved or other ground surface areas at the time that work is completed.
- C. Minimum Quantity of Instruments: While quantities in following Paragraph are considered minimums, obtain data from instrumentation in quantity to monitor construction, performance, and safety aspects of the Work.
- D. Following subparagraphs identify instrument type, minimum number to be provided, and approximate installed depth from below bottom of excavation / tunnel invert:

	<u>Instrument Type:</u>	<u>Number:</u>	<u>Depth:</u>
1.	Observation Wells:	2	10 feet.
2.	Seismographs:	2	N/A.
3.	Deformation Monitoring Points:	9	N/A.
4.	Crack Gauges	(as req'd to monitor existing cracks)	

E. Locate instruments and obtain approval from the Engineer.

2.3 GROUNDWATER OBSERVATION WELLS

- A. Pipe: ASTM D1785, Schedule 40 PVC pipe, 1-inch (25 mm) minimum inside diameter.
- B. Maximum Screen Size: 0.020 inch (0.508 mm), unless otherwise approved by the Engineer.
- C. Use observation wells to monitor groundwater levels outside excavations.

2.4 MONITORING POINTS

- A. Deformation Monitoring Points (DMPs):
 - 1. Use to monitor vertical and horizontal movement of existing dam retaining wall, adjacent utilities and structures with following approved by the Engineer.
 - 2. Materials: Nails, screws, reinforcing bars, bolts, and similar materials with well-defined measurement points.
 - 3. Firmly attach and protect from damage and vandalism. Remove or cover points protruding more than 1/4 inch (6.35 mm) with a protective box or cap.
 - 4. Clearly identify with permanent easily readable letters and numbers.

2.5 SEISMOGRAPHS

- A. Portable for monitoring ground vibrations velocities resulting from construction activities, calibrated within the previous six months, and having following characteristics:
 - 1. Measure three mutually perpendicular components of particle velocity in directions vertical, radial, and perpendicular to vibration source.
 - 2. Measure and display maximum peak particle velocity continuously during vibration-generating activities.
 - 3. Have a low frequency omnidirectional transducer for measuring air blast overpressure with a flat frequency response within the limits of 2 Hertz to 200 Hertz with a tolerance equal to or better than plus or minus 10 percent.
 - 4. Seismic Range: 0.01 inch to 4 inches per second with an accuracy of plus or minus 5 percent of measured peak particle velocity or better at frequencies between 10 Hertz and 100 Hertz, and with a resolution of 0.01 inch per second or less.
 - 5. Acoustic Range: 110 dB to 140 dB with an accuracy and resolution of plus or minus 1 dB .
 - 6. Frequency Response (plus or minus 3 dB : 2 Hertz to 200 Hertz .

7. Two Power Sources: Internal rechargeable battery and charger capable of supplying power to monitor vibrations continuously for up to 24 hours at 115 volts AC.
 8. Self-triggering wave form capture mode that provides plot of wave forms, peak particle velocities, peak overpressure, and frequencies of peaks.
 9. Continuous monitoring mode capable of recording single-component peak particle velocities and frequency of peaks with an interval of 1 minute or less.
- B. Provide for full-time use on the project during vibration causing construction activities including all demolition work.

2.6 CRACK MONITORS

- A. Crack Gauges:
1. Threaded Anchors: Include ball joints which can be grouted to each side of crack in any orientation.
 2. Transducer: Range of at least 1 inch and an accuracy of less than 0.1 percent and a non-linearity of no more than 0.5 percent.
 3. Gauge: Capable of operating in temperatures ranging from minus 68 degrees F to 176 degrees F.
- B. Provide a solid steel cover over each gauge which does not touch or otherwise interfere with gage operation.
- C. Basis-of-Design Manufacturer - Crack Gauges: Provide Model 4420 as manufactured by Geokon, Inc., Avongard Standard Tell-Tale, Humbolt H-2936A Standard Crack Gauge or equal for monitoring width of existing cracks and joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with the Engineer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Existing Conditions: Locate vaults, structures, conduits and underground utilities in areas where wells are to be drilled and installed. Conduct utility clearance and contact utility companies prior to any drilling.
1. Modify instrument locations, as approved by the Engineer, to avoid interference with existing vaults, structures, conduits and utilities.
 2. Repair damage to existing facilities resulting from instrument installations without additional compensation.

- B. Prior to commencing installation of demolition, excavation support, excavation, and dewatering work, furnish instrumentation and related components that are to be installed during construction and conduct pre-construction surveys.
- C. Protect from damage and maintain instruments. Repair or replace damaged instruments.
- D. Drilling from Ground Surface: Obtain necessary permits for each instrument and conform to permit requirements during drilling and installation.
- E. Implement remedial measures based on interpretations of monitoring data program.

3.3 GENERAL REQUIREMENTS

- A. Perform a pre-construction survey prior to any demolition, dewatering, excavation, or installation of excavation support.
- B. Install instruments at the Engineer approved locations in accordance with approved installation procedures. Engineer may modify instrument locations depending on field conditions and monitoring objectives. Install instrumentation in accordance with approved installation schedule. Install instruments and obtain baseline data before construction starts.
- C. Allow the Engineer access to instrument locations and assistance required in obtaining monitoring data.
- D. Clearly mark and label instruments and protected to avoid being obstructed or otherwise damaged by construction operations or general public. Immediately following installation, survey location and top of instruments to provide horizontal and vertical coordinates.
 - 1. Resurvey if the Engineer questions instrument locations
- E. Assign a unique identification number to each instrument and each point that is clearly marked in a non-destructible manner.
- F. Initial Reading: Immediately following instrument installation take two sets of initial readings in the Engineer's presence to provide baseline readings and to demonstrate adequacy of completed installation.

3.4 MONITORING POINTS

- A. Monitoring Points: Include but not be limited to DMPs. Monitor these control points using surveying methods. Modify locations to meet site constraints with the Engineer's approval.
- B. DMPs: Install as described on the existing dam retaining wall and nearby structures. Additional DMPs may be required by the Engineer.
- C. DMPs :
 - 1. Install on the existing dam retaining wall and exterior walls of buildings or structures located within 30 feet of open excavations. Preferred installations are on supporting walls or columns. Avoid installation in brick, unless no other option exists.

2. As a minimum, install on exterior wall corners of existing retaining wall, buildings, structures, or property boundary walls at not more than 50 feet spacing. Install additional DMPs to monitor building movement at other locations when determined by the Engineer.
3. Install DMPs in cooperation with property Owners so that installations are inconspicuous and acceptable to them. Existing features of building foundations that are permanent and can be repeatedly surveyed may be substituted for DMPs, if approved by the Engineer.

D. Measurement Frequency of DMPs:

1. Obtain two sets of measurements for each monitoring point to establish baseline data within three days of installation. Make at least 24 hours apart, but not more than 48 hours.
2. Check monitoring points with initial surveyed elevations or offsets as appropriate differing by more than 0.08 inch for secure installation and resurvey.
3. Read monitoring points prior to installing excavation support, beginning demolition, excavation, operation of groundwater control system at the site.
4. Read daily during demolition, excavation, dewatering, filling and backfilling, and excavation support installation located within 50 feet of the work, then at least twice a week until excavation, dewatering, and backfill has been completed.

E. Crack Gauges:

1. Install on exterior walls of buildings or structures with existing cracks located within 30 feet of open excavations.
2. Crack gauges shall be installed at a minimum on the existing dam retaining wall, clearwell, 1-bay barn, 3-bay barn and wet well concrete pad.
3. Install DMPs in accordance with manufacturer's recommendations and in cooperation with property Owners so that installations are inconspicuous and acceptable to them.

3.5 VIBRATION MONITORING

- A. Take seismograph readings during demolition and excavation support installation or other activities causing ground vibrations within 50 feet of existing structures to document that peak particle velocities do not exceed specified limit criteria.
- B. Install seismographs near existing structures when vibratory or impact hammers are used for the installation of excavation support within 50 feet of existing structures, and as directed by the Engineer.

3.6 GROUNDWATER OBSERVATION WELLS

- A. Install at least one monitoring well in the vicinity of the wet well excavation.
- B. Existing wells may be used if appropriate and approved by the Engineer.
- C. Set screened interval of each well to monitor groundwater levels.

- D. Drill 4 inch minimum diameter holes for observation wells of required size and depth and case with temporary casing. Do not use bentonite drilling mud in drilling holes for observation wells.
- E. Flush cased holes with clean water through an approved bit. Flush until discharge water is free of soil particles.
- F. Construct observation well with 10 feet of slotted PVC well screen, filter sand, bentonite seal, couplings, a pipe cap, and a locking cover.
 - 1. Place two feet of filter sand in bottom of drilled hole. Then place well screen and surround it with filter sand, as temporary casing is carefully withdrawn.
 - 2. Insert solid PVC casing and cap and fill annular space with bentonite pellets then non-shrink cement grout.
 - 3. Protect observation wells at ground surface by providing a roadway box or outer protective casing with lockable top and padlock. Design surface protection to prevent damage by vandalism or construction operations and to prevent surface water from infiltrating.
 - a. Provide two keys for each padlock to the Engineer for access to each well.
 - b. Develop observation wells to provide a reliable indication of groundwater levels. Re-develop wells if well clogging is observed, in event of apparent erroneous readings, or as directed by the Engineer.
 - c. Submit observation well installation logs, top of casing elevation, and well locations to the Engineer within 24 hours of completion of well installation.
- G. Observation Well Maintenance:
 - 1. Maintain each observation well until adjacent structures and pipelines are completed and backfilled. Clean out or replace any observation well which ceases to be operable before adjacent work is completed.
 - 2. Maintain observation wells and repair or replace them without additional compensation, whether or not observation wells are damaged by Contractor's operations or by third parties.
- H. Monitoring and Reporting of Observation Well Data:
 - 1. Begin daily monitoring of groundwater levels in work areas prior to initial operation of drainage and dewatering system. Continue daily monitoring in areas where groundwater control is in operation until time that adjacent structures and pipelines are completed and backfilled and until time that groundwater control systems are turned off.
 - 2. Be responsible for processing and reporting observation well data to the Engineer daily. Submit data to the Engineer on a form that includes following information.
 - a. Observation well number.
 - b. Depth to groundwater.
 - c. Top of casing elevation.
 - d. Groundwater level elevation.
 - e. Date and time of reading.
 - f. Lake level that may impact readings.

- I. Following construction, abandon new observation wells as directed by the Engineer.
 1. Abandon observation wells by removing materials within original borehole, including casing, filter, and grout seal in accordance with applicable permits.
 2. Using approved tremie methods, completely fill hole and voids with non-shrink cement grout prior to removal of drill casing, such that formation materials do not move into hole prior to grouting.
 3. Restore ground surface to its original condition.
 4. Abandon wells within paved areas by removing vaults and well caps to pavement subgrade.
 5. Remove wells with as discussed above and repair or patch pavement with same surface type.

3.7 INSTRUMENT PROTECTION, MAINTENANCE AND REPAIR

- A. Protect instruments from damage. Replace damaged or destroyed instruments within 72 hours of damage, without additional compensation. If necessary, suspend work in areas being monitored by damaged instrument and take remedial action.
- B. Maintain instruments by draining water and flushing debris from under protective covers and keeping covers locked and sealed at all times.

3.8 MONITORING

- A. Collect, tabulate, plot, and interpret survey monitoring data and provide the Engineer with tabulated and plotted data. Report status of demolition, excavation, bracing, groundwater levels, and backfilling at time of data collection with each report.
- B. Monitoring frequency may be modified as directed and approved by the Engineer.
- C. Submit data from readings of monitoring points to the Engineer within 24 hours of reading. Communicate verbally with the Engineer immediately after visual observations or data collection if excessive movements or other anomalies are indicated.
- D. For seismograph data, submit a summary report with event summary of peak particle velocity and frequency. Submit a strip chart indicating time and magnitude of maximum single-component peak particle velocity measured during each 5-minute interval of monitoring period. List a summary of vibration producing activities for that week along with specific events causing anomalous readings.
- E. Make visual observations of ground conditions and building conditions in site vicinity and communicate immediately with the Engineer if signs of ground or building movements are observed.
- F. Engineer may take independent instrumentation measurements. Cooperate with the Engineer during instrumentation monitoring by providing access to instrumentation locations in a timely manner and by providing and maintaining safe means of access to instrumentation locations for

data collection. Data acquired by the Engineer will be made available to Contractor in a timely manner.

- G. Contractor may make their own interpretations of monitoring data for their own purposes. Do not publish or disclose data or interpretations shall to other parties without advance written permission of Owner.
- H. For data collected from an instrument that has been installed to replace a damaged instrument, use formal initial reading as an initial reading for replacement instrument so that data are continuously plotted, without an offset at time of damage. Note time of damage and replacement on plot.

3.9 INTERPRETATION AND RESPONSE VALUES

- A. Make interpretations of data resulting from monitoring programs.
- B. Threshold and Limiting Values for Instruments:

	<u>Instrument</u>	<u>Threshold Value</u>	<u>Limiting Value</u>
1.	Seismographs:	1.0 in/sec over 40 Hz 0.75 in/sec at 30 to 40 Hz 0.50 in/sec at 20 to 30 Hz 0.25 in/sec under 20 Hz	2.0 in/sec over 40 Hz 1.5 in/sec at 30 to 40 Hz 1.0 in/sec at 20 to 30 Hz 0.5 in/sec under 20 Hz
2.	Deformation Monitoring Points:	0.25 inch	0.5 inch
3.	Observation Wells	2 feet *	2 feet **

NOTES: * below bottom of excavation.
** at bottom of excavation.

- C. Values are subject to adjustment by the Engineer as indicated by prevailing conditions or project circumstances. Crack gauge criteria will be established based upon existing conditions identified during pre-construction survey.
- D. If a Threshold Value is reached:
 - 1. Engineer and Contractor will meet to discuss remedial measures.
 - 2. Increase instrument monitoring frequency as directed by the Engineer.
 - 3. Install and monitor additional instruments as directed by the Engineer.
 - 4. Implement remedial measures in event Threshold Value is reached, so Limiting Value is not reached.
- E. Take necessary steps so Limiting Value is not exceeded. Engineer may direct Contractor to suspend activities in affected area with exception of those actions necessary to avoid exceeding Limiting Value.

3.10 TOLERANCES

- A. Survey Measurements: Initial location of each instrumentation elements consisting of determining elevation and horizontal positions with respect to the Engineer approved benchmarks.
- B. Monitoring Points (DMPs):
 - 1. Instrumentation Elevations: Determine to accuracy of plus/minus 0.01 foot.
 - 2. Horizontal Position of Deformation Monitoring Points: Determine to accuracy of plus/minus 0.01 foot.
- C. If actual field conditions prohibit installation at location and specified elevations, obtain prior acceptance from the Engineer for new instrument location and elevations.

3.11 DISPOSITION OF INSTRUMENTS

- A. Monitoring Points and Crack Gauges: Remove monitoring points and crack gauges during cleanup and restoration work, unless directed otherwise by the Engineer.
- B. Observation Wells: When required by the Engineer, abandon and remove protective housings and caps in accordance with required permits. Restore surfaces affected by installation of instruments to their original condition prior to completion of work.
 - 1. Leave in place any casings located within plan limits of new or existing structures or pipelines or within zone below 1H:1V planes extending downward and out from edges of foundation elements, from downward vertical footprint of pipe, or where removal would otherwise result in ground movements causing adverse settlement to adjacent ground surface, utilities or structures.
 - 2. Where casings are pulled, fill holes with sand. Where left in place, fill casings with non-shrink cement grout and cut off a minimum of 3 feet below finished ground level or 1 foot below foundation level so as not to interfere with finished structures or pipelines.
 - 3. Following backfilling, remove precast boxes or vaults and reconstruct pavement in paved areas. Restore surface to conditions existing prior to instrument installation.
- C. Seismographs: Remove units following completion of demolition, installation of excavation support and excavation.

END OF SECTION 310900

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SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Stripping and stockpiling rock.
6. Removing above- and below-grade site improvements.
7. Disconnecting, capping or sealing, and removing site utilities or abandoning site utilities in place as shown on the Drawings.
8. Temporary erosion and sedimentation control.

B. Related Requirements:

1. Section 312500 "Erosion and Sedimentation Controls" for temporary protection of erosion and sedimentation.

1.3 DEFINITIONS

- A. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.
- B. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil," but in disturbed areas such as urban environments, the surface soil can be subsoil.
- C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow.
- D. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.
- E. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and indicated on Drawings.
- F. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 MATERIAL OWNERSHIP

- A. Except for materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5 INFORMATIONAL SUBMITTALS

- A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.
 - 1. Use sufficiently detailed photographs or video recordings.
 - 2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plant designated to remain.
- B. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with North Carolina standards. Where conflict between OSHA, Federal, State and local regulations exists, the most stringent requirements shall apply.

1.7 FIELD CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed roadways if required by Owner or authorities having jurisdiction.
- B. Utility Locator Service: Notify utility locator service One Call North Carolina 811 for area where Project is located before site clearing.
- C. Do not commence site clearing operations until temporary erosion- and sedimentation-control measures are in place.
- D. Tree- and Plant-Protection Zones: Protect according to requirements in Section 015639 "Temporary Tree and Plant Protection."
- E. Soil Stripping, Handling, and Stockpiling: Perform only when the soil is dry or slightly moist.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 312000 "Earthwork."
 - 1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Protect existing site improvements to remain from damage during construction.
 - 1. Restore damaged improvements to their original condition, as acceptable to Owner.
- C. Call Local Utility Line Information service not less than three working days before performing Work.
 - 1. Request underground utilities to be located and marked within and surrounding construction areas.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.
- B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
- D. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 EXISTING UTILITIES

- A. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place as noted on the Drawings.
 - 1. Arrange with utility companies to shut off indicated utilities.
- B. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others, unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Owner and Engineer not less than seven days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Engineer's written permission.
- C. Excavate for and remove underground utilities indicated to be removed.

3.4 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.
 - 1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
 - 2. Grind down stumps and remove roots larger than 2 inches in diameter, obstructions, and debris to a depth of 18 inches below exposed subgrade.
 - 3. Use only hand methods or air spade for grubbing within protection zones.
 - 4. Chip removed tree branches and dispose of off-site.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
 - 1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches and compact each layer to a density equal to adjacent original ground.

3.5 TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil.
 - 1. Remove subsoil and nonsoil materials from topsoil, including clay lumps, gravel, and other objects larger than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.
- B. Stockpile topsoil away from edge of excavations without intermixing with subsoil or other materials. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.
 - 1. Limit height of topsoil stockpiles to 72 inches.
 - 2. Do not stockpile topsoil within protection zones.
 - 3. Dispose of surplus topsoil. Surplus topsoil is that which exceeds quantity indicated to be stockpiled or reused.

3.6 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.
- B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
 - 1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
 - 2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

3.7 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

END OF SECTION 311000

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SECTION 312000 – EARTHWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. General: Earthwork includes clearing and stripping, procurement of on-site and imported fill material, excavating, placing, and compacting fill and backfill, structural excavating and backfilling, transportation and storage of excess earthwork materials; disposal of unsuitable, waste, and surplus materials; restoration of excavation and trench surfaces; and subsidiary work necessary to complete the grading of developed areas to conform with required lines, grades, and slopes.
- B. Work includes but is not necessarily limited to; bulk excavation for structures, tanks, foundations, manholes, vaults, pipes, paving; embankments; grading; and related work such as sheeting, bracing and dewatering.
- C. Provide services of a licensed Professional Engineer to prepare temporary excavation support system, dewatering system designs, and submittals.
- D. Provide temporary excavation support systems, including sheeting, shoring, and bracing, to ensure the safety of personnel and protect adjacent structures, piping, and other materials in accordance with Federal, State and local laws, regulations, and requirements. Temporary excavation support systems are specified in Section 315000 “Excavation Support and Protection.”
- E. Provide dewatering, surface water control systems, and operate to dewater and maintain excavations in a dry condition. Control drainage into excavations and remove seepage water and rainwater. Dewatering and surface water control are specified in Section 312319 “Dewatering.”
- F. Examine site and review available geotechnical data prior to submitting a proposal, taking into consideration project conditions that may affect the work. Owner and Design Engineer do not assume responsibility for variations of subsurface conditions at locations other than places shown and at the time investigations were made.
- G. Do not initiate extra work without written notification to Owner and Engineer and receiving Owner’s written approval in response.
- H. Protect existing structures and utilities that remain.

I. Related Requirements:

1. Section 013200 "Construction Progress Documentation" for documentation procedures during the construction process.
2. Section 013233 "Photographic Documentation" for recording pre-excavation and earthwork progress.
3. 310515 "Soils and Aggregates for Earthwork" for earthwork fill and grading materials.
4. Section 310519 "Geotextiles for Earthwork" for geotextile materials.
5. Section 311000 "Site Clearing" for site preparation work, including stripping, grubbing, and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
6. Section 310900 "Geotechnical Instrumentation and Monitoring" for measuring impacts during demolition, installation of excavation support systems and earthwork activities.
7. Section 312319 "Dewatering" for dewatering excavations, controlling surface and groundwater, and disposing of water during construction.
8. Section 312333 "Trenching and Backfilling" for excavation, backfilling, and compaction of utility trenches.
9. Section 312500 "Erosion and Sedimentation Controls" for erosion and sedimentation control devices.
10. Section 315000 "Excavation Support and Protection" for shoring, bracing, and sheet piling of excavations.
11. Section 321216 "Asphalt Paving" for flexible paving system.

1.3 DEFINITIONS

- A. **Backfill:** Soil material or controlled low-strength material used to fill an excavation.
1. **Initial Backfill:** Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
 2. **Final Backfill:** Backfill placed over initial backfill to fill a trench.
- B. **Borrow Soil:** Satisfactory soil imported from off-site for use as fill or backfill.
- C. **Coverage:** Pass of compaction equipment over the complete surface area of exposed lift or subgrade to receive compaction.
- D. **Excavation:** Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
1. **Authorized Additional Excavation:** Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Engineer. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
 2. **Unauthorized Additional Excavation:** Excavation as directed by Engineer to correct Contractor's work not in compliance with Contract Documents, which will be performed without additional compensation.
 3. **Bulk Excavation:** Excavation more than 10 feet in width and more than 30 feet in length.

4. **Unauthorized Excavation:** Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, shall be provided without additional compensation.
- E. **Finished Grade:** Required final grade elevation indicated on Drawings. Spot elevations take precedent over proposed contours.
- F. **In-the-Dry:** An excavation subgrade where groundwater level: has been lowered to at least 2 feet (600 mm) below lowest level of excavation; is stable with no ponded water, mud, or muck; is able to support construction equipment without rutting or disturbance; and is suitable for placement and compaction of fill material, pipe, or concrete foundations.
- G. **Objectionable Material:** Includes topsoil, organic matter, contaminated soil, construction debris, perishable materials, snow, ice, frozen earth, and rocks or lumps of cemented soils over 6 inches (150 mm) in maximum dimension.
- H. **Optimum Moisture Content:** Moisture content (percent by dry weight) corresponding to maximum dry density of the same material as determined by ASTM Test Method D698.
- I. **Overexcavation:** Removal of unsuitable soil or objectionable material at or below the normal grade of excavation or subgrade as indicated on Drawings.
- J. **Percent Compaction:** Required in-place dry density of the material, expressed as a percentage of the maximum dry density of the same material, as determined in the laboratory by ASTM Test Method D698.
- K. **Structures:** Buildings, wet wells, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, manholes and vaults, or other man-made stationary features constructed above or below the ground surface.
- L. **Subgrade:** Required surface of soil, borrow fill, or compacted fill that is immediately beneath site improvements, especially dimensioned fill, paving, or other surfacing material.
- M. **Unsuitable Soil:** Includes existing fill materials, organic soils, weak native soils, or clays with a plasticity index of greater than 30, and any materials that cannot be properly placed and compacted as specified.
- N. **Utilities:** On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.
- O. **Zone of Influence:** A line extending at least 2 feet beyond foundation or pipeline edge, then outward and downward at a slope of 1 horizontal to 1 vertical. Do not excavate below foundation of existing structures or pipeline.
- P. **Professional Engineer:** Professional Engineer licensed in the State of North Carolina meeting project qualifications and who is hired by Contractor.
- Q. **The Engineer:** The Engineer or designated representative hired by Owner.
 1. Approval given by the Engineer shall not relieve Contractor of its responsibilities for performing the work in accordance with Contract Document requirements.

1.4 ACTION SUBMITTALS

- A. Coordinate various submittal types required by this Section with requirements of dewatering, support of excavation, and geotechnical instrumentation submittals specified in other Sections.
- B. Samples: Submit a representative sample weighing approximately 50 pounds of each fill material, filter sand, and crushed stone contained in sealed 5-gallon containers, at least 30 calendar days prior to date of anticipated use of each material.
- C. Submit laboratory test results for fill materials that include maximum density, gradation, Atterberg limits, sand equivalent, and other applicable criteria, at least 72 hours prior to importing or placing fill.
- D. Prepare excavation support system designs by a Professional Engineer, licensed in the State of North Carolina and having a minimum of 5 years of professional experience in design and construction of excavation support systems.
 - 1. Submit an original and three copies of licensed Professional Engineer's certification, on PE form specified in Section 013300, stating excavation support systems designs have been prepared by Professional Engineer who is responsible for their execution.

1.5 INFORMATIONAL SUBMITTALS

- A. Construction and Operations Plan: Submit proposed methods of construction, including earthwork operations, excavation limits, slopes, fill material moisture conditioning and handling, compaction equipment, excavation support systems designs, backfilling and filling and compaction, and material sources.
 - 1. Submit excavation support system plan as prepared by licensed Professional Engineer complying with requirements stated in previous Article.
- B. Submit copies of field daily reports by soil technician at the end of each work day that earthwork and grading operations occur.
- C. Upon completion of earthwork and grading operations, submit an as-graded map showing density test numbers and locations, a table of density test results and depths, and a certification of compliance by geotechnical engineer in charge.
- D. Pre-excavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earthwork operations. Submit before earthwork begins.

1.6 QUALITY ASSURANCE

- A. Excavation, trenching, sheeting, bracing, and similar work shall comply with requirements of OSHA excavation safety standards, 29 CFR Part 1926 Subpart P, and State and local authorities having jurisdiction. Where conflict between OSHA, State and local regulations exists, apply most stringent requirements.

- B. At least three working days prior to starting any excavation, notify the appropriate regional notification center for underground utilities and underground utility owners who are not members of notification center. To obtain area specific information for project site, refer to www.nc811.org.

1.7 FIELD CONDITIONS

- A. Be responsible for construction layout and reference staking necessary for proper control and satisfactory completion of structures, cutting, filling, grading, drainage, fencing, embankment improvements, curbing, and other appurtenances.
- B. Perform construction layout and staking by a Professional Surveyor or Professional Engineer licensed in the State of North Carolina, experienced and skilled in construction layout and staking requirements.
- C. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earthwork operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
 - 3. Do not proceed with work on adjoining property until directed by the Engineer.
- D. Utility Locator Service: Notify utility locator service North Carolina 811 before beginning earthwork operations.
- E. Do not commence earthwork operations until temporary site fencing and erosion- and sedimentation-control measures specified in Section 015000 "Temporary Facilities and Controls" and Section 311000 "Site Clearing" are in place.
- F. Do not commence earthwork operations until plant-protection measures specified in Section 015639 "Temporary Tree and Plant Protection" are in place.
- G. 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.
- H. Do not direct vehicle or equipment exhaust towards protection zones.
- I. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. Fill materials designated for use in this Section are specified in Section 310515 “Soils and Aggregates for Earthwork.”

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, tanks, utilities, sidewalks, pavements, fencing, landscaping, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
 - 1. If necessary, remove and restore or replace curbing, driveway aprons, and fencing after performing backfilling work.
 - 2. Replace existing facilities damaged by construction with new material fully equal to existing without additional compensation.
- B. Prior to and During Earthwork Operations:
 - 1. Provide, monitor, and maintain geotechnical instrumentation regarding deformation; coordinate with Section 310900 “Geotechnical Instrumentation and Monitoring.”
 - 2. Protect and maintain erosion and sedimentation controls; coordinate with Section 312500 “Erosion and Sedimentation Controls.”
 - 3. Provide, monitor, and maintain excavation support; coordinate with Section 315000 “Excavation Support and Protection.”
 - a. Use excavation support system for excavations within the zone of influence for existing structures or utilities.
 - b. Do not permit excavations below base level of adjacent foundations or retaining walls, unless excavation design and bracing includes an analysis of structure’s stability supported by the foundation. When necessary due to project conditions, incorporate required bracing and foundation underpinning.
 - 4. Provide, monitor, and maintain dewatering and drainage systems; coordinate with Section 312319 “Dewatering.”
- C. Test Pits:
 - 1. Perform exploratory excavation work, test pits, for purpose of verifying the location of underground utilities and structures and to check for unknown utilities and structures, prior to commencing excavation work.
 - 2. Backfill and compact test pits as soon as desired information has been obtained. Stabilize backfilled surfaces in accordance with approved erosion and sedimentation control plans.

- D. Clearing and Stripping. Initially clear and strip ground surfaces beneath planned structures and in areas requiring excavation or filling of organic material and debris. Remove from the site and properly dispose of or reuse as topsoil in landscape areas.
 - 1. Stripping Depth Variance: From about <insert dimension> inches (<insert dimension> mm) to <insert dimension> inches (<insert dimension> mm).
- E. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.
- F. Saw cut existing pavement with a saw, wheel, or pneumatic chisel along straight lines before excavating.

3.2 DEWATERING AND DRAINAGE

- A. Provide dewatering and drainage in accordance with Section 312319 “Dewatering”. This Article supplements those requirements.
- B. Prevent surface water and groundwater from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- C. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
 - 1. Re-route surface water runoff and groundwater seepage away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
- D. Prior to excavation, verify groundwater will be at required level indicated on reviewed dewatering and drainage submittal(s).
- E. Accomplish dewatering by methods that preserve undisturbed state of subgrade soils. Dewater in a manner to prevent boiling, detrimental under-seepage, or disturbance at excavation base.

3.3 SUPPORT OF EXCAVATION

- A. Provide excavation support in accordance with Section 315000 “Excavation Support and Protection”. This Article supplements those requirements.
- B. Install excavation support in accordance with reviewed Shop Drawings prior to beginning excavation work. Maintain excavation supports that are required to remain in place, if applicable, as indicated on Drawings or as required by approved Shop Drawings.
- C. Owner or Engineer may direct that certain excavation supports remain in place or be cut off at any specific elevation. Supports directed by Owner or Engineer to be left in place and not so designated on Contract Documents will be paid for according to Contract provisions for changes in the Work.
- D. The right of Owner or Engineer to direct that certain excavation supports remain in place shall not be construed as creating any obligation on Owner or Engineer to give such direction, nor

shall failure to give such direction relieve the Contractor from liability for damages to persons or property occurring from or upon the work occasioned by negligence or otherwise, growing out of a failure on the part of the Contractor to leave in place sufficient excavation supports to prevent any movement of the ground or damage to adjacent structures.

- E. Construct temporary excavation slopes in accordance with the requirements of OSHA excavation safety standards and approved Shop Drawings.
- F. Where allowed, carefully remove excavation supports in a manner without endangering the Work or other adjacent structures, utilities, or property. Immediately fill voids left or caused by withdrawal of supports with sand and compact.

3.4 EXCAVATION

- A. Include material of every description and of whatever substance encountered as an unclassified excavation.
- B. General: Excavate on-site soils using standard earthmoving equipment. Excavation in dense soil or rock may require special equipment. Do not plough, scrape, or dig earth with machinery so near to finished subgrade to result in excavation of or disturbance of below grade material.
- C. Make excavations to grades indicated on Drawings and in widths sufficient for laying of pipe, construction of the structure, installing bracing, excavation supports, dewatering and drainage facilities, and working clearances.
- D. Perform excavation in-the-dry and accomplished by methods which preserve the natural undisturbed condition of subgrade soils.
- E. Moisture Sensitive Soils: Use a smooth-edge bucket to excavate last one foot of depth when excavation is to end in such soils.
- F. If excavation bottom is removed below the limits shown on Drawings, specified, or directed by the Engineer, refill with structural fill or other material satisfactory to the Engineer without additional compensation.
- G. When excavation has reached prescribed depths, notify the Engineer who will observe the conditions. If materials and conditions are not satisfactory, the Engineer will issue instructions for corrective procedures. The Engineer will be the sole judge as to whether the work has been accomplished satisfactorily.
- H. Subgrade soils that have become soft, loose, quick, or otherwise unsatisfactory due to inadequate excavation, dewatering, or other construction methods in the opinion of the Engineer, remove existing soil and replaced with structural fill or other material satisfactory to the Engineer at Contractor's expense.

- I. Exposed subgrades in large open areas shall be proofrolled with at least two overlapping coverages of a vibratory drum roller with a minimum static drum weight of 10 ton. Conduct proofrolling in presence of the Engineer. The Engineer will waive this requirement, if in its opinion the subgrade will be rendered unsuitable by such proofrolling.
 1. Confined Areas: Proofroll with hand operated vibratory equipment that is approved by the Engineer.
- J. Perform overexcavation at the Engineer's request to remove unsuitable soil, objectionable material, or other materials as determined by the Engineer and to such depth and width as directed. Replace with suitable material as directed by the Engineer.
 1. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
- K. Perform excavation for pipelines and beneath structures with excavating equipment operating from the subgrade for the structure, while in-the-dry and in a manner preserving the undisturbed state of subgrade soils.
- L. When excavations have reached the required subgrade, including any allowances for working mats or base materials and prior to their placement, notify soils testing laboratory to verify suitability of existing subgrade soils for anticipated foundation and structural loadings.
 1. If existing subgrade soils are determined to be unsuitable, follow direction provided by the Engineer regarding removal and replacement with suitable materials.
 2. Notify the Engineer if the revised work scope would modify Contractor's cost and thereby entitle a change to the Contract Sum. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
- M. Replace overexcavation beyond the limits and depths required by Contract Documents using structural fill or other material satisfactory to the Engineer without additional compensation.
- N. Trenches in Tree- and Plant-Protection Zones:
 1. Hand-excavate to indicated lines, cross-sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
 2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
 3. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.5 SUBGRADE PREPARATION

- A. Notify Engineer when excavations have reached required subgrade.
- B. Maintain excavated subgrade in-the-dry condition.

- C. Prior to fill placement, remove objectionable material which includes, but not be limited to, pavement, topsoil, organic matter, contaminated soil, construction debris, perishable materials, snow, ice, frozen earth, and rocks or lumps of cemented soils over 6 inches (152 mm) in maximum dimension.
- D. For subgrades consisting of granular soils, proofroll the final subgrade using at least four coverages of a vibrator plate compactor.
- E. Where existing subgrade contains a significant amount of clay or cohesive soils, overexcavate sufficiently below the bottom of structure for placement of a lean concrete or screened gravel working mat. Remove loose or soft material from the subgrade immediately prior to placing working mat.
- F. Remove and replace soft subgrades or unusable material with structural fill or other material satisfactory to the Engineer.
- G. During wet or freezing weather, or in areas where exposed subgrade consists of moisture-sensitive soils, take measures to protect foundation excavations once they have been approved by the Engineer. Protective measures include, but are not limited to, placing insulation blankets, placing a layer of fill, pea gravel, crushed rock, or lean concrete on the exposed subgrade, or covering the exposed subgrade with a plastic tent.
 - 1. If additional overexcavation is required due to the subgrade not being protected against wet or freezing weather, perform additional work without additional compensation.
- H. Notify the Engineer to observe conditions following subgrade preparation and prior to fill placement. If existing subgrade soils are determined to be unsuitable, follow direction provided by the Engineer regarding removal and replacement with suitable materials.
 - 1. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

3.6 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust. Protect from precipitation.
 - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.7 FILL PLACEMENT AND COMPACTION PROCEDURES

- A. Fill and Backfill: Place materials in lifts to suit specified compaction requirements to required lines and grades, making allowances for settlement and placement of cover materials, such as topsoil or sod. Correct soft spots or uncompacted areas.

- B. Do not place or compact fill and backfill when materials are too wet to properly compact.
 - 1. In-place Soil Moisture Content: Maximum of three percentage points above optimum moisture content of soil, as determined by laboratory test of moisture-density relation appropriate to specified level of compaction.
- C. Structural Fill and Select Common Fill: Construct to required lines and grades, making allowances for settlement and placement of cover materials, such as topsoil and sod. Correct soft spots or uncompacted areas.
- D. Fill material shall be free of snow, ice, frost, and frozen earth. Do not place fill materials on frozen surfaces or surfaces covered by snow, ice, or frost.
- E. If subgrade slopes more than 10 percent, step subgrade to produce a stable, horizontal surface for placement of fill materials. Scarify existing subgrade slope to a depth of at least 6 inches.
- F. Compact filled slopes by slope rolling and trimming or overfill and trim back to plan grade to expose a firm, smooth surface free of loose material.
- G. Do not allow fill lifts to contain stones with a dimension larger than 1/2 the specified loose measured lift thickness.
- H. Perform compaction in open areas using compaction equipment by any of the following methods:
 - 1. Fully loaded ten-wheel trucks or front-end loaders.
 - 2. Tractor dozers weighing minimum of 30,000 pounds.
 - 3. Heavy vibratory rollers.
- I. Confined Compaction: Perform compaction in confined areas, including areas within a 45-degree angle extending upward and outward from the base of a wall, and in areas where the use of large equipment is impractical, using hand-operated vibratory equipment or mechanical tampers.
 - 1. Do not exceed lift thickness of 6 inches or 1/2 the specified lift thickness (whichever is less), measured before compaction, when using hand operated equipment.
- J. Moisture condition on-site fill material prior to placement, unless Contractor demonstrates to the Engineer in-place moisture conditioning methods can achieve the required moisture content.
- K. Conduct compaction of each specified lift of fill materials by a minimum of four complete coverages with acceptable compaction equipment to a specified density as a percentage of maximum dry density as determined by ASTM D698, unless otherwise specified.
- L. Use structural fill required beneath foundations or slabs on grade, except sidewalks. Place and compact structural fill in even lifts having a maximum thickness of 8 inches, measured before compaction.
- M. Use select common fill and backfill material placed within 10 feet of all structures. Uniformly place and compact select common fill around the structure in even lifts having a maximum thickness of 8 inches, measured before compaction.

- N. Use common fill in areas beyond those designated for structural fill or select common fill, unless shown or otherwise specified. Place in even lifts having a maximum thickness of 12 inches, measured before compaction.
- O. Place impervious fill in controlled, even lifts having a maximum thickness (measured before compaction) of 6 inches.
 - 1. Permeability: Compact to attain a reading of less than 1×10^{-7} cm/sec.
 - 2. Moisture Content: Compact to optimum moisture content of minus 2 percent to plus 3 percent.

3.8 COMPACTION REQUIREMENTS

- A. Perform in-place testing of compacted fill lifts to measure in-place density and water content according to ASTM D698.
- B. Beneath Foundations and Slabs-on-Grade, except sidewalks: Compact top 12 inches (300 mm) of existing subgrade and each layer of fill, if applicable to:
 - 1. Maximum Dry Density: Minimum of 98 percent for ASTM D698.
 - 2. Moisture Content: At or near its optimum moisture content of minus 2 percent to plus 2 percent.
- C. Area Around Structures: Within 10 feet (3 meters), compact each fill or backfill layer to:
 - 1. Maximum Dry Density: Minimum of 98 percent for ASTM D698.
 - 2. Moisture Content: At or near its optimum moisture content of minus 3 percent to plus 3 percent.
- D. Embankments, Lawn, or Unimproved Areas: Does not include embankments under roadways and earth dam structures. Compact each fill or backfill layer to:
 - 1. Maximum Dry Density: Minimum of 92 percent for ASTM D698.
 - 2. Moisture Content: At or near its optimum moisture content of minus 3 percent to plus 3 percent.
- E. Sidewalks: Compact each fill layer to:
 - 1. Maximum Dry Density: Minimum of 98 percent for ASTM D698.
 - 2. Moisture Content: At or near its optimum moisture content of minus 3 percent to plus 3 percent.
- F. Roads, Paved Areas, and Roadway Embankments: Compact each layer of fill or backfill to:
 - 1. Maximum Dry Density: Minimum of 98 percent for ASTM D698].
 - 2. Moisture Content: At or near its optimum moisture content of minus 3 percent to plus 3 percent.

3.9 DISPOSAL OF UNSUITABLE, WASTE, AND SURPLUS EXCAVATED MATERIALS

- A. Unsuitable soil, objectionable material, waste, and surplus excavated material shall be removed and disposed of off-site. Materials may be temporarily stockpiled in an area within the limits of construction that does not disrupt construction activities, create any nuisances or safety hazards, or otherwise restricts access to work site.
- B. Topsoil or loam excavated under this Section may be salvaged for use as specified under Section 329200 "Turf and Grasses", as approved by the Engineer.

3.10 GRADING

- A. Perform grading to lines and grades shown on Drawings. Remove objectionable materials encountered within the limits indicated and disposed of off-site. Completely and continuously drained and dewatered subgrades throughout the grading process. Install temporary drains and drainage ditches to intercept or divert surface water that may affect the execution or condition of grading work.
- B. If it is not possible at the time of grading to place material in its proper section of the Work, stockpile it in approved areas for later use. No additional compensation will be made for stockpiling or double handling of excavated materials.
- C. In cut areas, remove loose or protruding rocks in slopes to line or finished grade of the slope. Uniformly dress, cut, and fill slopes to slope cross-section and alignment shown on Drawings, unless otherwise directed by the Engineer.

3.11 FIELD QUALITY CONTROL

- A. Test and observe materials as described in this Article. Cooperate by allowing free access to work for selection of test materials and observations.
- B. General Testing Requirements:
 - 1. At Structures: Prior to placement of bedding material, working mats, structural fill or structural concrete, coordinate with the Soils Testing Laboratory to verify suitability of existing subgrade soil.
 - 2. Backfill and Fill: Prior to and during the placement of backfill and fill coordinate with the Soils Testing Laboratory to perform in-place soil density tests to verify that backfill and fill material has been placed and compacted in accordance with specified compaction requirements.
 - a. Provide minimum 48 hours' notice prior to placement of backfill and fill.
 - 3. Subgrade: Do not cover with fill without observation, testing, and approval by Soils Testing Laboratory.
 - a. Earthwork activities performed without properly scheduled inspection are subject to removal and replacement or additional testing as directed by the Engineer without additional compensation.

- C. Test materials by a certified independent laboratory, engaged by Contractor and acceptable to the Engineer, demonstrating conformance with project requirements. Deliver test reports and material certifications to the Engineer before using any material in the work.
 - 1. Owner will make payment for laboratory and in place density testing.
- D. If field test results are not in conformance with project requirements, costs involved in correcting deficiencies in compacted materials to satisfaction of the Engineer without additional compensation.
- E. Earthwork activities performed without properly scheduled inspection are subject to removal and replacement or additional testing as directed by the Engineer without additional compensation.
- F. Testing methods shall comply with latest ASTM or equivalent AASHTO Standards applicable during bidding.
- G. During placement of pipe bedding, backfill, and fill, perform in-place soil density testing to confirm that fill material has been compacted in accordance with project requirements. The Engineer may designate areas to be tested. Notify the Engineer at least 72 hours in advance of scheduled compaction testing. In place soil density tests on backfill and fill material shall be as required by authorities having jurisdiction, but in no instance, shall less than those listed:
 - 1. Structures and Embankments: At least one density and moisture content test for each 2,500 square feet of surface area for each lift of fill at embankment, structure, and manhole locations.
 - 2. The Engineer may designate supplemental areas to be tested at additional compensation.
- H. Materials which have been previously tested may be subjected to further testing from time to time and may be rejected, if it is determined that results do not conform to project requirements. Immediately remove rejected materials when directed by the Engineer, notwithstanding results of previous testing.
- I. The Engineer or Owner may conduct additional soil testing. Cooperate fully in allowing additional test to be made, including free access to the work.

3.12 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
 - 1. Scarify or remove and replace soil material to depth as directed by the Engineer; reshape and recompact.

- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

END OF SECTION 312000

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SECTION 312319 – DEWATERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes temporary construction dewatering and surface water control and incorporates the design, equipment, materials, installation, operation, protection, monitoring and removal of dewatering and drainage system. Provide dewatering system sufficient to lower groundwater and collect surface water, regardless of groundwater level or rainfall at any time during the work.
- B. Obtain and pay for permits required for dewatering and drainage systems. Implement measurements to comply with dewatering and discharge permits requirements.
- C. Related Requirements:
 - 1. Section 013233 "Photographic Documentation" for recording preexisting conditions and dewatering system progress.
 - 2. Section 310515 "Soils and Aggregates for Earthwork" for earthwork fill and grading materials.
 - 3. Section 310519 "Geotextiles for Earthwork" for filter fabric materials.
 - 4. Section 310900 "Geotechnical Instrumentation and Monitoring" for measuring impacts during demolition, installation of excavation support systems and earthwork activities.
 - 4. Section 312000 "Earthwork" for excavation, backfilling, and compaction procedures.
 - 5. Section 312333 "Trenching and Backfilling" for excavation, backfilling, and compaction of utility trenches.
 - 6. Section 312500 "Erosion and Sedimentation Controls" for controlling surface-water runoff and ponding.
 - 7. Section 315000 "Excavation Support and Protection" for support of excavations and protection of existing structures.
 - 8. Division 32 "Site Improvements" for various Sections relating to civil and landscape related work.

1.3 DEFINITIONS

- A. In-the-Dry: An excavation subgrade where all of the following are met:
 - 1. Groundwater level has been lowered to at least 2 feet below lowest excavation level.
 - 2. Subgrade is stable with no ponded water, mud, or muck.
 - 3. Subgrade is able to support construction equipment without rutting or disturbance.

4. Subgrade is suitable for placement and compaction of fill material, pipe, or concrete foundations.
- B. Contractor's Engineered Design: Design prepared on behalf of Contractor by a Professional Engineer licensed in the State of North Carolina.
 - C. Professional Engineer: Professional Engineer licensed in the State of North Carolina meeting project qualifications and who is hired by Contractor.
 - D. The Engineer: Engineer hired by Owner.
 1. Approvals given by the Engineer shall not relieve Contractor of its responsibilities for performing the work in accordance with Contract Document requirements.
 - E. Pre-installation Conference: Conduct conference at the project site.
 1. Verify availability of Installer's personnel, equipment, and facilities needed to perform the work, make progress and avoid delays.
 2. Review condition of site to be dewatered including coordination with temporary erosion-control measures, excavation support systems, and temporary controls and protections.
 3. Review geotechnical data.
 4. Review proposed site clearing and excavations.
 5. Review existing utilities and subsurface conditions.
 6. Review observation and monitoring of dewatering system.
 7. Review pretreatment requirements prior to discharge, discharge location(s), and flow rate requirements.

1.4 ACTION SUBMITTALS

- A. Design Plan: Submit written dewatering and drainage system design plan, prepared by a qualified Professional Engineer licensed in North Carolina, that includes:
 1. Description of proposed dewatering system and installation methods to be used for system elements and observation wells.
 2. Description of equipment, drilling methods, holes sizes, filter sand placement techniques, sealing materials, development techniques, number and location of dewatering points and observations wells.
 3. Dewatering system design calculations demonstrating that the proposed system meets all requirements herein and elsewhere.
 4. Sequence of well and well-point placement coordinated with support of excavation system installation and control procedures to be adopted, if dewatering problems arise.
 5. Identification of anticipated area influenced by dewatering system and address impacts to adjacent existing and proposed structures.
 - a. Include detailed plans for pre-construction surveys of existing structures in vicinity of dewatering system, settlement monitoring of existing structures during construction, and provisions to address settlement of existing structures resulting from dewatering activities.

6. Coordinate dewatering and drainage submittals with excavation and support of excavation submittals.
- B. Shop Drawings: For dewatering system and/or temporary cofferdam (if selected by Contactor), design shall be prepared by a qualified Professional Engineer licensed in North Carolina.
1. Include plans, elevations, sections, and details. For cofferdam, include stability calculations and sufficient construction sequence details to evaluate the assumptions for the design.
 2. Show arrangement, locations, and details of wells and well points; locations of risers, headers, filters, pumps, power units, and discharge lines; and means of discharge, control of sediment, and disposal of water.
 3. Include pump capacity and anticipated discharge rate.
 4. Include layouts of piezometers and flow-measuring devices for monitoring performance of dewatering system.
 5. Show areas and depths of excavation to be dewatered and adjacent structures or facilities within the anticipated area influence.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer, land surveyor, and Professional Engineer.
- B. Field quality-control reports.
- C. Existing Conditions: Using photographs or video recordings, show existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by dewatering operations. Submit before Work begins.
- D. Record Drawings: Identify locations and depths of capped wells and well points and other abandoned-in-place dewatering equipment.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer that has specialized in installation of dewatering systems and dewatering work and having a minimum of 5 years' experience.
- B. Professional Engineer Qualifications: Professional Engineer licensed in the State of North Carolina; having a minimum of 5 years' experience in design and construction of dewatering and drainage systems; and having completed not less than 5 successful dewatering and drainage projects of equal type, size, and complexity to that required for the work.
- C. Comply with authorities having jurisdiction for the following:
 1. Drilling and abandoning of wells used for dewatering systems.
 2. Water discharge and disposal from dewatering operations.
- D. Obtain permit from EPA under National Pollutant Discharge Elimination System (NPDES), for storm water discharge from construction sites.

1.7 FIELD CONDITIONS

- A. Project-Site Information: Geotechnical data has been prepared for this Project and is available for information only. Owner is not responsible for interpretations or conclusions drawn from this data.
1. Make additional test borings and conduct other exploratory operations necessary for dewatering according to the performance requirements.
 2. Groundwater levels may vary during the work and should not be assumed to be accurately represented by groundwater level readings reported in the geotechnical data.
 3. The geotechnical data is included elsewhere in Project Manual.
- B. Survey Work: Engage a qualified land surveyor or Professional Engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

PART 2 - PRODUCTS

2.1 DESIGN REQUIREMENTS

- A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of surface including lake levels and groundwater and permit excavation and construction to proceed in-the-dry in accordance with the requirements herein and elsewhere.
1. Design dewatering system, including comprehensive engineering analysis by the Contractor's Design Engineer.
 2. Continuously monitor and maintain dewatering operations to ensure required groundwater lowering, erosion control, stability of excavations, excavation support, and constructed slopes, prevention of flooding in excavation, and prevention of damage to subgrades and permanent structures.
 3. Prevent surface water from entering excavations by grading, dikes, or other means.
 4. Accomplish dewatering without damaging existing dam, retaining wall, buildings, structures, and site improvements adjacent to excavation.
 5. Remove dewatering system when no longer required for construction.
- B. Primary Purpose of Work: Preserve natural undisturbed condition of subgrade soils in areas of proposed excavations.
1. Prior to excavation, lower groundwater to at least 2 feet below lowest excavation subgrade elevation.
 2. Additional groundwater lowering may be necessary beyond the 2 foot requirement, depending on construction methods, equipment used, and prevailing groundwater and soil conditions. Lower groundwater as necessary to complete construction in accordance with Contract Documents without additional compensation.
- C. Design deep wells, well points and sumps, and other groundwater control system components to prevent loss of fines from surrounding soils. Use sand filters with dewatering installations,

unless screens are properly sized by Contractor's Design Engineer to prevent passage of fines from surrounding soils.

- D. Maintain standby pumping systems and sources of standby power at various sites.
- E. Design dewatering system to prevent damage to adjacent properties, buildings, structures, utilities, and facilities from dewatering operations. Be responsible for damage to properties, buildings or structures, sewers and other utility installations, pavements, and work that may result from dewatering or surface water control operations.
- F. Regulatory Requirements: Comply with governing EPA notification regulations before beginning dewatering. Comply with water- and debris-disposal regulations of authorities having jurisdiction.

2.2 MATERIALS

- A. Pipe for Observation Wells: ASTM D 1785, PVC Schedule 40 in minimum interior diameter of 1 inch and machine slotted having a maximum slot size of 0.020 inch. Coordinate with Section 310900 "Geotechnical Instrumentation and Monitoring."
- B. Equipment: Piping, pumping, and other equipment and materials to provide control of surface water and groundwater in excavations.
- C. Grout: Mixture of portland cement and bentonite clay or sand suitable for sealing abandoned wells and piping.

PART 3 - EXECUTION

3.1 GENERAL

- A. Control surface water and groundwater such that:
 - 1. Excavation to final grade is made in-the-dry.
 - 2. Natural undisturbed conditions of subgrade soils are maintained.
 - 3. Softening, instability, or disturbance due to presence or seepage of water does not occur.
 - 4. Construction and backfilling proceeds in-the-dry.
 - 5. Floatation of completed portions of work shall be prohibited.
- B. Methods of groundwater control may include but are not limited to perimeter trenches and sump pumping, perimeter groundwater cutoff, well points, ejectors, deep wells, or any combination.
- C. Where groundwater levels are above proposed bottom of excavation level, provide a pumped dewatering system for pre-drainage of soils prior to excavation and for maintaining lowered groundwater level until construction has been completed such that structure, pipeline, or fill will not be floated or otherwise damaged.
- D. Vary type of system, spacing of dewatering units, and other details of the work depending on soil and water conditions at each location.

- E. Do work in a manner to protect adjacent structures and utilities without causing loss of ground or disturbance to pipe bearing soils or soils supporting overlying or adjacent structures.
- F. Install, monitor, and report data from observation wells. Evaluate collected data relative to groundwater control system performance and modify systems necessary to dewater site.
- G. Locate groundwater control system components where they will not interfere with construction activities adjacent to the work area or interfere with installation and monitoring of geotechnical instrumentation including observation wells. Do not make excavations for sumps or drainage ditches within or below 1H:1V slopes extending downward and out from edges of existing or proposed foundation elements or from downward vertical footprint of pipe without approval by the Engineer.

3.2 PREPARATION

- A. Protect existing dam, retaining wall, structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by dewatering operations.
 - 1. Prevent surface water or groundwater from entering excavations, from ponding on prepared subgrades, and from flooding site or surrounding area.
 - 2. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.
- B. Install dewatering system to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways, if required by authorities having jurisdiction.
- C. Provide temporary grading to facilitate dewatering and control of surface water.
- D. Protect and maintain temporary erosion and sedimentation controls, which are specified in Section 015000 "Temporary Facilities and Controls," during dewatering operations.

3.3 INSTALLATION

- A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface water controls.
 - 1. Space well points or wells at intervals required to provide sufficient dewatering.
 - 2. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.
- B. Place dewatering system into operation to lower water to specified levels before excavating below groundwater level.

- C. Provide sumps, sedimentation tanks, and other flow-control devices as required by authorities having jurisdiction.
- D. Provide standby equipment on-site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails.

3.4 SURFACE WATER CONTROL

- A. Construct surface water control measures, including dikes, ditches, sumps and other methods to prevent flow of surface water into excavations and to allow construction to proceed without delay.
- B. Grade excavation to divert surface water and groundwater within excavation areas into sumps and dewatering wells.

3.5 EXCAVATION DEWATERING

- A. Provide and maintain equipment and facilities to promptly remove and properly dispose of water entering excavations. Maintain excavations in-the-dry.
- B. Excavation dewatering shall maintain the subgrade in a natural undisturbed condition and be in operation until the fill, structure or pipes to be built thereon have been completed to such extent that they will not be floated or otherwise damaged by allowing water levels to return to natural elevations.
- C. Do not place pipe, masonry, and concrete in water or submerge within 24 hours after being installed. Prevent water from flowing over new masonry or concrete within four days after placement.
- D. Prevent water from rising to cause unbalanced pressure on structures until concrete or mortar has set at least 24 hours. Prevent pipe flotation by promptly placing backfill.
- E. Conduct dewatering to preserve natural undisturbed condition of subgrade soils at bottom of excavation.
- F. If trench subgrade or excavation bottom becomes disturbed due to inadequate dewatering or drainage, excavate below normal grade as directed by the Engineer and refill with structural fill or other material as approved by the Engineer without additional compensation.
- G. It is expected that initial dewatering plan may be modified to suit variable soil and water conditions encountered. Dewater and excavate in a manner without causing loss of ground or disturbance to pipe bearing soils, soil that supports overlying or adjacent structures or instability of excavation.
- H. If methods do not properly dewater excavation, install additional groundwater observation wells as directed by the Engineer. Do not place pipe or structure until readings obtained from observation wells indicate that groundwater has been lowered to specified minimum of below bottom of final excavation.

- I. Surround dewatering units with suitable filter sand with no fines being removed by pumping. Pump continuously from dewatering system until pipe or structure is adequately backfilled. Provide stand-by pumps.
- J. Collect water entering excavations from precipitation or surface runoff in shallow ditches around excavation perimeter, drained to a sump, and pump from excavation to maintain a bottom free from standing water.
- K. Dispose of drainage to an approved area as specified in Section 013543 “Environmental Protection Procedures”. Do not use existing or new sanitary sewers to dispose of drainage.

3.6 OBSERVATION WELLS

- A. Refer to Section 310900 “Geotechnical Instrumentation and Monitoring”.

3.7 REMOVAL OF SYSTEMS

- A. Refer to Section 310900 “Geotechnical Instrumentation and Monitoring”.

END OF SECTION 312319

SECTION 312323.33 - FLOWABLE FILL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Flowable fill for:
 - a. Structural backfill.
 - b. Utility bedding.
 - c. Utility backfill.
 - d. Filling abandoned utilities.

- B. Related Sections:

- 1. Section 312000 "Earthwork" for excavation, backfilling, and compaction procedures.
- 2. Section 312333 "Trenching and Backfilling" for excavation, backfilling, and compaction of utility trenches.
- 3. Section 330513 "Manholes and Structures"
- 4. Section 330519 "Ductile-Iron Utility Pipe for Water Service"

1.3 DEFINITIONS

- A. Utility: Any buried pipe, duct, conduit, manhole, tank, or cable.
- B. Excavatable Flowable Fill: Lean cement concrete fill used where future excavation may be required, such as fill for utility trenches.
- C. Non-excavatable Flowable Fill: Lean cement concrete fill used where future excavation is not anticipated, such as fill below structure foundations and filling abandoned utilities.

1.4 SUBMITTALS

- A. Section 013300 "Submittal Procedures": Requirements for submittals.
- B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

C. Field Quality-Control Submittals:

1. Mix Design:

- a. Furnish flowable fill mix design for each specified strength.
- b. Furnish separate mix designs when admixtures are required for the following:
 - 1) Flowable fill work during hot and cold weather.
 - 2) Air entrained flowable fill work.
- c. Identify design mix ingredients, proportions, properties, admixtures, and tests.
- d. Sieve analysis of aggregate.

- 2. Furnish test results to certify flowable fill mix design properties meet or exceed specified requirements.

D. Delivery Tickets:

- 1. Furnish duplicate delivery tickets indicating actual materials delivered to the project site.

E. Qualifications Statements:

- 1. Submit qualifications for supplier.

1.5 ACTION SUBMITTALS

1.6 Manufacturer's Certificate: Products meet or exceed specified design requirements, QUALITY ASSURANCE

- A. Perform Work according to State of North Carolina Department of Transportation standards.
- B. All testing and inspection services required, unless otherwise specified, shall be provided and paid for by the Contractor. Testing necessary to establish the mix shall be performed by and at the expense of the Contractor. Methods of testing shall comply with the latest applicable ASTM Methods except as specified herein.

1.7 QUALIFICATIONS

A. Supplier:

- 1. Company specializing in supplying products specified in this Section with minimum three years' experience.
- 2. Product source approved by authority having jurisdiction.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Section 015000 “Temporary Facilities and Controls” specifies ambient condition control facilities for product storage and installation.
 - 1. Store or stockpile fly ash, aggregate and cement in conformity with the recommendations of ACI 301.
- B. Minimum Conditions: Do not install flowable fill during inclement weather or when ambient temperature is less than 40 degrees F.

1.9 FIELD MEASUREMENTS

- A. Verify field measurements before installing flowable fill to establish quantities required to complete the Work.

PART 2 - PRODUCTS

2.1 FLOWABLE FILL

- A. Furnish materials according to State of North Carolina Department of Transportation standards or as specified herein.
- B. Flowable Fill: non-excavatable type.

2.2 MIXES

- A. Mix and deliver flowable fill according to ASTM C94/C94M, Option C.
- B. Flowable Fill Design Mix:

ITEM	NON-EXCAVATABLE
Cement Content	100 lb/cu yd min
Fly Ash Content	300 lb/cu yd min
Water Content	As specified
Air Entrainment	5 to 15 percent
28-Day Compressive Strength	Minimum 300psi
Unit Mass (Wet)	110 to 145 pcf
Temperature, Minimum at Point of Delivery	50 degrees F

- C.
- C. Provide water content in design mix to produce self-leveling, flowable fill material at time of placement.

- D. Design mix air entrainment and unit mass are for laboratory design mix and source quality control only.

2.3 SOURCE QUALITY CONTROL

- A. Section 014000 “Quality Requirements”: Testing, inspection and analysis requirements.
- B. Test properties of flowable fill design mix and certify results for the following:
 - 1. Design mix proportions by weight of each material.
 - 2. Aggregate: ASTM C33 for material properties and gradation.
 - 3. Properties of plastic flowable fill design mix including:
 - a. Temperature.
 - b. Slump.
 - c. Air entrainment.
 - d. Wet unit mass.
 - e. Yield.
 - f. Cement factor.
 - 4. Properties of hardened flowable fill design mix including:
 - a. Compressive strength at 1 day, 7 days, and 28 days. Report compressive strength of each specimen and average specimen compressive strength.
 - b. Unit mass for each specimen and average specimen unit mass at time of compressive strength testing.
- C. Prepare delivery tickets containing the following information:
 - 1. Project designation.
 - 2. Date.
 - 3. Time.
 - 4. Class and quantity of flowable fill.
 - 5. Actual batch proportions.
 - 6. Free moisture content of aggregate.
 - 7. Quantity of water withheld.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 013000 “Administrative Requirements”: Verification of existing conditions before starting Work.
- B. Verify excavation specified in Section 312000 or trenching specified in Section 312333 is complete.

- C. Verify utility installation as specified in Section 330513 and 330519 is complete and tested before placing flowable fill.
- D. Verify excavation is dry and dewatering system is operating.

3.2 PREPARATION

- A. Section 017000 “Execution and Closeout Requirements” for installation preparation.
- B. Support and restrain utilities to prevent movement and flotation during installation of flowable fill.
- C. Protect structures and utilities from damage caused by hydraulic pressure of flowable fill before fill hardens.
- D. Protect utilities and foundation drains to prevent intrusion of flowable fill.

3.3 INSTALLATION - FILL, BEDDING, AND BACKFILL

- A. Engineer approval required for the condition of subgrade and method of placement.
- B. Remove all debris and foreign matter from the excavation before depositing flowable fill.
- C. Do not place flowable fill in water or submerge within 24 hours after placing.
- D. Do not place flowable fill through flowing water.
- E. Place flowable fill by chute, pumping or other methods approved by Engineer.
- F. Place flowable fill in lifts to prevent lateral pressures from exceeding structural capacity of structures and utilities.
- G. Place flowable fill evenly on both sides of utilities to maintain alignment.
- H. Place flowable fill to elevations indicated on Drawings without vibration or other means of compaction.

3.4 INSTALLATION - FILLING ABANDONED UTILITIES

- A. Verify pipes and conduits are not clogged and are sufficiently empty to permit gravity installation of flowable fill for entire length indicated to be filled.
- B. Seal lower end of pipes and conduits by method to contain flowable fill and to vent trapped air caused by filling operations.
- C. Place flowable fill using method to ensure there are no voids.
 - 1. Fill pipes and conduits from high end.

2. Fill manholes, tanks, and other structures from grade level access points.

D. After filling pipes and conduits seal both ends.

3.5 FIELD QUALITY CONTROL

A. Section 014000 “Quality Requirements” for inspecting and testing.

B. Perform inspection and testing according to ASTM C94/C94M.

1. Take samples for tests for every 150 cu yd of flowable fill, or fraction thereof, installed each day.
2. Sample, prepare and test four compressive strength test cylinders according to ASTM D4832. Test one specimen at 3 days, one at 7 days, and two at 28 days.
3. Measure temperature at point of delivery when samples are prepared.

C. Perform in place penetration (density) tests using hand held penetrometer to measure penetration resistance of hardened flowable fill according to ASTM C403.

1. Perform tests at locations as directed by Engineer.

D. Defective Flowable Fill: Fill failing to meet the following test requirements or fill delivered without the following documentation.

1. Test Requirements:
 - a. Minimum temperature at point of delivery.
 - b. Compressive strength requirements for each type of fill.
2. Documentation: Duplicate delivery tickets.

3.6 CLEANING

A. Section 017000 “Execution and Closeout Requirements”: Requirements for cleaning.

B. Remove spilled and excess flowable fill from Project Site.

C. Restore facilities and Site areas damaged or contaminated by flowable fill installation to existing condition before installation.

END OF SECTION 312323.33

SECTION 312333 - TRENCHING AND BACKFILLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes trench excavation, backfilling, and compaction.
- B. Related Requirements:
 - 1. Section 310515 “Soils and Aggregates for Earthwork” for earthwork fill and grading materials.
 - 2. Section 310519 “Geotextiles for Earthwork” for geotextile materials.
 - 3. Section 312000 “Earthwork” for excavation, backfilling, and compaction procedures.
 - 4. Section 312319 "Dewatering" for dewatering and drainage.
 - 5. Section 312500 “Erosion and Sedimentation Controls” for erosion and sedimentation control devices.
 - 6. Section 315000 “Excavation Support and Protection” for temporary excavation support systems and protecting existing structures and utilities.
 - 7. Section 321216 “Asphalt Paving” for flexible paving system.
 - 8. Section 329119 “Landscape Grading” for placing, leveling, and compacting topsoil materials prior to final landscaping.
 - 9. Section 329200 “Turfs and Grasses”
 - 10. Section 330510 “Temporary Bypass Pumping”
 - 11. Section 330513 “Manholes and Structures”
 - 12. Section 330519 “Ductile-Iron Utility Pipe for Water Service”

1.3 DEFINITIONS

- A. Percent Compaction: Means at least the stated percentage of maximum density as determined by ASTM D 698.

1.4 ACTION SUBMITTALS

- A. Submit proposed method of backfilling and compaction prior to start of Work.

1.5 INFORMATIONAL SUBMITTALS

- A. Material Test Reports: For material excavated from trench for re-use as backfill, by a qualified testing agency.

1.6 QUALITY ASSURANCE

- A. Comply with following regulations:
 - 1. Occupational Safety and Health Administration (OSHA): 29 CFR Part 1926 Subpart P.
 - 2. Applicable Federal and State Laws and Regulations.
- B. Provide excavation, trenching, related sheeting, bracing, and related materials to comply with requirements of OSHA excavation safety standards (29 CFR Part 1926 Subpart P) and the State of North Carolina requirements. Where conflict exists between OSHA and State regulations, more stringent requirements apply.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store excavated materials according to Section 312500 “Erosion and Sedimentation Control” to prevent erosion of soil type materials and contamination of adjacent water sources.

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine that erosion and sedimentation controls are in place and comply with project requirements and authorities having jurisdiction.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Where excavation activities occur across active vehicular or pedestrian circulation paths, use temporary controls specified in Division 01 to maintain circulation during operations required by this Section. Maintain temporary controls for each day circulation paths are restricted.
- B. Coordinate work of this Section with materials specified in other Sections of Division 31.
- C. Identify required lines, levels, contours, and datum locations.
- D. Protect features to remain-in-place including benchmarks, existing dam, structures, fences, sidewalks, paving, curbs, etc. from excavating equipment and vehicular traffic.
- E. Maintain and protect above and below grade utilities indicated to remain.

3.3 TRENCH EXCAVATION

- A. Trench excavation includes material of every description and substance encountered.

- B. Cut rigid and flexible pavement with a saw, wheel, or pneumatic chisel along straight lines before excavating.
- C. Strip and stockpile topsoil from grassed areas crossed by trenches.
 - 1. At the Contractor's option when required, topsoil may be disposed of and replaced with approved topsoil of equal quality.
- D. While excavating and backfilling is in progress, maintain traffic and protect utilities and other property.
- E. Excavate trenches to indicated depths and in widths sufficient and of practical minimum for pipe laying, bracing, and pumping and drainage facilities.
- F. Accomplish excavation and dewatering by methods preserving undisturbed state of subgrade soils. Excavate trench by machinery to or just below designated subgrade, if material remaining in trench bottom is no more than slightly disturbed.
 - 1. Remove subgrade soils that become soft, loose, quick, or otherwise unsatisfactory due to inadequate excavation, dewatering, or other construction methods and replace with screened gravel fill acceptable to the Engineer at Contractor's expense.
- G. Use care when working in clay and organic silt soils, which are particularly susceptible to disturbance due to construction operations. When excavation is to end in such soils, use a smooth-edge bucket to excavate the last 12 inches of depth.
- H. Where pipe is to be laid in screened gravel bedding, excavate trench by machinery to normal depth of pipe, provided material remaining in trench bottom is no more than slightly disturbed.
- I. Where pipe is to be laid directly on trench bottom, manually perform final excavation, providing a flat-bottom, true to grade upon undisturbed material. Make bell holes required by project conditions.

3.4 DISPOSAL OF MATERIALS

- A. Stack excavated material without excessive surcharge on trench bank or obstructing free access to hydrants and gate valves. Avoid inconvenience to traffic and abutters. Segregated excavated material for use in backfilling as specified below.
- B. Do not remove excavated material from work site, except as directed by the Engineer. When removal of surplus materials is approved by the Engineer, dispose of such surplus material in approved designated areas.
- C. Should conditions make it impracticable or unsafe to stack material adjacent to trench, haul and store material at a location provided. When required, re-handled and use it in backfilling trench.

3.5 SHEETING AND BRACING

- A. Refer to Section 311500 "Excavation Support and Protection" for excavation support requirements.

- B. Provide and maintain sheeting and bracing required by Federal, State, or local safety requirements to support sides of excavation and prevent loss of ground which could endanger personnel, damage, adjacent structures, or delay the work.
 - 1. Engineer may order additional supports placed at the Contractor's expense if it is determined that at any point sufficient or proper supports have not been provided. Compliance with such order shall not relieve the Contractor from their responsibility for sufficiency of such supports. Take care to prevent voids outside of sheeting; if voids are formed, immediately fill and ram them.
- C. When moveable trench bracing such as trench boxes, moveable sheeting, shoring or plates are used to support trench sides, take care in placing and moving the boxes or supporting bracing to prevent pipe movement, disturbance of pipe bedding, or screened gravel backfill.
 - 1. Rigid Pipe Installation (such as R.C., V.C., A.C.): Raise that portion of box extending below mid-diameter above this point prior to moving box ahead to install next pipe. Perform to prevent separation of installed pipe joints due to box movement.
 - 2. Flexible Pipe Installation (such as PVC): Do not allow trench boxes, moveable sheeting, shoring, or plates to extend below mid-diameter of pipe. As trench boxes, moveable sheeting, shoring, or plates are moved, place screened gravel to fill voids created. Re-compact screened gravel and backfill to provide uniform side support for pipe.
- D. Engineer may give permission to use steel sheeting in lieu of wood sheeting for entire job wherever sheeting use is necessary. Include cost for use of sheeting in bid items for pipe, including full compensation for driving, bracing, and later removal of sheeting.
- E. Carefully remove sheeting and bracing in manner to not endanger construction of other structures, utilities, or property, whether public or private. Immediately refill voids left after withdrawal of sheeting using sand by ramming with tools especially adapted to that purpose and watering or otherwise directed by the Engineer.
- F. No payment will be given for sheeting, bracing, or other support during progress of the work. No payment will be given for sheeting left in trench for Contractor's convenience.
- G. Leave sheeting driven below mid-diameter of pipe in place from driven elevation to at least 12 inches above top of pipe.

3.6 TEST PITS

- A. Excavation of test pits may be required for purpose of locating underground utilities or structures as an aid in establishing the precise location of new work.
- B. Backfill test pits as soon as desired information has been obtained. Maintain backfilled surface appropriate for travel until resurfaced.

3.7 EXCAVATION BELOW GRADE AND REFILL

- A. Drain trench completely and effectively be in-the-dry, whatever the nature of unstable material encountered or groundwater conditions.

- B. If Contractor excavates below grade through error or for their own convenience, through failure to properly dewater the trench, or disturbs subgrade before dewatering is sufficiently complete, the Engineer may direct Contractor to excavate below grade as set forth in following Paragraph, where work shall be performed at its own expense.
- C. If material at trench bottom consists of fine sand, sand and silt or soft earth which may work into the screened gravel, even with effective drainage, remove subgrade material to extent directed. Refill excavation with a 6-inch layer of coarse sand or a mixture graded from coarse sand to fine pea stone to form a filter layer preserving voids in pipe gravel bed. Composition and gradation of gravel shall be approved by the Engineer prior to placement. Place screened gravel in 6-inch layers thoroughly compacted up to normal grade of pipe. If directed by the Engineer, use structural fill or select common fill for refill of excavation below grade.
- D. Subsurface Drainage Geotextile: Non-woven filter fabric as specified in Section 310519.13 "Geotextiles for Earthwork" may be substituted for filter layer, if approved by the Engineer.

3.8 BACKFILLING

- A. Begin backfilling as soon as practicable after laying and jointing pipe and continue expeditiously. Place pipe bedding of specified type for pipe installed up to 12 inches over the pipe.
- B. Construct an impervious dam or bulkhead cutoff of clay or other impervious material in the trench, as directed by the Engineer, to interrupt unnatural flow of groundwater after construction is completed. Key dam into trench bottom and sidewalls. Provide at least one clay or other impervious material dam in pipe bedding between each manhole where directed or every 300 feet, whichever is less.
- C. Where pipes are laid cross-country, fill remainder of trench with common fill material in layers not to exceed 12 inches and mounded 6 inches above existing grade or as directed by the Engineer. Where a loam or gravel surface exists prior to cross-country excavations, remove, conserve and replace it to full original depth as part of the work under pipe items. Where necessary, remove excess material during clean-up process, so that ground may be restored to its original level and condition.
- D. Where pipes are laid in streets, backfill remainder of trench up to a depth of 12 inches below bottom of specified permanent paving with select common fill material in layers not to exceed 12 inches and thoroughly compacted. Use bank-run gravel for subbase layer of paving and compact in 6 inches (150 mm) layers.
- E. To prevent longitudinal pipe movement, do not dump backfill material into trench and then spread, until selected material or screened gravel has been placed and compacted to a level at least 12 inches over the pipe.
- F. Bring backfill up evenly on all sides. Thoroughly compact each layer of backfill material by rolling, tamping, or vibrating with mechanical compacting equipment or hand tamping to 95 percent of maximum dry density in accordance with ASTM D698 for common fill and 98 percent of maximum dry density in accordance with ASTM D698 for select common fill. If rolling, use a suitable roller or tractor being careful to compact fill throughout full width of trench.

- G. During placement of pipe bedding, backfill, and fill, perform in-place soil density testing to confirm that fill material has been compacted in accordance with project requirements. The Engineer may designate areas to be tested. Notify the Engineer at least 72 hours in advance of scheduled compaction testing. In place soil density tests on backfill and fill material shall be as required by authorities having jurisdiction, but in no instance, shall less than those listed:
1. Trench Excavations: At least one nuclear density and one moisture content test at a maximum of 50 feet intervals for each lift of fill placed or as directed by the Engineer.
 2. The Engineer may designate supplemental areas to be tested at additional compensation.
- H. Do not compact by puddling or water jetting.
- I. Use hand or pneumatic ramming with tools weighing at least 20 pounds for compacting in confined areas. Spread and compact material in layers not exceeding 6 inches thick, an uncompacted loose measurement.
- J. Use granular fill material as backfill around structures. Spread and compact specified backfill under and over pipes connected to structures.
- K. Do not place bituminous paving in backfill. Do not use frozen material under any circumstances.
- L. Broom and hose-clean road surfaces immediately after backfilling. Employ dust control measures throughout construction period.

3.9 RESTORING TRENCH SURFACE

- A. Where trench occurs adjacent to paved streets, in shoulders, sidewalks, or in cross-country areas, thoroughly consolidate backfill and maintain surface as the work progresses. If settlement takes place, immediately deposit additional fill to restore ground level.
- B. In and adjacent to streets, 12 inches of trench backfill below specified initial pavement shall consist of compacted bank-run gravel. If Contractor wants to use material excavated from trench as gravel subbase for pavement replacement, take samples at intervals not to exceed 500 feet of material and test by an independent testing laboratory at Contractor's expense. Use only materials approved by the Engineer.
- C. Restore surface of driveways or other areas which are disturbed by trench excavation to a condition at least equal to that existing before work began.
- D. In areas where pipeline passes through grassed areas, remove and replace sod or loam and seed surface at Contractor's own expense.

END OF SECTION 312333

SECTION 312500 - EROSION AND SEDIMENTATION CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Rock Energy Dissipator
2. Rock Barriers/Check Dams
3. Sediment Fences
4. Construction Entrances
5. Filter Bags
6. Erosion Control Blanket

- B. Related Sections:

1. Section 031000 "Concrete Forming and Accessories"
2. Section 032000 "Concrete Reinforcing"
3. Section 033000 "Cast-In-Place Concrete"
4. Section 055000 "Metal Fabrications"
5. Section 310515 "Soils and Aggregates for Earthwork"
6. Section 311000 "Site Clearing"

1.3 REFERENCE STANDARD

- A. North Carolina Sediment and Erosion Control Planning and Design Manual
- B. NCDEQ-Approved Erosion and Sedimentation Control Plan .

1.4 INFORMATIONAL SUBMITTALS

- A. Product data for all erosion and sedimentation control materials including manufacturer's installation recommendations (as applicable).

1.5 CLOSEOUT SUBMITTALS

- A. Section 017700 "Closeout Procedures": Requirements for submittals.

1.6 QUALITY ASSURANCE

- A. Be responsible for the timely installation and maintenance of all sedimentation control devices necessary to prevent the movement of sediment from the construction site to off site areas or into the stream system via surface runoff or underground drainage systems. Measures in addition to those shown on the Drawings necessary to prevent the movement of sediment off site shall be installed, maintained, removed, and cleaned up at the expense of the CONTRACTOR..
- B. Perform Work according to North Carolina Department of Environmental Quality: Erosion and Sediment Control Planning and Design Manual.
- C. Maintain one copy of each document on site.

1.7 PRE-INSTALLATION MEETINGS

- A. Section 013100 “Project Management and Coordination”: Pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Section 016000 “Product Requirements”: Environmental conditions affecting products on site.

PART 2 - PRODUCTS

2.1 ROCK AND GEOTEXTILE MATERIALS

- A. Furnish materials according to North Carolina Department of Transportation.
- B. Geotextile Fabric: 6 oz. Non-woven fabric.

2.2 BLOCK, STONE, AGGREGATE, AND SOIL MATERIALS

- A. Stone: ASTM C33 #57. Furnish according to North Carolina Department of Transportation standards.
- B. Coarse Aggregate: ASTM C33 #2. Furnish according to North Carolina Department of Transportation.

2.3 SILT FENCE

- A. Use a synthetic filter fabric of at least 95% by weight of polyolefins or polyester, which is certified by the manufacturer or supplier as conforming to the requirements in ASTM D 6461 (refer to the NC Erosion and Sediment Control Planning and Design Manual). Synthetic filter fabric should contain ultraviolet ray inhibitors and stabilizers to provide a minimum of 6 months of ex-

pected usable construction life at a temperature range of 0 to 120° F.

- B. Ensure that posts for sediment fences are 1.33 lb/liner ft steel with a minimum length as shown on the Drawings. Make sure that steel posts have projections to facilitate fastening the fabric.
- C. For reinforcement of standard strength filter fabric, use wire fence with a minimum 14 gauge and a maximum mesh spacing of 6 inches.

2.4

2.4 FILTER BAGS

- A. Filter Bags: Sized with manufacturer recommendations based on pumped discharge rate.
- B. Geotextile Material for Bags: Meet the following minimum requirements:

Minimum Grab Tensile Strength	200 lbs
Minimum Grab Tensile Elongation	50%
Minimum Trapezoidal Tear Strength	80 lbs
Mullen Burst Strength	380 psi
Minimum Puncture Strength	130 lbs
Apparent Opening Size	40-80 US Sieve
Minimum Flow Through	70 gpm/square foot

- C. Bag shall have opening large enough to accommodate 4-inch diameter discharge hose.

2.5 EROSION CONTROL BLANKET

- A. Erosion control blankets: comprised of natural materials such as coconut fiber, jute netting, etc. as suitable for the intended purpose and meeting the requirements of the North Carolina Sediment and Erosion Control Planning and Design Manual. Plastic netting, including photo- or bio-degradable polypropylene, shall not be permitted.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 017300 "Execution": Verification of existing conditions before starting work.
- B. Verify compacted subgrade is acceptable and ready to support devices and imposed loads.
- C. Verify gradients and elevations of base or foundation for other work are correct.

3.2 ROCK ENERGY DISSIPATOR

- A. Excavate to indicated depth of rock lining or nominal placement thickness as follows. Remove loose, unsuitable material below bottom of rock lining, then replace with suitable material. Thoroughly compact and finish entire foundation area to firm, even surface.
- B. Lay and overlay geotextile fabric over substrate. Lay fabric parallel to flow from upstream to downstream. Overlap edges upstream over downstream and upslope over downslope. Provide a minimum overlap of 1 foot. Offset adjacent roll ends a minimum of 5 feet when lapped. Cover fabric as soon as possible and in no case leave fabric exposed more than 4 weeks.
- C. Carefully place rock on geotextile fabric to produce an even distribution of pieces, with minimum of voids and without tearing geotextile.
- D. Unless indicated otherwise, place full course thickness in one operation to prevent segregation and to avoid displacement of underlying material. Arrange individual rocks for uniform distribution.

3.3 SILT FENCE

- A. Position sediment fences as indicated on the Drawings and to prevent off site movement of sediment produced by construction activities as directed by the Engineer. Areas beyond limits of silt fence shall be undisturbed or stabilized.
- B. Dig trench approximately 6 inches wide and 6 inches deep along proposed fence lines.
- C. Drive stakes, 10 feet on center (maximum) at back edge of trenches. Drive stakes 2 feet (minimum) into ground.
- D. Hang filter fabric on posts carrying to bottom of trench with about 4 inches of fabric laid across bottom of trench. Stretch fabric fairly taut along fence length and maintain secure both ways.
- E. Backfill trench with excavated material and tamp.
- F. Install pre-fabricated silt fence according to manufacturer's instructions.

3.4 CONSTRUCTION ENTRANCE

- A. Construct entrance with minimum of 6 inches of course aggregate at all points of ingress/egress.
- B. Width: Minimum 20 feet, increased as needed for typical construction vehicles.
- C. Minimum Length: 50 feet.
- D. Install filter fabric below aggregate.
- E. Maintain entrance throughout construction, adding more aggregate or increasing length as needed.

3.5 FILTER BAG

- A. Locate filter bag at least 50 feet from all wetlands, streams or other surface waters.
- B. Install bag on a 2-inch gravel bed to allow water to flow in all directions.
- C. Bag is full when remaining flow area is reduced by 75%. Replace full bags with new bags.

3.6 EROSION CONTROL BLANKETS

- A. Install erosion control blankets onto all exposed slopes to be loamed and seeded that are steeper than 4(Horizontal) to 1(Vertical) as shown on the Drawings. Erosion control blankets shall also be installed in all seeded drainage swales and ditches, and as directed by the Engineer in accordance with manufacturer's instructions.
- B. The area to be covered shall be properly prepared, fertilized and seeded with permanent vegetation before the blanket is applied. The blankets shall be applied in the direction of water flow and stapled.
- C. Place blankets and stapled together in accordance with manufacturer's instructions. Side overlaps shall be 4-inch minimum. The staples shall be made of wire, 0.091 inch in diameter or greater, "U" shaped with legs 10-in in length and a 1-1/2-in crown. Commercial biodegradable stakes may also be used with prior approval by the Engineer. The staples shall be driven vertically into the ground, spaced approximately two linear feet apart, on each side, and one row in the center alternately spaced between each side. Upper and lower ends of the matting shall be buried to a depth of 4-in in a trench. In swales and ditches, erosion stops shall be created every 25-ft by making a fold in the fabric and carrying the fold into a silt trench across the full width of the blanket. The bottom of the fold shall be 4-in below the ground surface. Staple on both sides of fold. Where the matting must be cut or more than one roll length is required in the swale, turn down upper end of downstream roll into a slit trench to a depth of 4-in. Overlap lower end of upstream roll 4-in past edge of downstream roll and staple
- D. To ensure full contact with soil surface, roll matting with a roller weighing 100 lbs/ft of width perpendicular to flow direction after seeding, placing matting and stapling. Thoroughly inspect channel after completion. Correct any areas where matting does not present a smooth surface in full contact with the soil below. EC blankets for bottom of swales and along edge of pathways.

3.7 SITE STABILIZATION

- A. Incorporate erosion control devices indicated on the Drawings into the Project at the earliest practicable time.
- B. Construct, stabilize and activate erosion controls before site disturbance within tributary areas of those controls.
- C. Stockpile and waste pile heights shall not exceed 35 feet. Slope stockpile sides at 2: 1 or flatter.

- D. Stabilize any disturbed area of affected erosion control devices on which activity has ceased and which will remain exposed for more than 7 days for slopes 3 (horizontal) to 1 (vertical) and 14 days for all other areas.
 - 1. During non-germinating periods, apply mulch at recommended rates.
- E. Stabilize diversion channels, sediment traps, and stockpiles immediately.
- F. Permanently stabilize disturbed areas as indicated on the Drawings. Vegetated areas shall be sodded in accordance with the North Carolina Sediment and Erosion Control Planning and Design Manual, except the plastic netting, including photo- and bio-degraded polypropylene, shall not be permitted.

3.8 FIELD QUALITY CONTROL

- A. Section 014000 “Quality Requirements”: Field inspecting, testing, adjusting, and balancing.
- B. Inspect erosion control devices on a weekly basis and after each runoff event. Make necessary repairs to ensure erosion and sediment controls are in good working order.

3.9 CLEANING

- A. Section 017700 “Closeout Procedures”: Requirements for cleaning.
- B. When sediment accumulation in sedimentation structures has reached a point one-third depth of sediment structure or device, remove and dispose of sediment.
- C. Do not damage structure or device during cleaning operations.
- D. Do not permit sediment to erode into construction or site areas or natural waterways.
- E. Clean channels when depth of sediment reaches approximately one-half channel depth.

3.10 PROTECTION

- A. Section 017700 “Closeout Procedures”: Requirements for protecting finished Work.
- B. Immediately after placement, protect paving from premature drying, excessive hot or cold temperatures, and mechanical injury.
- C. Do not permit construction traffic over paving until 75 percent design strength of concrete has been achieved.
- D. Protect paving from elements, flowing water, or other disturbance until curing is completed.

END OF SECTION 312500

SECTION 315000 - EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes temporary excavation and trench support and protection systems.
- B. Related Requirements:
 - 1. Section 013233 "Photographic Documentation" for recording pre-existing conditions and excavation support and protection system progress.
 - 2. Section 014000 "Quality Requirements" for testing and laboratory services.
 - 3. Section 310900 "Geotechnical Instrumentation and Monitoring" for measuring impacts during demolition, installation of excavation support systems and earthwork activities.
 - 4. Section 311000 "Site Clearing" for site stripping, grubbing, and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
 - 5. Section 312000 "Earthwork" for excavation, backfilling, and compaction procedures.
 - 6. Section 312319 "Dewatering" for lowering and disposing of groundwater during construction and dewatering excavations.
 - 7. Section 312333 "Trenching and Backfilling" for excavation, backfilling, and compaction of utility trenches.

1.3 ACTION SUBMITTALS

- A. Shop Drawings: For excavation support and protection system, prepared by or under the supervision of a qualified professional engineer, meeting the minimum performance requirements in Part 2 of this Section.
 - 1. Include overall system plan, indicating clearances, dimensions, material properties, member sizes, locations, spacing and member penetrations depths, and locations of various types of lateral supports.
 - 2. Show details, layout, arrangement, equipment requirements, and method of construction of proposed excavation support system.
 - 3. Indicate existing and proposed utilities, structures or other obstructions.
 - 4. Show wall elevations and locations of bracing.
 - 5. Show overall installation sequence and removal of bracing. Indicate work levels to be performed before bracing is installed or removed.
 - 6. Method of pre-loading bracing, if required, including preload for each member, and method of locking-off the preload. Submit detailed drawings of connections, jacking supports, and method of shimming.

7. Include procedures for resolving difficulties arising from misalignment of members exposed during excavation and criteria for implementing those procedures.
- B. Design Calculations: For excavation support and protection system. Include analysis data prepared, signed, and sealed by professional engineer licensed in the State of North Carolina responsible for their preparation.
1. Include loads on excavation support system for all stages of excavation, bracing removal, and concrete placement, including material and equipment loads on adjacent ground during construction.
 2. Include design of wall and bracing members including details for all construction stages.
 3. Include theoretical deflections of excavation support system and deformation of structures, pipelines, and other improvements located within areas influencing excavations.
 4. Include design and description of protection methods of existing dam during construction and remedial measures if any deformation threshold values are observed.
- C. Submit to the Engineer for review, a plan of action to be implemented in the event any deformation threshold value is reached as specified in Section 310900 "Geotechnical Instrumentation and Monitoring." Identify positive measures in action plan to further limit wall movement, including but not limited to trenching for struts and wales, placement of granular earth berms against the wall, installation of additional struts, or combinations thereof.
1. Include description and details of mitigating measures, work schedule, location and availability of materials, and structural details for connections to wall and support elements.
 2. Be prepared to work 24 hours per day to implement such measures.
 3. Perform remedial work and mitigating measures at no additional cost to Owner.

1.4 INFORMATIONAL SUBMITTALS

- A. Submit quality control measures to ensure that performance of excavation support system complies with project requirements.
- B. Submit welder qualifications and weld procedures in accordance with AWS D1.1.
- C. Qualification Data: For land surveyor.
- D. Maintain at least one copy of design at job site during excavation that includes a plan indicating sizes, types, and configurations of the materials to be used in protective system. Identify registered Contractor's design engineer who stamped the design.
- E. Do not proceed with excavation support or protection activities until submittals have been reviewed by the Engineer.

1.5 QUALITY ASSURANCE

- A. Contractor Qualifications: Minimum 5 years' experience compatible to indicated Work, and who employs labor and supervisory personnel similarly experienced in Work of this Section.

- B. Contractor's Design Engineer: Professional Engineer licensed in the State of North Carolina with at least 5 years' professional experience in design and construction of support of excavation systems and having completed a minimum of 5 successful excavation support projects of equal type, size, and complexity to specified work.
- C. Existing Conditions: Using photographs or video recordings, show existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by inadequate performance of excavation support and protection systems. Submit before Work begins.
- D. Regulatory Requirements: Comply with authorities having jurisdiction, including OSHA requirements.
- E. Record Drawings: Identify locations and depths of capped utilities, abandoned-in-place support and protection systems, and other subsurface structural, electrical, or mechanical conditions.

1.6 FIELD CONDITIONS

- A. Interruption of Existing Utilities: Do not interrupt any utility serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:
 - 1. Contact utility companies and other responsible authorities to locate and mark underground utilities.
 - 2. Notify the Owner no fewer than two days in advance of proposed interruption of utility.
 - 3. Do not proceed with interruption of utility without the Owner's written permission.
- B. Project-Site Information: Test boring logs for the previous dam rehabilitation project are available for information only. Owner is not responsible for interpretations or conclusions drawn from the data.
 - 1. Make additional test borings and conduct other exploratory operations necessary for excavation support and protection according to the performance requirements.
 - 2. The test boring logs are included elsewhere in Project Manual.
- C. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Provide, design, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls and of resisting earth and hydrostatic pressures and superimposed and construction loads.
 - 1. Contractor Design: Design excavation support and protection system, including comprehensive engineering analysis by a qualified professional engineer.

2. Prevent surface water from entering excavations by grading, dikes, or other means.
 3. Install excavation support and protection systems to minimize horizontal and vertical movements without damaging existing buildings, structures, and site improvements adjacent to excavation.
 4. Continuously monitor vibrations, settlements, and movements to ensure stability of excavations and constructed slopes and to ensure that damage to permanent structures is prevented.
- B. Do not permit excavations below the level of the base of adjacent existing foundations or retaining walls, unless excavation design and bracing includes an analysis of stability of structure supported by foundation and if necessary, incorporates required bracing or underpinning of foundation.
- C. For support systems in which bracing is installed between opposite sides of the excavation, design excavation support of both sides to be nearly the same as feasible.
- D. Where necessary to resist point loads, fill pipe piles used as soldier piles with concrete. Do not consider concrete strength in design of pipe pile for bending stress.
- E. Design, install, operate, and maintain groundwater control systems to control groundwater inflows, prevent piping or loss of ground, and maintain stability of the excavation. Refer to the requirements of Section 312319 “Dewatering.”
- F. Design review and field monitoring activities by Owner or the Engineer does not relieve Contractor of its work responsibilities.

2.2 MATERIALS

- A. General: Provide materials that are either new or in serviceable condition.
- B. Structural Steel: ASTM A 36/A 36M, ASTM A 690/A 690M, or ASTM A 992/A 992M.
- C. Steel Pipe Used as Soldier Piling: ASTM A 252, Grade 45 or better.
- D. Steel Sheet Piling: ASTM A 328/A 328M, ASTM A 572/A 572M, or ASTM A 690/A 690M; with continuous interlocks.
1. Steel sheet piling conforming to ASTM A 572, Grade 50 or better.
 2. Corners: Site-fabricated mechanical interlock.
- E. Wood Lagging: Lumber, mixed hardwood, nominal rough thickness of 3 inches with minimum allowable flexural strength of 1,100 psi.
- F. Cast-in-Place Concrete: ACI 301, with minimum compressive strength of 3,000 psi, unless a higher strength is required for application.
- G. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that instrumentation required under Section 310900 “Geotechnical Instrumentation and Monitoring” is installed and initialized prior to start of work required by this Section.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Obtain permits from local authority having jurisdiction prior to initiating excavation work.
- B. Protect existing dam, structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.
 - 1. Shore, support, and protect utilities encountered.
- C. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
 - 2. Install fencing, gates, lights, and signs around excavations and staging areas to provide for public safety.
- D. Locate excavation support and protection systems clear of permanent construction so that construction and finishing of other work is not impeded.

3.3 GENERAL

- A. Install excavation support systems in accordance with the shop drawings and applicable permits.
- B. Fill voids between excavation support system and earth with materials acceptable to the Engineer.
- C. If unstable material is encountered during excavation, take immediately measures to contain it in place and prevent ground displacement.
- D. If settlement or deflections of supports indicate that support system requires modification to prevent excessive movements, redesign and resubmit revised shop drawings and calculations to the Engineer without additional compensation.
- E. Maintain sufficient quantity of material on site for protection of work and for use in case of accident or emergency.

3.4 PORTABLE TRENCH BOXES

- A. Use portable trench boxes or sliding trench shields only for worker protection.
- B. Additional excavation, backfilling, and surface restoration required as result of trench box use shall be provided without additional compensation.
- C. Design, construct, and maintain trench boxes or shields to meet acceptable engineering and industry standards.
- D. Install shields in a manner to restrict lateral or other hazardous movement of the shield in the event of sudden lateral loads.
- E. Maintain a written copy of trench box manufacturer's specifications, recommendations, and limitations at job site during excavation work.

3.5 SOLDIER PILES AND LAGGING

- A. Install steel soldier piles before starting excavation.
 - 1. Install using pre-drilled holes.
 - 2. Soldier Piles in Pre-drilled Holes:
 - a. Provide casing or other methods of support to prevent caving of holes and loss of ground.
 - b. Backfill with concrete from elevation of bottom excavation to pile tip elevation. Backfill remainder of pre-drilled hole with lean concrete or sand.
 - c. Pre-drilled hole of sufficient diameter allowing for proper alignment and concrete backfilling of pile.
 - 3. Advance driven soldier piles without aid of a water jet.
- B. Extend soldier piles below excavation grade level to depths shown on reviewed Shop Drawings. Space soldier piles at regular intervals not to exceed allowable flexural strength of wood lagging. Accurately align exposed faces of flanges to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment.
- C. Install wood lagging within flanges of soldier piles as excavation proceeds. Trim excavation as required to install lagging.
 - 1. Install lagging so ground loss does not occur between adjacent or below lowest board. As excavation proceeds, do not maximum height of 4 feet for unlagged face of excavation.
 - 2. Do not exceed unlagged face of 2 feet, if water seeps or flows from excavation face or excavation face becomes unstable.
- D. As installation progresses, fill voids behind lagging with soil, and compact.
- E. Install wales at locations indicated on Drawings and secure to soldier piles.

3.6 STEEL SHEET PILING

- A. Thoroughly cleaned and inspect sheet piles for defects and proper interlock dimensions prior to installation. Provide a tool for checking interlock dimensions.
- B. Before starting excavation, drive one-piece sheet piling lengths in plumb position and tightly interlock vertical edges for its entire length to form a continuous barrier. Form a continuous diaphragm throughout length of each run of wall, bearing tightly against original ground.
 - 1. Exercise care in driving so interlocking members can be extracted without damaging adjacent structures or utilities.
 - 2. Use driving, cutting, and splicing methods conforming to approved Shop Drawings.
 - 3. Use templates or other temporary alignment facilities to maintain piling line.
- C. Accurately place piling, using templates and guide frames unless otherwise recommended in writing by sheet piling manufacturer. Limit vertical offset of adjacent sheet piling to 5 feet . Accurately align exposed faces of sheet piling to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment.
- D. Install each sheet pile having sufficient clearance in interlocks to slide under its own weight into interlock of previously placed sheet pile.
- E. Do not excavate in advance of steel sheet piling installation.
- F. Where obstructions are anticipated, pre-excavate or pre-drill along sheet pile wall alignment without additional compensation. Do not extend pre-excavation and pre-drilling below lowest excavation level or into bearing soils for existing or future structures.
- G. Remove obstructions encountered before the specified embedment for piles. Where obstructions cannot be removed, re-evaluate sheet pile system by Contractor's Design Engineer show reduced embedment and additional toe stability measures to be implemented for sheet pile wall realignment. Submittal proposed design measures to the Engineer for review.
- H. Withdraw damaged or faulty aligned pilings with provide new piling, driven properly in its place without additional compensation.
- I. Cut tops of sheet piling to uniform elevation at top of excavation.

3.7 INTERNAL BRACING

- A. Bracing: Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move brace, install new bracing before removing original brace.
 - 1. Do not place bracing where it will be cast into or included in permanent concrete work, unless otherwise approved by the Engineer.
 - 2. Install internal bracing if required to prevent spreading or distortion of braced frames.
 - 3. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.
- B. Provide internal bracing to carry maximum design load without distortion or buckling.

- C. Include web stiffeners, plates, or angles required to prevent rotation, crippling, or buckling of connections and points of bearing between structural steel members. Allow for eccentricities caused by field fabrication and assembly.
- D. Install and maintain bracing support members in tight contact with each other and with the surface being supported. Do not use wood shims.
- E. Coordinate excavation work with installation of bracing. Extend excavation no more than 2 feet below any brace level prior to installation of the bracing.
- F. Use procedures that produce uniform loading of bracing member without eccentricities, overstressing, or distortion of system members.

3.8 FIELD QUALITY CONTROL

- A. Survey-Work Benchmarks: Resurvey benchmarks weekly during installation of excavation support and protection systems, excavation progress, and for as long as excavation remains open. Maintain an accurate log of surveyed elevations and positions for comparison with original elevations and positions. Promptly notify Engineer if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.
- B. Promptly correct detected bulges, breakage, or other evidence of movement to ensure that excavation support and protection system remains stable.
- C. Promptly repair damages to adjacent facilities caused by installation or faulty performance of excavation support and protection systems.

3.9 REMOVAL

- A. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and earth and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils and rock or damaging structures, pavements, facilities, and utilities.
 - 1. Remove excavation support and protection systems to a minimum depth of 48 inches below overlying construction and abandon remainder.
 - 2. Fill voids immediately with approved backfill compacted to density specified in Section 312000 "Earthwork."
 - 3. Repair or replace, as approved by Engineer, adjacent work damaged or displaced by removing excavation support and protection systems.
- B. Do not remove vertical support members that were installed within zone of influence of new or existing structures. Cut off support members installed within this zone at 5 feet below finished grade and abandon in place.
- C. Do not remove internal bracing or transfer loads to permanent structure without prior acceptance of the Engineer.

- D. Begin removal at excavation bottom and progress upward. Slowly release members noting indication of possible failure of remaining members or possible cave-in of excavation sides.
- E. Progress backfilling together with removal of support systems from excavations.
- F. Remove all portions of excavation support, unless otherwise indicated by approved Shop Drawings.
 - 1. Zone of Influence Definition: Zone extending down and away from outer edge of the structure at 1 horizontal to 1 vertical.
- G. Do not leave untreated wood as part of abandoned portion of the work.
- H. When removing excavation support system, do not disturb or damage existing dam, adjacent buildings, structures, waterproofing material, or utilities. Fill voids immediately with lean concrete or well-graded cohesionless sand or as directed by the Engineer.
- I. Immediately remove excavation support system material from site.

END OF SECTION 315000

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Division 33

Utilities

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SECTION 330513 - MANHOLES AND STRUCTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Monolithic concrete manholes and structures transition to cover frame, covers, anchorage, and accessories.
- 2. Modular precast concrete manhole and structures with tongue-and-groove joints, covers, anchorage, and accessories.
- 3. Bedding and cover materials.

- B. Related Requirements:

- 1. Section 312333 “Trenching and Backfilling” for soil for backfill in trenches.
- 2. Section 310515 “Soils and Aggregates for Earthwork” for soil and aggregate for backfill in trenches.

1.3 ACTION SUBMITTALS

- A. Section 013300 “Submittal Procedures” for submittals requirements.
- B. Product Data: Submit cover and frame construction, features, configuration, dimensions.
- C. Shop Drawings: Indicate manhole and structure locations, elevations, piping, sizes and elevations of penetrations.

1.4 INFORMATIONAL SUBMITTALS

- A. Manufacturer's Certificate: Products meet or exceed specified requirements.
- B. Manufacturer Instructions: Detailed instructions on installation requirements, including storage and handling procedures.
- C. Field Quality-Control Submittals: Results of Contractor-furnished tests and inspections.
- D. Qualifications Statements: Qualifications for manufacturer.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Section 016000 "Product Requirements" for transporting, handling, storing, and protecting products requirements.
- B. Unload, store, and handle precast manholes and structures according to manufacturer instructions.
- C. Storage: Store precast concrete manholes and structures as to prevent damage to Owner's property or other public or private property.
 - 1. Repair property damaged from materials storage.
- D. Cold Weather Requirements: According to ACI 530/530.1.

PART 2 - PRODUCTS

2.1 PERFORMANCE AND DESIGN CRITERIA

- A. Equivalent strength: Based on structural design of reinforced concrete as outlined in ACI 318.
- B. Design of Lifting Devices for Precast Components: According to ASTM C913.
- C. Design of Joints for Precast Components:
 - 1. According to ASTM C913.
 - 2. Maximum Leakage: 0.025 gal. per hour per foot of joint at 3 feet of head.
- D. Shaft Construction: Concentric with eccentric cone top section; lipped male/female dry joints; sleeved to receive pipe sections.
- E. Shape: Cylindrical.
- F. Clear Inside Dimensions: As indicated on Drawings.
- G. Design Depth: As indicated on Drawings.
- H. Clear Cover Opening: As indicated on Drawings.
- I. Pipe and Conduit Entry: Furnish openings as indicated on Drawings.

2.2 MANHOLES AND STRUCTURES

A. Manufacturers:

1. Substitutions: Section 016000 “Product Requirements.”

B. Manhole and Structure Sections: Reinforced precast concrete according to ASTM C478.

1. Gaskets: According to ASTM C923.

2.3 FRAMES AND COVERS

A. Manufacturers:

1. Substitutions: Section 016000 “Product Requirements.”
2. Construction: ASTM A48, Class 30B cast iron.
3. Surface: Machined flat bearing.
4. Lid: Removable.
5. Cover Design: Open checkerboard grille.
6. Live Load Rating: HS-20 highway loading.
7. Cover: Molded with “Water”, “Sewer”, “Storm”, or other designation, as applicable.

2.4 MATERIALS

A. Bedding and Cover:

1. Bedding: Fill Type as specified in Section 310515 “Soils and Aggregates for Earthwork.”
2. Cover: Fill Type as specified in Section 310515 “Soils and Aggregates for Earthwork.”
3. Soil Backfill from Above Pipe to Finish Grade:
 - a. Soil Type as specified in Section 310515 “Soils and Aggregates for Earthwork.”
 - b. Subsoil: No rocks over 6 inches in diameter, frozen earth, or foreign matter.

2.5 ACCESSORIES

A. Manhole and Structure Steps:

1. Formed FRP rungs.
2. Formed integral with manhole and structure sections.
3. Diameter: 3/4 inch.
4. Width: 12 inch.
5. Spacing: 16 inch o.c. vertically, set into manhole and structure wall.

B. Base Pad: Leveled top surface. Cast-in-place concrete of type as specified in Section 033000 “Cast-in-Place Concrete.”

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 017300 “Execution” and 017700 “Closeout Procedures” for installation examination requirements.
- B. Verify that items provided by other Sections of Work are properly sized and located.
- C. Verify that built-in items are in proper location and ready for roughing into Work.
- D. Verify correct size of manhole and structure excavation.

3.2 PREPARATION

- A. Section 017300 “Execution” and 017700 “Closeout Procedures” for installation preparation requirements.
- B. Mark each precast structure by indentation or waterproof paint showing date of manufacture, manufacturer, and identifying symbols and numbers as indicated on Drawings to indicate its intended use.
- C. Coordinate placement of inlet and outlet pipe or duct sleeves required by other Sections.
- D. Do not install structures where Site conditions induce loads exceeding structural capacity of structures.
- E. Inspect precast concrete structures immediately prior to placement in excavation to verify structures are internally clean and free from damage; remove and replace damaged units.

3.3 INSTALLATION

- A. Excavation and Backfill:
 - 1. Excavate manholes and structures as specified in Section 312000 “Earthwork” in location and to indicated depth.
 - 2. Provide clearance around sidewalls of structure for construction operations.
 - 3. When groundwater is encountered, prevent accumulation of water in excavations; place manholes and structures in dry trench.
 - 4. Where possibility exists of watertight structure becoming buoyant in flooded excavation, anchor structure to avoid flotation as approved by Engineer.
- B. Base Pad:
 - 1. Place base pad.
 - 2. Trowel top surface level.

- C. Place manhole and structure sections plumb and level, trim to correct elevations, and anchor to base pad.
- D. Backfill excavations for manholes and structures as specified in Section 312000 “Earthwork.”
- E. Form and place manhole and structures cylinder plumb and level and to correct dimensions and elevations.
- F. As Work progresses, build fabricated metal items.
- G. Cut and fit for pipe sleeves.
- H. Grout base of shaft sections to achieve slope to exit piping, trowel smooth, and contour to form continuous drainage channel.
- I. Set cover frames and covers level without tipping and to correct elevations.
- J. Coordinate with other Sections of Work to provide correct size, shape, and location.
- K. Precast Concrete Manholes and Structures:
 - 1. Lift precast components at lifting points designated by manufacturer.
 - 2. When lowering manholes and structures into excavations and joining pipe to units, take precautions to ensure that interior of pipeline and structure remains clean.
 - 3. Set precast structures bearing firmly and fully on crushed stone bedding, compacted as specified in Section 312000 “Earthwork” or on other support system as indicated on Drawings.
 - 4. Assemble multi-section structures by lowering each section into excavation; set level and firmly position base section before placing additional sections.
 - 5. Remove foreign materials from joint surfaces and verify sealing materials are placed properly.
 - 6. Maintain alignment between sections by using guide devices affixed to lower section.
 - 7. Joint sealing materials may be installed on Site or at manufacturer's plant.
 - 8. Verify that installed manholes and structures meet required alignment and grade.
 - 9. Remove knockouts or cut structure to receive piping without creating openings larger than required to receive pipe; fill annular spaces with mortar.
 - 10. Cut pipe flush with interior of structure.
 - 11. Shape inverts through manhole and structures as indicated on Drawings.
- L. Cast-in-Place Concrete Manholes and Structures:
 - 1. Prepare crushed stone bedding or other support system as indicated on Drawings to receive base slab as specified for precast structures.
 - 2. Erect and brace forms against movement as specified in Section 031000 “Concrete Forming and Accessories.”
 - 3. Install reinforcing steel as indicated on Drawings and as specified in Section 032000 “Concrete Reinforcing.”
 - 4. Place and cure concrete as specified in Section 033000 “Cast-in-Place Concrete.”

5. Frames and Covers:

- a. Set frames using mortar and masonry.
- b. Install radially-laid concrete brick with 1/4 inch thick vertical joints at inside perimeter.
- c. Lay concrete brick in full bed of mortar and completely fill joints.
- d. If more than one course of concrete brick is required, stagger vertical joints.
- e. Set frame and cover 2 inches above finished grade for manholes and structures with covers located within unpaved areas to allow area to be graded away from cover beginning 1 inch below top surface of frame.

3.4 FIELD QUALITY CONTROL

- A. Section 014000 “Quality Requirements” for inspecting and testing requirements, and Section 017300 “Execution” and 017700 “Closeout Procedures” for testing, adjusting, and balancing requirements.
- B. Test concrete manhole and structure sections according to ASTM C497.
- C. Test cast-in-place concrete as specified in Section 033000 “Cast-in-Place Concrete.”
- D. Leakage Tests:
 1. Performed on every manhole with Engineer observing.
 2. Preparation:
 - a. Prior to placing the shelf and invert, and pointing the horizontal joints, fill all lifting holes within 6 feet of ground surface with approved non-shrinking mortar.
 - b. Lower groundwater table as required.
 - c. Plug all pipes and other openings into manhole.
 3. Test:
 - a. Fill water to top of cone section.
 - b. Observe for visible water in the excavated area.
 - c. If area around manhole is backfilled or the test is unsatisfactory, repeat the test allowing for suitable time for absorption of water in the excavated area.
 - d. At the end of the absorption period, refill manhole and wait 8 hours.
 - e. Refill the cone at the end of 8 hours, measuring the amount required to refill.
 - f. Extrapolate to determine 24-rate of leakage. Leakage not exceed 1 gallon per vertical foot in a 24-hour period.
 - g. Engineer will perform visual inspection along with the Contractor.
 4. Repair:
 - a. If leakage is less than 3 gallons per vertical foot per 24 hours, make approved repairs to the manhole and retest, if it is determined the leakage is due to defects in the joints or sections.

- b. If leakage is 3 gallons or more, then replace the entire manhole, including all joints and sections at the Contractor's expense. Retest the new manhole as described above.
- E. A vacuum test may be substituted for a leakage test as follows:
1. The filling and pointing of exterior joints are not required where the excavation has not been backfilled.
 2. Inflate to affect a seal between the vacuum base and the top of the manhole.
 3. Connect the vacuum pump to the outlet port with the valve open and a vacuum of 10" Hg (20" of Hg absolute) drawn.
 4. Close the valve.
 5. The following test criteria shall apply to 4-ft and 5-ft diameter manholes:
 6. Allowable drops in pressure:
 - a. Manholes 0 – 10 ft. deep:
 - 1) drop of 1" Hg over 2 minutes.
 - b. Manholes 10 -15 ft. deep:
 - 1) Drop of 1" Hg over 2-1/2 minutes
 - c. Manholes 15 - 30 feet:
 - 1) Drop of 1" Hg over 3 minutes
 7. If the pressure drop exceeds the acceptable limits, make necessary repairs as approved by the Engineer, and:
 - a. Re-test the manhole.
 - b. If the manhole fails to meet the minimum requirements of the vacuum test retest using the leakage test.
 8. Upon completion of a successful vacuum test, the interior and exterior joints shall be filled and pointed.

3.5 CLEANING

- A. Clean all new manholes to be free of silt, debris and foreign matter of any kind, prior to final inspection.

END OF SECTION 330513

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SECTION 330519 - DUCTILE-IRON UTILITY PIPE FOR WATER SERVICE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Materials, equipment and incidentals required to install, disinfect, and test ductile iron pipe and fittings for yard piping as shown on Drawings and as specified.
 - a. The word "pipe" is used to refer to pipe, fittings, or appurtenances unless otherwise noted.
2. Yard Piping: Includes piping in valve vaults, manholes, cleanouts and similar yard structures.
3. Locate piping as shown on the Drawings. The Engineer reserves the right to make modifications in locations as may be found desirable to avoid interference between pipes or for other reasons.

B. Related Requirements:

1. Section 310515 "Soils and Aggregates for Earthwork" for granular fill
2. Section 312333 "Trenching and Backfilling"
3. Section 312500 "Erosion and Sedimentation Controls"
4. Section 321216 "Asphalt Paving"

1.3 COORDINATION

- A. Section 013100 "Project Management and Coordination" specifies requirements for coordination.

1.4 ACTION SUBMITTALS

- A. Section 013300, "Submittal Procedures" for submittals requirements.

B. Shop Drawings and Product Data:

1. Including piping layouts, design calculations, warranty information, test reports, in accordance with Section 013000 and the referenced standards.
2. Design calculations in accordance with the "Pipe Wall Thickness Analysis" Paragraph under Part 2 Products, below, signed by a Professional Engineer, as noted in Section 013000.

3. Name of the pipe and fitting suppliers and a list of materials to be furnished.
4. Anticipated production and delivery schedule.

C. Tabulated Laying Schedule:

1. Reference stations and invert elevations as shown on the Drawings
 - a. Include fittings, bends, outlets, restrained joints, tees, special deflection bells, adapters, solid sleeves and specials.
2. Manufacturer's drawings and specifications providing complete details of all items. Show on the laying schedule:
 - a. Pipe class,
 - b. Class coding,
 - c. Station limits
 - d. Transition stations
 - e. Various pipe classes
 - f. Submit to engineer for approval before manufacture and shipment.
3. Full length pipe may be supplied from inventory provided that all specification requirements are met. Shop drawings shall include but not be limited to:
 - a. Complete and dimensional working drawings of pipe layouts, including pipe stationing, invert elevation at changes in grade or horizontal alignment, all elements of curves and bends both in horizontal alignment and vertical position.
4. The grade of material; size, wall thickness, of the pipe and fittings and appurtenances, type and location of fittings, specials, and valves; and the type and limits of the lining, lining reinforcing and coating systems of the pipe and fittings. Methods and procedures recommended by the coating manufacturer to also be documented.
5. Joint details; methods and locations of supports and complete information concerning type, size and location of all welds.
 - a. Shop welds (no field welding will be allowed) will be clearly differentiated
 - b. welds will be clearly detailed with preparation procedures for all pipe and parent material comprising each weld.
 - c. Critical welding procedures will be identified along with methods for controlling welding stresses and distortions.
 - d. Locations and proposed joint details will also be clearly identified.
6. Method of manufacture of pipe; joint details, fittings and any specials.
7. All other pertinent information for all items to be furnished; product data to show compliance of all couplings, supports, fittings, coatings and related items.

1.5 INFORMATIONAL SUBMITTALS

A. Prior to Pipe Shipment:

1. Certified copies of mill tests confirming the type of materials used in the pipe, and shop testing of pipe to show compliance with the requirements of the applicable standards, along with a sworn affidavit of compliance that the pipe complies with the referenced standards.
2. Certified affidavit of compliance from manufacturer stating that pipe, fittings, gaskets, linings and exterior coatings for project have been manufactured and tested in accordance with AWWA and ASTM standards and requirements specified herein.

B. Copies of shop tests, including hydrostatic tests.

C. Handling Procedures: For all phases from finished fabrication through delivery including storage, transportation, loading, and unloading. This will include storage at the project site and required protection following installation prior to startup.

1.6 CLOSEOUT SUBMITTALS

A. Section 017300 “Execution” and 017700 “Closeout Procedures” for closeout procedures requirements.

B. Project Record Documents: Actual locations of pipe.

1.7 QUALITY ASSURANCE

A. Designed and supplied by a single manufacturer. Pipe and Fitting Connections: Pipe to be supplied by a single manufacturer and fittings may be supplied by a different manufacturer.

B. Hydrostatically tested at point of manufacture to 500 psi for a duration of 10 seconds per AWWA C151. Testing may be performed prior to machining bell and spigot.

1. Test Failure: Defined as any leak or rupture of pipe wall.
2. Certified test results furnished in duplicate to Engineer prior to shipment.

C. Pipe and Fittings:

1. Inspected and tested at foundry as required by specified referenced standards.
2. Certified test results furnished in duplicate to Engineer 5 days prior to shipment.

D. Inspection of Pipe and Fittings After Delivery: By Engineer or representative of the Owner.

1. Pipe and fittings subject to rejection if failing to meet specified requirements even though pipe may have been accepted as satisfactory at the place of manufacture.
2. Pipe rejected after delivery (including defects from manufacturing or delivery/transport) to be marked for identification and immediately removed from the job.

E. Pipe and fittings installed under this Contract may be inspected at the factory for compliance with this Section by an independent testing laboratory selected by the Owner at the Owner's expense.

- F. Pipe and fittings marked in accordance with all applicable AWWA standards. Legibly and permanently mark pipe, fittings, specials and appurtenances to be consistent with the laying schedule and marking drawings (if required) with the following information:
1. Manufacturer
 2. Date of manufacture.
 3. Size, type, class, or wall thickness.
 4. AWWA Standard(s) produced to.
 5. Pipe identified with sequential numbering consistent with the laying schedule and marking drawings and each marked pipe will appear on the marking drawings in the identified location for installation.
 6. Special fittings, bends, and appurtenances requiring specific orientation will be appropriately marked with the words "TOP" in the correct position and in a consistent location.

1.8 QUALIFICATIONS

- A. The manufacturer shall meet the following criteria and furnish the necessary project information, which demonstrates the required experience:
1. Experience that includes successful fabrication (followed by installation, acceptance and service) to AWWA C151 standards of at least the largest specified diameter or larger ductile iron pipe with similar linings/coatings within the past 5 years.
 2. Experience to include the successful fabrication of at least 50 fittings in compliance with AWWA C110 or C153 of the largest specified diameter or larger with similar lining/coatings within the past 5 years.
 3. Experience that includes the successful fabrication (followed by installation, acceptance and service) of at least the largest specified diameter or larger push-on style, boltless restrained joint for ductile iron pipe within the last 5 years.
- B. Pipe Origin: Manufactured in the United States. Ductile iron pipe to be supplied by a single manufacturer.
- C. Fittings Origin: Manufactured in or outside the United States but supplied by one of the named pipe fitting manufacturers in Part 2 or Engineer approved equal. Ductile iron fittings to be supplied by a single manufacturer. Written certification fittings are compatible with the supplied brand of pipe.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Section 016000, "Product Requirements" for transporting, handling, storing, and protecting products requirements.
- B. Delivery: Per AWWA C600 and referenced AWWA Standards for shipping, handling and storage procedures.
1. Deliver materials in manufacturer's packaging including application instructions.

2. Handle to prevent injury to the pipe, pipe linings and pipe coatings.
 - a. Examine pipe and fittings as noted in Division 1. Damage to linings or coatings discovered during examination to be repaired to the satisfaction of the Engineer before proceeding with the work.
 3. Transport pipe to job site on padded bunks or oak timbers and secured with steel banding or nylon tie down straps adequately protecting the pipe and coating.
 - a. Handle pipe using slings, hooks, pipe tongs or other devices acceptable to the Engineer.
 - b. Do not use non-cushioned ropes, chairs, wedges, cables or levers when handling finished pipe, fittings or couplings.
 - c. Do not drop pipe or fittings.
 - d. Do not skid pipe or fittings against each other.
 - e. Do not mar pipe or fitting coatings.
 - f. Utilize padded wooden pipe cradles, or chocks suitable for protecting coatings between and beneath finished pipes when pipes are placed upon rough surfaces.
- C. Storage:
1. Do not store pipe on bare ground unless soft sand berms are used to support the pipe and is approved by the Engineer.
 2. Keep materials safe from damage if stored. The interior of pipe, fittings and other appurtenances to be kept free from dirt, excessive corrosion or foreign matter.
 3. Do not stack pipe higher than the limits recommended by manufacturer. Keep the bottom tier off the ground using timbers, rails, or concrete. Stacking to conform to manufacturer's recommendations and/or AWWA C600.
 4. Store gaskets for mechanical and push-on joints in a cool location out of direct sunlight; not in contact with petroleum products. Use gaskets on a first-in, first-out basis.
- D. Protection:
1. Lined and coated pipe: Suitably protected from exposure and heating from the sun. Follow procedures recommended by the coating and lining system manufacturer.
 - a. Exposure will not be allowed except for short periods such as installation, assembly and repairs.
 2. Metal tools or heavy objects are not permitted to come in contact unnecessarily with the finished coating.
 - a. Workers may walk on coated pipe only when necessary, and only when wearing footwear with rubber or composition soles and heels sufficiently free of dirt and mud so coating remains undamaged.
 3. Prevent damage to linings and coatings caused by handling, onsite storage, and exposure to low temperatures (due to embrittlement), high temperatures, or direct sunlight.
- E. Inspection: Accept on Site. Inspect for damage.

1.10 EXISTING CONDITIONS

- A. Field Measurements: Verify field locations and sizes of connections to existing piping and equipment prior to submitting pipe lay drawings.
 - 1. Indicate field measurements on Shop Drawings.

1.11 WARRANTY

- A. Section 017300 “Execution” and 017700 “Closeout Procedures” for warranties requirements.
- B. Furnish two year manufacturer's warranty for ductile iron pipe and fittings.

PART 2 - PRODUCTS

2.1 SYSTEMS

- A. Assure compatibility between joints of all items supplied.

2.2 DUCTILE IRON PIPE

- A. Manufacturers: Provide pipe and fittings supplied by:
 - 1. American Cast Iron Pipe Co.
 - 2. U.S. Pipe and Foundry.
 - 3. Griffin Pipe Products.
 - 4. McWane Company; all pipe divisions.
 - 5. An approved equivalent member of the Ductile Iron Pipe Research Association (DIPRA).
- B. Fitting Certification: From fitting manufacturer; written certification that fittings are compatible with supplied brand of pipe.
- C. Ductile Iron Pipe: Per AWWA C151. Provide in standard lengths as much as possible.
- D. Thickness Design: Per AWWA C150, except as follows:
 - 1. Piping 12 inches and Smaller: Minimum Class 350.
 - 2. Piping 14 inches to 20 inches: Minimum Class 350.
 - 3. Piping Larger than 24 inches: Minimum Class 250.
- E. Gravity Sewer Piping: Per ASTM A746.
- F. Pipe Wall Thickness Analysis:
 - 1. Tensile strength: 60,000 psi
 - 2. Yield strength of 42,000 psi (per AWWA M-41).
 - 3. Design and analyze external and internal pressures separately. Use the larger of the two to determine the net design thickness.

4. Design additional allowances for service allowance and casting tolerance per AWWA C150.
5. Pipe Classes: The minimum pipe class specified in the Thickness design paragraph above.
6. Design the net thickness for external loading based on the greater of the following conditions:
 - a. Cover: 30 inches with HS-20 wheel loads per AASHTO Standard Specifications for Highway Bridges, with an impact factor of 1.5.
 - b. Depth from existing ground level or future proposed grade, whichever is greater, to top of pipe as shown on the Drawings, with truck load.
 - c. Soil Density: 120 lbs per cu ft.
 - d. Laying Conditions: Per AWWA C150, Type 4.
7. Design the net thickness based upon the following internal pressure conditions:
 - a. Design Pressure: 140 psi.
 - b. Surge Allowance: 100 psi.
 - c. Safety Factor: 2.
 - d. Total Internal Pressure Design: 500 psi.
 - e. E': 300 psi.
8. Furnish to the Engineer for approval, copies of design calculations showing pipe meets the specified requirements during shop drawing review in accordance with Section 013000.

2.3 END TREATMENTS/JOINTS

1. Unrestrained Pipe and Fitting Joints can be used for gravity drains only: Push-on rubber gasket type or rubber-gasket mechanical joint per AWWA C111 , except where flanged joints are required as shown on the drawings.
2. All piping except gravity drains for this project shall have Restrained Pipe and Fitting Joints: Push-on rubber gasket, locking ring type joints per the manufacturer' standard described below, except where flange joints are shown on the Drawings.
3. Gasket materials: Per Table 5-1 of AWWA M-41.
 - a. Rubber-Gasket Joints: Per AWWA C111. Styrene butadiene rubber (SBR).
4. Restraints for push-on joint pipe and fittings to be positive locking, utilizing restraints independent of the joint gasket.
 - a. Joint Test Pressure 250 psig.
 - b. Joint Fabrication: Heavy section ductile iron casting.
 - c. Bolts and Nuts: Low carbon steel conforming to ASTM A193, Grade B7.
 - d. Restraint for mechanical joint pipe shall use retainer glands for restraining joint.
5. Provide restrained push on joints from one of the following manufacturers or an Engineer approved equivalent.
 - a. US Pipe and Foundry Company: "TR Flex."
 - b. American Cast Iron Pipe Company: "Lok-Ring" or "Flex Ring (positive locking style)."

- c. Griffin Pipe Products Company: "Snap Lok."
 - d. Clow Water Systems Company: "Superlok."
6. Determine the minimum number of restrained joints required for resisting forces at fittings and changes in direction of the pipe from the length of restrained pipe on each side of the fittings and changes in direction necessary to develop adequate resistance friction with the soil.
 - a. The required lengths of restrained joints shall be as shown on the Drawings.
7. Restrained pipe joints incorporating cut out sections in the pipe wall must have a minimum wall thickness at the cut out corresponding with the minimum specified wall thickness for the rest of the pipe.
8. Pipe manufacturer proprietary mechanical joint restraint systems that utilize a wedge-style gripping system or a gland/ring positive restraint system will be considered acceptable on a case by case basis as determined by the Engineer.
 - a. The optional mechanical joint restraint shall be incorporated in the design of a follower gland. The gland shall be manufactured of ductile iron per ASTM A536. Dimensions of the gland must be such that it can be used with the standard mechanical joint bell and tee-headed bolts, as specified with the pipe.
 - b. Restraint Mechanism:
 - 1) Individually activated gripping surfaces maximizing restraint capability.
 - 2) Wedges designed to spread the bearing surfaces on the pipe.
 - 3) Torque limiting twist-off nuts sized same as T bolts for mechanical joints. When the nut is sheared off, standard hex nut shall remain.
 - c. Restraint Device for Ductile Iron Pipe: EBAA Iron Megalug Series 1100, or approved equivalent.
 - 1) Working Pressure: 250 psi and a safety factor of 2:1.
9. Threaded Ductile Iron Flanges
 - a. Fabricated per AWWA C115 and sealed during installation with a special high pressure, full face gasket per AWWA C111.
 - b. At pipe manufacturer's option, the use of 250 lbs pattern flanges, faced and drilled in accordance with ANSI B16.1 may be substituted in order to match valves or other equipment or to meet the required working pressure requirements.
 - c. Flanges:
 - 1) Rated for the same pressure as the adjacent pipe in all cases.
 - 2) Compatible with 250 lbs class and higher special class AWWA valves.
 - 3) Pre-drilled and faced after being screwed onto the pipe,
 - 4) True to 90 degrees of the pipe axis and shall be flush with the end of the pipe.
 - d. Gaskets: Full face rubber, 1/8 inch thick SBR material.
 - 1) American Torseal Gasket or approved equal.

- 2) Special material ring gaskets such as those by Garlock or equivalent may be required if pressures exceed 250 psi for ANSI rated and custom flanges.
 - e. Flanged joints:
 - 1) Supplied with bolts and nuts on one end.
 - 2) Bolt studs with a nut at each end, or studs with nuts on one end where the flange is tapped.
 - 3) Quantity and size of bolts to comply with the corresponding flange standard.
 - 4) Bolts and Nuts: Per ASTM A193, grade B7.
 - f. Blind flanges shall mate with regular flanges.
 - g. Filler flanges and beveled flange fillers shall be furnished faced and drilled complete with extra length bolts.
10. Couplings and Adapters Sleeve Type Couplings: Dresser Style 38, 138 or equivalent by:
- a. Ford Meter Box Co.
 - b. Smith Blair
 - c. Romac Industries.

2.4 FITTINGS

1. Pipe Fittings: Ductile iron per AWWA C110 or AWWA C153 as applicable. Fittings to have the same pressure rating, as a minimum, of the connecting pipe.
 - a. Piping 24 inch and smaller: minimum pressure rating of 350 psi.
 - b. Piping 30 inch and larger: 350 psi.
2. Closures: Made with mechanical joint ductile iron solid sleeves. Locate in straight runs of pipe at minimum cover outside the limits of restrained joint sections; subject to approval of the Engineer.

2.5 LININGS, COATINGS & CORROSION PROTECTION

A. Interior Lining:

1. Ductile iron pipe and fittings shall have the same type of lining.
2. Cement Mortar Lining: Per AWWA C104 double thickness. Cement type per ASTM C150.

B. EXTERIOR COATING

1. Buried pipe installed with bituminous coating per AWWA C151 and C110 respectively.
2. Install buried pipe with polyethylene encasement.
 - a. Polyethylene Encasement: 8 mils thickness meeting standards per AWWA C105.

- b. Three layers of co-extruded linear low-density polyethylene (LLDPE), fused into a single thickness not less than eight mils. Infuse the inside surface in contact with the pipe exterior with an antimicrobial compound and volatile corrosion inhibitor blend, mitigating microbiologically influenced corrosion galvanic corrosion.
 - 1) Polyethylene encasement shall be V-Bio, as patented by DIPRA.
- c. Manufacturers:
 - 1) North Town Company
 - 2) AA Thread and Seal Tape, Inc.
 - 3) Sigma Corp.
- d. Size Requirements: Per TABLE 3, section 2.15 of DIPRA's Installation Guide for Ductile Iron Pipe.
- e. Test Results: Submitted to Engineer for approval prior to use.
 - 1) Testing: Independent testing agency certifying polyethylene encasement meets criteria established by AWWA C105 associated with tensile strength, elongation, dielectric strength, impact resistance, and propagation tear resistance.
 - 2) Samples: Include with test results.
- f. Plastic Adhesive Tape: 2 inch for sealing seams, cuts, or tears in polyethylene encasement. Duct tape is not acceptable.
 - 1) Calpico Vinyl
 - 2) Polyken
 - 3) U.P.C.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 017300 "Execution" and 017700 "Closeout Procedures" for installation examination requirements.

3.2 PREPARATION

- A. Section 017300 "Execution" and 017700 "Closeout Procedures" for installation preparation requirements.
- B. Handle piping and fittings per "Delivery, Storage, and Handling" Article in Part 1 of this specification.
- C. Examine pipe and fittings before laying. Repair any damage to the pipe, lining or coatings per manufacturer's recommendations prior to installation.

- D. The interior of all pipe, fittings and other appurtenances shall be kept free from dirt, excessive corrosion or foreign matter at all times.

3.3 INSTALLATION

- A. Installed per requirements of the laying schedule and AWWA C600, unless otherwise specified.

1. Provide firm, even bearing the length of the pipe. Dig bell holes at each joint. Tamp backfill materials on pipe sides to the springline per details on the Drawings.
2. Blocking is not permitted.
3. Replace with sound pipe or fitting, defective pipe or fitting discovered after having been laid.
4. When laid, pipe and fittings shall perform to lines and grades required. When laying is not in progress, close open ends of the pipe with watertight plug or other approved means.
5. Place sufficient backfill to prevent flotation. Joint deflection not to exceed manufacturer's recommendation.
6. Pipe Laid Underground: 4 feet cover unless Drawings show otherwise or otherwise specified.
7. Lay pipe such that the invert elevations shown on Drawings are not exceeded.
8. Provide fittings, in addition to those shown on the Drawings, where required, in crossing utilities which may be encountered upon opening the trench. Install solid sleeve closures at locations approved by the Engineer.
9. Pipe Interior: Maintain dry and broom clean throughout construction period.
10. Field Cutting Pipe: When required, smooth cut by machine perpendicular to pipe axis. Bevel cut pipe ends per manufacturer's recommendations for the spigot end.
 - a. Repair coating removed from cut per manufacturer's recommendation and/or the coating and lining paragraphs of Part 2 above (whichever method is more stringent in the opinion of the Engineer).
 - b. Cement lining shall be undamaged.
 - c. Cutting of restrained joint pipe will not be allowed, unless approved at specific joints in conjunction with the use of restrainer glands by EBAA Iron or field adaptable restrained joints.
 - d. Where Field Cuts are Permitted" Pipe supplied by the factory as "gauged full length".
 - 1) Gauged Full Length Pipe is Unavailable: Pipe to be field gauged at the location of the new spigot using a measuring tape, or other means approved by the manufacturer, to verify that the diameter is within tolerances permitted in Table 1 of AWWA C151.

- B. Jointing Ductile-Iron Pipe

1. Push-On Joints: Install per manufacturer's instructions, AWWA C600 and Appendix B of AWWA C111. If there is conflict, manufacturer's instructions take precedence.
 - a. Lay pipe with bell ends looking ahead.
 - b. Insert rubber gasket in the groove of bell end of pipe.
 - c. Clean and lubricate joint surfaces

- d. Align the plain end of the pipe with the bell of the pipe to which it is to be joined and pushed home.
 - e. Metal feeler shall be used to make certain that the rubber gasket is properly seated.
2. Mechanical Joints: Assembled per manufacturer's instructions, AWWA C600 and Appendix A of AWWA C111. If there is conflict, manufacturer's instructions take precedence.
 - a. Lay pipe with bell ends looking ahead.
 - b. Clean and lubricate joint surfaces and rubber gasket.
 - c. Tighten bolts to the specified torques.
 - d. Extension wrenches or pipe over handle of ordinary ratchet wrench are not allowed to secure greater leverage.
 - e. Encapsulate bolts and nuts using wax sealing tape per AWWA Standard C217.
 - f. Install polyethylene encasement as specified.
 3. Bolts in Mechanical or Restrained Joints: Tightened alternately and evenly.
 4. Restraint for Mechanical Joint Pipe:
 - a. Retainer glands for restraining joint.
 - b. Restrained mechanical joints to be suitable for the specified test pressure.
 - c. Installed according to pipe manufacturer's instructions.
 5. Flanged Joints: Assembled per manufacturer's instructions and Appendix C of AWWA C111. If there is conflict, manufacturer's instructions take precedence.
 - a. Ensure there is no restraint on opposite ends of pipe or fitting, which would prevent uniform gasket compression, cause unnecessary stress, bending or torsional strains, or distortion of flanges or flanged fittings.
 - b. Adjoining push-on joints are not to be assembled until flanged joints have been tightened.
 - c. Tighten flange bolts for uniform gasket compression and sealing.
 - 1) Leave flange bolts with approximately **1/2 inch (13 mm)** projection beyond the nut face after tightening.
 - d. Encapsulate bolts and nuts using wax sealing tape per AWWA Standard C217,
 6. Sleeve Couplings: Only installed for closure or as shown on the Drawings. Do not assemble couplings until adjoining joints have been assembled.
 - a. Encapsulate bolts and nuts using wax sealing tape per AWWA Standard C217,
 - b. Install protective wrap recommended by manufacturer or as required herein. Maintain insulating properties of insulating and dielectric couplings.
 7. Blowoffs, outlets, valves, fittings and other appurtenances to be set and jointed as indicated on the Drawings and per manufacturer's instructions.

3.4 CONNECTIONS TO STRUCTURES

- A. Where pipe 3 inch diameter or larger horizontally passes from concrete to earth, install two flexible joints spaced 2 to 4 feet apart depending on pipe size within 2 feet of exterior wall face, whether shown on Drawings or not.
- B. Utilize wall sleeves for pipes passing through walls designed to pass through the wall via restrained piping unless otherwise specified.
- C. Encase piping underneath structures in reinforced concrete as shown in the Drawings.

3.5 FIELD QUALITY CONTROL

- A. Section 014000 "Quality Requirements" for inspecting and testing requirements.
- B. Replace with sound pipe or fitting, defective pipe or fitting discovered after having been laid.
- C. Thoroughly clean pipe and fittings before laying. Keep clean until used in the Work.
- D. Pipe and fittings, when installed or laid, shall conform to the lines and grades required.

E. FILLING AND TESTING

- 1. After Installation: Test pipe shall for compliance as specified.
 - a. Furnish necessary equipment and labor for hydrostatic pressure testing the pipelines.
 - b. Submit detailed test procedures and methods per AWWA C600 for Engineer's review and approval at least 10 days prior to testing
- 2. Pressure Pipelines: Subjected to hydrostatic pressure of 1.25 times the working pressure at the highest point along the test segment.
 - a. Maintained test pressure for 2 hours.
 - b. Hydrostatic testing allowances are not to exceed those indicated in AWWA C600.
 - c. Provide suitable restrained bulkheads as required to complete the specified hydrostatic testing.
 - d. Make taps and furnish necessary caps, plugs, etc., required to conduct testing.
- 3. Gravity Pipelines: Subjected to hydrostatic pressure test as specified in AWWA C600.
- 4. Valves and Valve Boxes" Properly located, installed and operable prior to testing.
- 5. Provide bulkheads with a sufficient number of outlets for filling and draining the line and for venting air.
- 6. Hydrostatic Pressure Tests: Per Section 5.2 of AWWA C600.
 - a. Furnish gauges, meters, pressure pumps and other equipment required to slowly fill the line and perform the required tests.

7. Owner will provide a source of supply from the existing treated water distribution system for use in filling the lines. An air break shall be maintained at all times between the distribution system and equipment to prevent cross-connection.
 - a. Slowly fill the line with water. Maintain the specified test pressure in the pipe for entire test period. Provide accurate means for measuring the quantity of makeup water required to maintain this pressure.
8. Pressure Test Duration: 2 hours.
 - a. Repair leaks evident at the surface regardless of total leakage as shown by test.
 - b. Repair lines failing to meet tests. Retest as necessary until test requirements are met.
 - c. Defective materials, pipes, valves and accessories shall be removed and replaced.

3.6 CLEANING AND DISINFECTION

- A. Sections 017300 “Execution” and 017700 “Closeout Procedures” for cleaning requirements.
- B. At conclusion of the Work, thoroughly clean pipes by flushing with water or other means to remove dirt, stones, pieces of wood, or other material which may have entered during the construction period. Remove all debris from the pipeline. The lowest segment outlet shall be flushed last to assure debris removal.
- C. After pipes have been cleaned and if groundwater level is above the pipes or water in the pipe trench is above the pipe following a heavy rain, the Engineer will examine the pipe for leaks.
 1. Repair and replace defective pipes, fittings or joints that are discovered.
- D. Potable Water Service: Disinfect ductile iron pipe used for potable water service after cleaning. Provide necessary equipment and labor.
 1. Disinfection per AWWA C651 standard.
 2. Discharge chlorinated water in compliance with Federal, State and local standards. Provide sodium bisulfite for de-chlorination prior to discharge.

3.7 PROTECTION

- A. Section 017300 “Execution” and 017700 “Closeout Procedures” for protecting finished Work requirements.

END OF SECTION 330519

Division 40

Process Interconnections

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SECTION 400559.33 - CAST IRON SLIDE GATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes: Cast-iron slide gates.
- B. Related Requirements:
 - 1. Section 099000 "Painting and Coating," for coating requirements required.
 - 2. Section 400557 "Actuators for Process Valves and Gates."
 - 3. Section 460548 "Vibration and Seismic Control for Water and Wastewater Equipment," vibration and seismic control requirements for equipment specified.
 - 4. Section 460553 "Identification for Water and Wastewater Equipment," for equipment nameplates.

1.3 DEFINITIONS

- A. Operating Head: Distance from centerline of gate to maximum water level of channel.

1.4 COORDINATION

- A. Section 013000 "Administrative Requirements," for coordination requirements.
- B. Coordinate Work of this Section with Work of other Sections.

1.5 PRE-INSTALLATION MEETINGS

- A. Section 013000 "Administrative Requirements," for pre-installation meeting requirements.
- B. Convene minimum one week prior to commencing Work of this Section.

1.6 ACTION SUBMITTALS

- A. Section 013300 "Submittal Procedures," for submittals requirements.
- B. Product Data: Manufacturer's product information for system materials and component equipment.

C. Shop Drawings:

1. System materials and component equipment.
2. Description of materials cross-referenced to a sectional drawing listing material by trade name and ASTM reference number.
3. Certified shop and installation Drawings showing details of construction, dimensions and anchor bolt locations.
4. Installation and anchoring requirements, fasteners, and other details.
5. Descriptive literature, bulletins and/or catalogs of the equipment.
6. Weight of each component.
7. Description of surface preparation and shop prime painting of gates and accessories.
8. Gate identification number, location, service, type, size, design pressure, operator details, stem details, and loads.
9. Listing of all forces transmitted to floor stands if applicable.

1.7 INFORMATIONAL SUBMITTALS

- A. Manufacturer's Certificate: Products meet or exceed specified requirements.
- B. Manufacturer's Instructions: Detailed instructions on installation requirements, including storage and handling procedures.
- C. Source Quality-Control Submittals: Results of shop tests and inspections.
- D. Field Quality-Control Submittals: Results of Contractor-furnished tests and inspections.
- E. Manufacturer Reports:
 1. Certify that equipment has been installed according to manufacturer's instructions.
 2. Document activities on Site, adverse findings, and recommendations.
- F. Qualifications Statements:
 1. Submit qualifications for manufacturer and licensed professional.

1.8 DELEGATED DESIGN SUBMITTALS:

- A. Delegated Design Submittals: Submit signed and sealed Shop Drawings with design calculations and assumptions for unseating pressure.
- B. Copy of PE License of Engineer of Record.

1.9 CLOSEOUT SUBMITTALS

- A. Section 017700 "Closeout Procedures," for closeout procedures requirements.
- B. Project Record Documents: Record actual locations of installed slide gates and components.

- C. Operation and Maintenance Data: Submit maintenance instructions for equipment and accessories.

1.10 MAINTENANCE MATERIAL SUBMITTALS

- A. Section 017300 “Execution,” for maintenance materials requirements.
- B. Spare Parts:
 - 1. Furnish one set of manufacturer's recommended spare parts.
- C. Tools: Furnish special wrenches and other devices required for normal operation and for Owner to maintain equipment.
- D. O&M Manual: copies of manufacturer's operation and maintenance manuals.
 - 1. Include required cuts, drawings, equipment lists, descriptions, etc. to instruct operating and maintenance personnel unfamiliar with such equipment.
 - 2. Include trouble shooting data and full preventive maintenance schedules.
- E. Factory Representative: Provide [three] (3) days to instruct representatives of the Owner on proper operation and maintenance of the equipment.

1.11 QUALITY ASSURANCE

- A. Materials in Contact with Potable Water: Certified to NSF Standard 61 and NSF Standard 372.
- B. Cast iron slide gates, operators, operating stems, wall thimbles and appurtenances: Furnish by single manufacturer fully experienced, reputable and qualified in the manufacture of the equipment specified.
- C. Perform Work according to Municipality of Fayetteville Department of Public Works standards.
- D. Maintain a copy of each standard affecting Work of this Section on Site.

1.12 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.
- B. Licensed Professional: Professional engineer experienced in design of specified Work and licensed in State of North Carolina.

1.13 DELIVERY, STORAGE, AND HANDLING

- A. Section 016000 “Product Requirements,” for transporting, handling, storing, and protecting products requirements.

- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- C. Store materials according to manufacturer's instructions.
- D. Protect materials from physical damage, moisture and dust by storing in clean, dry location remote from areas involved in construction operations.
 - 1. Provide additional protection according to manufacturer's instructions.

1.14 EXISTING CONDITIONS

- A. Field Measurements: Verify field measurements prior to fabrication. Document field measurements on Shop Drawings.

1.15 WARRANTY

- A. Section 017700 "Closeout Procedures" for warranties requirements.
- B. Furnish three-year manufacturer's warranty for slide gates.
- C. Furnish five-year manufacturer's warranty that clear plastic stem covers will not crack, discolor, or become opaque.

PART 2 - PRODUCTS

2.1 PERFORMANCE AND DESIGN CRITERIA

- A. Unseating Pressure:
 - 1. 20 feet of water.
 - 2. Measurement: From maximum water surface to centerline of gate.
- B. Minimum Vertical Loading: 50 percent of force on the gate from operating head acting on horizontal centerline of gate, multiplied by effective gate area, plus weight of slide and stem.
- C. Gate Reinforcement: As required for deflection not greater than 1/360 of span.
- D. Operating Head:
 - 1. Safety Factor: Design gate to operate under specified operating head with safety factory of five.

2.2 CAST-IRON SLIDE GATES

A. Manufacturers:

1. Waterman
2. Hydrogate
3. Substitutions: Specified in Section 016000 "Product Requirements".

B. Furnish materials according to Municipality of Fayetteville Department of Public Works standards.

C. Description:

1. Comply with AWWA C560.
2. Self-contained cast-iron slide gate, with conventional frame, yoke, lifting stem attached to yoke, lift and lift support, rising stem, stem guide, and stem block.
3. Material: High nickel content cast iron
4. Strength: Adequate to prevent distortion during handling, placing and service conditions.
5. Mating and sliding surfaces: Fully machined.
Fasteners: Stainless steel, ASTM A276, Type 316, or bronze ASTM B98 CA-655.
6. Non-self-contained cast-iron slide gate, with limited frame, lifting stem, lift and lift support, rising stem, stem guide, and stem block.
7. Size: 2 by 2 feet.
8. Operating Head: [20feet].
9. Closure: Bottom flush.
10. Opening: Upward.

D. Gate Configuration: Cast iron, one piece. Removable.

1. Minimum Thickness: 3/4 inch.
2. Ribs: As required based on operating head.
 - a. Molded into gate. Bolted or bonded ribs are not acceptable.
 - b. Provide reinforcing rib around gate perimeter.

E. Yokes: Cast iron. Bolted to gate frame.

F. Seats: Impacted into dovetail slots and held in position without use of screws or other fasteners.

1. Maximum Clearance between Seating Faces: 0.004 inch when gate is fully closed.

G. Wedges: Machined brass blocks with angled faces and secured with a stud bolt to prevent slippage during operation.

1. Wedge Types: Side, top, and bottom.
2. Cast wedge pads for side and top wedges integrally on gate. Machine to receive the adjustable, stainless steel or bronze wedges.
3. Locate side wedge pads at the ends of horizontal ribs.

H. Wall Thimble: One-piece construction.

1. Joint Type: F.

2. Material: High nickel content cast iron.
3. Thimble Depth: Equal to thickness of concrete wall in which the thimble is to be located.
4. Machine front flange of thimble to a true surface and accurately drill and tap as required for stud bolts.
5. Cast a water stop center ring of the thimble.
6. Studs and Nuts: Stainless steel Type 316.
7. Gate Attachment: Corrosion-resistant metal studs.
8. Gasket or mastic between sluice gate and wall thimble or wall casting.
9. Square thimbles with holes in invert to allow concrete placement beneath thimble.

I. Frames: One piece configuration.

1. Construction: Flat or flange type. Rectangular or circular opening.
2. Bolt to wall thimble or wall casting.
3. Material: High nickel content cast iron, per ASTM A126, Class B,
4. Extend frame sides upward to support and retain at least half the disc when in full open position.
 - a. Machine frame with dove-tailed grooves on front face into which stainless steel or bronze seat facings are driven and machined to a 63 micro-in finish.
 - b. Machine back of frame to bolt directly to the machined face of wall thimble with mastic between.
 - c. Machine frames for slide gates as integrally cast pads with keyways to receive top wedge seats.

J. Gate Guide and Disc: One piece configuration.

1. Construction: One-piece. Rectangular with integrally cast vertical and horizontal ribs.
2. Material: High nickel content cast iron, per ASTM A126 Class B.
3. Reinforcing rib along each side
4. Strength: Deflection of top and bottom ribs with full head on the gate less than 0.025 inch.
5. Machine frame with dove-tailed grooves on the seating face of the gate slide into which stainless steel or bronze ASTM B-21 Alloy B seat facings are driven and machined to a 63-micro-inch finish.
6. A tongue on each side, extending full length of gate. Machine on all sides with a 1/16 inch clearance maintained between gate tongue and gate guide groove.
7. Stainless steel or bronze lined disc tongues.
8. Integrally cast heavily reinforced nut pocket on vertical centerline and above the horizontal center of such shape as to receive the square-backed manganese bronze stem block.
9. Operating or Lift Nuts: Bronze ASTM B147 Alloy 8A.
10. Modulating Type Gate Lift Nuts:
 - a. Cast nylon operating nut on polished stainless-steel stem.
 - b. Strength: Withstand total thrust due to water pressure and wedging action.
 - c. Machine guides on all contact surfaces.
 - d. Machine groove entire length of guide to allow 1/16 inch clearance between gate tongue and guide groove.
 - e. Line guide grooves with stainless steel or bronze.

- f. Guides length to retain and support at least 1/2 the gate in full open position.
 - g. Integrally cast guides or attach to frame with silicon bronze or stainless-steel studs and nuts. Dowel to prevent any relative motion between the guides and the frame.
 - h. Securely attach stainless steel or bronze wedge seats to machined pads on the guides.
 - 1) Stainless steel or bronze wedges machined on contact surfaces.
 - 2) Attach to gate with stainless steel or silicone bronze studs and nuts
 - 3) Stainless steel or silicone bronze adjusting screws with lock nuts or other approved method.
 - i. Seat Facings: Stainless steel or bronze.
 - 1) Extruded Seat Facings: Shape to fill and permanently lock in the machined dove-tail grooves when pneumatically impacted into place.
 - 2) Attaching pins and screws will not be allowed.
 - 3) Installed seat facings machined to a 63 micro-in finish.
 - j. Maximum Allowable Leakage:
 - 1) For Seating Head Conditions: 0.1 gpm per ft of perimeter.
 - 2) For Unseating Heads up to 20 ft: 0.1 gpm per ft of perimeter.
11. Guide Slot Length: Minimum 50 percent of slide length when in full open position.
12. Mounting: Thimble.
13. Bottom Flush Closure: Resilient seal securely attached to frame along invert.
- K. Lifting Nut: Brass.
- 1. Grease fitting.
 - 2. Polymer bearing pads above and below lifting nut.
- L. Lifting Stem: Type 316 stainless steel.
- 1. Tensile Strength: an 60,000 psi.
 - 2. Diameter: Of sufficient size at base of thread to lift the weight of the gate, offset the resistance of the gate to the maximum unbalanced head and fully allow for starting impact.
 - 3. Transmit in compression at least two times the rated output of the crank operated floor stand with a 40 lb effort on the crank.
 - 4. Stems More Than One Section: Joined by stainless steel couplings pinned and bolted to the stems.
 - 5. Threaded and Keyed Couplings of Same Size: To be interchangeable.
 - 6. Minimum Diameter: 1-1/2 inch to withstand twice the rated output of the operator.
 - 7. Slenderness Ratio (l/r): Less than 200.
 - 8. Adjustable Bronze Stop Collars: Above and below the lift nut to prevent over opening or over closing the gate.

9. Stem Guide: High nickel content cast iron, bronze bushed, mounted in a high nickel content cast iron bracket.
10. Adjustable in two directions. Spaced at sufficient intervals to adequately support the stem. Spacing not exceed 10 ft.
11. Configuration: Rising. Removable.
12. Thread: Machine cut threads, Acme type, double lead. Cut threads are not acceptable.
13. Diameter: 1-1/8 inch.
14. Maximum Number of Turns: 16 per foot of travel.
15. Stem Covers: Provide rising stem gates with clear fracture resistant polycarbonate covers.
 - a. Capped, vented, and of a length to allow full travel of gate.
 - b. Will not discolor or become opaque for a minimum of 5 years after installation.
 - c. Capped, vented, and of a length to allow full travel of gate.
 - d. Bottom end mounted in a housing or adapter plate for easy field mounting.
 - e. Indicator markings showing gate position.

2.3 FINISHES

- A. As specified in Section 099000 "Painting and Coating."
- B. Stainless Steel Surfaces: Mill finish.

2.4 ACCESSORIES

- A. Hardware: Type 316 stainless steel. Conform to ASTM A193/A194 and F593/F594 unless otherwise specified.
- B. Attaching bolts and anchor bolts Type 316 stainless steel. Furnished by slide gate manufacturer.
- C. Nameplates: Per Section 460553 "Identification for Water and Wastewater Equipment."

2.5 SOURCE QUALITY CONTROL

- A. Section 014000 "Quality Requirements," for testing, inspection, and analysis requirements.
- B. Shop inspection and testing of completed assemblies.
- C. Owner Inspection: Make completed clarifier equipment available for inspection at manufacturer's factory prior to packaging for shipment. Notify Owner seven days before inspection is allowed.
- D. Owner Witnessing: Allow witnessing of factory inspections and test at manufacturer's test facility. Notify Owner at least seven days before inspections and tests are scheduled.

- E. Certificate of Compliance: When fabricator is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at fabricator's facility conforms to Contract Documents.
 - 1. Specified shop tests are not required for Work performed by approved fabricator.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 017300 "Execution," for installation examination requirements.
- B. Verify that facilities are ready to receive slide gates.

3.2 PREPARATION

- A. Section 017300 "Execution," for installation preparation requirements.
- B. Clean surfaces according to manufacturer's instructions.

3.3 INSTALLATION

- A. Install slide gates according to manufacturer's instructions.
- B. Ensure that products are installed plumb, true, and free of warp or twist.
- C. Locate operators to avoid interference with handrails and other Work.
- D. Internally brace wall thimbles during concrete placement to prevent warping.
- E. Gate Installation: Under the supervision of the gate manufacturer's factory representative.
 - 1. Factory Representative: Furnish services for one day. To have complete knowledge of proper installation, startup and operation of cast iron slide gates. Inspect the final installation and supervise a test of the equipment.
- F. If there are difficulties in operation of the equipment due to the manufacturer's fabrication or Contractor's installation, additional service will be provided at no cost to the Owner.
- G. Guides: Surface and Flange-Mounted.
 - a. Install guides with expansion anchors.
 - b. Position guides at elevation as indicated on Drawings.
- H. Guides: Recessed.
 - a. Cut slot in concrete to receive guides.
 - b. Position guides at elevation as indicated on Drawings.
 - c. Grout guides in place according to manufacturer's instructions.

- I. Sealant: Rubber gasket of uniform thickness or mastic, to form seal between front face of thimble and back of gate frame.
- J. Sealant:
 - 1. Apply 1/8-inch-thick layer of elastomeric sealant to back of frame.
 - 2. Tighten nuts snug until sealant begins to flow beyond frame.
 - 3. Remove excess sealant.
 - 4. Cure sealant for minimum seven days.
 - 5. Tighten nuts to their final positions.
- K. Lubrication: Lubricate stem threads prior to initial operation.
- L. Painting and Coating: As specified in Section 099000 "Painting and Coating".
- M. Installation Standards: Install Work according to Municipality of Fayetteville Department of Public Works standards.

3.4 FIELD QUALITY CONTROL

- A. Section 014000 "Quality Requirements," for inspecting and testing requirements.
- B. Section 017300 "Execution," for testing, adjusting, and balancing requirements.
- C. Inspection: Verify gate and components alignment, smooth operation, with no binding or scraping.
- D. Testing per AWWA C560:
 - 1. Leakage Under 20 feet of Seating Head: 0.1 gpm/ft. of seating perimeter.
 - 2. Leakage Under 20 feet of Unseating Head: 0.21 gpm/ft..
- E. Manufacturer Services: Manufacturer's representative experienced in installation of products furnished under this Section a minimum of 1 day on Site for installation, inspection, field testing, and instructing and training Owner's personnel in maintenance of equipment.
- F. Equipment Acceptance: Adjust, repair, modify, or replace components failing to perform as specified and re-inspect.
 - 1. Make final adjustments to equipment under direction of manufacturer's representative.
- G. Furnish physical checkout and installation certificate from equipment manufacturer's representative attesting equipment has been properly installed and is ready for startup and testing.
- H. Submit the equipment manufacturer's Certificate of Field Testing.
- I. Submit the equipment manufacturer's Certificate of Functional Testing.

3.5 ADJUSTING

- A. Section 017300 “Execution,” for starting and adjusting requirements.
- B. Adjust slide gates to provide smooth operation.

3.6 DEMONSTRATION

- A. Section 017900 “Demonstration and Training,” for demonstration and training requirements.
- B. Demonstrate equipment operation, routine maintenance, and emergency repair procedures to Owner's personnel.

END OF SECTION 400559.33

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APPENDIX A
AVAILABLE GEOTECHNICAL DATA

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Attachment 2
Test Boring and Piezometer Installation Logs



BOREHOLE LOG

P-301

Client: PWC
Project Location: Fayetteville, NC

Project Name: Glenville Lake Dam
Project Number: 6384-100259

Drilling Contractor: FROEHLING & ROBERTSON, INC.
Drilling Method/Rig: 2 1/4 I.D. HSA/CME-55 ATV
Drillers: Shawn Davis/David Tignor
Drilling Date: Start: 11-14-13 **End:** 11-14-13
Borehole Coordinates:
 N 479,993.20 E 2,030,740.40

Surface Elevation (ft.): 121.4
Total Depth (ft.): 33
Depth to Initial Water Level (ft-bgs): 13
Abandonment Method: Completed as Piezometer
Field Screening Instrument: N/A
Logged By: JAC

Sample Type	Sample Number	Sample Adv/Rec (inches)	Elev. Depth (ft.)	N-Value	Blows per 6-in or Rock Coring Rate (min:sec)	Graphic Log	USCS Classification	Material Description	
			121.4						
			0		3		FILL	Dry, very stiff, red brown, SILT and fine sand. -FILL -	
SS	S-1	24/24		15	7				
					8				
					9				
SS	S-2	24/22		9	5				Moist, loose, red brown, fine SAND, some clayey silt.
					4				
					5				
					6				
SS	S-3	24/24	116.4 5	7	4				Moist, medium stiff, light brown, clayey SILT, some fine sand.
					4				
					3				
					3				
SS	S-4	24/24		6	3				Moist, loose, dark brown, fine to coarse SAND and silt.
					4				
					2				
					3				
SS	S-5	24/20		0	1			Moist, very soft, gray, silty CLAY, trace fine sand.	
					WOH				
					WOH				
			111.4		WOH				
			10		1			Moist, soft, gray, CLAY, little fine to coarse sand.	
SS	S-6	24/21		4	2				
					2				
					2				
					2				
SS	S-7	24/24		0	WOH			Wet, very soft, gray, CLAY and SILT, some fine sand.	
					WOH				
					WOH				
					WOH				
			106.4		WOH			Wet, very soft, gray, CLAY, trace fine to coarse sand.	
					WOH				

BOREHOLE/WITH ROCK GLENVILLE LAKE DAM.GPJ.CDM_CORP.GDT 2/26/14

EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
 HSA - Hollow Stem Auger
 SSA - Solid Stem Auger
 HA - Hand Auger
 AR - Air Rotary
 DTR - Dual Tube Rotary
 FR - Foam Rotary
 MR - Mud Rotary
 RC - Reverse Circulation
 CT - Cable Tool
 JET - Jetting
 D - Driving
 DTC - Drill Through Casing

SAMPLING TYPES:
 AS - Auger/Grab Sample
 CS - California Sampler
 BX - 1.5" Rock Core
 NX - 2.1" Rock Core
 GP - Geoprobe
 HP - Hydro Punch
 SS - Split Spoon
 ST - Shelby Tube
 WS - Wash Sample
OTHER:
 AGS - Above Ground Surface

REMARKS

Hammer weight = 140 pounds, drop height = 30 inches
 Split spoon = 2 inches OD, 24 inches long
 WOH=Weight of Hammer
 Borings were located by a surveyor.
 Surface elevations noted are approximate based upon survey contours.

Reviewed by: D. Neamtu

Date: 2-25-14



BOREHOLE LOG

P-301

Client: PWC

Project Name: Glenville Lake Dam

Project Location: Fayetteville, NC

Project Number: 6384-100259

Sample Type	Sample Number	Sample Adv/Rec (inches)	Elev. Depth (ft.)	N-Value	Blows per 6-in or Rock Coring Rate (min:sec)	Graphic Log	USCS Classification	Material Description
SS	S-8	24/24	106.4 15	1	1 1		FILL	Wet, very soft, gray, CLAY, trace fine to coarse sand.
SS	S-9	24/24	0	WOH WOH 3				
SS	S-10	24/22	5	1 2 3 3				
SS	S-11	24/19	101.4 20	2	WOH WOH 2 3		SP	Wet, very loose, brown, coarse SAND, trace clay. -ALLUVIAL SOIL-
SS	S-12	24/18	1	WOH WOH 1 1				
SS	S-13	24/24	96.4 25	5	2 3 2 2			
SS	S-14	24/24	7	2 3 4 2				
SS	S-15	24/24	91.4 30	45	9 18 27 23		CL	Wet, hard, gray, silty CLAY, trace fine sand. -CAPE FEAR FORMATION-
SS	S-16	24/24	43	12 17 26 46				
SS	S-17	12/12	43	18 25				
			86.4 35					Boring terminated at 33.0 feet below ground surface.

BOREHOLE/WITH ROCK GLENNVILLE LAKE DAM.GPJ_CDM_CORP.GDT 2/26/14



BOREHOLE LOG

P-302

Client: PWC
Project Location: Fayetteville, NC

Project Name: Glenville Lake Dam
Project Number: 6384-100259

Drilling Contractor: FROEHLING & ROBERTSON, INC.
Drilling Method/Rig: 2 1/4 I.D. HSA/CME-55 ATV
Drillers: Shawn Davis/David Tignor
Drilling Date: Start: 11-15-13 **End:** 11-15-13
Borehole Coordinates:
 N 479,963.60 E 2,030,731.90

Surface Elevation (ft.): 113.5
Total Depth (ft.): 24
Depth to Initial Water Level (ft-bgs): 14
Abandonment Method: Completed as Piezometer
Field Screening Instrument: N/A
Logged By: JAC

Sample Type	Sample Number	Sample Adv/Rec (inches)	Elev. Depth (ft.)	N-Value	Blows per 6-in or Rock Coring Rate (min:sec)	Graphic Log	USCS Classification	Material Description	
			113.5						
			0		2		FILL	Dry, medium stiff, brown, clayey SILT, little fine sand, trace fine gravel. -FILL-	
SS	S-1	24/24		6	3				
					3				
					4				
SS	S-2	24/24		5	3				Moist, medium stiff, brown, clayey SILT, and fine to coarse sand, trace fine gravel.
					3				
					2				
					2				
SS	S-3	24/22	108.5 5	5	1				Moist, medium stiff, brown, clayey SILT, and fine to coarse sand, trace fine gravel.
					3				
					2				
					2				
SS	S-4	24/24		4	3				Moist, loose, brown, fine to coarse SAND, some clayey silt, trace fine gravel.
					2				
					2				
					2				
SS	S-5	24/24		3	2			Moist, soft, gray, silty CLAY and fine to coarse sand.	
					1				
					2				
					2				
					2				
SS	S-6	24/23	103.5 10	4	1			Moist, soft, gray, SILT and CLAY, little fine sand.	
					1				
					3				
					3				
SS	S-7	24/21		4	1			Wet, soft, gray, SILT and CLAY, some fine sand.	
					2				
					2				
					2				
					1				
					7		SP	Wet, medium dense, brown, coarse SAND, little fine to coarse gravel, trace silt. -ALLUVIAL SOIL-	
			98.5						

BOREHOLE/WITH ROCK GLENVILLE LAKE DAM.GPJ_CDM_CORP.GDT 2/26/14

EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
 HSA - Hollow Stem Auger
 SSA - Solid Stem Auger
 HA - Hand Auger
 AR - Air Rotary
 DTR - Dual Tube Rotary
 FR - Foam Rotary
 MR - Mud Rotary
 RC - Reverse Circulation
 CT - Cable Tool
 JET - Jetting
 D - Driving
 DTC - Drill Through Casing

SAMPLING TYPES:
 AS - Auger/Grab Sample
 CS - California Sampler
 BX - 1.5" Rock Core
 NX - 2.1" Rock Core
 GP - Geoprobe
 HP - Hydro Punch
 SS - Split Spoon
 ST - Shelby Tube
 WS - Wash Sample
OTHER:
 AGS - Above Ground Surface

REMARKS

Hammer weight = 140 pounds, drop height = 30 inches
 Split spoon = 2 inches OD, 24 inches long
 WOH=Weight of Hammer
 Borings were located by a surveyor.
 Surface elevations noted are approximate based upon survey contours.

Reviewed by: D. Neamtu

Date: 2-25-14



BOREHOLE LOG

P-302

Client: PWC

Project Name: Glenville Lake Dam

Project Location: Fayetteville, NC

Project Number: 6384-100259

Sample Type	Sample Number	Sample Adv/Rec (inches)	Elev. Depth (ft.)	N-Value	Blows per 6-in or Rock Coring Rate (min:sec)	Graphic Log	USCS Classification	Material Description	
SS	S-8	24/15	98.5 15	15	8 3		SP	Wet, loose, brown, coarse SAND, trace silt.	
SS	S-9	24/16		9	4 5 4 3				
SS	S-10	24/19		19	1 3 16		CL		Dry, very stiff, gray, silty CLAY. -CAPE FEAR FORMATION-
SS	S-11	24/24	93.5 20	>50	27 21 28 35 51				Dry, hard, gray, silty CLAY.
SS	S-12	24/24		47	9 19 28 29				Dry, hard, gray, silty CLAY.
			88.5 25						Boring terminated at 24.0 feet below ground surface.
			83.5 30						
			78.5 35						

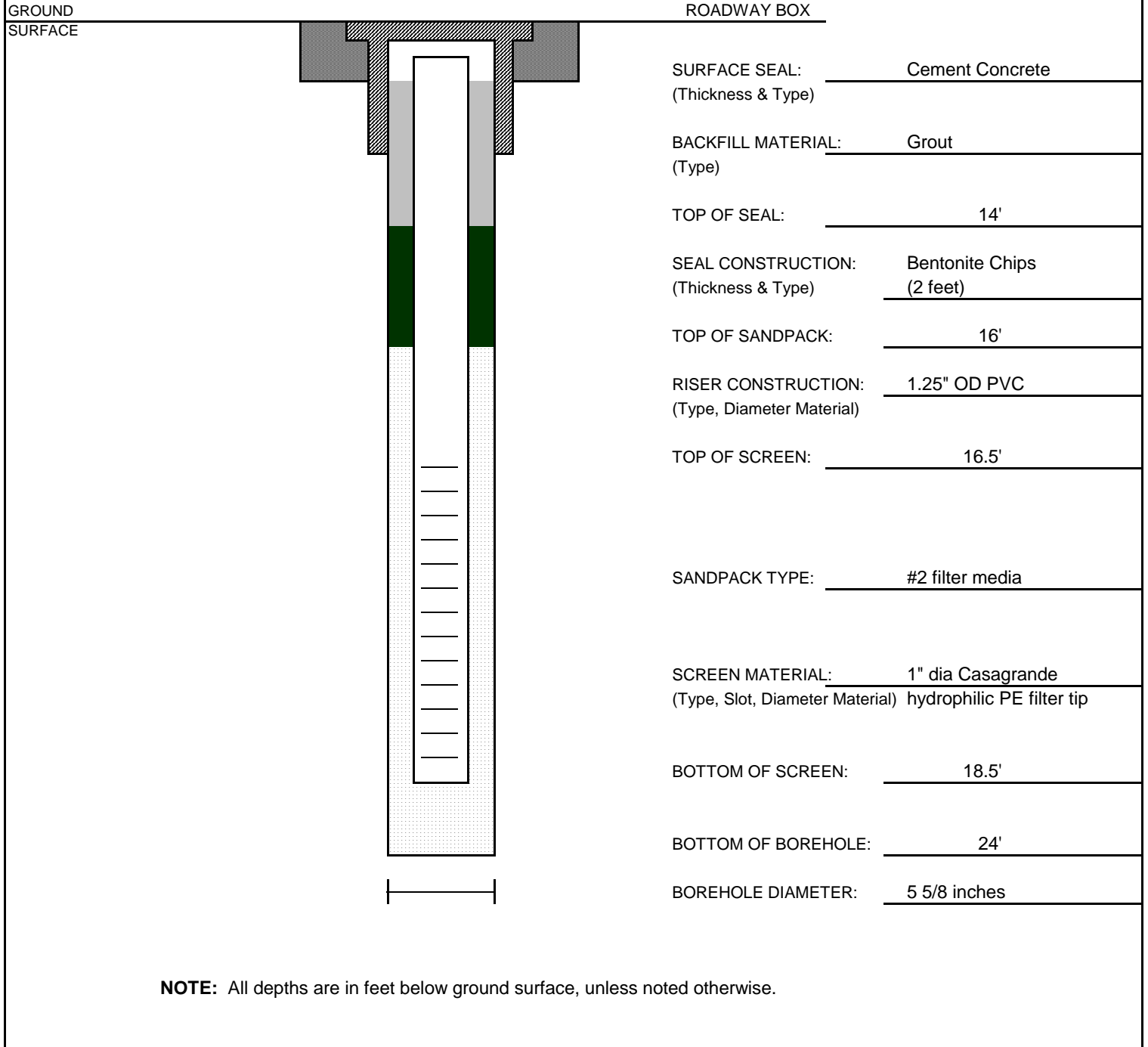
BOREHOLE/WITH ROCK GLENVILLE LAKE DAM.GPJ_CDM_CORP.GDT 2/26/14



5400 Glenwood Avenue
 Suite 300
 Raleigh, NC 27612
 (919) 787-5620

Monitoring Well Installation Log

Client: PWC	Contractor: Froehling & Robertson, Inc.	Boring/Well No.: P-302
Project Name: Glenville Lake Dam	Driller: Shawn Davis/Dave Tignor	Date Installed: 11/15/2013
Project Location: Fayetteville, NC	Ground EL: 113.5	Logged By: JAC
Project Number: 6384-100259	Riser EL: 113.5	Page: 1 of 1



NOTE: All depths are in feet below ground surface, unless noted otherwise.

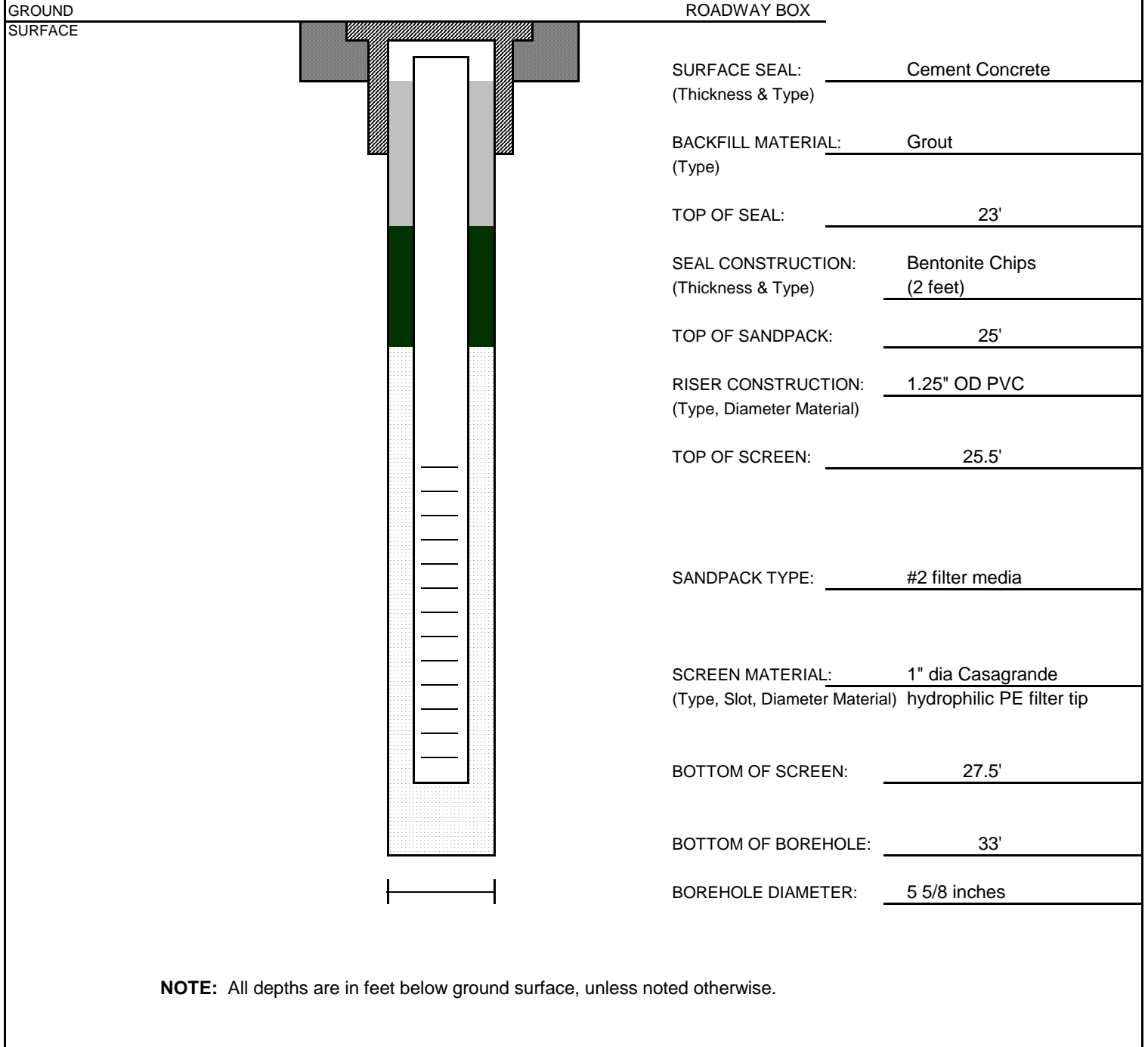
Remarks:



5400 Glenwood Avenue
 Suite 300
 Raleigh, NC 27612
 (919) 787-5620

Monitoring Well Installation Log

Client: PWC	Contractor: Froehling & Robertson, Inc.	Boring/Well No.: P-301
Project Name: Glenville Lake Dam	Driller: Shawn Davis/Dave Tignor	Date Installed: 11/14/2013
Project Location: Fayetteville, NC	Ground EL: 121.4	Logged By: JAC
Project Number: 6384-100259	Riser EL: 121.4	Page: 1 of 1



Remarks:

APPENDIX B
TEST HOLE LOGS

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VACUUM EXCAVATION TEST HOLE REPORT

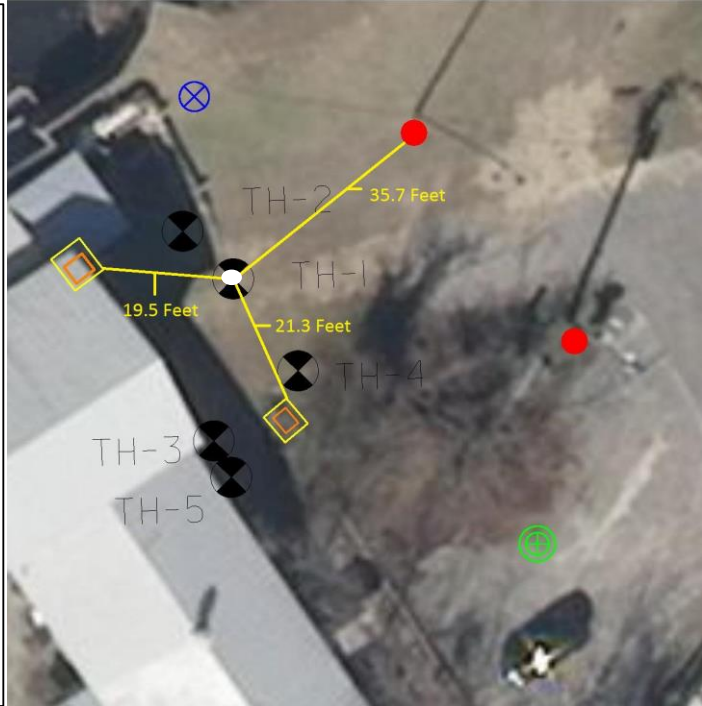
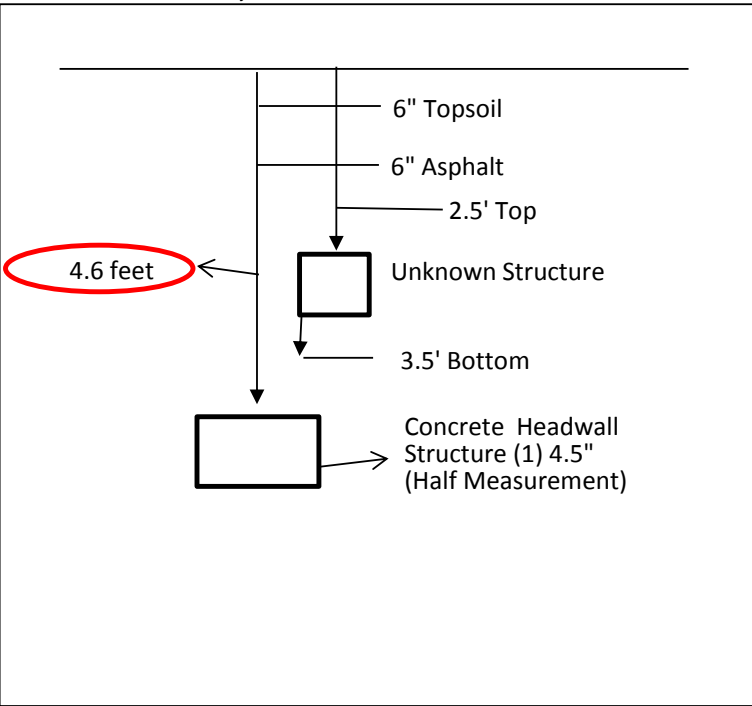
PROJECT NUMBER:	CDMK-00216	TEST HOLE NUMBER:	1
CLIENT NAME:	CDM Smith	SOIL TYPE:	Fine to medium sand/ clay-silt
PROJECT TITLE:	Glenville Lake Dam SUE Study	SURFACE MATERIAL:	Grass/ Buried Asphalt
LOCATION:	Glenville Lake Dam	PAVEMENT TYPE:	Asphalt
DATE:	1/18/2016	PAVEMENT THICKNESS:	0.5'

UTILITY #:	1	UTILITY #:	2	SITE PERSONNEL:	RR,AT
TYPE:	Buried Headwall	TYPE:	Concrete Structure	METHOD USED:	Vac Ex
SIZE:	4.5" (Half)	SIZE:	N/A	OTHER NOTES:	
MATERIAL:	Concrete	MATERIAL:	Concrete		
DEPTH:	4.6'	DEPTH:	3.54'		
DIRECTION:	North	DIRECTION:	North		

UTILITY #:		UTILITY #:		SURVEY PROVIDED BY:	GEL Engineering of NC
TYPE:		TYPE:		SURVEY COORDINATES:	
SIZE:		SIZE:		ELEVATION:	113.83'
MATERIAL:		MATERIAL:		NORTH:	479942.69'
DEPTH:		DEPTH:		EAST:	479942.69'
DIRECTION:		DIRECTION:			

Notes: All measurements obtained from top/center of associated utility unless otherwise noted.

Test Hole Location Map



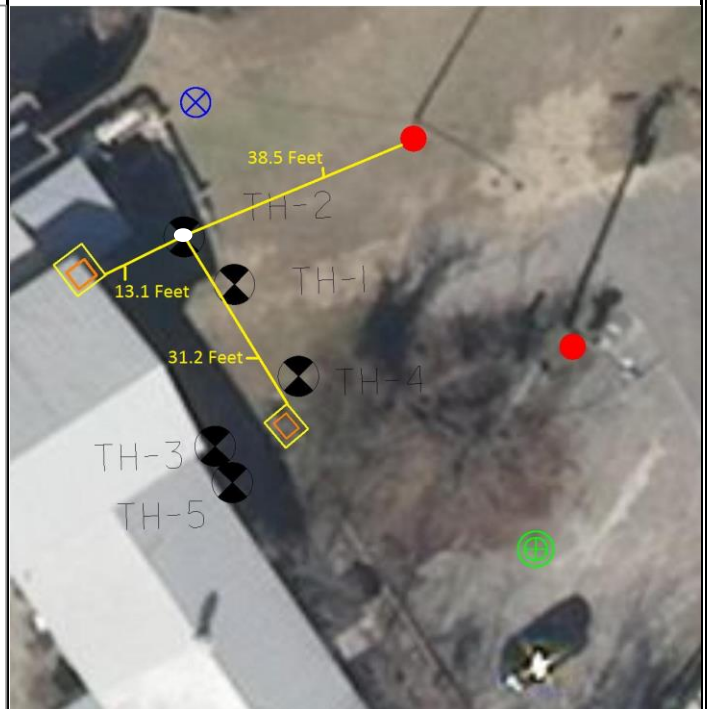
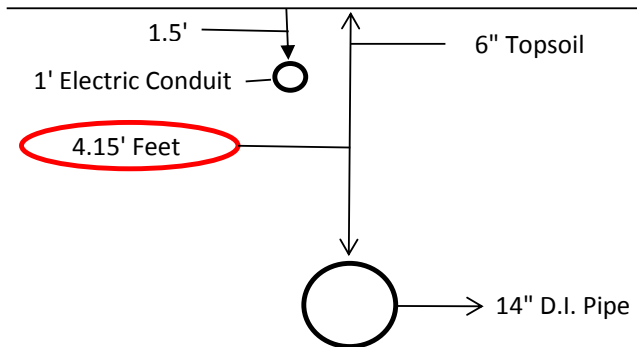


VACUUM EXCAVATION TEST HOLE REPORT

PROJECT NUMBER:	CDMK-00216	TEST HOLE NUMBER:	2
CLIENT NAME:	CDM Smith	SOIL TYPE:	Fine to medium sand/clay-silt
PROJECT TITLE:	Glenville Lake SUE Study	SURFACE MATERIAL:	Grass
LOCATION:	Glenville Lake Dam	PAVEMENT TYPE:	N/A
DATE:	1/19/2016	PAVEMENT THICKNESS:	N/A
UTILITY #:	1	UTILITY #:	2
TYPE:	Unknown	TYPE:	Electric
SIZE:	14"	SIZE:	1"
MATERIAL:	D.I	MATERIAL:	Plastic Conduit
DEPTH:	4.15'	DEPTH:	1.5"
DIRECTION:	East	DIRECTION:	East
UTILITY #:		UTILITY #:	
TYPE:		TYPE:	
SIZE:		SIZE:	
MATERIAL:		MATERIAL:	
DEPTH:		DEPTH:	
DIRECTION:		DIRECTION:	
		SURVEY PROVIDED BY:	GEL Engineering of NC
		SURVEY COORDINATES:	
		ELEVATION:	113.16'
		NORTH:	479949.93'
		EAST:	2030713.58'

Notes: All measurements obtained from top/center of associated utility unless otherwise noted.

Test Hole Location Map





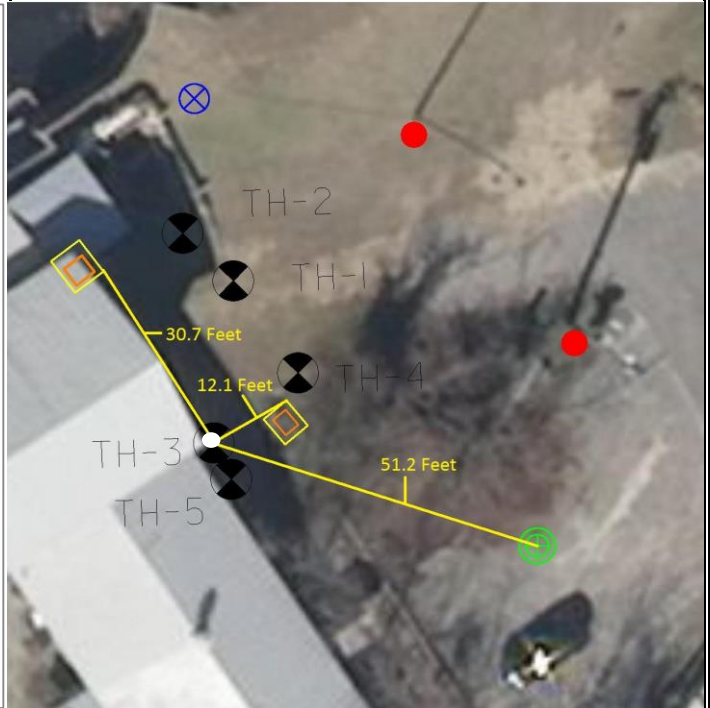
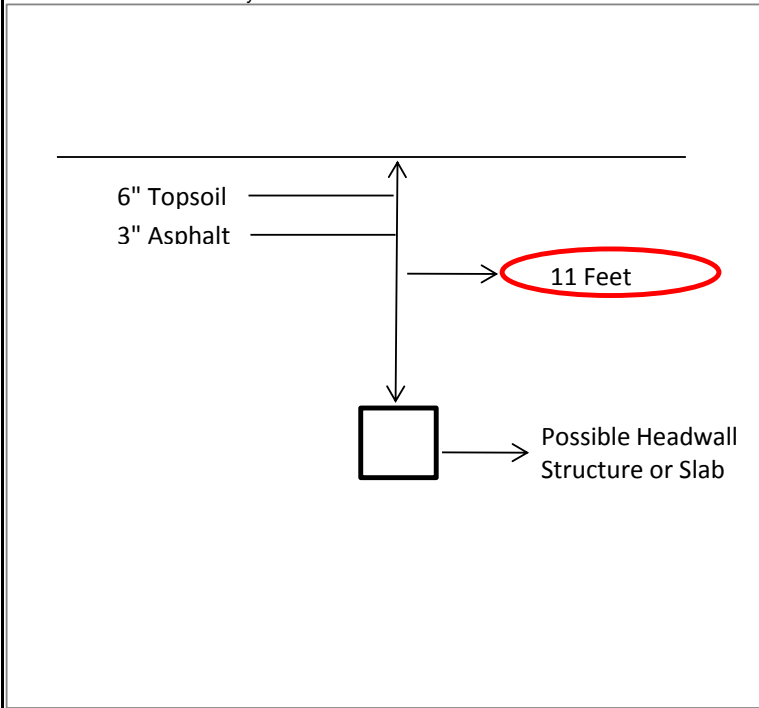
VACUUM EXCAVATION TEST HOLE REPORT

PROJECT NUMBER:	CDMK-00216	TEST HOLE NUMBER:	3
CLIENT NAME:	CDM Smith	SOIL TYPE:	Fine to medium sand/ clay-silt
PROJECT TITLE:	Glenville Lake Dam SUE Study	SURFACE MATERIAL:	Grass/Buried Asphalt
LOCATION:	Glenville Lake Dam SUE Study	PAVEMENT TYPE:	Asphalt
DATE:	1/19/2016	PAVEMENT THICKNESS:	0.3'

UTILITY #:	1	UTILITY #:		SITE PERSONNEL:	RR, AT
TYPE:	Buried Headwall	TYPE:		METHOD USED:	Vac Ex
SIZE:	Unknown	SIZE:		OTHER NOTES:	*Added Extension to 11' and Probed in 3 Linear Areas within hole and field structure. Due to extreme depth, tesh hole only open to 6'
MATERIAL:	Unknown	MATERIAL:			
DEPTH:	11'	DEPTH:			
DIRECTION:	East	DIRECTION:			
UTILITY #:		UTILITY #:		SURVEY PROVIDED BY:	
TYPE:		TYPE:		SURVEY COORDINATES:	
SIZE:		SIZE:		ELEVATION:	111.94'
MATERIAL:		MATERIAL:		NORTH:	479918.07'
DEPTH:		DEPTH:		EAST:	2030718.26'
DIRECTION:		DIRECTION:			

Notes: All measurements obtained from top/center of associated utility unless otherwise noted.

Test Hole Location Map



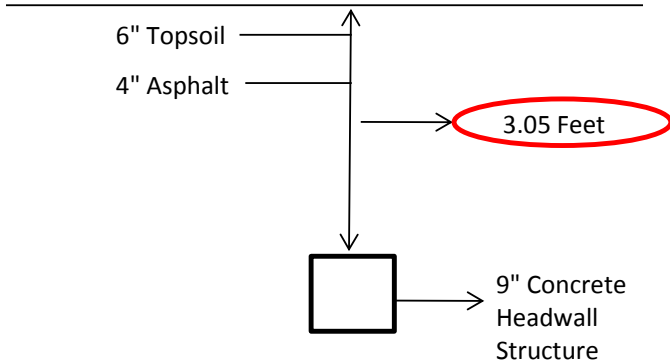


VACUUM EXCAVATION TEST HOLE REPORT

PROJECT NUMBER:	CDMK-00216	TEST HOLE NUMBER:	4
CLIENT NAME:	CDM Smith	SOIL TYPE:	Fine to medium sand/ clay silt
PROJECT TITLE:	Glenville Lake Dam SUE Study	SURFACE MATERIAL:	Grass/ Buried Asphalt
LOCATION:	Glenville Lake Dam	PAVEMENT TYPE:	Asphalt
DATE:	1/19/2016	PAVEMENT THICKNESS:	0.3'
UTILITY #:	1	UTILITY #:	
TYPE:	Buried Headwall	TYPE:	
SIZE:	9"	SIZE:	
MATERIAL:	Concrete	MATERIAL:	
DEPTH:	3.05'	DEPTH:	
DIRECTION:	Northeast	DIRECTION:	
UTILITY #:		UTILITY #:	
TYPE:		TYPE:	
SIZE:		SIZE:	
MATERIAL:		MATERIAL:	
DEPTH:		DEPTH:	
DIRECTION:		DIRECTION:	
SITE PERSONNEL:		AT,RR	
METHOD USED:		Vac Ex	
OTHER NOTES:		*Field Investigation showed a metal spike directly in the center of buried concrete headwall structure	
SURVEY PROVIDED BY:		GEL Engineering of NC	
SURVEY COORDINATES:			
ELEVATION:		112.52'	
NORTH:		479928.71'	
EAST:		2030730.89'	

Notes: All measurements obtained from top/center of associated utility unless otherwise noted.

Test Hole Location Map





VACUUM EXCAVATION TEST HOLE REPORT

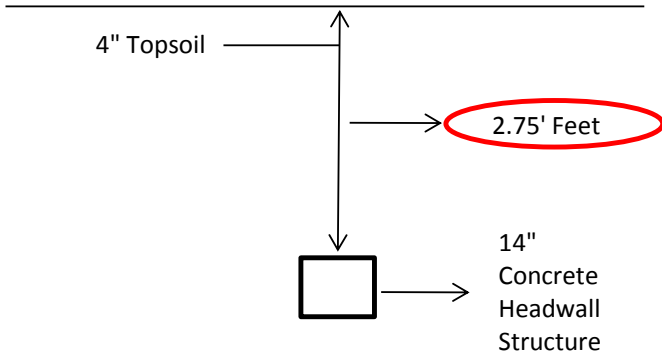
PROJECT NUMBER:	CDMK-00216	TEST HOLE NUMBER:	5
CLIENT NAME:	CDM Smith	SOIL TYPE:	Fine to medium sand/ clay-silt
PROJECT TITLE:	Glenville Lake Dam SUE Study	SURFACE MATERIAL:	Grass
LOCATION:	Glenville Lake Dam	PAVEMENT TYPE:	N/A
DATE:	1/19/2016	PAVEMENT THICKNESS:	N/A

UTILITY #:	1	UTILITY #:		SITE PERSONNEL:	RR. AT
TYPE:	Buried Headwall	TYPE:		METHOD USED:	Vac Ex
SIZE:	14"	SIZE:		OTHER NOTES:	* Concrete Headwall structure seemed to disperse into a Y Shape towards the building
MATERIAL:	Concrete	MATERIAL:			
DEPTH:	2.75'	DEPTH:			
DIRECTION:	Northeast	DIRECTION:			

UTILITY #:		UTILITY #:		SURVEY PROVIDED BY:	GEL Engineering of NC
TYPE:		TYPE:		SURVEY COORDINATES:	
SIZE:		SIZE:		ELEVATION:	112.25'
MATERIAL:		MATERIAL:		NORTH:	479912.53'
DEPTH:		DEPTH:		EAST:	2030720.88'
DIRECTION:		DIRECTION:			

Notes: All measurements obtained from top/center of associated utility unless otherwise noted.

Test Hole Location Map



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APPENDIX C
SITE AND BUILDING PHOTOS
2018

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**Former WTP Building Pre-Demolition Condition Assessment Inspection
August 29, 2018**



**Photo 1: Former WTP Building Eastern Exterior,
Viewed from Northeast**



**Photo 2: Former WTP Building Southeastern Exterior,
Viewed from East**

**Former WTP Building Pre-Demolition Condition Assessment Inspection
August 29, 2018**



**Photo 3: Former WTP Building Northeastern Exterior,
Viewed from East**



**Photo 4: Former WTP Building Southwestern Exterior,
Viewed from Southwest**

**Former WTP Building Pre-Demolition Condition Assessment Inspection
August 29, 2018**



**Photo 5: Former WTP Building Western Exterior,
Viewed from Southwest**



**Photo 6: Former WTP Building Northwestern Exterior,
Viewed from Northwest**

**Former WTP Building Pre-Demolition Condition Assessment Inspection
August 29, 2018**



**Photo 7: Former WTP Building Northern Exterior,
Viewed from Northwest**



Photo 8: Boulders at Southeast Corner of Former WTP Building

**Former WTP Building Pre-Demolition Condition Assessment Inspection
August 29, 2018**



**Photo 9: Catch Basin 1 Area,
Viewed from East**



**Photo 10: Wet Well, Intake Retaining Wall, Electrical Cabinet and 16-inch Raw Water Line,
Viewed from South**

**Former WTP Building Pre-Demolition Condition Assessment Inspection
August 29, 2018**



**Photo 11: Wet Well, Intake Retaining Wall, Electrical Cabinet and 16-inch Raw Water Line,
Viewed from East**



**Photo 12: Raised Wet Well Pumping Platform,
Viewed from East**

**Former WTP Building Pre-Demolition Condition Assessment Inspection
August 29, 2018**



**Photo 13: Intake Area and Retaining Wall,
Viewed from Dam Upstream Slope**



**Photo 14: Intake Area,
Viewed from Dam Upstream Slope**

**Former WTP Building Pre-Demolition Condition Assessment Inspection
August 29, 2018**



**Photo 15: South Room,
Viewed from Southwest Corner to East Wall**



**Photo 16: South Room,
Viewed from Southeast Corner to West Wall**

**Former WTP Building Pre-Demolition Condition Assessment Inspection
August 29, 2018**



**Photo 17: South Room,
Viewed from South Wall to North Wall**



Photo 18: Bathroom #1 Toilet Stalls

**Former WTP Building Pre-Demolition Condition Assessment Inspection
August 29, 2018**



Photo 19: Bathroom #1 Sinks



Photo 20: Bathroom #1 Urinals

**Former WTP Building Pre-Demolition Condition Assessment Inspection
August 29, 2018**



**Photo 21: Office #1,
Viewed from Doorway**



**Photo 22: Office #2,
Viewed from Doorway**

**Former WTP Building Pre-Demolition Condition Assessment Inspection
August 29, 2018**



**Photo 23: Offices #3 and #4,
Viewed from Doorway**



**Photo 24: Bathroom #2,
Viewed from Doorway**

**Former WTP Building Pre-Demolition Condition Assessment Inspection
August 29, 2018**



Photo 25: Bathroom #2 Toilet



**Photo 26: Storage #1,
Viewed from Doorway**

**Former WTP Building Pre-Demolition Condition Assessment Inspection
August 29, 2018**



**Photo 27: Middle Room,
Viewed from Northeast Corner to Southwest Corner**



**Photo 28: Middle Room,
Viewed from Northeast Corner to West Wall**

**Former WTP Building Pre-Demolition Condition Assessment Inspection
August 29, 2018**



**Photo 29: Middle Room,
Viewed from Southeast Corner to West Wall**



**Photo 30: Middle Room,
Viewed from Southeast Corner to North Wall**

**Former WTP Building Pre-Demolition Condition Assessment Inspection
August 29, 2018**



**Photo 31: Upper Level North Room,
Viewed from Northwest Corner to South Wall**



**Photo 32: Upper Level North Room,
Viewed from Southwest Corner to Northeast Corner**

**Former WTP Building Pre-Demolition Condition Assessment Inspection
August 29, 2018**

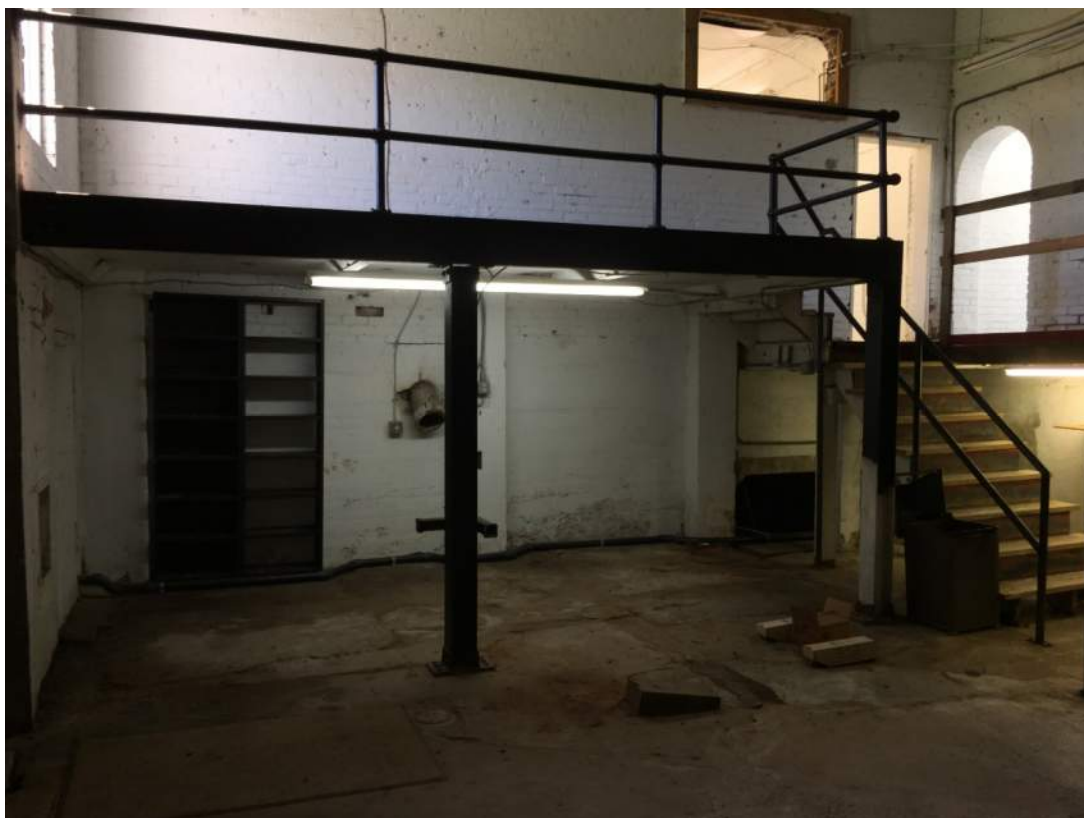


**Photo 33: Upper Level North Room,
Viewed from Southwest Corner to East Wall**



**Photo 34: Lower Level North Room,
Viewed from Staircase at Southwest Corner of Room**

**Former WTP Building Pre-Demolition Condition Assessment Inspection
August 29, 2018**



**Photo 35: Lower Level North Room,
Viewed from Northeast Corner to South Wall**



**Photo 36: Lower Level North Room,
Viewed from East Wall to West Wall**

**Former WTP Building Pre-Demolition Condition Assessment Inspection
August 29, 2018**



**Photo 37: Lower Level North Room,
Viewed from East Wall to Southwest Corner towards Pipe Gallery**



**Photo 38: Pipe Gallery
Viewed from Opening Beneath Mezzanine to South**

**Former WTP Building Pre-Demolition Condition Assessment Inspection
August 29, 2018**



**Photo 39: Hallway #2,
Viewed from East Wall to West Wall**



**Photo 40: Hallway #2,
Viewed from West Wall to East Wall**

**Former WTP Building Pre-Demolition Condition Assessment Inspection
August 29, 2018**



**Photo 41: Kitchen,
Viewed from East Wall to West Wall**



**Photo 42: Kitchen
Viewed from Southwest Corner to East Wall**

**Former WTP Building Pre-Demolition Condition Assessment Inspection
August 29, 2018**



**Photo 43: Kitchen,
Viewed from Southwest Corner to North Wall**



**Photo 44: Storage #2,
Viewed from South Wall to North Wall**

**Former WTP Building Pre-Demolition Condition Assessment Inspection
August 29, 2018**



**Photo 45: Storage Shed,
Viewed from Doorway to West Wall**



**Photo 46: Storage Shed,
Viewed from Doorway to East Wall**

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APPENDIX D
LIMITED REGULATED MATERIALS
REPORT

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LIMITED REGULATED MATERIALS SURVEY REPORT

**Former Glenville Dam Water Treatment Plant
628 Filter Plant Drive
Fayetteville, North Carolina 28301**



Prepared For:

CDM Smith - Raleigh
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Issue Date: September 21, 2018

F&R Project Number: 66W-0121

Conducted By:

**Michael Krupa
Industrial Hygienist**

Prepared By:

**For: Christian Borrel
Environmental Professional**

Reviewed By:

**Jesse Phillips
Senior Environmental Professional**



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APPENDICES

Appendix A

F&R Personnel Certifications

Appendix B

Laboratory Accreditations

Appendix C

Facility Sketch with Asbestos Sampling Locations:
Interior/Roofing/Exterior

Appendix D

Facility Sketch with Hazardous Materials Sampling Locations:
Interior/Roofing/Exterior

Appendix E

Laboratory Certificates of Analysis
Bulk Sample Chain of Custody Forms

Section 1
Asbestos-Containing Materials

Section 2
Polychlorinated Biphenyls

Appendix F

Photographic Documentation

Section 1
Asbestos-Containing Materials

Section 2
Lead-Based Paint

Section 3
Polychlorinated Biphenyls

Appendix G

Explanation of XRF Data Table
XRF Data Table
XRF Performance Characteristic Sheet



1.0 INTRODUCTION

Froehling & Robertson, Inc. (F&R) conducted limited regulated materials consulting services on August 29 and 30, 2018 at the Former Glenville Dam Water Treatment Plant located at 628 Filter Plant Drive in Fayetteville, North Carolina. It is F&R's understanding that the structure is the subject of planned demolition which may impact building materials. The following sections document the survey procedures and results. Refer to Appendix A for Personnel Accreditation documentation of F&R personnel associated with this survey.

1.1. Purpose

The purpose of the Limited Regulated Materials Survey is to identify Asbestos-Containing Materials (ACMs), Lead-Based Paint (LBP) coatings, and other select Regulated Materials that may require appropriate removal, handling, and disposal procedures prior to scheduled demolition activities at the subject property. This survey is to aid in the determination of health and safety requirements during the conduct of work which may impact identified materials, as well as the preliminary classification of select regulated building materials for possible recycling activities.

1.2. Site Description

The project site is located north of Filter Plant Drive, approximately 300 feet north-west of the intersection with Ames Street in Fayetteville, North Carolina. The Property currently consists of a former water treatment plant, currently unoccupied, which includes a one-story office building (the south wing), which was occupied by offices, storage areas, and bathrooms, attached to a technical building (the north wing) that includes storage rooms, a garage with mezzanine, a kitchen, as well as a mechanical/pipe tunnel. Interior finishes include carpeting, vinyl floor tile, gypsum board walls, brick walls, and ceiling tiles, among others. The building structure is an approximately 5,500 square foot structure of steel-frame and masonry (brick) construction with a slab-on-grade floor. Vinyl siding associated with rigid foam insulation is present on all facades of the building, installed over the original brick-layered walls. Refer to Appendix C for site sketches of the facility, including asbestos sample locations.

Based on information provided by the client, F&R understands that the existing building structure will be demolished.

Note that F&R utilized Hallway and Room names/numbers as they were labeled on client-provided floor plans/drawings; such designations are expected to persist throughout the project. Structural Finished Floor Plans, dated July 2017, were provided to F&R by CDM Smith. Refer to Appendix C for facility sketches manipulated by F&R based upon site conditions observed at the time this survey was conducted.



It should be noted that material and color descriptions are subjective and that, due to the nature of the environment, identical materials and colors may have been labeled as different depending on the lighting, other colors in the area, and other factors.

2.0 SCOPE OF SERVICES

As outlined in F&R proposal number 1866-00353, the survey included the following services with respect to the proposed demolition activities:

- Identification and sampling, as necessary, of suspect ACMs.
- Determination of the presence, location, and estimated quantity of identified ACMs.
- Testing, as necessary, of surface coatings for the presence of Lead.
- Limited identification and sampling, as necessary, of suspect Polychlorinated Biphenyls (PCB)-Containing caulking and glazing compound.
- Visual survey for PCB-Containing Equipment (e.g., Fluorescent Light Ballasts).
- Visual survey for Universal Wastes (e.g., Mercury-Containing Equipment, Mercury Lamps, and Batteries).
- Visual survey of Other Regulated Materials (e.g., equipment containing Ozone Depleting Substances, Tritium Exit signs, and Electronics).

Based on information provided by the client, it is F&R's understanding that the extent of the demolition relates to the entire Former Glenville Dam Water Treatment Plant structure and excludes the adjoining concrete structure which houses pipes and pumping equipment located at the North end of the building. Consequently, only those areas which are anticipated to be impacted by the demolition scope of work were included in this survey, including the building exterior and the roof. However, concealed, inaccessible areas that would have required a more thorough dismantling (i.e. furnaces and HVAC components, etc.) were excluded. As such, while this survey as performed constitutes a relatively comprehensive building survey, this report shall not be utilized for the determination of presence or absence of Regulated Materials, should additional materials be discovered during the effective scheduled demolition.

3.0 LIMITED ASBESTOS-CONTAINING MATERIALS SURVEY

F&R's North Carolina Health Hazards Control Unit (HHCU) Accredited Asbestos Building Inspector, Michael Krupa (North Carolina Asbestos Accreditation #12880), conducted the Asbestos Survey of the current site structure located at 628 Filter Plant Drive in Fayetteville, on August 29 and 30, 2018. The noted Inspector was assisted by Christian Borrel (North Carolina Asbestos Accreditation #13007).

Federal Regulations (40 CFR Part 61, Subpart M – National Emission Standard for Asbestos (NESHAP)), as well as North Carolina State Regulations (10A NCAC 41C .0601 – Asbestos Hazard Management Program (AHMP)) require a thorough asbestos inspection of the structure to be



conducted prior to the commencement of renovation and/or demolition activities. An ACM is defined by the Occupational Safety & Health Administration (OSHA) and the Environmental Protection Agency (EPA) as material containing greater than one percent (1%) asbestos.

3.1. Asbestos-Containing Materials (ACM) Methodology

This survey was conducted in general accordance with the Federal NESHAP and applicable State regulations for the presence of ACMs. The survey was characterized by a visual inspection and sampling of suspect building components at the subject property to be impacted by the proposed demolition activities.

Guidelines utilized in the asbestos survey were established by the EPA, ASTM International (ASTM), and The Environmental Information Association, Inc. (EIA). Utilized guidelines included: the Asbestos Hazard Emergency Response Act (40 CFR Part 763, Subpart E – Asbestos-Containing Materials in Schools (cited as AHERA)), ASTM Standard E2356-14 *Standard Practice for Comprehensive Building Asbestos Surveys*, and the EIA publication *Managing Asbestos in Buildings: A Guide for Owners and Managers – A Revision to the United States Environmental Protection Agency’s 1985 document Guidance for Controlling Asbestos-Containing Materials in Buildings (EPA 560/5-85-024) Known as the Purple Book*.

F&R’s aforementioned Industrial Hygienists collected and submitted suspect asbestos-containing bulk samples to the laboratory, of which, a total of one hundred eleven (111) suspect asbestos-containing bulk samples with discernable layers were analyzed. Due to multiple layers, a total of one hundred twenty three (123) samples were analyzed.

Samples of suspect ACMs were organized as per the AHERA concept of Homogeneous Area (HA), collected, and transported to the EMSL Analytical, Inc. (EMSL) in Morrisville, North Carolina. EMSL is a National Institute for Standards and Technology (NIST) NVLAP accredited laboratory (NVLAP Lab Code: 200671-0) for analysis by Polarized Light Microscopy (PLM) following EPA Method 600/R-93/116. Refer to Appendix B for Laboratory Certificates of Accreditations, and Appendix D for Laboratory Certificates of Analysis and Bulk Sample Chain of Custody Forms for further description of sampled materials/analytical results.

F&R collected bulk samples of roofing materials during this survey. However, due to the nature of the present roofing material (metal roofing), no roof core samples were collected.

3.2. Asbestos-Containing Materials Findings

The following material types were identified, sampled, and accordingly homogenized based upon similar construction discovered during bulk sampling:



- Vinyl Floor Tile/Mastic
- Carpet Glue/Mastic
- Duct Seam Tape/Mastic
- Concrete – Various Applications
- Brick/Mortar
- Terra Cotta Chimney Sleeve
- Roof Coating
- Exterior Window/Door Caulking
- Window Glazing
- Roofing Mastics/Sealants
- Interior Caulking – Various Applications
- Drywall/Joint Compound
- Textured Ceiling Coatings
- Mastics – Various Applications
- Sink Undercoating
- Chimney Liner/Mastic
- Roof Composite Shingles/Felt Paper
- Cementitious Piping
- Exterior HVAC Duct Coating

The following table presents a summary of survey results from sampling events performed on August 29 and 30, 2018. Refer to Appendix C for illustration of the locations of collected bulk samples. Positive asbestos samples (samples containing >1% asbestos) are in **BOLD** type.

SUSPECT ASBESTOS-CONTAINING MATERIALS SAMPLE INFORMATION

HA #	Sample #	Situation ¹	Sample Location(s)	Material Description	Laboratory Description	Result (Percent ACM)
I1	I1-1	I	East Building, South Room	12" x 12" Off-White with Gray Specks Floor Tile	White Non-Fibrous Homogeneous	NAD ²
I1				Mastic	Tan/Black Fibrous Homogeneous	NAD
I1	I1-2	I	East Building, Middle Room	12" x 12" Off-White with Gray Specks Floor Tile	Gray Non-Fibrous Homogeneous	NAD
I1				Mastic	Gray/Black Fibrous Homogeneous	NAD
I2	I2-1	I	East Building, South Room	12" x 12" Lt. Gray with Black Specks Floor Tile	White Non-Fibrous Homogeneous	NAD
I2				Mastic	Black Fibrous Homogeneous	NAD
I2	I2-2	I	East Building, Middle Room	12" x 12" Lt. Gray with Black Specks Floor Tile	Gray/Black Non-Fibrous Homogeneous	NAD
I2				Mastic	Yellow Fibrous Homogeneous	NAD
I3	I3-1	I	East Building, Bathroom #2	12" x 12" White with Blue Specks Floor Tile	White Non-Fibrous Homogeneous	NAD



HA #	Sample #	Situation ¹	Sample Location(s)	Material Description	Laboratory Description	Result (Percent ACM)
13				Mastic	Brown/Tan Fibrous Homogeneous	NAD
13	13-2	I	East Building, Bathroom #2	12" x 12" White with Blue Specks Floor Tile	White/Blue Non-Fibrous Homogeneous	NAD
13				Mastic	Yellow Fibrous Homogeneous	NAD
14	14-1	I	East, Building, Office #3	Yellow Carpet Mastic	Yellow Fibrous Homogeneous	NAD
14	14-2	I	East, Building, Office #2	Yellow Carpet Mastic	Yellow Fibrous Homogeneous	NAD
15	15-1	I	East Building, Hallway #1	12" x 12" Gray with Black Specks Floor Tile	White Non-Fibrous Homogeneous	NAD
15				Mastic	Tan/Black Fibrous Homogeneous	NAD
15	15-2	I	East Building, Hallway #1	12" x 12" Gray with Black Specks Floor Tile	Gray/White/Black Non-Fibrous Homogeneous	NAD
15				Mastic	Black/Yellow Fibrous Homogeneous	NAD
16	16-1	I	East Building, Office #2	Gray Concrete Slab	Gray Non-Fibrous Homogeneous	NAD
16				Mastic	Tan Fibrous Homogeneous	NAD
16	16-2	I	East Building, Office #1	Gray Concrete Slab	Gray Non-Fibrous Homogeneous	NAD
16				Mastic	Yellow Fibrous Homogeneous	NAD
17	17-1	I	East Building, South Room	Red Fireplace Brick	Red Non-Fibrous Homogeneous	NAD
17	17-2	I	East Building, South Room	Red Fireplace Brick	Red Non-Fibrous Homogeneous	NAD
18	18-1	I	East Building, South Room	Gray Fireplace Brick Mortar	Gray Non-Fibrous Homogeneous	NAD



HA #	Sample #	Situation ¹	Sample Location(s)	Material Description	Laboratory Description	Result (Percent ACM)
I8	I8-2	I	East Building, South Room	Gray Fireplace Brick Mortar	Gray Non-Fibrous Homogeneous	NAD
I9	I9-1	I	East Building, South Room at sides of fireplace surround	White Fireplace Caulking	White Non-Fibrous Homogeneous	NAD
I9	I9-2	I	East Building, South Room at sides of fireplace surround	White Fireplace Caulking	White Non-Fibrous Homogeneous	NAD
I10	I10-1	I	East Building, South Room	White/Gray Drywall	Brown/Gray Fibrous Homogeneous	NAD
I10	I10-2	I	East Building, Office #2	White/Gray Drywall	Brown/Gray Fibrous Homogeneous	NAD
I10	I10-3	I	East Building, Office #2	White/Gray Drywall	Brown/Gray Fibrous Homogeneous	NAD
I11	I11-1	I	East Building, South Room	White Joint Compound	White Non-Fibrous Homogeneous	NAD
I11	I11-2	I	East Building, Office #2	White Joint Compound	White Non-Fibrous Homogeneous	NAD
I11	I11-3	I	East Building, Office #2	White Joint Compound	White Non-Fibrous Homogeneous	NAD
I12	I12-1	I	East Building, Office #1	White Swirl Pattern Textured Ceiling Coating	White Non-Fibrous Homogeneous	NAD
I12	I12-2	I	East Building, Office #3	White Swirl Pattern Textured Ceiling Coating	White Non-Fibrous Homogeneous	NAD
I12	I12-3	I	East Building, Hallway #1 by Storage Room #1	White Swirl Pattern Textured Ceiling Coating	White Non-Fibrous Homogeneous	NAD
I13	I13-1	I	East Building, Hallway #1, South end	White Dimples Pattern Textured Ceiling Coating	White Non-Fibrous Homogeneous	NAD
I13	I13-2	I	East Building, Office #2	White Dimples Pattern Textured Ceiling Coating	White Non-Fibrous Homogeneous	NAD
I13	I13-3	I	East Building, Hallway #1, North end	White Dimples Pattern Textured Ceiling Coating	White Non-Fibrous Homogeneous	NAD



HA #	Sample #	Situation ¹	Sample Location(s)	Material Description	Laboratory Description	Result (Percent ACM)
I14	I14-1	I	East Building, Storage Room #1	Gray/Brown Duct Mastic	Gray Non-Fibrous Homogeneous	NAD
I14	I14-2	I	East Building, Storage Room #1	Gray/Brown Duct Mastic	Brown/Gray Non-Fibrous Homogeneous	NAD
I15	I15-1	I	East Building, Storage Room #1	Gray/Yellow Duct Seam Tape	Gray Fibrous Homogeneous	NAD
I15				Mastic	Yellow Fibrous Homogeneous	NAD
I15	I15-2	I	East Building, Storage Room #1	Gray/Yellow Duct Seam Tape	White/Silver/Yellow Fibrous Homogeneous	NAD
I15				Mastic	Beige Fibrous Homogeneous	NAD
I16	I16-1	I	East Building, Middle Room at base of brick walls	White/Gray Base Caulking	White Non-Fibrous Homogeneous	NAD
I16	I16-2	I	East Building, Middle Room at base of brick walls	White/Gray Base Caulking	White Non-Fibrous Homogeneous	NAD
I17	I17-1	I	East Building, Middle Room, North side	White Interior Window Caulking	White Non-Fibrous Homogeneous	NAD
I17	I17-2	I	East Building, Middle Room, South side	White Interior Window Caulking	White Non-Fibrous Homogeneous	NAD
I18	I18-1	I	East Building, South Room at stainless steel sink	White Sink Undercoating	White Fibrous Homogeneous	NAD
I18	I18-2	I	East Building, South Room at stainless steel sink	White Sink Undercoating	White Fibrous Homogeneous	NAD
I19	I19-1	I	West Building, North Room	Gray Concrete Slab (Original)	Gray Non-Fibrous Homogeneous	NAD
I19	I19-2	I	West Building, North Room	Gray Concrete Slab (Original)	Gray Non-Fibrous Homogeneous	NAD
I20	I20-1	I	West Building, North Room, patch in floor slab	White Concrete Patch	Gray Non-Fibrous Homogeneous	NAD
I20	I20-2	I	West Building, North Room, patch in floor slab	White Concrete Patch	Gray Non-Fibrous Homogeneous	NAD



HA #	Sample #	Situation ¹	Sample Location(s)	Material Description	Laboratory Description	Result (Percent ACM)
I21	I21-1	I	West Building, North Room	Gray Concrete Joint in Slab	Gray Non-Fibrous Homogeneous	NAD
I21	I21-2	I	West Building, North Room	Gray Concrete Joint in Slab	Gray Non-Fibrous Homogeneous	NAD
I22	I22-1	I	West Building, Hallway #2	Gray Concrete Slab	Tan Non-Fibrous Homogeneous	NAD
I22	I22-2	I	West Building, Kitchen	Gray Concrete Slab	Gray Non-Fibrous Homogeneous	NAD
I23	I23-1	I	West Building, Kitchen wall	White Drywall	Gray Fibrous Homogeneous	NAD
I23	I23-2	I	West Building, Kitchen wall	White Drywall	Brown/Gray Fibrous Homogeneous	NAD
I24	I24-1	I	West Building, Kitchen ceiling	White Joint Compound	White Non-Fibrous Homogeneous	<1% Chrysotile³
I24	I24-2	I	West Building, Kitchen ceiling	White Joint Compound	White Non-Fibrous Homogeneous	<1% Chrysotile
I25	I25-1	I	West Building, Kitchen	White Caulking at Electrical Outlets	White Non-Fibrous Homogeneous	NAD
I25	I25-2	I	West Building, Kitchen	White Caulking at Electrical Outlets	White Fibrous Homogeneous	NAD
E1	E1-1	R	Low Roof, East Chimney	Red Chimney Brick	Red Non-Fibrous Homogeneous	NAD
E1	E1-2	R	Low Roof, South Chimney	Red Chimney Brick	Red Non-Fibrous Homogeneous	NAD
E2	E2-1	R	Low Roof, East Chimney	Gray Chimney Brick Mortar	White Non-Fibrous Homogeneous	NAD
E2	E2-2	R	Low Roof, South Chimney	Gray Chimney Brick Mortar	Gray Non-Fibrous Homogeneous	NAD
E3	E3-1	R	Low Roof, East Chimney	Terra Cotta Chimney Sleeve	Brown Non-Fibrous Homogeneous	NAD
E3	E3-2	R	Low Roof, East Chimney	Terra Cotta Chimney Sleeve	Red Non-Fibrous Homogeneous	NAD



HA #	Sample #	Situation ¹	Sample Location(s)	Material Description	Laboratory Description	Result (Percent ACM)
E4	E4-1	R	Low Roof, South Chimney Flashing	Black Chimney Mastic/Sealant	Black Fibrous Homogeneous	3% Chrysotile
E4	E4-2	R	Low Roof, South Chimney Flashing	Black Chimney Mastic/Sealant	Brown/Black Fibrous Homogeneous	5% Chrysotile
E5	E5-1	R	Low Roof, East side	Silver Roof Coating	Silver Fibrous Homogeneous	2% Chrysotile
E5	E5-2	R	Low Roof, center	Silver Roof Coating	Gray/Silver Fibrous Homogeneous	2% Chrysotile
E6	E6-1	R	High Roof, NE Corner	Silver Roof Coating	Silver Fibrous Homogeneous	3% Chrysotile
E6	E6-2	R	High Roof, NE Corner	Silver Roof Coating	Silver Fibrous Homogeneous	5% Chrysotile
E7	E7-1	R	East Building, Entrance Awning at East side	Silver/Black Asphaltic Roof Shingle	Black Fibrous Homogeneous	NAD
E7	E7-2	R	East Building, Entrance Awning at East side	Silver/Black Asphaltic Roof Shingle	Gray/Black Fibrous Homogeneous	NAD
E8	E8-1	R	East Building, Entrance Awning at East side under roof shingle	Black Roof Felt Paper Underlayment	Black Fibrous Homogeneous	NAD
E8	E8-2	R	East Building, Entrance Awning at East side under roof shingle	Black Roof Felt Paper Underlayment	Brown/Black Fibrous Homogeneous	NAD
E9	E9-1	R	West Building, South Entrance Awning	Silver/Black Asphaltic Roof Shingle	Black Fibrous Homogeneous	NAD
E9	E9-2	R	West Building, West Entrance Awning	Silver/Black Asphaltic Roof Shingle	Gray/Black Fibrous Homogeneous	NAD
E10	E10-1	E	East Building, South façade door	Gray Cementitious Window, Door, and Siding Caulking	Gray Non-Fibrous Homogeneous	NAD
E10	E10-2	E	East Building, south façade window	Gray Cementitious Window, Door, and Siding Caulking	Gray Non-Fibrous Homogeneous	NAD
E11	E11-1	E	East Building, North façade at fixed windows	Tan Exterior Rubberized Window Caulking	Clear Non-Fibrous Homogeneous	NAD



HA #	Sample #	Situation ¹	Sample Location(s)	Material Description	Laboratory Description	Result (Percent ACM)
E11	E11-2	E	East Building, North façade at fixed windows	Tan Exterior Rubberized Window Caulking	Tan/Clear Non-Fibrous Homogeneous	NAD
E12	E12-1	E	East Building, Entrance at East side	Silver Rubberized Door Caulking	Gray Non-Fibrous Homogeneous	NAD
E12	E12-2	E	East Building, Entrance at East side	Silver Rubberized Door Caulking	Brown/Gray Non-Fibrous Homogeneous	NAD
E13	E13-1	E	West Building, West façade window	Black Rubberized Window Caulking	Gray Non-Fibrous Homogeneous	NAD
E13	E13-2	E	West Building, West façade window	Black Rubberized Window Caulking	Brown/Gray Fibrous Homogeneous	NAD
E14	E14-1	E	West Building, West façade window	White Cementitious Window Glazing	White Non-Fibrous Homogeneous	NAD
E14	E14-2	E	West Building, West façade window	White Cementitious Window Glazing	White Non-Fibrous Homogeneous	NAD
E15	E15-1	E	West Building, South façade door	Gray Cementitious Window and Door Caulking	Gray Non-Fibrous Homogeneous	NAD
E15	E15-2	E	West Building, South façade window	Gray Cementitious Window and Door Caulking	Gray Non-Fibrous Homogeneous	NAD
E16	E16-1	E	East Building, South façade window	White Cementitious Window Glazing	White Non-Fibrous Homogeneous	NAD
E16	E16-2	E	East Building, South façade window	White Cementitious Window Glazing	White Non-Fibrous Homogeneous	NAD
E17	E17-1	E	East Building, South façade at HVAC unit	Silver HVAC Duct Coating	Black/Silver Fibrous Homogeneous	NAD
E17	E17-2	E	East Building, North façade at HVAC unit	Silver HVAC Duct Coating	Silver Fibrous Homogeneous	NAD
E18	E18-1	E	East Building, corner at East side	Red Exterior Brick	Tan Non-Fibrous Homogeneous	NAD
E18	E18-2	E	East Building, North side	Red Exterior Brick	Red Non-Fibrous Homogeneous	NAD
E19	E19-1	E	East Building, corner at East side	Gray Brick Mortar	White Non-Fibrous Homogeneous	NAD



HA #	Sample #	Situation ¹	Sample Location(s)	Material Description	Laboratory Description	Result (Percent ACM)
E19	E19-2	E	East Building, North side	Gray Brick Mortar	Gray Non-Fibrous Homogeneous	NAD
E20	E20-1	E	East Building, corner at East side	Gray Concrete Foundation	Gray Non-Fibrous Homogeneous	NAD
E20	E20-2	E	East Building, North side	Gray Concrete Foundation	Gray Non-Fibrous Homogeneous	NAD
E21	E21-1	E	In front of East Building in lawn	Gray Cement Fiber Pipe	Gray Fibrous Homogeneous	25% Chrysotile 15% Crocidolite
E21	E21-2	E	In front of East Building in lawn	Gray Cement Fiber Pipe	Gray Fibrous Homogeneous	20% Chrysotile 15% Crocidolite
E22	E22-1	E	In ramp at North entrance of East Building	Cement Lining in Metal Pipe	Gray Non-Fibrous Homogeneous	NAD
E22	E22-2	E	In ramp at North entrance of East Building	Cement Lining in Metal Pipe	Gray/Red Non-Fibrous Homogeneous	NAD
E23	E23-1	E	West Building, North facade	Gray Concrete Foundation	Tan Non-Fibrous Homogeneous	NAD
E23	E23-2	E	West Building, North facade	Gray Concrete Foundation	Gray/Tan Non-Fibrous Homogeneous	NAD
E24	E24-1	E	West Building, North façade under vinyl siding	White/Gray Cement Coating	Gray/White Non-Fibrous Homogeneous	NAD
E24	E24-2	E	West Building, North façade under vinyl siding	White/Gray Cement Coating	Gray/White Non-Fibrous Homogeneous	NAD
E24	E24-3	E	West Building, North façade under vinyl siding	White/Gray Cement Coating	Gray/White Non-Fibrous Homogeneous	NAD
E25	E25-1	E	West Building, South façade	Red Exterior Brick	White/Red Non-Fibrous Homogeneous	NAD
E25	E25-2	E	West Building, South façade	Red Exterior Brick	Red Non-Fibrous Homogeneous	NAD
E26	E26-1	E	West Building, South façade	Gray Brick Mortar	White Non-Fibrous Homogeneous	NAD
E26	E26-2	E	West Building, South façade	Gray Brick Mortar	Gray Non-Fibrous Homogeneous	NAD



HA #	Sample #	Situation ¹	Sample Location(s)	Material Description	Laboratory Description	Result (Percent ACM)
E27	E27-1	E	West Building, old wood windows	White/Black Window Caulking	Gray Non-Fibrous Homogeneous	NAD
E27	E27-2	E	West Building, old wood windows	White/Black Window Caulking	White/Black Non-Fibrous Homogeneous	NAD
E28	E28-1	E	West Building, old wood windows	White Cementitious Window Glazing	Gray/White Non-Fibrous Homogeneous	NAD
E28	E28-2	E	West Building, old wood windows	White Cementitious Window Glazing	White Fibrous Homogeneous	NAD

¹Situation: I – Building Interior; R - Roof; E – Exterior

²NAD: No Asbestos Detected

³**Bold:** Asbestos-Containing Material or Trace (<1%) Asbestos Present

3.3. Asbestos-Containing Materials Inventory

F&R conducted a survey of the reasonably and safely accessible portions of the building. As the interiors of the HVAC units, electrical panels, or plumbing systems were not accessible during the site visit without significant dismantlement, suspect ACM associated with these components were not represented during this survey and should therefore be presumed positive.

The following table presents identified materials containing greater than 1% asbestos, detectable concentrations of asbestos at concentrations <1%, as well as presumed materials with regard to F&R survey activities. Estimated quantities of the ACMs identified are provided for use in development of budgetary estimates for demolition and may not accurately represent all materials present. Photographic documentation of ACMs for reference is provided in Appendix F: Section 1.

ASBESTOS-CONTAINING MATERIALS INVENTORY

HA #	Material Description	Material Location(s)	Result (Percent ACM)	NESHAP Category	Estimated Quantity
I24	White Joint Compound	West Building, Kitchen	<1% Chrysotile	Friable Class II	1,200 SF
E4	Black Chimney Mastic/Sealant	Low Roof – South Chimney Flashing	3-5% Chrysotile	Category I Non-Friable	10 SF
E5	Silver Roof Coating	Low Roof (East Building)	2% Chrysotile	Category I Non-Friable	5,500 SF
E6	Silver Roof Coating	High Roof (West Building)	3-5% Chrysotile	Category I Non-Friable	3,000 SF
E21	Gray Cement Fiber Pipe*	In front of East Building in Lawn	20-25% Chrysotile, 15% Crocidolite	Category II Non-Friable	30 LF

SF = Square Feet | LF = Linear Feet | CF = Cubic Feet | TBD = To Be Determined



* A portion of the Gray Cement Fiber Pipe is buried below grade and will require excavation to access the material for proper removal and disposal. F&R observed that the length of the pipe appeared to be approximately 30 linear feet; however, F&R cannot preclude the presence of other subsurface plumbing infrastructure which may constitute ACM. See Photo Documentation in Appendix E of the report for details regarding the location and accessibility of this material.

F&R presumes that, where materials have been documented to be ACMs and where those materials are similar to other materials which have not been found to be positive, those similar materials will be considered to be ACMs (i.e. where one material was analyzed and found to be positive, it is prudent to consider other similar materials positive, despite potential analytical data to the contrary).

3.3.1. Trace Asbestos

Asbestos (<1% Chrysotile asbestos) was detected in two (2) representative samples of the HA #124 White Joint Compound located in the West Building Kitchen. Although this concentration of asbestos is below the regulatory threshold under EPA regulations, OSHA has regulations for the removal and disturbance of trace levels of asbestos. F&R recommends that the owner either conduct follow-up sampling of this material using a more sensitive method (TEM Analysis) to evaluate if there is asbestos present in this material or assume that the material is asbestos containing and manage it accordingly. F&R notes, however, that this is not a regulatory requirement and our recommendation is based on experience and good practice.

3.3.2. Presumed Asbestos-Containing Materials

During the conduct of this survey, sampling was limited to those materials which were within the areas designated by the client, which were safely accessible, and which were able to be sampled without damaging systems or structures. As such, some materials should be presumed to be positive, unless sampling is conducted and shown to be negative. Such presumed asbestos containing materials (PACMS) include, but are not limited to:

- Gaskets and packing materials in plumbing or hydraulic systems, where present,
- Electrical panel backing/arc deflectors/spark arresters,
- Internal components within the HVAC units,
- Et al.

Note that asbestos was used in over 3,000 known products and was used extensively in construction materials including in insulation and finish materials such as drywall-based systems, acoustical tiles, caulks and mastics, vinyl-based materials, and specialty products. Asbestos also continues to be used in new construction because, as stated by the EPA, "the manufacture, importation, processing, and distribution in commerce of [various] products [...] are not banned."



3.4. Asbestos-Containing Materials Recommendations

As detailed above, several materials were identified as asbestos-containing, utilized in various instances through the structure. Prior to demolition activities, F&R recommends that the identified ACMs (including materials with trace concentrations) be appropriately removed, handled, and disposed of by an appropriately licensed/accredited Abatement Contractor utilizing appropriately licensed/accredited personnel.

F&R further recommends that a third party Asbestos Professional be retained to provide on-site surveillance and guidance of the Asbestos Abatement Contractor to confirm complete and proper removal/disposal of ACMs in accordance with applicable federal, state, and local regulations. This recommendation is made as a best practice to reduce potential exposure to workers and limit liability.

In addition, it should be noted that through NESHAP Applicability Determinations, asbestos bulk samples analyzed via PLM which indicate a result of asbestos content to be less than ten (10) percent, including trace amounts (<1%), the material in question shall either be assumed to be an ACM or further analyzed via PLM Point Count or TEM to verify asbestos content. Results obtained via PLM Point Count or TEM analysis shall supersede previous results obtained by standard PLM analysis. Samples with analytical results via PLM which indicate that no asbestos was detected are not required to be further analyzed via PLM Point Count or TEM.

Should additional suspect ACMs be discovered during demolition activities that have not been sampled and will be disturbed, F&R recommends the work be temporarily halted. Samples of suspect materials should be collected, analyzed, and handled accordingly prior to the resumption of renovation and/or demolition activities.

3.5. Applicable Regulations

3.5.1. EPA/NESHAP Regulations for Asbestos-Containing Materials

The U.S. Environmental Protection Agency promulgated the National Emission Standards for Hazardous Air Pollutants (NESHAP) [40 CFR Part 61], which addresses the application, removal, and disposal of asbestos-containing materials (ACM). Under NESHAP the following categories are defined for asbestos-containing materials:

Friable - When dry, can be crumbled, pulverized, or reduced to powder by hand pressure.

Non-friable - When dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure.

Category I Non-friable ACM - Packings, gaskets, resilient floor coverings, and asphalt roofing products containing more than 1% asbestos.



Category II Non-friable ACM – Material, excluding Category I Non-friable ACM, which contains more than 1% asbestos.

Regulated Asbestos Containing Material (RACM) – One of the following:

1. Friable ACM
2. Category I Non-friable ACM that has become friable.
3. Category I Non-friable ACM that will be or has been subjected to sanding, grinding, cutting, or abrading.
4. Category II Non-friable ACM that has a high probability of becoming, or has become, friable by the forces expected to act on the material in the course of demolition or renovation operations.

Under NESHAP, the following actions are required:

1. Prior to the commencement of demolition or renovation activities, the building owner must inspect the affected facility or part of the facility where the demolition or renovation activities will occur for the presence of asbestos.
2. Remove RACM from the facility before activities begin that would break up, dislodge, or similarly disturb the material or preclude access for subsequent removal.
3. RACM need not be removed if:
 - a) It is Category I non-friable ACM that is not in poor condition.
 - b) It is on a facility component that is encased in concrete or other similar material and is adequately wet whenever exposed.
 - c) It was not accessible for testing and was therefore not discovered until after demolition began and because of the demolition the material cannot be safely removed.
 - d) It is Category II non-friable ACM and the probability is low that the material will become crumbled, pulverized, or reduced to powder during demolition.

3.5.2. North Carolina Asbestos Hazard Management Program

The North Carolina Health Hazards Control Unit (HHCU) administers the Asbestos Hazard Management Program (AHMP) which accredits individuals and issues permits for asbestos removal projects on behalf of the Federal NESHAP program which has been delegated to the State of North Carolina.



For more information, visit the North Carolina HHCU website at:
<http://epi.publichealth.nc.gov/asbestos/ahmp.html>.

3.5.3. OSHA Asbestos Regulations

The Occupational Safety and Health Administration (OSHA) regulates employee exposure to asbestos under 29 CFR 1926.1101 and 29 CFR 1910.1001. Work associated with known or suspect ACMs must be conducted according to these regulations in addition to the noted EPA regulations.

4.0 LIMITED LEAD-BASED PAINT SURVEY

F&R personnel, Michael Krupa and Christian Borrel, performed the testing of surface coatings for lead on August 30, 2018 using a Heuresis Pb200i X-Ray Fluorescence (XRF) gun. Refer to Appendix G for the XRF Performance Characteristic Sheet.

For definitions of terms used in this document with regard to Lead-Based Paint, please reference the Glossary of the U.S. Department of Housing and Urban Development (HUD) Guidelines for the Evaluation and Control of Lead-Based paint Hazards in Housing (Second Edition, July 2012).

Based on the nature of this survey, when one component tests positive for the presence of lead similar painted/coated components shall be assumed to be lead-containing, unless additional testing is performed.

4.1. Lead-Based Paint Survey Methodology

The survey was conducted in general accordance with EPA's work practice standards for conducting LBP activities (40 CFR 745.227), and the HUD Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing (Second Edition, July 2012); however, this was not a comprehensive surface-by-surface investigation for LBP, but rather a screening survey of major coated surfaces where the presence of LBP is suspected.

4.1.1. XRF Testing

Sampling of surface coatings was conducted utilizing Heuresis Pb200i X-Ray Fluorescence (XRF) Lead Paint Analyzer (Serial Number 1460). Only accessible painted, coated, and/or varnished surfaces were tested using the XRF.

The XRF contains a small radioisotopic source and operates on the principle of x-ray fluorescence, whereby lead atoms in a surface coating are stimulated to emit characteristic x-rays, which are then detected by the instrument. Levels of lead are reported in units of milligrams per square centimeter (mg/cm²). The XRF can measure surface or non-surface concentrations of lead with



95% accuracy at the HUD action level of 1.0 mg/cm². The XRF is able to accurately detect a concentration as low as 0.1 mg/cm² of lead. The XRF classifies coated surfaces as “positive”, “negative”, or “null” for lead content based on the action level (1.0 mg/cm²) and the performance characteristics of the XRF. The XRF was checked for calibration before and after the survey. The calibration was checked against a standard reference material (1.04 mg/cm² NIST Standard) supplied by the XRF manufacturer. A copy of the XRF Performance Characteristic sheet is included as an attachment to this report.

Positive: Lead is present at or above the action level of 1.0 mg/cm² on *one or more* of the components tested.

Negative: Lead is not present at or above the action level of 1.0 mg/cm² on any of the components tested.

Null: Insufficient data was collected by the XRF during the sample time to determine if the surface is positive or negative (i.e. – premature removal or instrument slippage, terminating the test).

4.2. Lead-Based Paint Survey Findings

4.2.1. XRF Survey Results

A total of two hundred eleven (211) XRF readings, excluding calibration readings, were collected from the interior and exterior of the building. Twenty-six (26) of the readings collected from the Project site were positive for LBP when compared to the action level of 1.0 mg/m². Refer to the following table and to Appendix F, XRF Data Table for a listing of the readings and respective information as well as an explanation of the table and the Performance Characteristic Sheet. The following table presents the positive readings collected.

XRF READINGS FOR LEAD-BASED PAINT

Reading Number	Component	Paint Color	Substrate	Location	Floor	Side	Lead Content
410	Window Casing	White	Wood	South Room	1	A	8.1 mg/cm ²
414	Window Casing	Brown	Wood	South Room	1	C	7.3 mg/cm ²
419	Ceiling	White	Wood	South Room	1	A	13.7 mg/cm ²
420	Crown Molding	White	Wood	South Room	1	A	8.4 g/cm ²
421	Crown Molding	Light Blue	Wood	South Room	1	D	1.1 mg/cm ²
461	Window Casing	White	Wood	Office #3	1	C	1.8 mg/cm ²
466	Sink	Off-White	Metal	Bathroom #2	1	B	29.1 mg/cm ²



Reading Number	Component	Paint Color	Substrate	Location	Floor	Side	Lead Content
492	Window Casing	White	Wood	Middle Room	1	A	1.0 mg/cm ²
520	Stair Frame	White	Wood	North Room	1	A	1.2 mg/cm ²
524	Window Casing	White	Wood	North Room	M	A	2.0 mg/cm ²
525	Window Sill	White	Wood	North Room	M	A	1.1 mg/cm ²
534	Window Casing	Off-White	Wood	North Room	M	D	1.1 mg/cm ²
536	Window Sash	Off-White	Wood	North Room	M	D	5.5 mg/cm ²
537	Wall	White	Brick	Hallway #2	1	D	1.2 mg/cm ²
538	Wall	White	Brick	Hallway #2	1	B	1.4 mg/cm ²
540	Window Casing	White	Wood	Hallway #2	1	B	1.3 mg/cm ²
545	Door	White	Wood	Hallway #2	1	C	1.0 mg/cm ²
546	Ceiling	White	Wood	Hallway #2	1	A	1.1 mg/cm ²
552	Door Jamb	White	Wood	Kitchen	1	A	1.5 mg/cm ²
555	Garage Door Casing	White	Wood	Kitchen	1	D	14.4 mg/cm ²
567	Door Casing	White	Wood	Storage #2	1	A	2.5 mg/cm ²
568	Door Jamb	White	Wood	Storage #2	1	A	3.0 mg/cm ²
573	Pipe	Off-White	Metal	Storage #2	1	A	2.1 mg/cm ²
590	Soffit	White	Wood	Exterior	1	A	4.5 mg/cm ²
591	Siding	White	Wood	Exterior	1	A	1.6 mg/cm ²
592	Roof	Silver	Metal	Exterior	1	A	6.5 mg/cm ²

4.2.1.1. Locations of Detected Lead-Based paint

Based on the detection of LBP on specific component types and our observation of an apparent homogenous painting history, the following building components should be considered to be coated with LBP:



LEAD-BASED PAINT MATERIALS INVENTORY

Material Description	Color	Substrate	Material Location(s)
Interior			
Window Casings	White	Wood	East Building: all white painted window casings in the South Room, Office #3, and Middle Room West Building: all white painted window casings in the North Room and Hallway #2
Window Casings	Brown	Wood	East Building: all brown painted window casings in the South Room
Window Casings	Off-White	Wood	West Building: all off-white painted window casings in the North Room
Window Sills	White	Wood	West Building: all white painted window sills in the North Room
Window Sashes	Off-White	Wood	West Building: all off-white painted window sashes in the North Room
Door Casings	White	Wood	West Building: all white painted door casings in Storage #2
Door Jambs	White	Wood	West Building: all white painted door jambs in the Kitchen and Storage #2
Doors	White	Wood	West Building; all white painted doors in Hallway #2
Garage Door Casings	White	Wood	West Building: all white painted garage door casings in the Kitchen
Ceilings	White	Wood	East Building: all white painted ceiling components in the South Room West Building: all white painted ceiling components in Hallway #2
Crown Moldings	White	Wood	East Building: all white painted crown molding in the South Room
Crown Moldings	Light Blue	Wood	East Building: all light blue painted crown molding in the South Room
Sink	Off-White	Metal	East Building Bathroom #2 (one sink)
Stair Frames (stringer)	White	Wood	West Building North Room (both side of stairs)
Walls	White	Brick	West Building: all white painted walls in Hallway #2
Pipe Flange	Off-White	Metal	West Building Storage #2 (remnant pipe section)



Material Description	Color	Substrate	Material Location(s)
Solid Lead Pipe	N/A	Metal	West Building North Room (Lower Level in wall)
Exterior			
Soffits	White	Wood	Exterior soffits (all white painted soffits concealed by vinyl soffit covering)
Siding	White	Wood	Exterior Facades (all white painted siding boards concealed by vinyl siding components)
Roof	Silver	Metal	East Building Rooftop and West Building Rooftop

The above table details only those building materials with painted and/or coated surfaces with a reported lead concentration greater than or equal to 1.0 mg/cm². However, readings of the majority of painted or coated surfaces indicated a lead content between 0.1 mg/cm² and 0.9 mg/cm².

Note that the sink finish may not constitute lead based paint; however, it exceeded the noted threshold and is included here for the convenience of the client.

Note that the solid lead pipe may not constitute lead based paint; however, it is included here for the convenience of the client.

Caulking materials associated with interior and exterior door, window, and vinyl siding components may additionally contain PCBs. Roof coatings associated with the East Building Roof and the West Building Roof may additionally contain asbestos. See appropriate sections of this Report for additional details regarding asbestos and PCB content.

4.2.1.2. Inaccessible or Presumed Lead-Based Paint

During the conduct of this survey, testing was limited to those materials which were safely accessible and readily visible. As such, some materials should be presumed to be positive, unless sampling is conducted and shown to be negative. Such presumed LBP coated components include, but are not limited to:

- Painted components within the attic; and
- Original fascia components.

4.3. Lead-Based Paint Conclusions & Recommendations

This survey concludes that building components located on both the exterior and interior of the structure contain lead-based paint/coatings and lead plumbing systems. Photographic



documentation of select lead-containing paint/coatings on building materials is presented in Appendix F: Section 2.

F&R recommends that activities which may disturb such coatings be conducted following appropriate Federal and State regulations. Federal regulations with regard to worker safety and disposal requirements are summarized in the following Section – Applicable Regulations; this is not an exhaustive list.

4.4. Applicable Regulations

4.4.1. OSHA Regulations for Lead-Based Paint

While the majority of materials tested at the site were negative for lead based paint and/or surface coatings, other painted and/or coated surfaces or materials containing lead may contain sufficient concentrations of lead, which when disturbed, may generate lead dust greater than the “Action Level” concentration of 30 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) or greater than the “Permissible Exposure Limit” of 50 micrograms per cubic meter established by the OSHA “Lead Exposure in Construction Rule” (29 CFR 1926.62). The OSHA standard does not define acceptable levels of lead in paint at which no exposure to airborne lead (above the action level) would be expected; however, guidance is available for work practices which present the highest risk for lead exposure to workers. Rather, OSHA defines airborne concentrations and references specific types of work practices and operations from which a lead hazard may be generated (reference 29 CFR 1926.62, section d). Environmental and personnel monitoring should be conducted during removal or demolition processes (as applicable) to determine actual personal exposure. This monitoring information can be used to determine the levels of personnel protection and environmental controls required for work involving specific removal/demolition processes on specific structures. Under OSHA requirements, the Contractor performing the work will be required to conduct this monitoring. It is important to note that environmental controls will vary dependent upon the content of lead in paint, the process used to remove it, duration of the work, and the amount of paint to be removed.

F&R recommends that workers disturbing painted (or coated) surfaces as part of this project receive OSHA Lead in Construction Awareness training and that engineering controls and hygiene practices described in 29 CFR 1926.62 be followed during the disturbance of painted (or coated) surfaces.

4.4.2. EPA Regulations for Lead-Based Paint

For disposal of construction/demolition debris that has LBP, testing may be required as specified by the Environmental Protection Agency (EPA) for lead content to determine proper disposal. EPA regulations require that a generator of waste determine if that waste is hazardous by performing testing in accordance with the requirements of 40 CFR 261.11 or for wastes that may



be RCRA hazardous (such as items with high lead content), the generator may assume that the waste is hazardous and comply with the hazardous waste regulation. The need for determination of disposal may be additionally subject to the disposal and/or recycling facility utilized.

Alternately, known lead-based paint or lead-based components can be segregated for special disposal.

5.0 LIMITED PCB-CONTAINING MATERIALS SURVEY

F&R's personnel, Michael Krupa and Christian Borrel, conducted bulk sampling of caulking and glazing for PCB content analysis, as well as conducted a visual survey for PCB-containing building materials at the current site structure located at 628 Filter Plant Drive in Fayetteville, North Carolina on August 30, 2018.

According to the EPA, Polychlorinated Biphenyls (PCBs) are man-made organic chemicals which have no taste or smell and vary in use and consistency from an oil (e.g., electrical or hydraulic equipment) to being used as a constituent in a solid (e.g., caulking). PCBs were banned in 1979 under the Toxic Substances Control Act (TSCA) and are regulated under the associated EPA rule 40 CFR 761. Materials which may include PCBs include electrical equipment and devices, oils in motors and hydraulic systems, Fluorescent Light Ballasts (FLBs), cable insulation, thermal insulation materials, adhesives, oil-based paints, caulking, plastics, carbonless copy paper, and floor finishes. In total, there are 209 PCB component mixtures or congeners which are most commonly referred to by the industrial trade name Aroclor. For additional general information regarding PCBs, refer to the EPA website.

5.1. PCB-Containing Materials Sampling Methodology

The survey was conducted in general accordance with EPA's PCB regulations (40 CFR 761), the *Standard Operating Procedure for Sampling Porous Surfaces for Polychlorinated Biphenyls (PCBs)* dated May 2011, as well as readily available guidance found on the EPA website. A PCB-Containing Material is generally described by the EPA as a building material, oil-filled electrical equipment, etc. containing a concentration of PCBs greater than 50 parts per million (ppm).

5.1.1. Bulk Sampling

Collected bulk samples of suspect caulking and glazing were organized as per the AHERA concept of Homogeneous Area (HA); caulking and glazing samples were composited for analysis. The collected samples were transferred to the Laboratory under chain-of-custody procedures and analyzed in accordance with EPA Method SW-846 8082A by Con-Test Analytical Laboratory in East Longmeadow, Massachusetts.



5.1.2. Visual Review

F&R visually inspected building components for the labeled presence of PCBs. Specific components inspected included transformers, electrical equipment, and FLBs.

FLBs are the electrical components attached to fluorescent light fixtures usually found under a metal cover-plate. Polychlorinated biphenyls (PCBs) were historically used in FLBs because of the superior electrical insulating capabilities. Based on EPA guidance on PCB-Containing FLBs, FLBs manufactured before July 1, 1979 may contain PCBs; FLBs manufactured between July 1, 1978 and July 1, 1998 that do not contain PCBs must be labeled “No PCBs” by the manufacturer; if an FLB is not labeled “No PCBs”, it shall be assumed to contain PCBs unless it is known to be manufactured after 1979; FLBs manufactured after 1998 are not required to be labeled but should not contain PCBs.

High Intensity Discharge (HID) lamps including mercury, metal halide, and high pressure sodium also require ballasts for starting and controlling the lamp circuit and contain a small capacitor that may contain high concentrations of PCBs.

Transformers, capacitors, and hydraulic equipment may contain dielectric or other fluids which contain PCBs.

Other materials which may contain PCBs such as cable insulation, thermal insulation materials, adhesives, oil-based paints, caulking, plastics, carbonless copy paper, and floor finishes were not evaluated as part of this review. Such materials may be present at the facility; however, testing of these materials is not required prior to demolition or disposal. Client concerns may dictate additional evaluation prior to demolition including sampling and analysis.

5.2. PCB Bulk Sampling & Visual Review Results

5.2.1. Bulk Sampling

Caulking and Glazing Materials

While none of the sampled caulking or glazing at the facility contained a PCB content greater than the EPA threshold limit of 50 ppm, materials with PCB content <50 ppm may still pose a concern with regard to potential contamination of adjoining building materials and/or soil.

Eight (8) samples of caulking and glazing were taken at the facility on August 30, 2018. The following table presents the results of materials sampled for PCBs:



PCB CAULKING AND BUILDING MATERIALS SAMPLE RESULTS				
Sample #	Material Description	Material Location(s)	Concentration mg/Kg (ppm)	Estimated Quantities
WTP-01	Exterior Window Caulking	West Building at Wood Windows	0.18	230 LF (20 SF)
WTP-02	Window Glazing	West Building at Wood Windows	ND	-
WTP-03	Base Caulking	East Building South Room at Base of Walls	1.6	270 LF (SF)
WTP-04	Base Caulking	East Building Middle Room at Base of Walls	2.3	270 LF (25 SF)
WTP-05	Interior Window Caulking	East Building at Vinyl Windows	2.7	230 LF (20 SF)
WTP-06	Exterior Caulking	Exterior Facades at windows, doors, and vinyl siding intersections	ND	-
WTP-07	Window Glazing	Exterior Facades at Vinyl Windows	0.57	60 LF (5 SF)
WTP-08	Black Exterior Door and Window Caulking	West Building at Exterior Doors and Windows	ND	-

ND = Non Detect

SF = Square Feet | LF = Linear Feet | CF = Cubic Feet | TBD = To Be Determined

Refer to Appendix E: Section 2 Laboratory Certificates of Analysis and Bulk Sample Chain of Custody Forms for further description of sampled materials/analytical results and Appendix F: Section 3 for photographic representation of PCB-containing caulking.

5.2.2. Visual Review

F&R personnel identified approximately 64 FLBs throughout the structure. F&R deconstructed several light fixtures and in those cases, FLBs indicated “No PCBs”. While the deconstructed lighting fixtures indicated that PCBs were not present, based upon the age of the building, it is possible that older lighting fixtures may utilize PCB-containing FLBs.

In addition, the following suspect PCB-containing equipment was identified during the survey:

1. Hydraulic fluids and capacitors associated with the four (4) exterior air handling units, and other electrical/mechanical equipment located at the interior and exterior of the building.

PCB-containing electrical equipment was not identified during the visual review. The electrical transformer, referred on the floor plan as an “Existing Electrical Box”, and located on the North-East side of the building shows a “blue dot sticker” that indicates that either it has been tested for the presence of PCBs and contained concentrations of PCBs less than 50 parts per million (ppm), or was manufactured after 1978. However, F&R cautions that PCB-containing electrical



equipment may be discovered during the decommissioning of the facility prior to demolition activities.

5.3. Conclusions and Recommendations

Known PCB-containing caulking and glazing, as well as PCB-containing equipment should be removed and disposed of in accordance with 40 CFR 761 of the Toxic Substances Control Act (TSCA) and other applicable federal, state, and/or local regulations, unless determined through laboratory analysis and/or equipment markings to be non-PCB-containing.

5.3.1. Caulking and Building Materials

PCB-containing caulk and/or adjoining building materials is considered PCB Bulk Product Waste if the concentration in caulk is greater than or equal to 50 parts per million (ppm); through analysis of representative samples, F&R did not identify PCBs in caulks or glazing at concentrations exceeding 50 ppm. Materials containing a PCB concentration of less than 50 ppm may require further evaluation and/or notification to the accepting facility prior to disposal.

If identified, PCB bulk product waste must be disposed of in a non-hazardous solid waste landfill permitted by the State. Disposal in this manner does not require prior approval by the EPA, although generators must send a written notice to the landfill prior to shipment.

5.3.2. PCB-Containing Equipment

F&R recommends that the FLBs be inspected at the time of demolition to verify the presence or absence of PCB labeling. If no label is present, then the presence of PCB's should be assumed. If such light ballasts are encountered, the disposal of fluorescent light ballasts should be based upon the presence or lack thereof of PCBs and the condition of the ballasts (leaking, etc.). The best option for non-leaking PCB ballasts is to recycle them at an approved recycling facility. Non-leaking PCB ballasts that are not recycled must be managed and disposed of as hazardous waste. Leaking PCB ballasts should be handled with extreme caution to avoid exposure, contamination, and liability. Applicable local, state, and federal regulations should be followed.

PCB-containing transformers removed from service can be temporarily stored up to 30 days on pallets while incorporating inspection safeguards. Otherwise, PCB Transformers that are stored for disposal in an area that meets the requirements of 40 C.F.R. § 761.65(b) must be disposed of within a year.

6.0 LIMITED UNIVERSAL WASTE MATERIALS SURVEY

F&R personnel conducted a limited visual survey of for Universal Wastes including Mercury-Containing Equipment and Lamps.



6.1. Findings

F&R personnel identified approximately one hundred twenty-seven (127) fluorescent lamps (throughout) associated with approximately sixty-four (64) light fixtures, three (3) compact fluorescent lamps (one at the Southeast entrance door, two in the South Room), and two (2) mercury thermostats (Middle Room, Office #2). The locations of the identified fluorescent lamps, and fifty-four (64) light fixtures, totalizing one hundred twenty-seven (127) Mercury-containing fluorescent lamps, compact fluorescent lamps, and thermostats are listed below.

- East Building and West Building: Fifty-eight (58) light fixtures containing one hundred sixteen (116) 8' fluorescent lamps were observed throughout the buildings.
- East Building: Five (5) light fixtures containing ten (10) 4' fluorescent lamps were observed in the North Room and Office #2.
- East Building: One (1) light fixture containing one (1) 2' fluorescent lamp was observed in Office #2.
- East Building: Three (3) compact fluorescent lamps were observed at the Southeast entrance door and in the South Room.
- East Building: Two (2) mercury thermostats were observed in the Middle Room and Office #2.

The locations of the identified fluorescent lamps, compact fluorescent lamps, and mercury thermostats are provided on the drawing included in Appendix D.

F&R notes that newer lamps which are sold as low-mercury which are identified by green end caps (often referred to as "green-tipped" lamps) still contain 3-4 milligrams of Mercury and should be handled and disposed of properly.

F&R cannot preclude the presence of other mercury containing materials which were not accounted for.

6.2. Conclusions and Recommendations

Prior to demolition, Universal Waste items such as mercury thermostats, switches, or lighting components should be removed and disposed of/recycled according to regulatory guidelines by an appropriately licensed/certified contractor.

Mercury containing waste components are considered as hazardous waste materials in the State of North Carolina. Lighting fixtures are a universal waste and should be handled accordingly.

Mercury-Containing Bulbs: In accordance with the federal Universal Waste Rule (see 40 CFR 273), bulbs should be placed in packaging that minimizes bulb breakage. Broken bulbs must be stored separately in sealed containers. Used bulbs must be properly



labeled. Those transporting lamps for recycling must comply with Department of Transportation regulations in 48 CFR 171-180.

7.0 LIMITED CHLOROFLUOROCARBONS SURVEY

Chlorofluorocarbons (CFCs) are organic compounds comprising carbon, fluorine, and chlorine which have been widely used in various applications including refrigerants, blowing agents, propellants, and degreasers. CFCs are considered to be Class I ozone depleting substances (ODS) under the Clean Air Act and should be handled and managed appropriately. The manufacture of CFCs has been phased out under the Montreal Protocol and Section 601-607 of the Clean Air Act; however, equipment may still contain CFCs which were manufactured prior to the phase out. Other, non-CFC refrigerants can also contain combinations of molecules which are considered ozone-depleting as well. F&R conducted a visual survey of the structure in order to evaluate the presence of CFC-containing equipment.

7.1. Results

F&R identified the following suspect CFC, HCFC, or HFC-Containing equipment:

- Refrigerant associated with four (4) HVAC air conditioning units located outside the East Building (on East and West sides of the Building);
- Refrigerant associated with two (2) refrigerators present in the Kitchen (West Building).

7.2. Conclusions and Recommendations

Prior to disposal of units, refrigerant fluids should be removed from the equipment and disposed of/recycled in accordance with applicable regulations.

If during demolition, equipment containing refrigerants, propellants, or other suspect CFCs are encountered, they should be removed and disposed of/recycled according to regulatory guidelines by a qualified contractor.

8.0 LIMITED OTHER REGULATED MATERIALS SURVEY

F&R conducted a visual survey of the building contents in order to evaluate the presence of other obviously Regulated and/or potentially Hazardous Materials.

8.1. Results

F&R observed multiple Regulated and/or potentially Hazardous Materials including, but not limited to Exit Signs containing lead acid batteries, lead metal piping, Smoke Detectors and



associated batteries, Fire Extinguishers, and Remnant Electronics. Stored materials such as fuels, pesticides or herbicides, paints, paint thinners, et cetera were not observed.

The building is currently vacant and most of the furniture and equipment have been removed. F&R observed multiple Regulated and/or potentially Hazardous Materials including, but not limited to:

- four (4) battery-equipped EXIT signs associated with Fire Alarms, and one (1) Fire Alarm not associated with an Exit Sign (in Hallway #1);
- Three (3) smoke detectors (located in the South Room, Middle Room and Kitchen);
- Eight (8) Fire Extinguishers (in South Room, Office #2, Office #3, Middle Room, North Room, Storage #2, and Hallway #2);
- Miscellaneous remnant electronics located in Office #2;
- One (1) solid lead/metal pipe in the wall of the North Room (See Photo #0016 in Appendix F: Section 2 for details).

8.2. Conclusions and Recommendations

Prior to demolition activities, Regulated and/or potentially Hazardous Materials should be removed and disposed of/recycled according to regulatory guidelines by a qualified contractor. If additional chemicals of concern are revealed during work, they should be removed and disposed of/recycled according to regulatory guidelines by a qualified contractor.

Batteries: Batteries should be removed from equipment and transported for recycling in accordance with applicable regulations. Additional batteries likely associated with security, emergency lighting, and fire warning systems should be disposed of properly.

Fire Extinguishers: Chemical containing fire extinguishers should be removed, transported and disposed in accordance with applicable regulations.

Smoke Detectors: Generally, recycling is preferred for all smoke detectors, heat detectors, flame detectors or other types of fire detection systems and components. However, F&R recommends follow applicable regulations for disposal, particularly for ionization smoke detectors.

Remnant Electronics: North Carolina has established an electronics recycling program under NC General Statutes 130A-309.130 – 141 (“Discarded Computer Equipment and Television management”) which prohibits disposal of certain electronics in landfills. Applicable electronics discovered during demolition activities shall be appropriately removed, transported, and disposed in accordance with aforementioned NC General Statutes.



9.0 LIMITATIONS

This report has been prepared for the exclusive use of CDM Smith and/or their agents. This service was performed in accordance with generally accepted environmental practices. No other warranty, expressed or implied, is made. Conclusions and recommendations are based, in part, upon information provided to us by others and site observations. We have not verified the completeness or accuracy of the information provided by others, unless otherwise noted. Observations and recommendations are based upon conditions readily visible at the site at the time of the site visit, and upon current industry standards.

During this study, suspect asbestos samples were submitted for analysis at a NVLAP-accredited laboratory via polarized light microscopy; suspect LBP was field characterized using industry standard methods and practices. Inaccessible areas, such as behind solid ceilings or behind solid walls were not surveyed; therefore, some target materials may not have been identified. As with similar surveys of this nature, actual conditions exist only at the precise locations from which samples were collected or tested. Areas inspected were limited to those designated by the scope of services by the Client. Certain inferences are based on the results of this sampling and related testing to form a professional opinion of conditions in areas beyond those from which the samples were collected. Visual evaluation of other materials of concern conducted comprised a cursory visual review of the building materials and, to a limited extent, contents of the facility. It is also understood that this is a non-invasive survey so that it is possible that concealed materials may be present that were not accessible during the original survey. No other warranty, expressed or implied, is made. Reasonable effort was made by inspection personnel to locate and sample suspect materials within the structure with regard to the scope of services. However, for a facility, the existence of unique or concealed ACMs or LBP and debris is a possibility. F&R does not warrant, guarantee or profess to have the ability to locate or identify all ACMs, LBP, or other chemicals of concern in a facility.

Under this scope of services, F&R assumes no responsibility regarding response actions (e.g. O&M Plans, Encapsulation, Abatement, Removal, Tenant Notification, etc.) initiated as a result of these findings. F&R assumes no liability for the duties and responsibilities of the Client with respect to compliance with appropriate regulations. Compliance with regulations and response actions are the sole responsibility of the Client and should be conducted in accordance with local, state, and/or federal requirements and should be performed by appropriately qualified and licensed/accredited personnel, as warranted.

Froehling & Robertson, Inc. by virtue of providing the services described in this report, does not assume the responsibility of the person(s) in charge of the site, or otherwise undertake responsibility for reporting to local, state, or federal public agencies conditions at the site that may present a potential danger to public health, safety, or the environment. The Client agrees to notify the appropriate local, state, or federal public agencies as required by law, or otherwise to disclose, in a timely manner, information that may be necessary to prevent danger to public



health, safety, or the environment. The contents of the report should not be construed in any way as a recommendation to purchase, sell, or develop the project site. F&R retains the right to revise this report if new information is later discovered or made available. The report must be presented in its entirety.

Appendix A

F&R Personnel Certifications

MICHAEL KRUPA

Industrial Hygienist

mkrupa@fandr.com



Education

B.A., Geology
Rutgers University, 1996

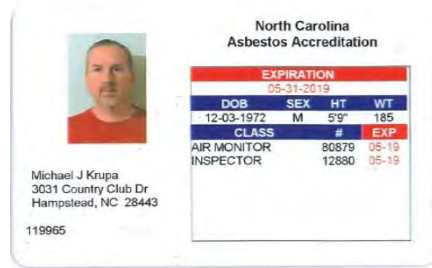
Years of Experience

<1 Year with F&R
22 Years Total

Asbestos

Federal / North Carolina

- Air Monitor (#80879)
- Asbestos Inspector (#12880)
- Abatement Supervisor Trained
- NIOSH 582 Equivalent Trained



Asbestos

Federal / South Carolina

- Air Sampler (#AS-00429)
- Consultant Building Inspector (#BI-01346)



Additional Professional Training

- MASC Confined Space Entrant & Attendant (MASC #284813)
- TAPPI Safe (ID #1200662467, exp. 01/19)



CHRISTIAN J. G. BORREL

Industrial Hygiene Technician

cborrel@fandr.com



Education

- A.A.S., Environment, Health and Safety Technology Durham Tech, 2014
- M.S., Applied Geology and Geophysics University of Bordeaux, France, 1988

Professional Affiliations

- American Association of Safety Engineers (ASSE)
- International Association of Hydrogeologists (IAH)

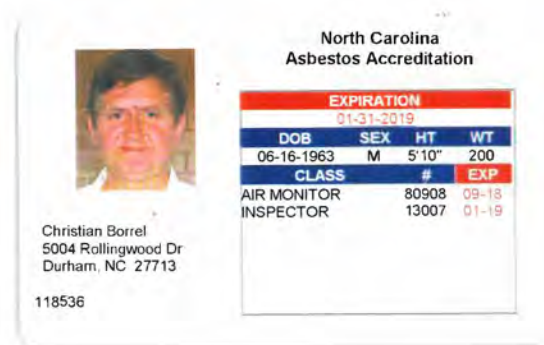
Years of Experience

2 Years with F&R
27 Years Total

Asbestos

Federal / North Carolina

- Air Monitor (#80908)
- Building Inspector (#13007)
- Abatement Supervisor Trained
- Abatement Worker Trained
- NIOSH 582 Equivalent Trained



Lead Based Paint

North Carolina

- Abatement Worker Trained
- RRP Renovator Trained
- Guest Instructor for RRP Renovator
- XRF Radiation Safety Trained



OSHA Training

- 40-Hour HAZWOPER
- 10-Hour General Industry
- Confined Space Safety
- Electrical Safety
- Construction Safety
- Fall Protection

Additional Professional Training

- EPA 240-Hour Brownfields Workforce Development
- NCDENR Underground Storage Tanks
- Grade I Wastewater Treatment Operator
- ISO 14001 (Environmental Management System)
- Waterloo Hydrogeologic Flowpath / AquiferTest
- USGS Modflow-USG (Visual ModFlow)
- Euphonia SoundPlan Acoustics

Appendix B

Laboratory Accreditations

United States Department of Commerce
National Institute of Standards and Technology



Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 200671-0

EMSL Analytical, Inc.
Morrisville, NC

*is accredited by the National Voluntary Laboratory Accreditation Program for specific services,
listed on the Scope of Accreditation, for:*

Asbestos Fiber Analysis

*This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005.
This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality
management system (refer to joint ISO-ILAC-IAF Communiqué dated January 2009).*

2018-04-01 through 2019-03-31

Effective Dates



For the National Voluntary Laboratory Accreditation Program



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

EMSL Analytical, Inc.
2500 Gateway Centre, Ste. 600
Morrisville, NC 27560
Mr. Billy Barnes
Phone: 919-465-3900
Email: bbarnes@emsl.com
http://www.emsl.com

ASBESTOS FIBER ANALYSIS

NVLAP LAB CODE 200671-0

Bulk Asbestos Analysis

Table with 2 columns: Code and Description. Rows include 18/A01 (EPA -- 40 CFR Appendix E...) and 18/A03 (EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials).

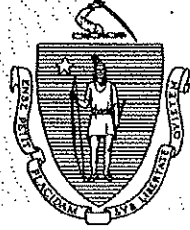
Airborne Asbestos Analysis

Table with 2 columns: Code and Description. Row includes 18/A02 (U.S. EPA's "Interim Transmission Electron Microscopy Analytical Methods-Mandatory and Nonmandatory-and Mandatory Section to Determine Completion of Response Actions" as found in 40 CFR, Part 763, Subpart E, Appendix A).

Handwritten signature of Dana S. Laman

For the National Voluntary Laboratory Accreditation Program

The Commonwealth of Massachusetts



*Department of Environmental Protection
Division of Environmental Laboratory Sciences
Senator William X. Wall Experiment Station*

certifies

M-MA100

**CON-TEST ANALYTICAL LABORATORY
39 SPRUCE ST
EAST LONGMEADOW, MA 01028-0000**

Laboratory Director: **TOD KOPYSCINSKI**

for the analysis of **POTABLE WATER (MICROBIOLOGY)
POTABLE WATER (CHEMISTRY)
NON POTABLE WATER (CHEMISTRY)
NON POTABLE WATER (MICROBIOLOGY)**

pursuant to 310 CMR 42.00

This certificate supersedes all previous Massachusetts certificates issued to this laboratory. The laboratory is regulated by and shall be responsible for being in compliance with Massachusetts regulations at 310 CMR 42.00.

This certificate is valid only when accompanied by the latest dated Certified Parameter List as issued by the Massachusetts D.E.P. Contact the Division of Environmental Laboratory Sciences to verify the current certification status of the laboratory.

Certification is no guarantee of the validity of the data. This certification is subject to unannounced laboratory inspections.

A handwritten signature in cursive script, reading "Oscar C. Jacobo".

Director, Division of Environmental Laboratory Sciences

Issued: **01 JUL 2018**

Expires: **30 JUN 2019**

**COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF ENVIRONMENTAL PROTECTION**

Certified Parameter List as of: 01 JUL 2018

**M-MA100 CON-TEST ANALYTICAL LABORATORY
EAST LONGMEADOW MA**

NON POTABLE WATER (CHEMISTRY) Effective Date 01 JUL 2018 Expiration Date 30 JUN 2019

<u>Analytes</u>	<u>Methods</u>
POTASSIUM	EPA 200.7
ALKALINITY, TOTAL	SM 2320B
CHLORIDE	SM 4500-CL-B
CHLORIDE	EPA 300.0
SULFATE	ASTM D516
SULFATE	EPA 300.0
AMMONIA-N	SM 4500-NH3-B, C
NITRATE-N	SM 4500-NO3-F
NITRATE-N	EPA 300.0
KJELDAHL-N	SM 4500-NH3-B, C
ORTHOPHOSPHATE	SM 4500-P-E
PHOSPHORUS, TOTAL	SM 4500-P-B,E
CHEMICAL OXYGEN DEMAND	EPA 410.4
BIOCHEMICAL OXYGEN DEMAND	SM 5210B
TOTAL ORGANIC CARBON	SM 5310B
CYANIDE, TOTAL	SM 4500-CN-C,E
NON-FILTERABLE RESIDUE	SM 2540D
CHLORINE, TOTAL RESIDUAL	SM 4500-CL-G
OIL AND GREASE	EPA 1664
PHENOLICS, TOTAL	EPA 420.1
VOLATILE HALOCARBONS	EPA 624.1
VOLATILE AROMATICS	EPA 602
VOLATILE AROMATICS	EPA 624.1
ALDRIN	EPA 608.3
ALPHA-BHC	EPA 608.3
BETA-BHC	EPA 608.3
GAMMA-BHC	EPA 608.3
DELTA-BHC	EPA 608.3
DIELDRIN	EPA 608.3
DDD	EPA 608.3
DDE	EPA 608.3
DDT	EPA 608.3
ENDOSULFAN I	EPA 608.3
ENDOSULFAN II	EPA 608.3
ENDOSULFAN SULFATE	EPA 608.3
ENDRIN	EPA 608.3
ENDRIN ALDEHYDE	EPA 608.3
HEPTACHLOR	EPA 608.3
HEPTACHLOR EPOXIDE	EPA 608.3
SVOC-ACID EXTRACTABLES	EPA 625.1
SVOC-BASE/NEUTRAL EXTRACTABLES	EPA 625.1
POLYCHLORINATED BIPHENYLS (WATEF	EPA 608.3
POLYCHLORINATED BIPHENYLS (OIL)	EPA 600/4-81-045

**COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF ENVIRONMENTAL PROTECTION**

Certified Parameter List as of: **01 JUL 2018**

**M-MA100 CON-TEST ANALYTICAL LABORATORY
EAST LONGMEADOW MA**

POTABLE WATER (CHEMISTRY)	Effective Date	03 MAY 2018	Expiration Date	30 JUN 2019
<u>Analytes</u>			<u>Methods</u>	
ALUMINUM			EPA 200.7	
ALUMINUM			EPA 200.8	
ANTIMONY			EPA 200.8	
ARSENIC			EPA 200.8	
BARIUM			EPA 200.7	
BARIUM			EPA 200.8	
BERYLLIUM			EPA 200.8	
CADMIUM			EPA 200.7	
CADMIUM			EPA 200.8	
CHROMIUM			EPA 200.7	
CHROMIUM			EPA 200.8	
COPPER			EPA 200.7	
COPPER			EPA 200.8	
IRON			EPA 200.7	
LEAD			EPA 200.8	
MANGANESE			EPA 200.7	
MANGANESE			EPA 200.8	
MERCURY			EPA 245.1	
NICKEL			EPA 200.7	
NICKEL			EPA 200.8	
SELENIUM			EPA 200.8	
SILVER			EPA 200.7	
SILVER			EPA 200.8	
THALLIUM			EPA 200.8	
ZINC			EPA 200.7	
ZINC			EPA 200.8	
NITRATE-N			EPA 300.0	
NITRATE-N			SM 4500-NO3-F	
NITRITE-N			EPA 300.0	
NITRITE-N			SM 4500-NO2-B	
FLUORIDE			EPA 300.0	
FLUORIDE			SM 4500-F-C	
SODIUM			EPA 200.7	
CHLORIDE			EPA 300.0	
CHLORIDE			SM 4500-CL-B	
SULFATE			EPA 300.0	
CYANIDE, TOTAL			SM 4500-CN-C,E	
TURBIDITY			EPA 180.1	
CHLORINE, RESIDUAL FREE			SM 4500-CL-G	
CALCIUM			EPA 200.7	
ALKALINITY, TOTAL			SM 2320B	
TOTAL DISSOLVED SOLIDS			SM 2540C	
PH			SM 4500-H-B	

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Certified Parameter List as of: 01 JUL 2018

M-MA100 CON-TEST ANALYTICAL LABORATORY
EAST LONGMEADOW MA

POTABLE WATER (CHEMISTRY)

Effective Date 03 MAY 2018

Expiration Date 30 JUN 2019

Analytes

TRihalOMETHANES
VOLATILE ORGANIC COMPOUNDS
1,2-DIBROMOETHANE
1,2-DIBROMO-3-CHLOROPROPANE

Methods

EPA 524.2
EPA 524.2
EPA 504.1
EPA 504.1

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Certified Parameter List as of: 01 JUL 2018

M-MA100 CON-TEST ANALYTICAL LABORATORY
EAST LONGMEADOW MA

NON POTABLE WATER (MICROBIOLOGY) Effective Date 01 JUL 2015 Expiration Date 30 JUN 2019

Analytes

FECAL COLIFORM WASTEWATER

Methods

MF-SM9222D

POTABLE WATER (MICROBIOLOGY) Effective Date 01 JUL 2015 Expiration Date 30 JUN 2019

Analytes

TOTAL COLIFORM WATER TREATMENT AND DISTRIBUTION (P/A)
E. COLI WATER TREATMENT AND DISTRIBUTION (P/A)
ENTEROCOCCI SOURCE WATER (P/A)

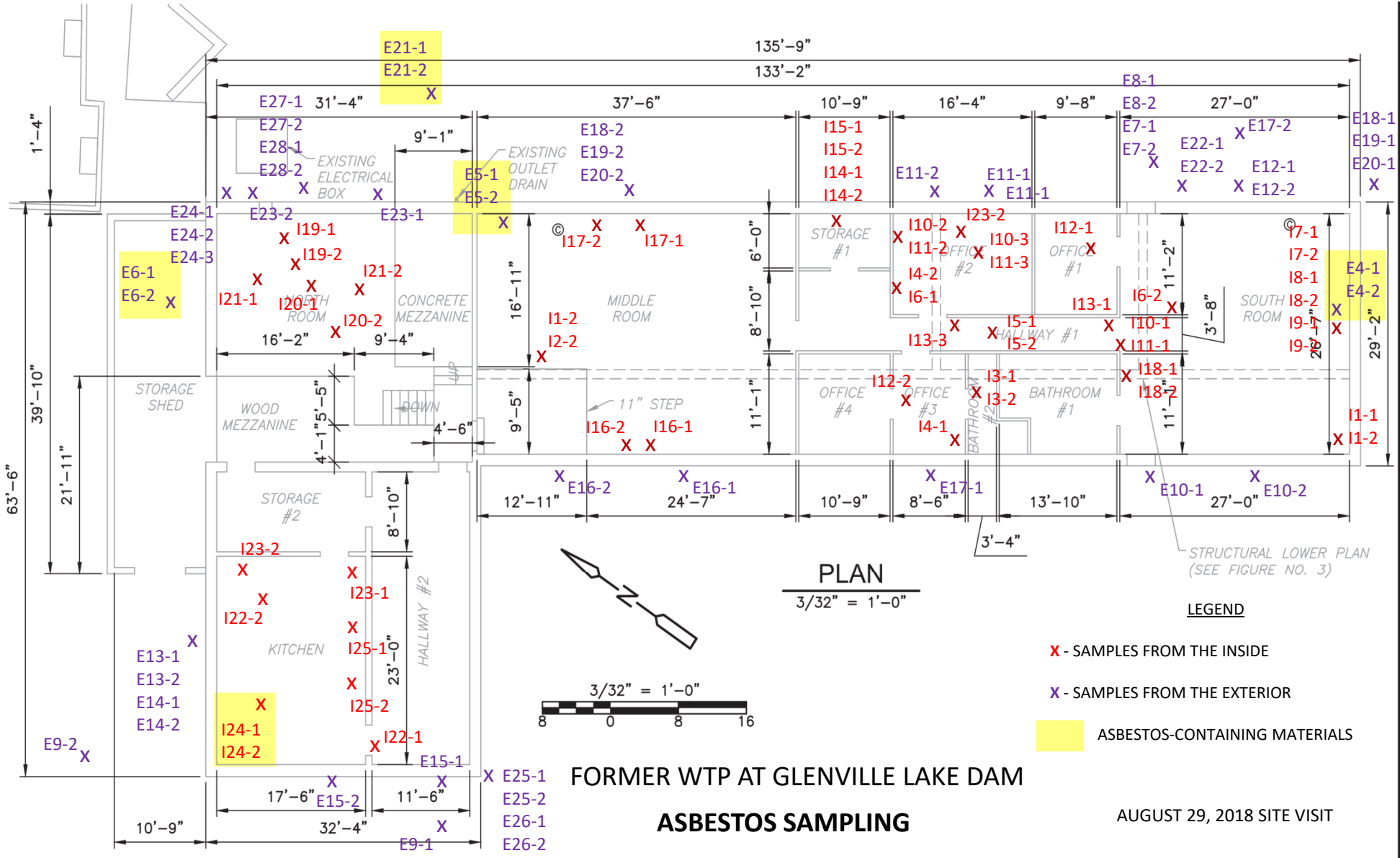
Methods

ENZ. SUB. SM9223
ENZ. SUB. SM9223
ENTEROLERT

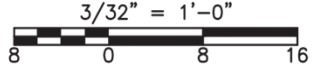
Appendix C

Facility Sketch with Asbestos Sampling Locations:
Interior/Roofing/Exterior

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- LEGEND**
- X - SAMPLES FROM THE INSIDE
 - X - SAMPLES FROM THE EXTERIOR
 - ASBESTOS-CONTAINING MATERIALS

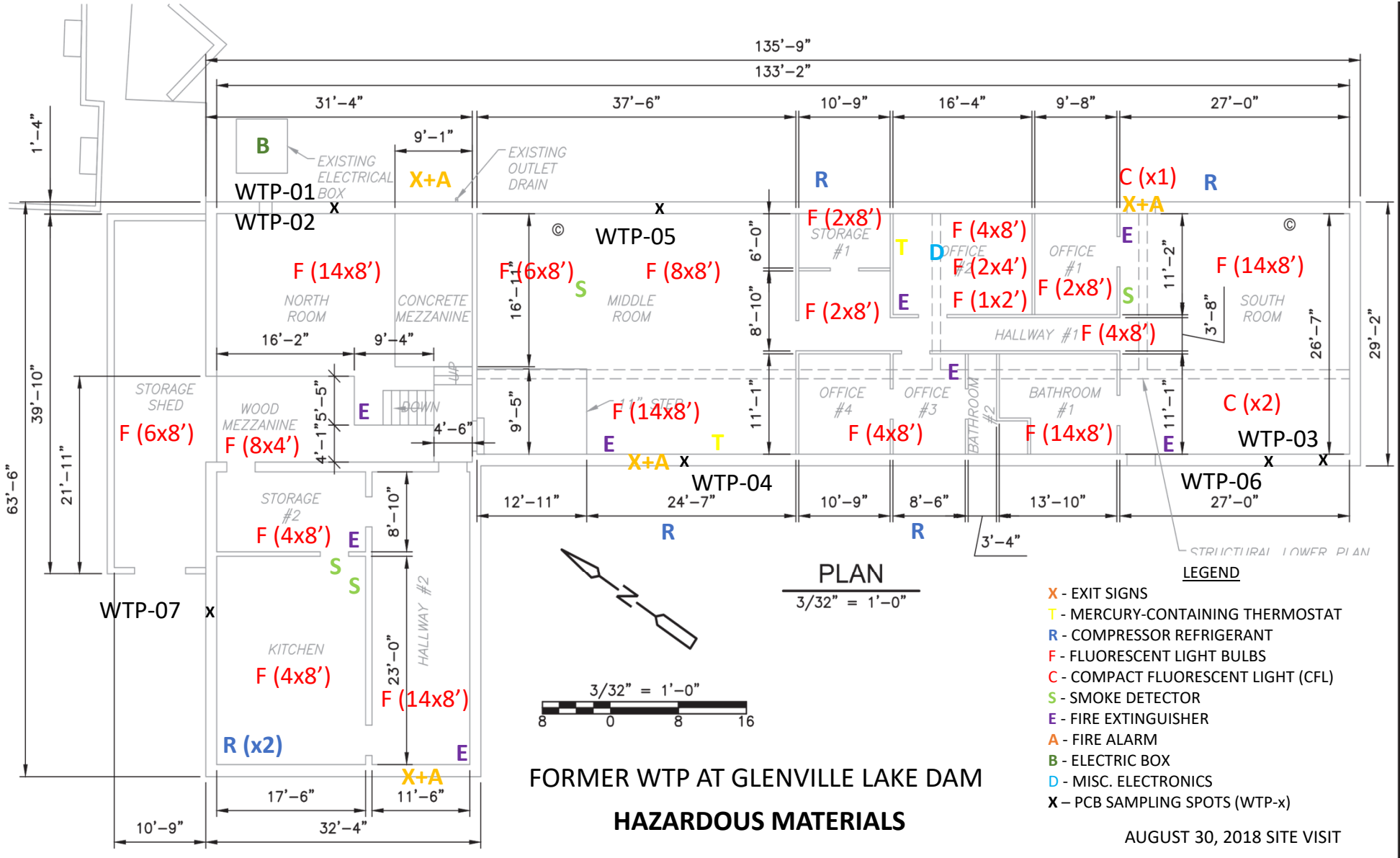


STRUCTURAL LOWER PLAN
(SEE FIGURE NO. 3)

Appendix D

Facility Sketch with Hazardous Materials Sampling Locations:
Interior/Roofing/Exterior

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Appendix E

Laboratory Certificates of Analysis
Bulk Sample Chain of Custody Forms

Section 1
Asbestos-Containing Materials



EMSL Analytical, Inc.

2500 Gateway Centre Blvd., Suite 600 Morrisville, NC 27560

Tel/Fax: (919) 465-3900 / (919) 465-3950

<http://www.EMSL.com> / raleighlab@emsl.com

EMSL Order: 291807737

Customer ID: FROE69

Customer PO: 66W012100001

Project ID:

Attention: Michael Krupa
Froehling & Robertson
310 Hubert St.
Raleigh, NC 27603

Phone: (919) 828-3441

Fax: (919) 582-0304

Received Date: 09/04/2018 10:43 AM

Analysis Date: 09/04/2018

Collected Date: 08/29/2018

Project: Old Glenville Lake Water Treatment Plant 628 Filter Plant Drive/66W0121-00001

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
291807737-0001	11-1-Floor Tile East Building, South Room - 12"X12" Off-White With Gray Specks	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
291807737-0001A	11-1-Mastic East Building, South Room - 12"X12" Off-White With Gray Specks	Tan/Black Fibrous Homogeneous	3% Cellulose	97% Non-fibrous (Other)	None Detected
291807737-0002	11-2-Floor Tile East Building, Middle Room - 12"X12" Off-White With Gray Specks	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
291807737-0002A	11-2-Mastic East Building, Middle Room - 12"X12" Off-White With Gray Specks	Gray/Black Fibrous Homogeneous	2% Cellulose	98% Non-fibrous (Other)	None Detected
291807737-0003	12-1-Floor Tile East Building, South Room - 12"X12" Lt. Gray With Black Specks Floor Tile/Mastic	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
291807737-0003A	12-1-Mastic East Building, South Room - 12"X12" Lt. Gray With Black Specks Floor Tile/Mastic	Black Fibrous Homogeneous	5% Cellulose	95% Non-fibrous (Other)	None Detected
291807737-0004	12-2-Floor Tile East Building, Middle Room - 12"X12" Lt. Gray With Black Specks Floor Tile/Mastic	Gray/Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
291807737-0004A	12-2-Mastic East Building, Middle Room - 12"X12" Lt. Gray With Black Specks Floor Tile/Mastic	Yellow Fibrous Homogeneous	2% Cellulose	98% Non-fibrous (Other)	None Detected
291807737-0005	13-1-Floor Tile East Building Bathroom #2 - 12"X12" White With Blue Specks Floor Tile/Mastic	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
291807737-0005A	13-1-Mastic East Building Bathroom #2 - 12"X12" White With Blue Specks Floor Tile/Mastic	Brown/Tan Fibrous Homogeneous	2% Cellulose	98% Non-fibrous (Other)	None Detected
291807737-0006	13-2-Floor Tile East Building Bathroom #2 - 12"X12" White With Blue Specks Floor Tile/Mastic	White/Blue Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

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			% Fibrous	% Non-Fibrous	% Type
13-2-Mastic 291807737-0006A	East Building Bathroom #2 - 12"X12" White With Blue Specks Floor Tile/Mastic	Yellow Fibrous Homogeneous	2% Cellulose	98% Non-fibrous (Other)	None Detected
14-1 291807737-0007	East, Building Office #3 - Yellow Carpet Mastic	Yellow Fibrous Homogeneous	<1% Cellulose 2% Synthetic	98% Non-fibrous (Other)	None Detected
14-2 291807737-0008	East, Building Office #2 - Yellow Carpet Mastic	Yellow Fibrous Homogeneous	2% Cellulose 2% Synthetic	96% Non-fibrous (Other)	None Detected
15-1-Floor Tile 291807737-0009	East Building Hallway #1 - 12"X12" Gray With Black Specks Floor Tile/Mastic	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
15-1-Mastic 291807737-0009A	East Building Hallway #1 - 12"X12" Gray With Black Specks Floor Tile/Mastic	Tan/Black Fibrous Homogeneous	5% Cellulose	95% Non-fibrous (Other)	None Detected
15-2-Floor Tile 291807737-0010	East Building Hallway #1 - 12"X12" Gray With Black Specks Floor Tile/Mastic	Gray/White/Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
15-2-Mastic 291807737-0010A	East Building Hallway #1 - 12"X12" Gray With Black Specks Floor Tile/Mastic	Black/Yellow Fibrous Homogeneous	4% Cellulose	96% Non-fibrous (Other)	None Detected
16-1-Concrete 291807737-0011	East Building, Office #2 - Gray Concrete Slab	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
16-1-Mastic 291807737-0011A	East Building, Office #2 - Gray Concrete Slab	Tan Fibrous Homogeneous	<1% Cellulose 2% Synthetic	98% Non-fibrous (Other)	None Detected
16-2-Concrete 291807737-0012	East Building, Office #1 - Gray Concrete Slab	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
16-2-Mastic 291807737-0012A	East Building, Office #1 - Gray Concrete Slab	Yellow Fibrous Homogeneous	2% Cellulose 2% Synthetic	96% Non-fibrous (Other)	None Detected
17-1 291807737-0013	East Building, South Room - Red Fireplace Brick	Red Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
17-1 291807737-0014 Sample is labeled 17-2	East Building, South Room - Red Fireplace Brick	Red Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
18-1 291807737-0015	East Building, South Room - Gray Fireplace Brick Mortar	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
18-2 291807737-0016	East Building, South Room - Gray Fireplace Brick Mortar	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
19-1 291807737-0017	East Building, South Room At Sides Of Fireplace Surround - White Fireplace Caulking	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

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			% Fibrous	% Non-Fibrous	% Type
19-2 291807737-0018	East Building, South Room At Sides Of Fireplace Surround - White Fireplace Caulking	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
110-1 291807737-0019	East Building, South Room - White/Gray Drywall	Brown/Gray Fibrous Homogeneous	15% Cellulose	85% Non-fibrous (Other)	None Detected
110-2 291807737-0020	East Building, Office #2 - White/Gray Drywall	Brown/Gray Fibrous Homogeneous	12% Cellulose	88% Non-fibrous (Other)	None Detected
110-3 291807737-0021	East Building, Office #2 - White/Gray Drywall	Brown/Gray Fibrous Homogeneous	20% Cellulose	80% Non-fibrous (Other)	None Detected
111-1 291807737-0022	East Building, South Room - White Joint Compound	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
111-2 291807737-0023	East Building, Office #2 - White Joint Compound	White Non-Fibrous Homogeneous	<1% Cellulose	100% Non-fibrous (Other)	None Detected
111-3 291807737-0024	East Building, Office #1 - White Joint Compound	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
112-1 291807737-0025	East Building, Office #1 - White Swirl Pattern Textured Ceiling Coating	White Non-Fibrous Homogeneous	<1% Cellulose	100% Non-fibrous (Other)	None Detected
112-2 291807737-0026	East Building, Office #3 - White Swirl Pattern Textured Ceiling Coating	White Non-Fibrous Homogeneous	<1% Cellulose	100% Non-fibrous (Other)	None Detected
112-3 291807737-0027	East Building, Hallway #1 By Storage Room #1 - White Swirl Pattern Textured Ceiling Coating	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
113-1 291807737-0028	East Building, Hallway #1, South End - White Dimples Pattern Textured Ceiling Coating	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
113-2 291807737-0029	East Building, Office #2 - White Dimples Pattern Textured Ceiling Coating	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
113-3 291807737-0030	East Building, Hallway #1, North End - White Dimples Pattern Textured Ceiling Coating	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
114-1 291807737-0031	East Building, Storage #1 - Gray/Brown Duct Mastic	Gray Non-Fibrous Homogeneous	<1% Cellulose	100% Non-fibrous (Other)	None Detected
114-2 291807737-0032	East Building, Storage #1 - Gray/Brown Duct Mastic	Brown/Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

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Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
15-1-Duct Tape 291807737-0033	East Building, Storage #1 - Gray/Yellow Duct Seam Tape/Mastic	Gray Fibrous Homogeneous	2% Cellulose 60% Synthetic	38% Non-fibrous (Other)	None Detected
15-1-Mastic 291807737-0033A	East Building, Storage #1 - Gray/Yellow Duct Seam Tape/Mastic	Yellow Fibrous Homogeneous	<1% Cellulose 2% Synthetic	98% Non-fibrous (Other)	None Detected
15-2-Duct Tape 291807737-0034	East Building, Storage #1 - Gray/Yellow Duct Seam Tape/Mastic	White/Silver/Yellow Fibrous Homogeneous	40% Synthetic	60% Non-fibrous (Other)	None Detected
15-2-Mastic 291807737-0034A	East Building, Storage #1 - Gray/Yellow Duct Seam Tape/Mastic	Beige Fibrous Homogeneous	3% Cellulose	97% Non-fibrous (Other)	None Detected
116-1 291807737-0035	East Building, Middle Room At base Of Brick Walls - White/Gray Base Caulking	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
116-2 291807737-0036	East Building, Middle Room At base Of Brick Walls - White/Gray Base Caulking	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
117-1 291807737-0037	East Building, Middle Room, North Side - White Interior Window Caulking	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
117-2 291807737-0038	East Building, Middle Room, South Side - White Interior Window Caulking	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
118-1 291807737-0039	East Building, South Room At Stainless Steel Sink - White Sink Undercoating	White Fibrous Homogeneous	15% Cellulose	85% Non-fibrous (Other)	None Detected
118-2 291807737-0040	East Building, South Room At Stainless Steel Sink - White Sink Undercoating	White Fibrous Homogeneous	15% Cellulose	85% Non-fibrous (Other)	None Detected
119-1 291807737-0041	West Building, North Room - Gray Concrete Slab(Original)	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
119-2 291807737-0042	West Building, North Room - Gray Concrete Slab(Original)	Gray Non-Fibrous Homogeneous	<1% Cellulose	100% Non-fibrous (Other)	None Detected
120-1 291807737-0043	West Building, North Room, Patch In Floor Slab - White Concrete Patch	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
120-2 291807737-0044	West Building, North Room, Patch In Floor Slab - White Concrete Patch	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

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Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
I21-1 291807737-0045	West Building, North Room - Gray Concrete Joint In Slab	Gray Non-Fibrous Homogeneous	<1% Cellulose	100% Non-fibrous (Other)	None Detected
I21-2 291807737-0046	West Building, North Room - Gray Concrete Joint In Slab	Gray Non-Fibrous Homogeneous	<1% Cellulose	100% Non-fibrous (Other)	None Detected
I22-1 291807737-0047	West Building, Hallway #2 - Gray Concrete Slab	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
I22-2 291807737-0048	West Building, Kitchen - Gray Concrete Slab	Gray Non-Fibrous Homogeneous	<1% Cellulose	100% Non-fibrous (Other)	None Detected
I23-1 291807737-0049	West Building, Kitchen - White Drywall	Gray Fibrous Homogeneous	10% Cellulose	90% Non-fibrous (Other)	None Detected
I23-2 291807737-0050	West Building, Kitchen - White Drywall	Brown/Gray Fibrous Homogeneous	20% Cellulose	80% Non-fibrous (Other)	None Detected
I24-1 291807737-0051	West Building Kitchen Ceiling - White Joint Compound	White Non-Fibrous Homogeneous	<1% Cellulose	100% Non-fibrous (Other)	<1% Chrysotile
I24-2 291807737-0052	West Building Kitchen Ceiling - White Joint Compound	White Non-Fibrous Homogeneous	<1% Cellulose	100% Non-fibrous (Other)	<1% Chrysotile
I25-1 291807737-0053	West Building, Kitchen - White Caulking At Electrical Outlets	White Non-Fibrous Homogeneous	<1% Wollastonite	100% Non-fibrous (Other)	None Detected
I25-2 291807737-0054	West Building, Kitchen - White Caulking At Electrical Outlets	White Fibrous Homogeneous	2% Wollastonite	98% Non-fibrous (Other)	None Detected
E1-1 291807737-0055	Low Roof, East Chimney - Red Chimney Brick	Red Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
E1-2 291807737-0056	Low Roof, South Chimney - Red Chimney Brick	Red Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
E2-1 291807737-0057	Low Roof, East Chimney - Gray Chimney Brick Mortar	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
E2-2 291807737-0058	Low Roof, South Chimney - Gray Chimney Brick Mortar	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
E3-1 291807737-0059	Low Roof, East Chimney - Terra Cotta Chimney Sleeve	Brown Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
E3-2 291807737-0060	Low Roof, East Chimney - Terra Cotta Chimney Sleeve	Red Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
E4-1 291807737-0061	Low Roof, South Chimney - Black Chimney Mastic	Black Fibrous Homogeneous		97% Non-fibrous (Other)	3% Chrysotile
E4-2 291807737-0062	Low Roof, South Chimney - Black Chimney Mastic	Brown/Black Fibrous Homogeneous		95% Non-fibrous (Other)	5% Chrysotile

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Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
E5-1 291807737-0063	Low Roof, East Side - Silver Roof Coating	Silver Fibrous Homogeneous		98% Non-fibrous (Other)	2% Chrysotile
E5-2 291807737-0064	Low Roof, Center - Silver Roof Coating	Gray/Silver Fibrous Homogeneous		98% Non-fibrous (Other)	2% Chrysotile
E6-1 291807737-0065	High Roof, NE Corner - Silver Roof Coating	Silver Fibrous Homogeneous		97% Non-fibrous (Other)	3% Chrysotile
E6-2 291807737-0066	High Roof, NE Corner - Silver Roof Coating	Silver Fibrous Homogeneous		95% Non-fibrous (Other)	5% Chrysotile
E7-1 291807737-0067	East Building, Entrance Awning At East Side - Silver/Black Asphaltic Roof Shingle	Black Fibrous Homogeneous	20% Glass	80% Non-fibrous (Other)	None Detected
E7-2 291807737-0068	East Building, Entrance Awning At East Side - Silver/Black Asphaltic Roof Shingle	Gray/Black Fibrous Homogeneous	20% Glass	80% Non-fibrous (Other)	None Detected
E8-1 291807737-0069	East Building, Entrance Awning At East Side Under Roof Shingle - Black Roof Felt Paper Underlayment	Black Fibrous Homogeneous	70% Cellulose	30% Non-fibrous (Other)	None Detected
E8-2 291807737-0070	East Building, Entrance Awning At East Side Under Roof Shingle - Black Roof Felt Paper Underlayment	Brown/Black Fibrous Homogeneous	65% Cellulose	35% Non-fibrous (Other)	None Detected
E9-1 291807737-0071	West Building, South Entrance Awning - Silver Black Asphaltic Roof Shingle	Black Fibrous Homogeneous	20% Glass	80% Non-fibrous (Other)	None Detected
E9-2 291807737-0072	West Building, West Entrance Awning - Silver Black Asphaltic Roof Shingle	Gray/Black Fibrous Homogeneous	20% Glass	80% Non-fibrous (Other)	None Detected
E10-1 291807737-0073	East Building, South Façade Door - Gray Cementitious Window, Door, And Siding Caulking	Gray Non-Fibrous Homogeneous	<1% Wollastonite	100% Non-fibrous (Other)	None Detected
E10-2 291807737-0074	East Building, South Façade Door - Gray Cementitious Window, Door, And Siding Caulking	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
E11-1 291807737-0075	East Building, North Façade At Fixed Windows - Tan Exterior Rubberized Window Caulking	Clear Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
E11-2 291807737-0076	East Building, North Façade At Fixed Windows - Tan Exterior Rubberized Window Caulking	Tan/Clear Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

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			% Fibrous	% Non-Fibrous	% Type
E12-1 291807737-0077	East Building, Entrance At East Side - Silver Rubberized Door Caulking	Gray Non-Fibrous Homogeneous	<1% Cellulose	100% Non-fibrous (Other)	None Detected
E12-2 291807737-0078	Eas Building, Entrance At East Side - Silver Rubberized Door Caulking	Brown/Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
E13-1 291807737-0079	West Building, West Façade Window - Black Rubberized Window Caulking	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
E13-2 291807737-0080	West Building, West Façade Window - Black Rubberized Window Caulking	Brown/Gray Fibrous Homogeneous	2% Wollastonite	98% Non-fibrous (Other)	None Detected
E14-1 291807737-0081	West Building, West Façade Window - White Cementitious Window Glazing	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
E14-2 291807737-0082	West Building, West Façade Window - White Cementitious Window Glazing	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
E15-1 291807737-0083	West Building, South Façade Door - Gray Cementitious Window And Door Caulkin	Gray Non-Fibrous Homogeneous	<1% Wollastonite	100% Non-fibrous (Other)	None Detected
E15-2 291807737-0084	West Building, South Façade Door - Gray Cementitious Window And Door Caulkin	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
E16-1 291807737-0085	East Building, South Façade - White Cementitious Window Glazing	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
E16-2 291807737-0086	East Building, South Façade - White Cementitious Window Glazing	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
E17-1 291807737-0087	East Building, South Façade At HVAC Unit - Silver HVAC Duct Coating	Black/Silver Fibrous Homogeneous	3% Cellulose	97% Non-fibrous (Other)	None Detected
E17-2 291807737-0088	East Building, North Façade At HVAC Unit - Silver HVAC Duct Coating	Silver Fibrous Homogeneous	5% Cellulose	95% Non-fibrous (Other)	None Detected
E18-1 291807737-0089	East Building, Corner East Side - Red Exterior Brick	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
E18-2 291807737-0090	East Building, North Side - Red Exterior Brick	Red Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
E19-1 291807737-0091	East Building, Corner At East Side - Gray Brick Mortar	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

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Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
E19-2 291807737-0092	East Building, North Side - Gray Brick Mortar	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
E20-1 291807737-0093	East Building, Corner At East Side - Gray Concrete Foundation	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
E20-2 291807737-0094	East Building, North Side - Gray Concrete Foundation	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
E21-1 291807737-0095	In Front of East Building In Lawn - Gray Cement Fiber Pipe	Gray Fibrous Homogeneous		60% Non-fibrous (Other)	25% Chrysotile 15% Crocidolite
E21-2 291807737-0096	In Front of East Building In Lawn - Gray Cement Fiber Pipe	Gray Fibrous Homogeneous		65% Non-fibrous (Other)	20% Chrysotile 15% Crocidolite
E22-1 291807737-0097	In Ramp At North Entrance Of East Building - Cement Lining In Metal Pipe	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
E22-2 291807737-0098	In Ramp At North Entrance Of East Building - Cement Lining In Metal Pipe	Gray/Red Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
E23-1 291807737-0099	West Building, North Façade - Gray Concrete Foundation	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
E23-2 291807737-0100	West Building, North Façade - Gray Concrete Foundation	Gray/Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
E24-1 291807737-0101	West Building, North Façade Under Vinyl Siding - White/Gray Cement Coating	Gray/White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
E24-2 291807737-0102	West Building, North Façade Under Vinyl Siding - White/Gray Cement Coating	Gray/White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
E24-3 291807737-0103	West Building, North Façade Under Vinyl Siding - White/Gray Cement Coating	Gray/White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
E25-1 291807737-0104	West Building, South Façade - Red Exterior Brick	White/Red Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
E25-2 291807737-0105	West Building, South Façade - Red Exterior Brick	Red Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
E26-1 291807737-0106	West Building, South Façade - Gray Brick Mortar	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
E26-2 291807737-0107	West Building, South Façade - Gray Brick Mortar	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

Initial report from: 09/05/2018 07:52:42



EMSL Analytical, Inc.

2500 Gateway Centre Blvd., Suite 600 Morrisville, NC 27560

Tel/Fax: (919) 465-3900 / (919) 465-3950

<http://www.EMSL.com> / raleighlab@emsl.com

EMSL Order: 291807737

Customer ID: FROE69

Customer PO: 66W012100001

Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
E27-1 291807737-0108	West Building, Old Wood Windows - White/Black Window Caulking	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
E27-2 291807737-0109	West Building, Old Wood Windows - White/Black Window Caulking	White/Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
E28-1 291807737-0110	West Building, Old Wood Windows - White Cementitious Window Glazing	Gray/White Non-Fibrous Homogeneous	<1% Wollastonite	100% Non-fibrous (Other)	None Detected
E28-2 291807737-0111	West Building, Old Wood Windows - White Cementitious Window Glazing	White Fibrous Homogeneous	2% Wollastonite	98% Non-fibrous (Other)	None Detected

Analyst(s)

Joshua Moorman (64)

Kelly Gallisdorfer (31)

Roxsee Stover (28)

Billy Barnes, Asbestos Lab Manager
or Other Approved Signatory

EMSL maintains liability limited to cost of analysis. The above analyses were performed in general compliance with Appendix E to Subpart E of 40 CFR (previously EPA 600/M4-82-020 "Interim Method"), but augmented with procedures outlined in the 1993 ("final") version of the method. This report relates only to the samples reported above, and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. All samples received in acceptable condition unless otherwise noted. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the federal government. EMSL recommends gravimetric reduction for all non-friable organically bound materials prior to analysis. Estimation of uncertainty is available on request.

Samples analyzed by EMSL Analytical, Inc. Morrisville, NC NVLAP Lab Code 200671-0, VA 3333 000278, WVA LT000296

Initial report from: 09/05/2018 07:52:42



FROEHLING & ROBERTSON, INC.

Froehling & Robertson
 Old Glenville Lake WATER Treatment Plant 628 Filter Plant
 9/4/2018 10:43
 PLM

TAT: 48 Hour
 Bulk

Order ID: 291807737
No Samples: 111
Due: 09/05 5.00 PM
Fax: 919-582-0304

BULK SAMPLE DATA AND CHAIN OF CUSTODY FORM

PROJECT INFORMATION

Client: CDM Smith
Project Name: Old Glenville Lake Water Treatment Plant
Project Location: 628 Filter Plant Drive
 Fayetteville, NC 28301
F&R Job #: 66W-0121
Purchase Order #: 66W0121-00001

Building ID: Former WTP
Sampling Area: Entire Building
Date Collected: 8/29/18
Inspectors: M. Krupa / C. Borrel
Project Manager: Michael Krupa
Comments:

Email Results to: mkrupa@fandr.com

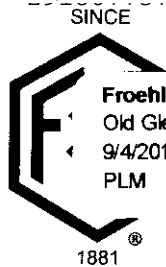
Analysis Requested: PLM EPA 600/R-93/116
Turn-Around-Time: 48-Hour

BULK SAMPLE INFORMATION

HA #	Sample #	Material Description	Situation	Location
11	11-1	12" x 12" Off-White with Gray Specks Floor Tile/Mastic	I	East Building, South Room
11	11-2	12" x 12" Off-White with Gray Specks Floor Tile/Mastic	I	East Building, Middle Room
12	12-1	12" x 12" Lt. Gray with Black Specks Floor Tile/Mastic	I	East Building, South Room
12	12-2	12" x 12" Lt. Gray with Black Specks Floor Tile/Mastic	I	East Building, Middle Room
13	13-1	12" x 12" White with Blue Specks Floor Tile/Mastic	I	East Building, Bathroom #2
13	13-2	12" x 12" White with Blue Specks Floor Tile/Mastic	I	East Building, Bathroom #2
14	14-1	Yellow Carpet Mastic	I	East, Building, Office #3
14	14-2	Yellow Carpet Mastic	I	East, Building, Office #2
15	15-1	12" x 12" Gray with Black Specks Floor Tile/Mastic	I	East Building, Hallway #1
15	15-2	12" x 12" Gray with Black Specks Floor Tile/Mastic	I	East Building, Hallway #1
16	16-1	Gray Concrete Slab	I	East Building, Office #2
16	16-2	Gray Concrete Slab	I	East Building, Office #1
17	17-1	Red Fireplace Brick	I	East Building, South Room

CHAIN OF CUSTODY

Relinquished By ¹ Michael Krupa	Date: 8/31/18	Received By ² C. Borrel	Date: 08/31/18
Signature <i>Michael Krupa</i>	Time: 2 PM	Signature <i>Christian Borrel</i>	Time: 14:00
Relinquished By ³ C. Borrel	Date: 08/31/18	Received By ⁴ MB	Date: 8/31/18 5:00
Signature <i>Christian Borrel</i>	Time: 17:00	Signature	Time:



FROEHLING & ROBERTSON, INC.

Froehling & Robertson

Old Glenville Lake Water Treatment Plant 628 Filter Plant

9/4/2018 10.43

PLM

TAT: 48 Hour

Bulk

Order ID: 291807737

No Samples: 111

Due: 09/05 5:00 PM

Fax: 919-582-0304

T 919.828.3441 | F 919.828.5751

BULK SAMPLE DATA AND CHAIN OF CUSTODY FORM

PROJECT INFORMATION

Client: CDM Smith
Project Name: Old Glenville Lake Water Treatment Plant
Project Location: 628 Filter Plant Drive
 Fayetteville, NC 28301
F&R Job #: 66W-0121
Purchase Order #: 66W0121-00001

Building ID: Former WTP
Sampling Area: Entire Building
Date Collected: 8/29/18
Inspectors: M. Krupa / C. Borrel
Project Manager: Michael Krupa
Comments:

Email Results to: mkrupa@fandr.com

Analysis Requested: PLM EPA 600/R-93/116

Turn-Around-Time: 48-Hour

BULK SAMPLE LOCATION

HA #	Sample #	Material Description	Situation	Location
I7	I7-1	Red Fireplace Brick	I	East Building, South Room
I8	I8-1	Gray Fireplace Brick Mortar	I	East Building, South Room
I8	I8-2	Gray Fireplace Brick Mortar	I	East Building, South Room
I9	I9-1	White Fireplace Caulking	I	East Building, South Room at sides of fireplace surround
I9	I9-2	White Fireplace Caulking	I	East Building, South Room at sides of fireplace surround
I10	I10-1	White/Gray Drywall	I	East Building, South Room
I10	I10-2	White/Gray Drywall	I	East Building, Office #2
I10	I10-3	White/Gray Drywall	I	East Building, Office #2
I11	I11-1	White Joint Compound	I	East Building, South Room
I11	I11-2	White Joint Compound	I	East Building, Office #2
I11	I11-3	White Joint Compound	I	East Building, Office #2
I12	I12-1	White Swirl Pattern Textured Ceiling Coating	I	East Building, Office #1
I12	I12-2	White Swirl Pattern Textured Ceiling Coating	I	East Building, Office #3
I12	I12-3	White Swirl Pattern Textured Ceiling Coating	I	East Building, Hallway #1 by Storage Room #1
I13	I13-1	White Dimples Pattern Textured Ceiling Coating	I	East Building, Hallway #1, South end



Froehling & Robertson

Old Glenville Lake Water Treatment Plant 628 Filter Plant

9/4/2018 10.43

PLM

FROEHLING & ROBERTSON

Order ID: 291807737

No Samples: 111

Due: 09/05 5.00 PM

Fax: 919-582-0304

TAT: 48 Hour

Bulk

T 919.828.3441 | F 919.828.5751

BULK SAMPLE DATA AND CHAIN OF CUSTODY FORM

PROJECT INFORMATION

Client: CDM Smith
 Project Name: Old Glenville Lake Water Treatment Plant
 Project Location: 628 Filter Plant Drive
 Fayetteville, NC 28301
 F&R Job #: 66W-0121
 Purchase Order #: 66W0121-00001

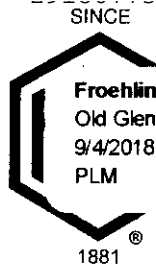
Building ID: Former WTP
 Sampling Area: Entire Building
 Date Collected: 8/29/18
 Inspectors: M. Krupa / C. Borrel
 Project Manager: Michael Krupa
 Comments:

Email Results to: mkrupa@fandr.com

Analysis Requested: PLM EPA 600/R-93/116

Turn-Around-Time: 48-Hour

HA #	Sample #	Material Description	Situation	Location
I13	I13-2	White Dimples Pattern Textured Ceiling Coating	I	East Building, Office #2
I13	I13-3	White Dimples Pattern Textured Ceiling Coating	I	East Building, Hallway #1, North end
I14	I14-1	Gray/Brown Duct Mastic	I	East Building, Storage Room #1
I14	I14-2	Gray/Brown Duct Mastic	I	East Building, Storage Room #1
I15	I15-1	Gray/Yellow Duct Seam Tape/Mastic	I	East Building, Storage Room #1
I15	I15-2	Gray/Yellow Duct Seam Tape/Mastic	I	East Building, Storage Room #1
I16	I16-1	White/Gray Base Caulking	I	East Building, Middle Room at base of brick walls
I16	I16-2	White/Gray Base Caulking	I	East Building, Middle Room at base of brick walls
I17	I17-1	White Interior Window Caulking	I	East Building, Middle Room, North side
I17	I17-2	White Interior Window Caulking	I	East Building, Middle Room, South side
I18	I18-1	White Sink Undercoating	I	East Building, South Room at stainless steel sink
I18	I18-2	White Sink Undercoating	I	East Building, South Room at stainless steel sink
I19	I19-1	Gray Concrete Slab (Original)	I	West Building, North Room
I19	I19-2	Gray Concrete Slab (Original)	I	West Building, North Room
I20	I20-1	White Concrete Patch	I	West Building, North Room, patch in floor slab
I20	I20-2	White Concrete Patch	I	West Building, North Room, patch in floor slab



Froehling & Robertson

Old Glenville Lake Water Treatment Plant 628 Filter Plant
9/4/2018 10 43
PLM

FROEHLING & ROBERTSON INC

Order ID: 291807737

No Samples: 111

Due: 09/05 5:00 PM

Fax: 919-582-0304

TAT: 48 Hour

Bulk

T 919.828.3441 | F 919.828.5751

BULK SAMPLE DATA AND CHAIN OF CUSTODY FORM

PROJECT INFORMATION

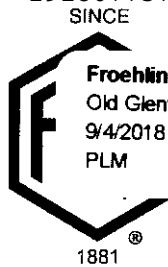
Client: CDM Smith
Project Name: Old Glenville Lake Water Treatment Plant
Project Location: 628 Filter Plant Drive
Fayetteville, NC 28301
F&R Job #: 66W-0121
Purchase Order #: 66W0121-00001

Building ID: Former WTP
Sampling Area: Entire Building
Date Collected: 8/29/18
Inspectors: M. Krupa / C. Borrel
Project Manager: Michael Krupa
Comments:

Email Results to: mkrupa@fandr.com

Analysis Requested: PLM EPA 600/R-93/116
Turn-Around-Time: 48-Hour

HA #	Sample #	Material Description	Situation	Location
I21	I21-1	Gray Concrete Joint in Slab	I	West Building, North Room
I21	I21-2	Gray Concrete Joint in Slab	I	West Building, North Room
I22	I22-1	Gray Concrete Slab	I	West Building, Hallway #2
I22	I22-2	Gray Concrete Slab	I	West Building, Kitchen
I23	I23-1	White Drywall	I	West Building, Kitchen wall
I23	I23-2	White Drywall	I	West Building, Kitchen wall
I24	I24-1	White Joint Compound	I	West Building, Kitchen ceiling
I24	I24-2	White Joint Compound	I	West Building, Kitchen ceiling
I25	I25-1	White Caulking at Electrical Outlets	I	West Building, Kitchen
I25	I25-2	White Caulking at Electrical Outlets	I	West Building, Kitchen
E1	E1-1	Red Chimney Brick	R	Low Roof, East Chimney
E1	E1-2	Red Chimney Brick	R	Low Roof, South Chimney
E2	E2-1	Gray Chimney Brick Mortar	R	Low Roof, East Chimney
E2	E2-2	Gray Chimney Brick Mortar	R	Low Roof, South Chimney
E3	E3-1	Terra Cotta Chimney Sleeve	R	Low Roof, East Chimney
E3	E3-2	Terra Cotta Chimney Sleeve	R	Low Roof, East Chimney



Froehling & Robertson

Old Glenville Lake Water Treatment Plant 628 Filter Plant

9/4/2018 10:43

PLM

FROEHLING & ROBERTSON, INC.

Order ID: 291807737

No Samples: 111

Due: 09/05 5:00 PM

Fax: 919-582-0304

TAT: 48 Hour

Bulk

T 919.828.3441 | F 919.828.5751

BULK SAMPLE DATA AND CHAIN OF CUSTODY FORM

PROJECT INFORMATION

Client: CDM Smith
Project Name: Old Glenville Lake Water Treatment Plant
Project Location: 628 Filter Plant Drive
 Fayetteville, NC 28301
F&R Job #: 66W-0121
Purchase Order #: 66W0121-00001

Building ID: Former WTP
Sampling Area: Entire Building
Date Collected: 8/29/18
Inspectors: M. Krupa / C. Borrel
Project Manager: Michael Krupa
Comments:

Email Results to: mkrupa@fandr.com

Analysis Requested: PLM EPA 600/R-93/116

Turn-Around-Time: 48-Hour

HA #	Sample #	Material Description	Situation	Location
E4	E4-1	Black Chimney Mastic	R	Low Roof, South Chimney
E4	E4-2	Black Chimney Mastic	R	Low Roof, South Chimney
E5	E5-1	Silver Roof Coating	R	Low Roof, East side
E5	E5-2	Silver Roof Coating	R	Low Roof, center
E6	E6-1	Silver Roof Coating	R	High Roof, NE Corner
E6	E6-2	Silver Roof Coating	R	High Roof, NE Corner
E7	E7-1	Silver/Black Asphaltic Roof Shingle	R	East Building, Entrance Awning at East side
E7	E7-2	Silver/Black Asphaltic Roof Shingle	R	East Building, Entrance Awning at East side
E8	E8-1	Black Roof Felt Paper Underlayment	R	East Building, Entrance Awning at East side under roof shingle
E8	E8-2	Black Roof Felt Paper Underlayment	R	East Building, Entrance Awning at East side under roof shingle
E9	E9-1	Silver/Black Asphaltic Roof Shingle	R	West Building, South Entrance Awning
E9	E9-2	Silver/Black Asphaltic Roof Shingle	R	West Building, West Entrance Awning
E10	E10-1	Gray Cementitious Window, Door, and Siding Caulking	E	East Building, South façade door
E10	E10-2	Gray Cementitious Window, Door, and Siding Caulking	E	East Building, south façade window
E11	E11-1	Tan Exterior Rubberized Window Caulking	E	East Building, North façade at fixed windows
E11	E11-2	Tan Exterior Rubberized Window Caulking	E	East Building, North façade at fixed windows



FROEHLING & ROBERTSON, INC.

Engineering Stability Since 1991

Froehling & Robertson

Old Glenville Lake Water Treatment Plant 628 Filter Plant

9/4/2018 10:43

PLM

TAT: 48 Hour

Bulk

Order ID: 291807737

No Samples: 111

Due: 09/05 5:00 PM

Fax: 919-582-0304

BULK SAMPLE DATA AND CHAIN OF CUSTODY FORM

PROJECT INFORMATION

Client: CDM Smith
Project Name: Old Glenville Lake Water Treatment Plant
Project Location: 628 Filter Plant Drive
 Fayetteville, NC 28301
F&R Job #: 66W-0121
Purchase Order #: 66W0121-00001

Building ID: Former WTP
Sampling Area: Entire Building
Date Collected: 8/29/18
Inspectors: M. Krupa / C. Borrel
Project Manager: Michael Krupa
Comments:

Email Results to: mkrupa@fandr.com

Analysis Requested: PLM EPA 600/R-93/116

Turn-Around-Time: 48-Hour

HA #	Sample #	Material Description	Situation	Location
E12	E12-1	Silver Rubberized Door Caulking	E	East Building, Entrance at East side
E12	E12-2	Silver Rubberized Door Caulking	E	East Building, Entrance at East side
E13	E13-1	Black Rubberized Window Caulking	E	West Building, West façade window
E13	E13-2	Black Rubberized Window Caulking	E	West Building, West façade window
E14	E14-1	White Cementitious Window Glazing	E	West Building, West façade window
E14	E14-2	White Cementitious Window Glazing	E	West Building, West façade window
E15	E15-1	Gray Cementitious Window and Door Caulking	E	West Building, South façade door
E15	E15-2	Gray Cementitious Window and Door Caulking	E	West Building, South façade window
E16	E16-1	White Cementitious Window Glazing	E	East Building, South façade window
E16	E16-2	White Cementitious Window Glazing	E	East Building, South façade window
E17	E17-1	Silver HVAC Duct Coating	E	East Building, South façade at HVAC unit
E17	E17-2	Silver HVAC Duct Coating	E	East Building, North façade at HVAC unit
E18	E18-1	Red Exterior Brick	E	East Building, corner at East side
E18	E18-2	Red Exterior Brick	E	East Building, North side
E19	E19-1	Gray Brick Mortar	E	East Building, corner at East side
E19	E19-2	Gray Brick Mortar	E	East Building, North side



Froehling & Robertson

Old Glenville Lake Water Treatment Plant 628 Filter Plant
9/4/2018 10:43
PLM

TAT: 48 Hour
Bulk

FROEHLING & ROBERTSON, INC.

Order ID: 291807737

No Samples: 111

Due: 09/05 5:00 PM

Fax: 919-582-0304

1881

BULK SAMPLE DATA AND CHAIN OF CUSTODY FORM

PROJECT INFORMATION

Client: CDM Smith
Project Name: Old Glenville Lake Water Treatment Plant
Project Location: 628 Filter Plant Drive
Fayetteville, NC 28301
F&R Job #: 66W-0121
Purchase Order #: 66W0121-00001

Building ID: Former WTP
Sampling Area: Entire Building
Date Collected: 8/29/18
Inspectors: M. Krupa / C. Borrel
Project Manager: Michael Krupa
Comments:

Email Results to: mkrupa@fandr.com

Analysis Requested: PLM EPA 600/R-93/116
Turn-Around-Time: 48-Hour

HA #	Sample #	Material Description	Situation	Location
E20	E20-1	Gray Concrete Foundation	E	East Building, corner at East side
E20	E20-2	Gray Concrete Foundation	E	East Building, North side
E21	E21-1	Gray Cement Fiber Pipe	E	In front of East Building in lawn
E21	E21-2	Gray Cement Fiber Pipe	E	In front of East Building in lawn
E22	E22-1	Cement Lining in Metal Pipe	E	In ramp at North entrance of East Building
E22	E22-2	Cement Lining in Metal Pipe	E	In ramp at North entrance of East Building
E23	E23-1	Gray Concrete Foundation	E	West Building, North facade
E23	E23-2	Gray Concrete Foundation	E	West Building, North facade
E24	E24-1	White/Gray Cement Coating	E	West Building, North facade under vinyl siding
E24	E24-2	White/Gray Cement Coating	E	West Building, North facade under vinyl siding
E24	E24-3	White/Gray Cement Coating	E	West Building, North facade under vinyl siding
E25	E25-1	Red Exterior Brick	E	West Building, South facade
E25	E25-2	Red Exterior Brick	E	West Building, South facade
E26	E26-1	Gray Brick Mortar	E	West Building, South facade
E26	E26-2	Gray Brick Mortar	E	West Building, South facade
E27	E27-1	White/Black Window Caulking	E	West Building, old wood windows

Appendix E

Laboratory Certificates of Analysis
Bulk Sample Chain of Custody Forms

Section 2
Polychlorinated Biphenyls



39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

September 12, 2018

Mike Krupa
Froehling & Robertson - Raleigh, NC
310 Hubert Street
Raleigh, NC 27603

Project Location: 628 Filter Plant Drive, Fayetteville, NC
Client Job Number:
Project Number: 66W-0121
Laboratory Work Order Number: 18I0024

Enclosed are results of analyses for samples received by the laboratory on August 31, 2018. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in black ink that reads "Kerry K. McGee". The signature is written in a cursive, flowing style.

Kerry K. McGee
Project Manager

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Froehling & Robertson - Raleigh, NC
 310 Hubert Street
 Raleigh, NC 27603
 ATTN: Mike Krupa

REPORT DATE: 9/12/2018

PURCHASE ORDER NUMBER:

PROJECT NUMBER: 66W-0121

ANALYTICAL SUMMARY

WORK ORDER NUMBER: 18I0024

The results of analyses performed on the following samples submitted to the CON-TEST Analytical Laboratory are found in this report.

PROJECT LOCATION: 628 Filter Plant Drive, Fayetteville, NC

FIELD SAMPLE #	LAB ID:	MATRIX	SAMPLE DESCRIPTION	TEST	SUB LAB
WTP-01 Exterior Window Caulking	18I0024-01	Caulk		SW-846 8082A	
WTP-02 Exterior Window Glazing	18I0024-02	Caulk		SW-846 8082A	
WTP-03 Base Caulking	18I0024-03	Caulk		SW-846 8082A	
WTP-04 Base Caulking	18I0024-04	Caulk		SW-846 8082A	
WTP-05 Interior Window Caulking	18I0024-05	Caulk		SW-846 8082A	
WTP-06 Exterior Caulking	18I0024-06	Caulk		SW-846 8082A	
WTP-07 Exterior Window Glazing	18I0024-07	Caulk		SW-846 8082A	
WTP-08 Black Door & Window Caulking	18I0024-08	Caulk		SW-846 8082A	



39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

CASE NARRATIVE SUMMARY

All reported results are within defined laboratory quality control objectives unless listed below or otherwise qualified in this report.

The results of analyses reported only relate to samples submitted to the Con-Test Analytical Laboratory for testing.

I certify that the analyses listed above, unless specifically listed as subcontracted, if any, were performed under my direction according to the approved methodologies listed in this document, and that based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

A handwritten signature in black ink, appearing to read "Lisa A. Worthington", is written over a light gray rectangular background.

Lisa A. Worthington
Project Manager



39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: 628 Filter Plant Drive, Fayetteville

Sample Description:

Work Order: 18I0024

Date Received: 8/31/2018

Field Sample #: WTP-01 Exterior Window Caulking

Sampled: 8/30/2018 00:00

Sample ID: 18I0024-01

Sample Matrix: Caulk

Polychlorinated Biphenyls By GC/ECD

Analyte	Results	RL	DL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Aroclor-1016 [1]	ND	0.74	0.044	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 13:50	KAL
Aroclor-1221 [1]	ND	0.74	0.048	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 13:50	KAL
Aroclor-1232 [1]	ND	0.74	0.033	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 13:50	KAL
Aroclor-1242 [1]	ND	0.74	0.037	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 13:50	KAL
Aroclor-1248 [1]	ND	0.74	0.044	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 13:50	KAL
Aroclor-1254 [1]	0.18	0.74	0.048	mg/Kg	4	J	SW-846 8082A	9/5/18	9/11/18 13:50	KAL
Aroclor-1260 [1]	ND	0.74	0.052	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 13:50	KAL
Aroclor-1262 [1]	ND	0.74	0.037	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 13:50	KAL
Aroclor-1268 [1]	ND	0.74	0.030	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 13:50	KAL
Surrogates		% Recovery	Recovery Limits			Flag/Qual				
Decachlorobiphenyl [1]		81.7	30-150						9/11/18 13:50	
Decachlorobiphenyl [2]		97.6	30-150						9/11/18 13:50	
Tetrachloro-m-xylene [1]		83.3	30-150						9/11/18 13:50	
Tetrachloro-m-xylene [2]		92.1	30-150						9/11/18 13:50	



39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: 628 Filter Plant Drive, Fayetteville Sample Description:

Work Order: 18I0024

Date Received: 8/31/2018

Field Sample #: WTP-02 Exterior Window Glazing Sampled: 8/30/2018 00:00

Sample ID: 18I0024-02

Sample Matrix: Caulk

Polychlorinated Biphenyls By GC/ECD

Analyte	Results	RL	DL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Aroclor-1016 [1]	ND	0.72	0.043	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 14:08	KAL
Aroclor-1221 [1]	ND	0.72	0.047	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 14:08	KAL
Aroclor-1232 [1]	ND	0.72	0.032	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 14:08	KAL
Aroclor-1242 [1]	ND	0.72	0.036	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 14:08	KAL
Aroclor-1248 [1]	ND	0.72	0.043	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 14:08	KAL
Aroclor-1254 [1]	ND	0.72	0.047	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 14:08	KAL
Aroclor-1260 [1]	ND	0.72	0.050	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 14:08	KAL
Aroclor-1262 [1]	ND	0.72	0.036	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 14:08	KAL
Aroclor-1268 [1]	ND	0.72	0.029	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 14:08	KAL
Surrogates		% Recovery	Recovery Limits			Flag/Qual				
Decachlorobiphenyl [1]		81.5	30-150						9/11/18 14:08	
Decachlorobiphenyl [2]		95.3	30-150						9/11/18 14:08	
Tetrachloro-m-xylene [1]		77.9	30-150						9/11/18 14:08	
Tetrachloro-m-xylene [2]		85.4	30-150						9/11/18 14:08	



39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: 628 Filter Plant Drive, Fayetteville Sample Description:

Work Order: 18I0024

Date Received: 8/31/2018

Field Sample #: WTP-03 Base Caulking

Sampled: 8/30/2018 00:00

Sample ID: 18I0024-03

Sample Matrix: Caulk

Polychlorinated Biphenyls By GC/ECD

Analyte	Results	RL	DL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Aroclor-1016 [1]	ND	0.68	0.041	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 14:25	KAL
Aroclor-1221 [1]	ND	0.68	0.044	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 14:25	KAL
Aroclor-1232 [1]	ND	0.68	0.031	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 14:25	KAL
Aroclor-1242 [1]	ND	0.68	0.034	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 14:25	KAL
Aroclor-1248 [1]	ND	0.68	0.041	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 14:25	KAL
Aroclor-1254 [2]	1.6	0.68	0.044	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 14:25	KAL
Aroclor-1260 [1]	ND	0.68	0.048	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 14:25	KAL
Aroclor-1262 [1]	ND	0.68	0.034	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 14:25	KAL
Aroclor-1268 [1]	ND	0.68	0.027	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 14:25	KAL
Surrogates		% Recovery	Recovery Limits			Flag/Qual				
Decachlorobiphenyl [1]		77.3	30-150						9/11/18 14:25	
Decachlorobiphenyl [2]		92.2	30-150						9/11/18 14:25	
Tetrachloro-m-xylene [1]		75.3	30-150						9/11/18 14:25	
Tetrachloro-m-xylene [2]		83.4	30-150						9/11/18 14:25	



39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: 628 Filter Plant Drive, Fayetteville

Sample Description:

Work Order: 18I0024

Date Received: 8/31/2018

Field Sample #: WTP-04 Base Caulking

Sampled: 8/30/2018 00:00

Sample ID: 18I0024-04

Sample Matrix: Caulk

Polychlorinated Biphenyls By GC/ECD

Analyte	Results	RL	DL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Aroclor-1016 [1]	ND	0.76	0.046	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 14:43	KAL
Aroclor-1221 [1]	ND	0.76	0.050	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 14:43	KAL
Aroclor-1232 [1]	ND	0.76	0.034	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 14:43	KAL
Aroclor-1242 [1]	ND	0.76	0.038	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 14:43	KAL
Aroclor-1248 [1]	ND	0.76	0.046	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 14:43	KAL
Aroclor-1254 [2]	2.3	0.76	0.050	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 14:43	KAL
Aroclor-1260 [1]	ND	0.76	0.053	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 14:43	KAL
Aroclor-1262 [1]	ND	0.76	0.038	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 14:43	KAL
Aroclor-1268 [1]	ND	0.76	0.031	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 14:43	KAL
Surrogates		% Recovery	Recovery Limits			Flag/Qual				
Decachlorobiphenyl [1]		76.1	30-150						9/11/18 14:43	
Decachlorobiphenyl [2]		89.1	30-150						9/11/18 14:43	
Tetrachloro-m-xylene [1]		72.7	30-150						9/11/18 14:43	
Tetrachloro-m-xylene [2]		79.0	30-150						9/11/18 14:43	



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Project Location: 628 Filter Plant Drive, Fayetteville Sample Description:

Work Order: 18I0024

Date Received: 8/31/2018

Field Sample #: WTP-05 Interior Window Caulking Sampled: 8/30/2018 00:00

Sample ID: 18I0024-05

Sample Matrix: Caulk

Polychlorinated Biphenyls By GC/ECD

Analyte	Results	RL	DL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Aroclor-1016 [1]	ND	0.67	0.040	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 15:01	KAL
Aroclor-1221 [1]	ND	0.67	0.044	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 15:01	KAL
Aroclor-1232 [1]	ND	0.67	0.030	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 15:01	KAL
Aroclor-1242 [1]	ND	0.67	0.034	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 15:01	KAL
Aroclor-1248 [1]	ND	0.67	0.040	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 15:01	KAL
Aroclor-1254 [2]	2.7	0.67	0.044	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 15:01	KAL
Aroclor-1260 [1]	ND	0.67	0.047	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 15:01	KAL
Aroclor-1262 [1]	ND	0.67	0.034	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 15:01	KAL
Aroclor-1268 [1]	ND	0.67	0.027	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 15:01	KAL
Surrogates		% Recovery	Recovery Limits			Flag/Qual				
Decachlorobiphenyl [1]		87.0	30-150						9/11/18 15:01	
Decachlorobiphenyl [2]		104	30-150						9/11/18 15:01	
Tetrachloro-m-xylene [1]		88.9	30-150						9/11/18 15:01	
Tetrachloro-m-xylene [2]		95.5	30-150						9/11/18 15:01	



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Project Location: 628 Filter Plant Drive, Fayetteville

Sample Description:

Work Order: 18I0024

Date Received: 8/31/2018

Field Sample #: WTP-06 Exterior Caulking

Sampled: 8/30/2018 00:00

Sample ID: 18I0024-06

Sample Matrix: Caulk

Polychlorinated Biphenyls By GC/ECD

Analyte	Results	RL	DL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Aroclor-1016 [1]	ND	0.71	0.043	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 15:18	KAL
Aroclor-1221 [1]	ND	0.71	0.046	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 15:18	KAL
Aroclor-1232 [1]	ND	0.71	0.032	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 15:18	KAL
Aroclor-1242 [1]	ND	0.71	0.036	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 15:18	KAL
Aroclor-1248 [1]	ND	0.71	0.043	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 15:18	KAL
Aroclor-1254 [1]	ND	0.71	0.046	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 15:18	KAL
Aroclor-1260 [1]	ND	0.71	0.050	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 15:18	KAL
Aroclor-1262 [1]	ND	0.71	0.036	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 15:18	KAL
Aroclor-1268 [1]	ND	0.71	0.028	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 15:18	KAL
Surrogates		% Recovery	Recovery Limits			Flag/Qual				
Decachlorobiphenyl [1]		88.8	30-150						9/11/18 15:18	
Decachlorobiphenyl [2]		106	30-150						9/11/18 15:18	
Tetrachloro-m-xylene [1]		87.7	30-150						9/11/18 15:18	
Tetrachloro-m-xylene [2]		95.0	30-150						9/11/18 15:18	



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Project Location: 628 Filter Plant Drive, Fayetteville

Sample Description:

Work Order: 18I0024

Date Received: 8/31/2018

Field Sample #: WTP-07 Exterior Window Glazing

Sampled: 8/30/2018 00:00

Sample ID: 18I0024-07

Sample Matrix: Caulk

Polychlorinated Biphenyls By GC/ECD

Analyte	Results	RL	DL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Aroclor-1016 [1]	ND	0.78	0.047	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 15:36	KAL
Aroclor-1221 [1]	ND	0.78	0.051	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 15:36	KAL
Aroclor-1232 [1]	ND	0.78	0.035	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 15:36	KAL
Aroclor-1242 [1]	ND	0.78	0.039	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 15:36	KAL
Aroclor-1248 [1]	ND	0.78	0.047	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 15:36	KAL
Aroclor-1254 [2]	0.57	0.78	0.051	mg/Kg	4	J	SW-846 8082A	9/5/18	9/11/18 15:36	KAL
Aroclor-1260 [1]	ND	0.78	0.055	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 15:36	KAL
Aroclor-1262 [1]	ND	0.78	0.039	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 15:36	KAL
Aroclor-1268 [1]	ND	0.78	0.031	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 15:36	KAL
Surrogates		% Recovery	Recovery Limits			Flag/Qual				
Decachlorobiphenyl [1]		76.7	30-150						9/11/18 15:36	
Decachlorobiphenyl [2]		99.2	30-150						9/11/18 15:36	
Tetrachloro-m-xylene [1]		79.9	30-150						9/11/18 15:36	
Tetrachloro-m-xylene [2]		85.9	30-150						9/11/18 15:36	



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Project Location: 628 Filter Plant Drive, Fayetteville

Sample Description:

Work Order: 18I0024

Date Received: 8/31/2018

Field Sample #: WTP-08 Black Door & Window Caulking

Sampled: 8/30/2018 00:00

Sample ID: 18I0024-08

Sample Matrix: Caulk

Polychlorinated Biphenyls By GC/ECD

Analyte	Results	RL	DL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Aroclor-1016 [1]	ND	0.74	0.044	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 15:54	KAL
Aroclor-1221 [1]	ND	0.74	0.048	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 15:54	KAL
Aroclor-1232 [1]	ND	0.74	0.033	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 15:54	KAL
Aroclor-1242 [1]	ND	0.74	0.037	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 15:54	KAL
Aroclor-1248 [1]	ND	0.74	0.044	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 15:54	KAL
Aroclor-1254 [1]	ND	0.74	0.048	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 15:54	KAL
Aroclor-1260 [1]	ND	0.74	0.052	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 15:54	KAL
Aroclor-1262 [1]	ND	0.74	0.037	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 15:54	KAL
Aroclor-1268 [1]	ND	0.74	0.030	mg/Kg	4		SW-846 8082A	9/5/18	9/11/18 15:54	KAL
Surrogates		% Recovery	Recovery Limits			Flag/Qual				
Decachlorobiphenyl [1]		81.7	30-150						9/11/18 15:54	
Decachlorobiphenyl [2]		95.3	30-150						9/11/18 15:54	
Tetrachloro-m-xylene [1]		81.1	30-150						9/11/18 15:54	
Tetrachloro-m-xylene [2]		87.5	30-150						9/11/18 15:54	



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Sample Extraction Data

Prep Method: SW-846 3546-SW-846 8082A

Lab Number [Field ID]	Batch	Initial [g]	Final [mL]	Date
18I0024-01 [WTP-01 Exterior Window Caulking]	B211786	0.540	10.0	09/05/18
18I0024-02 [WTP-02 Exterior Window Glazing]	B211786	0.558	10.0	09/05/18
18I0024-03 [WTP-03 Base Caulking]	B211786	0.588	10.0	09/05/18
18I0024-04 [WTP-04 Base Caulking]	B211786	0.524	10.0	09/05/18
18I0024-05 [WTP-05 Interior Window Caulking]	B211786	0.594	10.0	09/05/18
18I0024-06 [WTP-06 Exterior Caulking]	B211786	0.562	10.0	09/05/18
18I0024-07 [WTP-07 Exterior Window Glazing]	B211786	0.512	10.0	09/05/18
18I0024-08 [WTP-08 Black Door & Window Caulking]	B211786	0.542	10.0	09/05/18



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QUALITY CONTROL

Polychlorinated Biphenyls By GC/ECD - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B211786 - SW-846 3546										
Blank (B211786-BLK1)										
Prepared: 09/05/18 Analyzed: 09/11/18										
Aroclor-1016	ND	0.17	mg/Kg							
Aroclor-1016 [2C]	ND	0.17	mg/Kg							
Aroclor-1221	ND	0.17	mg/Kg							
Aroclor-1221 [2C]	ND	0.17	mg/Kg							
Aroclor-1232	ND	0.17	mg/Kg							
Aroclor-1232 [2C]	ND	0.17	mg/Kg							
Aroclor-1242	ND	0.17	mg/Kg							
Aroclor-1242 [2C]	ND	0.17	mg/Kg							
Aroclor-1248	ND	0.17	mg/Kg							
Aroclor-1248 [2C]	ND	0.17	mg/Kg							
Aroclor-1254	ND	0.17	mg/Kg							
Aroclor-1254 [2C]	ND	0.17	mg/Kg							
Aroclor-1260	ND	0.17	mg/Kg							
Aroclor-1260 [2C]	ND	0.17	mg/Kg							
Aroclor-1262	ND	0.17	mg/Kg							
Aroclor-1262 [2C]	ND	0.17	mg/Kg							
Aroclor-1268	ND	0.17	mg/Kg							
Aroclor-1268 [2C]	ND	0.17	mg/Kg							
Surrogate: Decachlorobiphenyl	2.23		mg/Kg	3.38		66.0	30-150			
Surrogate: Decachlorobiphenyl [2C]	2.69		mg/Kg	3.38		79.8	30-150			
Surrogate: Tetrachloro-m-xylene	2.67		mg/Kg	3.38		79.2	30-150			
Surrogate: Tetrachloro-m-xylene [2C]	2.79		mg/Kg	3.38		82.5	30-150			
LCS (B211786-BS1)										
Prepared: 09/05/18 Analyzed: 09/11/18										
Aroclor-1016	3.3	0.19	mg/Kg	3.89		84.8	40-140			
Aroclor-1016 [2C]	3.4	0.19	mg/Kg	3.89		87.0	40-140			
Aroclor-1260	3.1	0.19	mg/Kg	3.89		79.2	40-140			
Aroclor-1260 [2C]	3.4	0.19	mg/Kg	3.89		86.4	40-140			
Surrogate: Decachlorobiphenyl	3.06		mg/Kg	3.89		78.7	30-150			
Surrogate: Decachlorobiphenyl [2C]	3.76		mg/Kg	3.89		96.6	30-150			
Surrogate: Tetrachloro-m-xylene	3.21		mg/Kg	3.89		82.4	30-150			
Surrogate: Tetrachloro-m-xylene [2C]	3.36		mg/Kg	3.89		86.3	30-150			
LCS Dup (B211786-BSD1)										
Prepared: 09/05/18 Analyzed: 09/11/18										
Aroclor-1016	2.9	0.20	mg/Kg	3.91		73.2	40-140	14.2		
Aroclor-1016 [2C]	2.9	0.20	mg/Kg	3.91		74.9	40-140	14.5		
Aroclor-1260	2.5	0.20	mg/Kg	3.91		63.3	40-140	21.8		
Aroclor-1260 [2C]	2.7	0.20	mg/Kg	3.91		69.3	40-140	21.5		
Surrogate: Decachlorobiphenyl	2.33		mg/Kg	3.91		59.5	30-150			
Surrogate: Decachlorobiphenyl [2C]	2.86		mg/Kg	3.91		73.0	30-150			
Surrogate: Tetrachloro-m-xylene	2.73		mg/Kg	3.91		69.9	30-150			
Surrogate: Tetrachloro-m-xylene [2C]	2.84		mg/Kg	3.91		72.7	30-150			



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**IDENTIFICATION SUMMARY
FOR SINGLE COMPONENT ANALYTES**

WTP-01 Exterior Window Caulking

SW-846 8082A

Lab Sample ID: 18I0024-01 Date(s) Analyzed: 09/11/2018 09/11/2018
 Instrument ID (1): ECD4 Instrument ID (2): ECD4
 GC Column (1): ID: (mm) GC Column (2): ID: (mm)

ANALYTE	COL	RT	RT WINDOW		CONCENTRATION	%RPD
			FROM	TO		
Aroclor-1254	1	0.000	0.000	0.000	0.18	
	2	0.000	0.000	0.000	0.16	11.8



39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

**IDENTIFICATION SUMMARY
FOR SINGLE COMPONENT ANALYTES**

WTP-03 Base Caulking

SW-846 8082A

Lab Sample ID: 18I0024-03 Date(s) Analyzed: 09/11/2018 09/11/2018

Instrument ID (1): ECD4 Instrument ID (2): ECD4

GC Column (1): ID: (mm) GC Column (2): ID: (mm)

ANALYTE	COL	RT	RT WINDOW		CONCENTRATION	%RPD
			FROM	TO		
Aroclor-1254	1	0.000	0.000	0.000	1.2	
	2	0.000	0.000	0.000	1.6	28.6



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**IDENTIFICATION SUMMARY
FOR SINGLE COMPONENT ANALYTES**

WTP-04 Base Caulking

SW-846 8082A

Lab Sample ID: 18I0024-04 Date(s) Analyzed: 09/11/2018 09/11/2018
 Instrument ID (1): ECD4 Instrument ID (2): ECD4
 GC Column (1): ID: (mm) GC Column (2): ID: (mm)

ANALYTE	COL	RT	RT WINDOW		CONCENTRATION	%RPD
			FROM	TO		
Aroclor-1254	1	0.000	0.000	0.000	1.7	
	2	0.000	0.000	0.000	2.3	30.0



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**IDENTIFICATION SUMMARY
FOR SINGLE COMPONENT ANALYTES**

WTP-05 Interior Window Caulking
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SW-846 8082A

Lab Sample ID: 18I0024-05 Date(s) Analyzed: 09/11/2018 09/11/2018

Instrument ID (1): ECD4 Instrument ID (2): ECD4

GC Column (1): ID: (mm) GC Column (2): ID: (mm)

ANALYTE	COL	RT	RT WINDOW		CONCENTRATION	%RPD
			FROM	TO		
Aroclor-1254	1	0.000	0.000	0.000	2.7	
	2	0.000	0.000	0.000	2.7	0.0



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**IDENTIFICATION SUMMARY
FOR SINGLE COMPONENT ANALYTES**

WTP-07 Exterior Window Glazing

SW-846 8082A

Lab Sample ID: 18I0024-07 Date(s) Analyzed: 09/11/2018 09/11/2018

Instrument ID (1): ECD4 Instrument ID (2): ECD4

GC Column (1): ID: (mm) GC Column (2): ID: (mm)

ANALYTE	COL	RT	RT WINDOW		CONCENTRATION	%RPD
			FROM	TO		
Aroclor-1254	1	0.000	0.000	0.000	0.39	
	2	0.000	0.000	0.000	0.57	37.5



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**IDENTIFICATION SUMMARY
FOR SINGLE COMPONENT ANALYTES**

LCS

SW-846 8082A

Lab Sample ID: B211786-BS1 Date(s) Analyzed: 09/11/2018 09/11/2018
 Instrument ID (1): ECD4 Instrument ID (2): ECD4
 GC Column (1): ID: (mm) GC Column (2): ID: (mm)

ANALYTE	COL	RT	RT WINDOW		CONCENTRATION	%RPD
			FROM	TO		
Aroclor-1016	1	0.000	0.000	0.000	3.3	
	2	0.000	0.000	0.000	3.4	3.0
Aroclor-1260	1	0.000	0.000	0.000	3.1	
	2	0.000	0.000	0.000	3.4	9.2



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FLAG/QUALIFIER SUMMARY

*	QC result is outside of established limits.
†	Wide recovery limits established for difficult compound.
‡	Wide RPD limits established for difficult compound.
#	Data exceeded client recommended or regulatory level
ND	Not Detected
RL	Reporting Limit is at the level of quantitation (LOQ)
DL	Detection Limit is the lower limit of detection determined by the MDL study
MCL	Maximum Contaminant Level
	Percent recoveries and relative percent differences (RPDs) are determined by the software using values in the calculation which have not been rounded.
	No results have been blank subtracted unless specified in the case narrative section.
J	Detected but below the Reporting Limit (lowest calibration standard); therefore, result is an estimated concentration (CLP J-Flag).



39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

CERTIFICATIONS**Certified Analyses included in this Report**

Analyte	Certifications
<i>SW-846 8082A in Water</i>	
Aroclor-1016	CT,NH,NY,NC,ME,VA
Aroclor-1016 [2C]	CT,NH,NY,NC,ME,VA
Aroclor-1221	CT,NH,NY,NC,ME,VA
Aroclor-1221 [2C]	CT,NH,NY,NC,ME,VA
Aroclor-1232	CT,NH,NY,NC,ME,VA
Aroclor-1232 [2C]	CT,NH,NY,NC,ME,VA
Aroclor-1242	CT,NH,NY,NC,ME,VA
Aroclor-1242 [2C]	CT,NH,NY,NC,ME,VA
Aroclor-1248	CT,NH,NY,NC,ME,VA
Aroclor-1248 [2C]	CT,NH,NY,NC,ME,VA
Aroclor-1254	CT,NH,NY,NC,ME,VA
Aroclor-1254 [2C]	CT,NH,NY,NC,ME,VA
Aroclor-1260	CT,NH,NY,NC,ME,VA
Aroclor-1260 [2C]	CT,NH,NY,NC,ME,VA
Aroclor-1262	NH,NY,NC,ME,VA
Aroclor-1262 [2C]	NH,NY,NC,ME,VA
Aroclor-1268	NH,NY,NC,ME,VA
Aroclor-1268 [2C]	NH,NY,NC,ME,VA

The CON-TEST Environmental Laboratory operates under the following certifications and accreditations:

Code	Description	Number	Expires
AIHA	AIHA-LAP, LLC - ISO17025:2005	100033	03/1/2020
MA	Massachusetts DEP	M-MA100	06/30/2019
CT	Connecticut Department of Public Health	PH-0567	09/30/2019
NY	New York State Department of Health	10899 NELAP	04/1/2019
NH-S	New Hampshire Environmental Lab	2516 NELAP	02/5/2019
RI	Rhode Island Department of Health	LAO00112	12/30/2018
NC	North Carolina Div. of Water Quality	652	12/31/2018
NJ	New Jersey DEP	MA007 NELAP	06/30/2019
FL	Florida Department of Health	E871027 NELAP	06/30/2019
VT	Vermont Department of Health Lead Laboratory	LL015036	07/30/2019
ME	State of Maine	2011028	06/9/2019
VA	Commonwealth of Virginia	460217	12/14/2018
NH-P	New Hampshire Environmental Lab	2557 NELAP	09/6/2019
VT-DW	Vermont Department of Health Drinking Water	VT-255716	06/12/2019
NC-DW	North Carolina Department of Health	25703	07/31/2019

I Have Not Confirmed Sample Container Numbers With Lab Staff Before Relinquishing Over Samples _____



Doc# 277 Rev 5 2017

Login Sample Receipt Checklist - (Rejection Criteria Listing - Using Acceptance Policy) Any False Statement will be brought to the attention of the Client - State True or False

Client Froehling + Robertson
 Received By J RAP Date 9/4/18 Time 10:06
 How were the samples received? In Cooler _____ No Cooler T On Ice _____ No Ice T
 Direct from Sampling _____ Ambient _____ Melted Ice _____
 Were samples within Temperature? 2-6°C F By Gun # 557 Actual Temp - 22.3
 By Blank # _____ Actual Temp - _____
 Was Custody Seal Intact? NA Were Samples Tampered with? NA
 Was COC Relinquished? T Does Chain Agree With Samples? T
 Are there broken/leaking/loose caps on any samples? F
 Is COC in ink/ Legible? T Were samples received within holding time? T
 Did COC include all pertinent Information? Client T Analysis T Sampler Name T
 Project F ID's T Collection Dates/Times F
 Are Sample labels filled out and legible? T
 Are there Lab to Filters? F Who was notified? _____
 Are there Rushes? F Who was notified? _____
 Are there Short Holds? F Who was notified? _____
 Is there enough Volume? T
 Is there Headspace where applicable? F MS/MSD? F
 Proper Media/Containers Used? T Is splitting samples required? F
 Were trip blanks received? F On COC? F
 Do all samples have the proper pH? NA Acid _____ Base _____

Vials	#	Containers:	#		#		#
Unp-		1 Liter Amb.		1 Liter Plastic		16 oz Amb.	
HCL-		500 mL Amb.		500 mL Plastic		8oz Amb/Clear	
Meoh-		250 mL Amb.		250 mL Plastic		4oz Amb/Clear	
Bisulfate-		Col./Bacteria		Flashpoint		2oz Amb/Clear	
DI-		Other Plastic		Other Glass		Encore	
Thiosulfate-		SOC Kit		Plastic Bag	8	Frozen:	
Sulfuric-		Perchlorate		Ziplock			

Unused Media

Vials	#	Containers:	#		#		#
Unp-		1 Liter Amb.		1 Liter Plastic		16 oz Amb.	
HCL-		500 mL Amb.		500 mL Plastic		8oz Amb/Clear	
Meoh-		250 mL Amb.		250 mL Plastic		4oz Amb/Clear	
Bisulfate-		Col./Bacteria		Flashpoint		2oz Amb/Clear	
DI-		Other Plastic		Other Glass		Encore	
Thiosulfate-		SOC Kit		Plastic Bag		Frozen:	
Sulfuric-		Perchlorate		Ziplock			

Comments:

Samples were received in an VPS envelope.

Appendix F

Photographic Documentation

Section 1

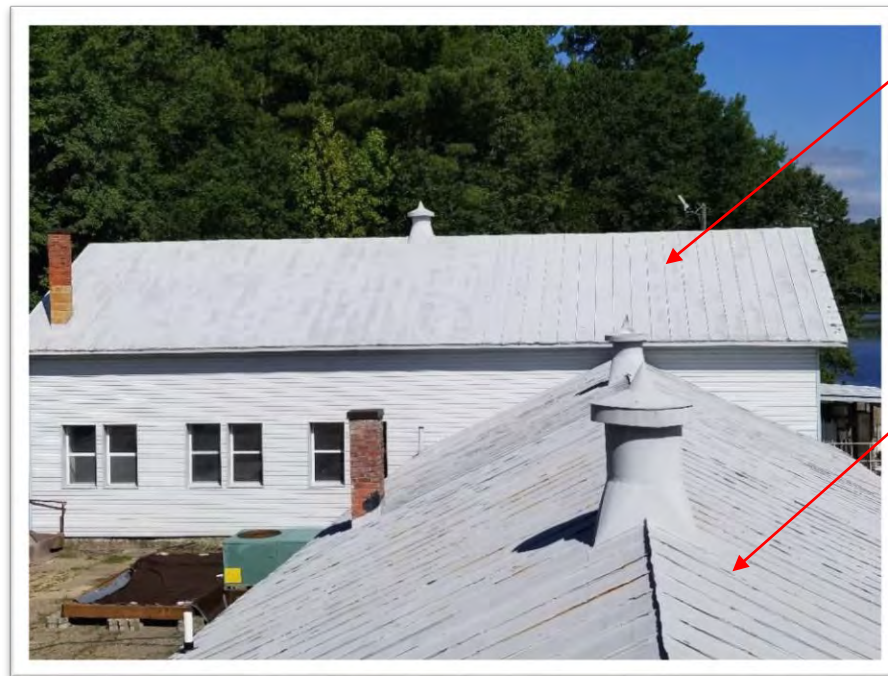
Asbestos-Containing Materials



Location of ACM
Black Mastic on
Chimney base
(Samples E4-1, E4-2)

Location of ACM
Silver Roof Coating on
East Wing Roof
(Samples E5-1, E5-2,
E6-1, E6-2)

Photograph #0001 East Wing - Low Roof South Chimney – Black Mastic and Silver Roof Coating



Location of ACM
Silver Roof Coating on
West Wing Roof

Location of ACM
Silver Roof Coating on
East Wing Roof
(Samples E5-1, E5-2,
E6-1, E6-2)

Photograph #0002 East and West Wings – Silver Roof Coating



Location of ACM cement fiber pipe in front of East Building (Samples E21-1, E21-2)

Photograph #0003 East Wing Exterior– Semi-buried Cement Fiber Pipe



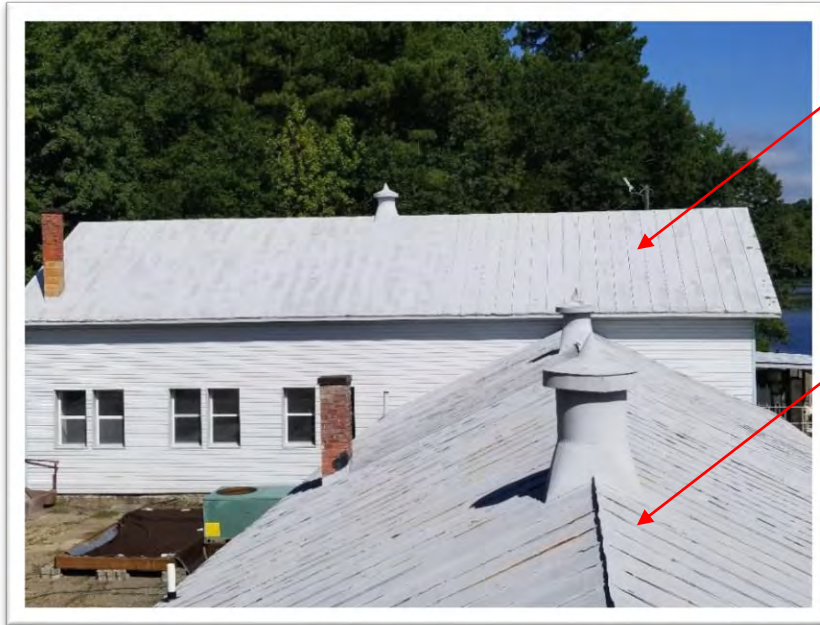
Location of ACM Joint compound on West Wing Kitchen Ceiling (Samples I24-1, I24-2)

Photograph #0004 Building West Wing Kitchen Ceiling – White Joint Compound

Appendix F

Photographic Documentation

Section 2
Lead-Based Paint



Silver LBP applied to metal roof (West Building)

Silver LBP applied to metal roof (East Building)

Photograph #0001 Silver Lead-Based Paint associated with metal roofs of East and West Buildings



White LBP applied to exterior wood soffit (East Building).

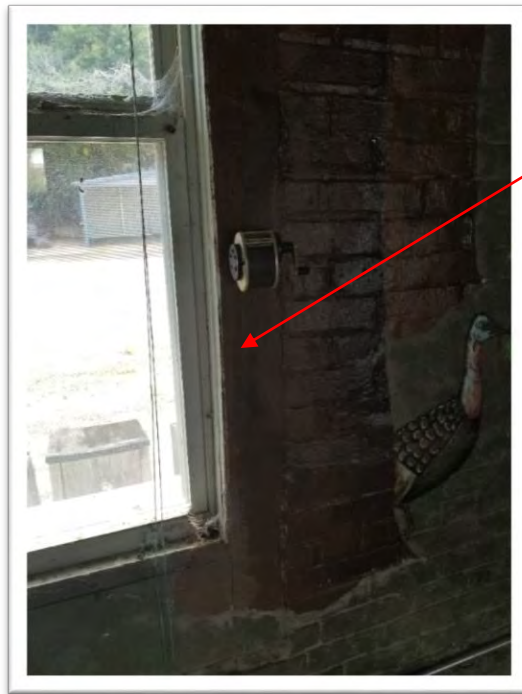
White LBP applied to exterior wood siding (East Building).

Photograph #0002 White Lead-Based Paint associated with exterior wood soffits and siding (East Building)



White LBP applied to interior wood window casings (South Room)

Photograph #0003 White Lead-Based Paint associated with wood window casing in South Room



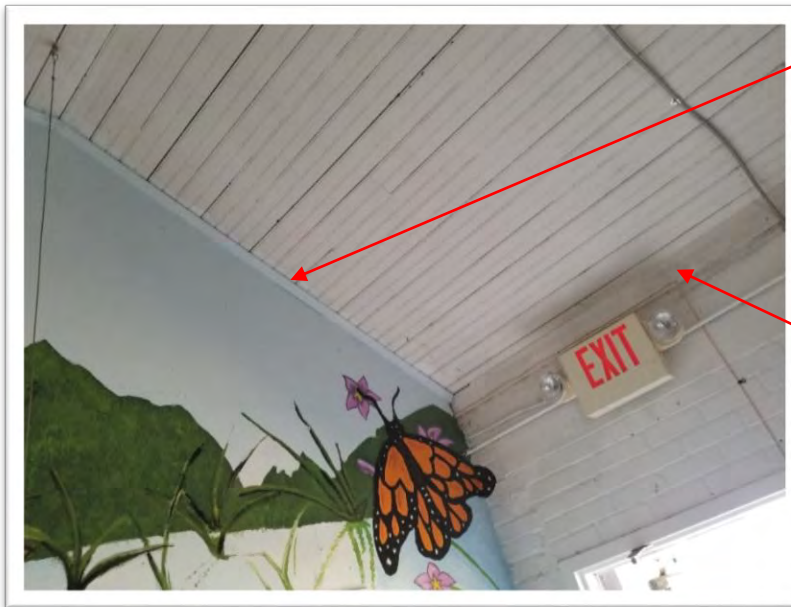
Brown LBP applied to interior wood window casing (South Room)

Photograph #0004 Brown Lead-Based Paint associated with wood window casing in South Room



White LBP applied to wood ceiling (South Room)

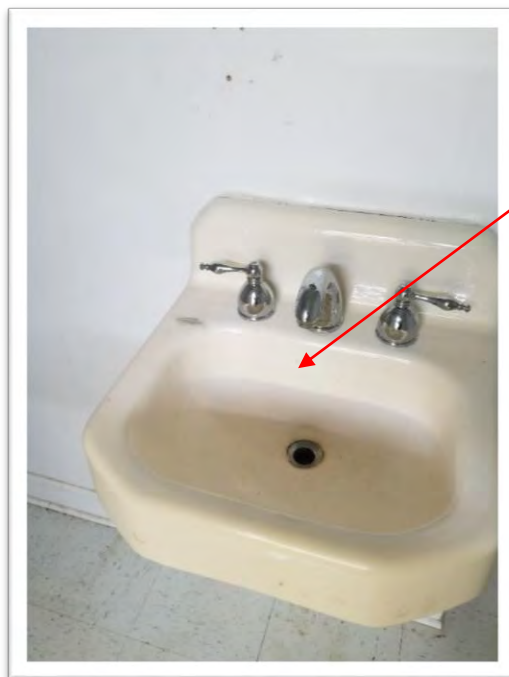
Photograph #0005 White Lead-Based Paint associated with wood ceiling in South Room



Light Blue LBP applied to wood crown molding (South Room)

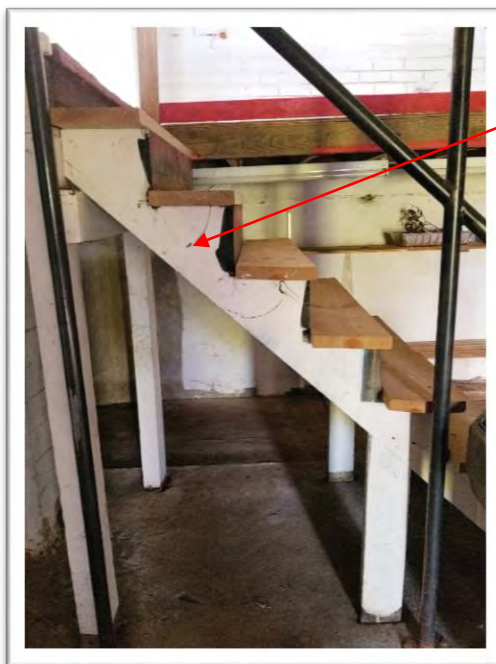
White LBP applied to wood crown molding (South Room)

Photograph #0006 Lt. blue & white Lead-Based Paints associated with wood crown molding in South Room



Off-White LBP
applied to metal sink
(Bathroom #2)

Photograph #0007 Off-White Lead-Based Paint associated with metal sink in Bathroom #2



White LBP applied to
wood stair frame
(North Room)

Photograph #0008 White Lead-Based Paint associated with wood stair frame in North Room



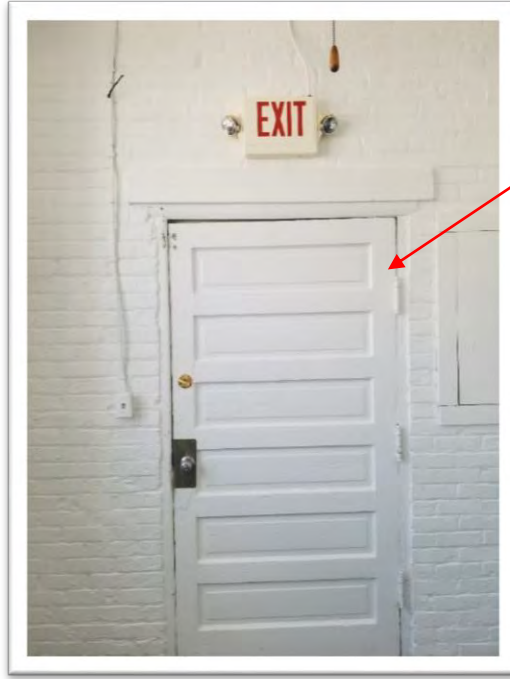
Off-White LBP applied to wood window casing and window sash (North Room)

Photograph #0009 Off-White Lead-Based Paint associated with wood window casing & sash in North Room



White LBP applied to brick walls (Hallway #2)

Photograph #0010 White Lead-Based Paint associated with brick walls in Hallway #2



White LBP applied to wood door (Hallway #2)

Photograph #0011 White Lead-Based Paint associated with wood door in Hallway #2



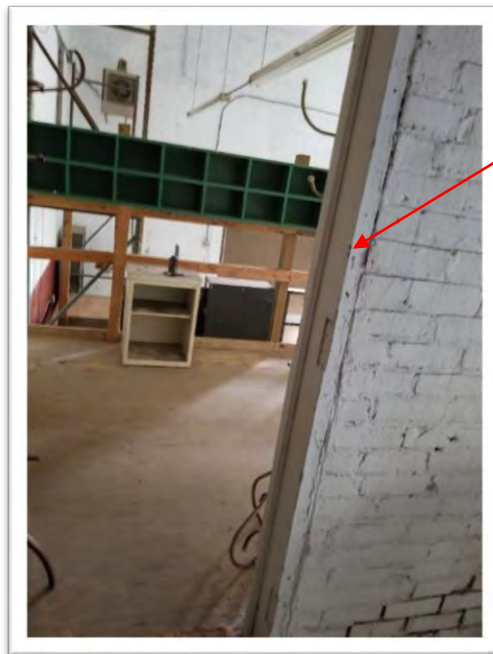
White LBP applied to wood ceiling (Hallway #2)

Photograph #0012 White Lead-Based Paint associated with wood ceiling in Hallway #2



White LBP applied to wood garage door casing (Kitchen)

Photograph #0013 White Lead-Based Paint associated with wood garage door casing in the Kitchen



White LBP applied to wood door casing and jamb (Storage #2)

Photograph #0014 White Lead-Based Paint associated with wood door casing and jamb in Storage #2



Off-White LBP
applied to metal pipe
(Storage #2)

Photograph #0015 Off-White Lead-Based Paint associated with metal pipe in Storage #2



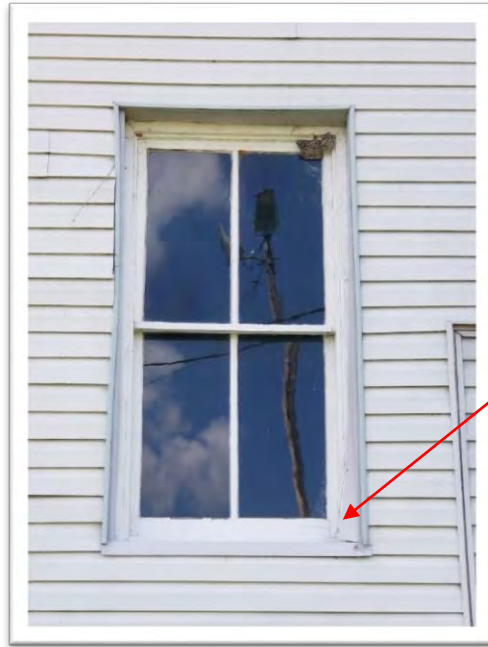
Solid lead pipe in wall
of North Room

Photograph #0016 Solid lead pipe in wall of North Room

Appendix F

Photographic Documentation

Section 3
Polychlorinated Biphenyls



Exterior Window
Caulking (Sample
WTP-01) and Glazing
(Sample WTP-02)

Photograph #0001 Exterior Window Caulking and Glazing sampled by the Mezzanine Level window



Exterior Window
Caulking

Photograph #0002 Close view of typical Exterior Window Caulking



Location of Base
Caulking around South
and Middle Rooms
(Samples WTP-03 and
WTP-04)

Photograph #0003 Base Caulking between floor and wall in the South Room



Caulking around
interior side of
Window (Sample
WTP-05)

Photograph #0004 Interior Caulking around Window in the Middle Room



Exterior Window
Glazing Sampling
Location (Sample
WTP-07)

Photograph #0005 Location of Glazing on Exterior side of Window on north side of building

Appendix G

Explanation of XRF Data Table
XRF Data Table
XRF Performance Characteristic Sheet



Appendix F: XRF Readings

Reading #	Concentration	Units	3 SD	Result	DateTime	Component	Substrate	Color	Side	Room	Floor
393	0.8	mg/cm2	0.1	Positive	8/30/2018 14:03	Calibration	Wood	N/A	N/A	N/A	N/A
394	0.3	mg/cm2	0.3	Negative	8/30/2018 14:03	Calibration	Wood	N/A	N/A	N/A	N/A
395	0.9	mg/cm2	0.1	Positive	8/30/2018 14:03	Calibration	Wood	N/A	N/A	N/A	N/A
396	0.9	mg/cm2	0.1	Positive	8/30/2018 14:06	Calibration	Wood	N/A	N/A	N/A	N/A
397	0.1	mg/cm2	0.3	Negative	8/30/2018 14:06	Wall	Brick	White	A	South Room	First
398	0.2	mg/cm2	0.3	Negative	8/30/2018 14:06	Wall	Brick	White	B	South Room	First
399	0.2	mg/cm2	0.3	Negative	8/30/2018 14:07	Wall	Brick	Brown	C	South Room	First
400	0.1	mg/cm2	0.3	Negative	8/30/2018 14:07	Wall	Brick	Green	C	South Room	First
401	0.1	mg/cm2	0.3	Negative	8/30/2018 14:07	Wall	Brick	Light Green	C	South Room	First
402	0.2	mg/cm2	0.3	Negative	8/30/2018 14:08	Wall	Brick	Black	C	South Room	First
403	0.1	mg/cm2	0.3	Negative	8/30/2018 14:08	Wall	Drywall	Dark Green	D	South Room	First
404	0.2	mg/cm2	0.3	Negative	8/30/2018 14:08	Wall	Drywall	Light Green	D	South Room	First
405	0.1	mg/cm2	0.3	Negative	8/30/2018 14:09	Wall	Drywall	Light Blue	D	South Room	First
406	0.1	mg/cm2	0.3	Negative	8/30/2018 14:09	Wall	Drywall	Brown	D	South Room	First
407	0.4	mg/cm2	0.3	Negative	8/30/2018 14:10	Door Casing	Metal	White	A	South Room	First
408	0	mg/cm2	0.3	Negative	8/30/2018 14:10	Door Jamb	Metal	White	A	South Room	First
409	0.1	mg/cm2	0.3	Negative	8/30/2018 14:10	Door	Metal	White	A	South Room	First
410	8.1	mg/cm2	0.3	Positive	8/30/2018 14:11	Window Casing	Wood	White	A	South Room	First
411	-0.2	mg/cm2	0.3	Negative	8/30/2018 14:11	Window Sill	Wood	White	A	South Room	First
412	0	mg/cm2	0.3	Negative	8/30/2018 14:12	Mantle Bracket	Metal	Brown	B	South Room	First
413	0.1	mg/cm2	0.3	Negative	8/30/2018 14:12	Fireplace Fence	Metal	Brown	B	South Room	First
414	7.3	mg/cm2	0.3	Positive	8/30/2018 14:12	Window Casing	Wood	Brown	C	South Room	First
415	-0.1	mg/cm2	0.3	Negative	8/30/2018 14:13	Window Sill	Wood	White	C	South Room	First
416	0.1	mg/cm2	0.3	Negative	8/30/2018 14:13	Door Casing	Metal	Green	C	South Room	First
417	0.1	mg/cm2	0.3	Negative	8/30/2018 14:14	Door Jamb	Metal	Gray	C	South Room	First
418	0.1	mg/cm2	0.3	Negative	8/30/2018 14:14	Door	Metal	Gray	C	South Room	First
419	13.7	mg/cm2	0.3	Positive	8/30/2018 14:14	Ceiling	Wood	White	A	South Room	First
420	8.4	mg/cm2	0.3	Positive	8/30/2018 14:15	Crown Molding	Wood	White	A	South Room	First
421	1.1	mg/cm2	0.3	Positive	8/30/2018 14:16	Crown Molding	Wood	Light Blue	D	South Room	First
422	0.2	mg/cm2	0.3	Negative	8/30/2018 14:17	Wall	Drywall	White	A	Office #1	First
423	0.1	mg/cm2	0.3	Negative	8/30/2018 14:17	Wall	Drywall	White	C	Office #1	First
424	0.1	mg/cm2	0.3	Negative	8/30/2018 14:18	Baseboard	Wood	White	A	Office #1	First
425	0	mg/cm2	0.3	Negative	8/30/2018 14:18	Baseboard	Wood	White	D	Office #1	First
426	0	mg/cm2	0.3	Negative	8/30/2018 14:18	Window Casing	Wood	White	B	Office #1	First
427	-0.2	mg/cm2	0.3	Negative	8/30/2018 14:18	Window Sill	Wood	White	B	Office #1	First
428	0	mg/cm2	0.3	Negative	8/30/2018 14:19	Door Casing	Wood	White	B	Office #1	First
429	0	mg/cm2	0.3	Negative	8/30/2018 14:19	Door Jamb	Wood	White	B	Office #1	First
430	0.1	mg/cm2	0.3	Negative	8/30/2018 14:19	Door	Wood	White	B	Office #1	First
431	0.2	mg/cm2	0.3	Negative	8/30/2018 14:20	Ceiling	Drywall	White	A	Office #1	First
432	0.2	mg/cm2	0.3	Negative	8/30/2018 14:20	Wall	Drywall	White	A	Bathroom #1	First
433	0.1	mg/cm2	0.3	Negative	8/30/2018 14:20	Wall	Drywall	White	C	Bathroom #1	First
434	0.2	mg/cm2	0.3	Negative	8/30/2018 14:21	Baseboard	Wood	White	C	Bathroom #1	First
435	0.1	mg/cm2	0.3	Negative	8/30/2018 14:21	Baseboard	Wood	White	D	Bathroom #1	First
436	-0.1	mg/cm2	0.3	Negative	8/30/2018 14:21	Toilet Stall	Metal	Gray	D	Bathroom #1	First
437	-0.2	mg/cm2	0.3	Negative	8/30/2018 14:22	Urinal	Porcelain	White	A	Bathroom #1	First
438	0.1	mg/cm2	0.3	Negative	8/30/2018 14:22	Base Cabinet	Wood	Stain	C	Bathroom #1	First
439	-0.1	mg/cm2	0.3	Negative	8/30/2018 14:22	Cabinet Door	Wood	Stain	C	Bathroom #1	First
440	0.1	mg/cm2	0.3	Negative	8/30/2018 14:22	Ceiling	Drywall	White	A	Bathroom #1	First
441	0.1	mg/cm2	0.3	Negative	8/30/2018 14:23	Door Casing	Wood	White	B	Bathroom #1	First
442	0	mg/cm2	0.3	Negative	8/30/2018 14:24	Door Jamb	Wood	White	B	Bathroom #1	First
443	0	mg/cm2	0.3	Negative	8/30/2018 14:24	Door	Wood	White	B	Bathroom #1	First
444	0.1	mg/cm2	0.3	Negative	8/30/2018 14:25	Wall	Wood Panel	Stain	A	Office #2	First
445	0.2	mg/cm2	0.3	Negative	8/30/2018 14:26	Wall	Drywall	White	C	Office #2	First
446	0.1	mg/cm2	0.3	Negative	8/30/2018 14:26	Wall	Drywall	White	D	Office #2	First
447	0	mg/cm2	0.3	Negative	8/30/2018 14:26	Baseboard	Wood	Brown	A	Office #2	First
448	-0.1	mg/cm2	0.3	Negative	8/30/2018 14:27	Baseboard	Wood	White	D	Office #2	First
449	0	mg/cm2	0.3	Negative	8/30/2018 14:27	Door Casing	Wood	White	C	Office #2	First
450	0.1	mg/cm2	0.3	Negative	8/30/2018 14:27	Door Jamb	Wood	White	C	Office #2	First
451	0.2	mg/cm2	0.3	Negative	8/30/2018 14:27	Door	Wood	White	C	Office #2	First
452	0	mg/cm2	0.3	Negative	8/30/2018 14:28	Ceiling	Drywall	White	A	Office #2	First
453	0.3	mg/cm2	0.3	Negative	8/30/2018 14:29	Floor	Concrete	Gray	A	Office #2	First
454	-0.3	mg/cm2	0.3	Negative	8/30/2018 14:29	Wall	Drywall	White	A	Office #3	First
455	0.5	mg/cm2	0.3	Negative	8/30/2018 14:29	Wall	Brick	White	C	Office #3	First
456	0.4	mg/cm2	0.3	Negative	8/30/2018 14:30	Wall	Brick	White	C	Office #3	First
457	0	mg/cm2	0.3	Negative	8/30/2018 14:30	Baseboard	Wood	White	A	Office #3	First
458	0.1	mg/cm2	0.3	Negative	8/30/2018 14:31	Door Casing	Wood	White	A	Office #3	First
459	0.1	mg/cm2	0.3	Negative	8/30/2018 14:31	Door Jamb	Wood	White	A	Office #3	First
460	0	mg/cm2	0.3	Negative	8/30/2018 14:31	Door	Wood	White	A	Office #3	First
461	1.8	mg/cm2	0.3	Positive	8/30/2018 14:32	Window Casing	Wood	White	C	Office #3	First
462	0.2	mg/cm2	0.3	Negative	8/30/2018 14:32	Ceiling	Drywall	White	A	Office #3	First
463	0.1	mg/cm2	0.3	Negative	8/30/2018 14:32	Wall	Drywall	White	A	Bathroom #2	First
464	0.3	mg/cm2	0.3	Negative	8/30/2018 14:33	Wall	Brick	White	C	Bathroom #2	First
465	-0.1	mg/cm2	0.3	Negative	8/30/2018 14:33	Baseboard	Wood	White	B	Bathroom #2	First
466	29.1	mg/cm2	0.3	Positive	8/30/2018 14:33	Sink	Metal	Off-White	B	Bathroom #2	First

Reading #	Concentration	Units	3 SD	Result	DateTime	Component	Substrate	Color	Side	Room	Floor
467	-0.2	mg/cm2	0.3	Negative	8/30/2018 14:34	Toilet	Porcelain	White	A	Bathroom #2	First
468	0.2	mg/cm2	0.3	Negative	8/30/2018 14:34	Ceiling	Drywall	White	A	Bathroom #2	First
469	0.1	mg/cm2	0.3	Negative	8/30/2018 14:35	Door Casing	Wood	White	D	Bathroom #2	First
470	0	mg/cm2	0.3	Negative	8/30/2018 14:35	Door Jamb	Wood	White	D	Bathroom #2	First
471	0.2	mg/cm2	0.3	Negative	8/30/2018 14:35	Door	Wood	White	D	Bathroom #2	First
472	-0.1	mg/cm2	0.3	Negative	8/30/2018 14:36	Wall	Drywall	White	A	Hallway #1	First
473	0.2	mg/cm2	0.3	Negative	8/30/2018 14:36	Wall	Drywall	White	C	Hallway #1	First
474	-0.1	mg/cm2	0.3	Negative	8/30/2018 14:36	Baseboard	Wood	White	A	Hallway #1	First
475	0.1	mg/cm2	0.3	Negative	8/30/2018 14:37	Baseboard	Wood	White	C	Hallway #1	First
476	0	mg/cm2	0.3	Negative	8/30/2018 14:37	Door Casing	Wood	White	D	Hallway #1	First
477	0	mg/cm2	0.3	Negative	8/30/2018 14:37	Door Jamb	Wood	White	D	Hallway #1	First
478	0.4	mg/cm2	0.3	Negative	8/30/2018 14:38	Wall	Brick	Off-White	A	Storage #1	First
479	0.1	mg/cm2	0.3	Negative	8/30/2018 14:38	Wall	Drywall	Off-White	D	Storage #1	First
480	0.1	mg/cm2	0.3	Negative	8/30/2018 14:38	Wall	Drywall	Off-White	C	Storage #1	First
481	0.1	mg/cm2	0.3	Negative	8/30/2018 14:39	Door Casing	Wood	Off-White	C	Storage #1	First
482	0	mg/cm2	0.3	Negative	8/30/2018 14:39	Door Jamb	Wood	Off-White	C	Storage #1	First
483	0.2	mg/cm2	0.3	Negative	8/30/2018 14:39	Door	Wood	White	C	Storage #1	First
484	0.1	mg/cm2	0.3	Negative	8/30/2018 14:39	Ceiling	Drywall	Off-White	A	Storage #1	First
485	0	mg/cm2	0.3	Negative	8/30/2018 14:40	Baseboard	Wood	Off-White	D	Storage #1	First
486	0.3	mg/cm2	0.3	Negative	8/30/2018 14:41	Wall	Brick	White	A	Middle Room	First
487	0.3	mg/cm2	0.3	Negative	8/30/2018 14:41	Wall	Brick	White	C	Middle Room	First
488	0.1	mg/cm2	0.3	Negative	8/30/2018 14:42	Wall	Drywall	White	B	Middle Room	First
489	0	mg/cm2	0.3	Negative	8/30/2018 14:42	Wall	Drywall	White	D	Middle Room	First
490	0	mg/cm2	0.3	Negative	8/30/2018 14:43	Door Casing	Wood	White	D	Middle Room	First
491	-0.2	mg/cm2	0.3	Negative	8/30/2018 14:43	Door Jamb	Wood	White	D	Middle Room	First
492	1	mg/cm2	0.3	Positive	8/30/2018 14:43	Window Casing	Wood	White	A	Middle Room	First
493	0	mg/cm2	0.3	Negative	8/30/2018 14:44	Window Sill	Wood	White	A	Middle Room	First
494	0.1	mg/cm2	0.3	Negative	8/30/2018 14:45	Ceiling	Wood	White	A	Middle Room	First
495	0.1	mg/cm2	0.3	Negative	8/30/2018 14:45	Ceiling	Wood	White	A	Middle Room	First
496	0.2	mg/cm2	0.3	Negative	8/30/2018 14:45	Crown Molding	Wood	White	C	Middle Room	First
497	0	mg/cm2	0.3	Negative	8/30/2018 14:46	Crown Molding	Wood	White	B	Middle Room	First
498	0	mg/cm2	0.3	Negative	8/30/2018 14:46	Door Casing	Metal	White	C	Middle Room	First
499	0.5	mg/cm2	0.3	Negative	8/30/2018 14:46	Door Jamb	Metal	White	C	Middle Room	First
500	0	mg/cm2	0.3	Negative	8/30/2018 14:46	Door	Metal	Brown/Gray	C	Middle Room	First
501	0	mg/cm2	0.3	Negative	8/30/2018 14:47	Small Window Soffit	Wood	White	C	Middle Room	First
502	0	mg/cm2	0.3	Negative	8/30/2018 14:48	Baseboard	Wood	White	B	Middle Room	First
503	0.1	mg/cm2	0.3	Negative	8/30/2018 14:48	Conduit	Metal	White	C	Middle Room	First
504	0.3	mg/cm2	0.3	Negative	8/30/2018 14:49	Floor	Concrete	Light Gray	A	Middle Room	First
505	0.5	mg/cm2	0.3	Negative	8/30/2018 14:49	Floor	Concrete	Dark Gray	A	Middle Room	First
506	0.8	mg/cm2	0.3	Negative	8/30/2018 14:51	Wall	Brick	White	A	North Room	First
507	0.1	mg/cm2	0.3	Negative	8/30/2018 14:51	Wall	Brick	White	A	North Room	First
508	0.5	mg/cm2	0.3	Negative	8/30/2018 14:51	Wall	Concrete	White	A	North Room	First
509	0.1	mg/cm2	0.3	Negative	8/30/2018 14:52	Door Casing	Metal	Gray	A	North Room	First
510	0	mg/cm2	0.3	Negative	8/30/2018 14:52	Door Jamb	Metal	Gray	A	North Room	First
511	-0.1	mg/cm2	0.3	Negative	8/30/2018 14:52	Door	Metal	Gray	A	North Room	First
512	0.1	mg/cm2	0.3	Negative	8/30/2018 14:53	Wall	Concrete	White	B	North Room	First
513	0.3	mg/cm2	0.3	Negative	8/30/2018 14:53	Wall	Brick	Red	D	North Room	First
514	0.4	mg/cm2	0.3	Negative	8/30/2018 14:53	Column	Metal	Black	A	North Room	First
515	0.4	mg/cm2	0.3	Negative	8/30/2018 14:54	Column	Metal	Black	A	North Room	First
516	0.1	mg/cm2	0.3	Negative	8/30/2018 14:54	Stair Railing	Metal	Black	A	North Room	First
517	0	mg/cm2	0.3	Negative	8/30/2018 14:54	Stair Railing	Metal	Black	A	North Room	First
518	0.5	mg/cm2	0.3	Negative	8/30/2018 14:54	Column	Metal	White	A	North Room	First
519	0.3	mg/cm2	0.3	Negative	8/30/2018 14:55	Stair Column	Wood	White	A	North Room	First
520	1.2	mg/cm2	0.1	Positive	8/30/2018 14:55	Stair Frame	Wood	White	A	North Room	First
521	0.6	mg/cm2	0.3	Negative	8/30/2018 14:56	Stair Riser	Wood	Black	A	North Room	First
522	0.4	mg/cm2	0.3	Negative	8/30/2018 14:57	Wall	Brick	White	A	North Room	Mezzanine
523	0.2	mg/cm2	0.3	Negative	8/30/2018 14:57	Wall	Brick	White	B	North Room	Mezzanine
524	2	mg/cm2	0.3	Positive	8/30/2018 14:58	Window Casing	Wood	White	A	North Room	Mezzanine
525	1.1	mg/cm2	0.3	Positive	8/30/2018 14:58	Window Sill	Wood	White	A	North Room	Mezzanine
526	0.5	mg/cm2	0.3	Negative	8/30/2018 14:58	Window Sash	Wood	White	A	North Room	Mezzanine
527	0.6	mg/cm2	0.3	Negative	8/30/2018 14:58	Window Sash	Wood	White	A	North Room	Mezzanine
528	0	mg/cm2	0.3	Negative	8/30/2018 14:59	Rail Guard	Metal	Black	C	North Room	Mezzanine
529	0.2	mg/cm2	0.3	Negative	8/30/2018 14:59	Ceiling	Wood	White	A	North Room	Mezzanine
530	0.1	mg/cm2	0.3	Negative	8/30/2018 14:59	Ceiling	Wood	White	A	North Room	Mezzanine
531	0.1	mg/cm2	0.3	Negative	8/30/2018 15:00	Stair Nose	Metal	Red	A	North Room	Mezzanine
532	0.3	mg/cm2	0.3	Negative	8/30/2018 15:00	Floor	Wood	Gray	A	North Room	Mezzanine
533	0.1	mg/cm2	0.3	Negative	8/30/2018 15:00	Shelves	Wood	Green	C	North Room	Mezzanine
534	1.1	mg/cm2	0.1	Positive	8/30/2018 15:01	Window Casing	Wood	Off-White	D	North Room	Mezzanine
535	0.4	mg/cm2	0.3	Negative	8/30/2018 15:01	Window Sill	Wood	Off-White	D	North Room	Mezzanine
536	5.5	mg/cm2	0.3	Positive	8/30/2018 15:02	Window Sash	Wood	Off-White	D	North Room	Mezzanine
537	1.2	mg/cm2	0.1	Positive	8/30/2018 15:03	Wall	Brick	White	D	Hallway #2	First
538	1.4	mg/cm2	0.3	Positive	8/30/2018 15:03	Wall	Brick	White	B	Hallway #2	First
539	0.8	mg/cm2	0.1	Negative	8/30/2018 15:03	Window Casing	Wood	White	B	Hallway #2	First
540	1.3	mg/cm2	0.2	Positive	8/30/2018 15:04	Window Casing	Wood	White	B	Hallway #2	First
541	-0.1	mg/cm2	0.3	Negative	8/30/2018 15:04	Window Sill	Wood	White	B	Hallway #2	First
542	0.2	mg/cm2	0.3	Negative	8/30/2018 15:05	Door Casing	Wood	White	C	Hallway #2	First
543	-0.1	mg/cm2	0.3	Negative	8/30/2018 15:05	Door Jamb	Wood	White	C	Hallway #2	First
544	-0.1	mg/cm2	0.3	Negative	8/30/2018 15:05	Door Jamb	Wood	Black	C	Hallway #2	First
545	1	mg/cm2	0.1	Positive	8/30/2018 15:05	Door	Wood	White	C	Hallway #2	First
546	1.1	mg/cm2	0.2	Positive	8/30/2018 15:07	Ceiling	Wood	White	A	Hallway #2	First

Reading #	Concentration	Units	3 SD	Result	DateTime	Component	Substrate	Color	Side	Room	Floor
547	VOID				8/30/2018 15:08	VOID					
548	0.3	mg/cm2	0.3	Negative	8/30/2018 15:08	Floor	Concrete	Gray	A	Hallway #2	First
549	0.1	mg/cm2	0.3	Negative	8/30/2018 15:09	Wall	Brick	White	C	Kitchen	First
550	0.1	mg/cm2	0.3	Negative	8/30/2018 15:09	Wall	Drywall	White	A	Kitchen	First
551	0	mg/cm2	0.3	Negative	8/30/2018 15:10	Door Casing	Wood	White	A	Kitchen	First
552	1.5	mg/cm2	0.3	Positive	8/30/2018 15:10	Door Jamb	Wood	White	A	Kitchen	First
553	0.2	mg/cm2	0.3	Negative	8/30/2018 15:10	Pipe	Metal	White	B	Kitchen	First
554	0	mg/cm2	0.3	Negative	8/30/2018 15:11	Window Casing	Wood	White	C	Kitchen	First
555	14.4	mg/cm2	0.3	Positive	8/30/2018 15:11	Garage Door Casing	Wood	White	D	Kitchen	First
556	0.1	mg/cm2	0.3	Negative	8/30/2018 15:11	Baseboard	Wood	White	A	Kitchen	First
557	0.1	mg/cm2	0.3	Negative	8/30/2018 15:12	Base Cabinet	Wood	Stain	A	Kitchen	First
558	-0.1	mg/cm2	0.3	Negative	8/30/2018 15:12	Cabinet Door	Wood	Stain	A	Kitchen	First
559	0	mg/cm2	0.3	Negative	8/30/2018 15:12	Base Cabinet	Wood	Stain	D	Kitchen	First
560	-0.2	mg/cm2	0.3	Negative	8/30/2018 15:12	Cabinet Door	Wood	Stain	D	Kitchen	First
561	0	mg/cm2	0.3	Negative	8/30/2018 15:13	Window Casing	Wood	White	D	Kitchen	First
562	0.1	mg/cm2	0.3	Negative	8/30/2018 15:13	Window Soffit	Wood	White	D	Kitchen	First
563	0.4	mg/cm2	0.3	Negative	8/30/2018 15:13	Electric Conduit	Metal	White	D	Kitchen	First
564	0.1	mg/cm2	0.3	Negative	8/30/2018 15:14	Ceiling	Drywall	White	A	Kitchen	First
565	0.3	mg/cm2	0.3	Negative	8/30/2018 15:14	Floor	Concrete	Gray	A	Kitchen	First
566	0.2	mg/cm2	0.3	Negative	8/30/2018 15:15	Wall	Brick	White	A	Storage #2	First
567	2.5	mg/cm2	0.3	Positive	8/30/2018 15:15	Door Casing	Wood	White	A	Storage #2	First
568	3	mg/cm2	0.3	Positive	8/30/2018 15:15	Door Jamb	Wood	White	A	Storage #2	First
569	0.1	mg/cm2	0.3	Negative	8/30/2018 15:16	Ceiling	Wood	White	A	Storage #2	First
570	0.9	mg/cm2	0.1	Negative	8/30/2018 15:16	Baseboard	Wood	White	C	Storage #2	First
571	0.1	mg/cm2	0.3	Negative	8/30/2018 15:16	Wall	Wood Panel	White	C	Storage #2	First
572	0.5	mg/cm2	0.3	Negative	8/30/2018 15:17	Floor	Concrete	Gray	A	Storage #2	First
573	2.1	mg/cm2	0.3	Positive	8/30/2018 15:17	Pipe	Metal	Off-White	A	Storage #2	First
574	0.7	mg/cm2	0.2	Negative	8/30/2018 15:18	Door Casing	Wood	White	C	Storage #2	First
575	0	mg/cm2	0.3	Negative	8/30/2018 15:18	Wall	Brick	Red	D	Storage #2	First
576	-0.1	mg/cm2	0.3	Negative	8/30/2018 15:19	Wall	Brick	White	B	Storage Shed	First
577	0.2	mg/cm2	0.3	Negative	8/30/2018 15:19	Wall	Brick	White	B	Storage Shed	First
578	0.3	mg/cm2	0.3	Negative	8/30/2018 15:21	Wall	Brick	White	A	Exterior	First
579	0.3	mg/cm2	0.3	Negative	8/30/2018 15:21	Wall	Brick	White	A	Exterior	First
580	0.5	mg/cm2	0.3	Negative	8/30/2018 15:22	Door Casing	Metal	Gray	A	Exterior	First
581	0	mg/cm2	0.3	Negative	8/30/2018 15:22	Door Jamb	Metal	Gray	A	Exterior	First
582	0	mg/cm2	0.3	Negative	8/30/2018 15:22	Door	Metal	Gray	A	Exterior	First
583	0.1	mg/cm2	0.3	Negative	8/30/2018 15:23	HVAC Stand	Metal	White	A	Exterior	First
584	0	mg/cm2	0.3	Negative	8/30/2018 15:23	Electric Panel	Metal	Gray	A	Exterior	First
585	0.4	mg/cm2	0.3	Negative	8/30/2018 15:24	Conduit	Metal	White	A	Exterior	First
586	-0.1	mg/cm2	0.3	Negative	8/30/2018 15:24	HVAC Conduit	Metal	Beige	A	Exterior	First
587	0.1	mg/cm2	0.3	Negative	8/30/2018 15:25	Bollard	Metal	White	A	Exterior	First
588	0.4	mg/cm2	0.3	Negative	8/30/2018 15:26	Foundation	Concrete	White	A	Exterior	First
589	0	mg/cm2	0.3	Negative	8/30/2018 15:26	Electric Cabinet	Metal	Green	A	Exterior	First
590	4.5	mg/cm2	0.3	Positive	8/30/2018 15:28	Soffit	Wood	White	A	Exterior	First
591	1.6	mg/cm2	0.3	Positive	8/30/2018 15:29	Siding	Wood	White	A	Exterior	First
592	6.5	mg/cm2	0.3	Positive	8/30/2018 15:29	Roof	Metal	Silver	A	Exterior	First
593	0.2	mg/cm2	0.3	Negative	8/30/2018 15:30	Chimney Wall	Brick	White	B	Exterior	First
594	0.2	mg/cm2	0.3	Negative	8/30/2018 15:30	Wall	Brick	White	B	Exterior	First
595	0.1	mg/cm2	0.3	Negative	8/30/2018 15:31	Post	Metal	Black	B	Exterior	First
596	0.3	mg/cm2	0.3	Negative	8/30/2018 15:31	Wall	Brick	White	C	Exterior	First
597	-0.1	mg/cm2	0.3	Negative	8/30/2018 15:32	HVAC Unit	Metal	Brown	C	Exterior	First
598	0	mg/cm2	0.3	Negative	8/30/2018 15:32	HVAC Stand	Metal	Red	C	Exterior	First
599	-0.1	mg/cm2	0.3	Negative	8/30/2018 15:33	HVAC Duct	Metal	Gray	C	Exterior	First
600	0	mg/cm2	0.3	Negative	8/30/2018 15:33	HVAC Unit	Metal	Green	C	Exterior	First
601	0.1	mg/cm2	0.3	Negative	8/30/2018 15:33	Door Jamb	Metal	Gray	C	Exterior	First
602	0	mg/cm2	0.3	Negative	8/30/2018 15:34	Door	Metal	Brown	C	Exterior	First
603	0.2	mg/cm2	0.3	Negative	8/30/2018 15:34	Pipe Elbow	Metal	White	C	Exterior	First
604	0	mg/cm2	0.3	Negative	8/30/2018 15:35	Screen Door	Wood	Gray	C	Exterior	First
605	0	mg/cm2	0.3	Negative	8/30/2018 15:35	Window Panel	Wood	Gray	C	Exterior	First
606	0.5	mg/cm2	0.3	Negative	8/30/2018 15:36	Wall	Brick	White	D	Exterior	First
607	0.1	mg/cm2	0.3	Negative	8/30/2018 15:36	Post	Metal	Black	C	Exterior	First
608	0.9	mg/cm2	0.1	Positive		Calibration	Wood	N/A	N/A	N/A	N/A
609	0.8	mg/cm2	0.1	Positive		Calibration	Wood	N/A	N/A	N/A	N/A
610	0.9	mg/cm2	0.1	Positive		Calibration	Wood	N/A	N/A	N/A	N/A

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Performance Characteristic Sheet

EFFECTIVE DATE: December 1, 2015

MANUFACTURER AND MODEL:

Make: *Heuresis*
 Models: *Model Pb200i*
 Source: *⁵⁷Co, 5 mCi (nominal – new source)*

FIELD OPERATION GUIDANCE

OPERATING PARAMETERS:

Action Level mode

XRF CALIBRATION CHECK LIMITS:

0.8 to 1.2 mg/cm ² (inclusive)

SUBSTRATE CORRECTION:

Not applicable

INCONCLUSIVE RANGE OR THRESHOLD:

ACTION LEVEL MODE READING DESCRIPTION	SUBSTRATE	THRESHOLD (mg/cm ²)
Results not corrected for substrate bias on any substrate	Brick	1.0
	Concrete	1.0
	Drywall	1.0
	Metal	1.0
	Plaster	1.0
	Wood	1.0

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BACKGROUND INFORMATION

EVALUATION DATA SOURCE AND DATE:

This sheet is supplemental information to be used in conjunction with Chapter 7 of the HUD *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing* ("HUD Guidelines"). Performance parameters shown on this sheet are calculated using test results on building components in the HUD archive. Testing was conducted on 146 test samples in November 2015, with two separate instruments running software version 2.1-2 in Action Level test mode. The actual source strength of each instrument on the day of testing was approximately 2.0 mCi; source ages were approximately one year.

OPERATING PARAMETERS

Performance parameters shown in this sheet are applicable only when properly operating the instrument using the manufacturer's instructions and procedures described in Chapter 7 of the HUD Guidelines.

XRF CALIBRATION CHECK:

The calibration of the XRF instrument should be checked using the paint film nearest 1.0 mg/cm² in the NIST Standard Reference Material (SRM) used (e.g., for NIST SRM 2579, use the 1.02 mg/cm² film).

If the average (rounded to 1 decimal place) of three readings is outside the acceptable calibration check range, follow the manufacturer's instructions to bring the instrument into control before XRF testing proceeds.

SUBSTRATE CORRECTION VALUE COMPUTATION:

Chapter 7 of the HUD Guidelines provides guidance on correcting XRF results for substrate bias. Supplemental guidance for using the paint film nearest 1.0 mg/cm² for substrate correction is provided:

XRF results are corrected for substrate bias by subtracting from each XRF result a correction value determined separately in each house for single-family housing or in each development for multifamily housing, for each substrate. The correction value is an average of XRF readings taken over the NIST SRM paint film nearest to 1.0 mg/cm² at test locations that have been scraped bare of their paint covering. Compute the correction values as follows:

Using the same XRF instrument, take three readings on a bare substrate area covered with the NIST SRM paint film nearest 1 mg/cm². Repeat this procedure by taking three more readings on a second bare substrate area of the same substrate covered with the NIST SRM.

Compute the correction value for each substrate type where XRF readings indicate substrate correction is needed by computing the average of all six readings as shown below.

For each substrate type (the 1.02 mg/cm² NIST SRM is shown in this example; use the actual lead loading of the NIST SRM used for substrate correction):

$$\text{Correction value} = (1\text{st} + 2\text{nd} + 3\text{rd} + 4\text{th} + 5\text{th} + 6\text{th Reading})/6 - 1.02 \text{ mg/cm}^2$$

Repeat this procedure for each substrate requiring substrate correction in the house or housing development.

EVALUATING THE QUALITY OF XRF TESTING:

Randomly select ten testing combinations for retesting from each house or from two randomly selected units in multifamily housing.

Conduct XRF re-testing at the ten testing combinations selected for retesting.

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Determine if the XRF testing in the units or house passed or failed the test by applying the steps below.

Compute the Retest Tolerance Limit by the following steps:

Determine XRF results for the original and retest XRF readings. Do not correct the original or retest results for substrate bias. In single-family and multi-family housing, a result is defined as a single reading. Therefore, there will be ten original and ten retest XRF results for each house or for the two selected units.

Calculate the average of the original XRF result and the retest XRF result for each testing combination.

Square the average for each testing combination.

Add the ten squared averages together. Call this quantity C.

Multiply the number C by 0.0072. Call this quantity D.

Add the number 0.032 to D. Call this quantity E.

Take the square root of E. Call this quantity F.

Multiply F by 1.645. The result is the Retest Tolerance Limit.

Compute the average of all ten original XRF readings.

Compute the average of all ten re-test XRF readings.

Find the absolute difference of the two averages.

If the difference is less than the Retest Tolerance Limit, the inspection has passed the retest. If the difference of the overall averages equals or exceeds the Retest Tolerance Limit, this procedure should be repeated with ten new testing combinations. If the difference of the overall averages is equal to or greater than the Retest Tolerance Limit a second time, then the inspection should be considered deficient.

Use of this procedure is estimated to produce a spurious result approximately 1% of the time. That is, results of this procedure will call for further examination when no examination is warranted in approximately 1 out of 100 dwelling units tested.

TESTING TIMES:

In the Action Level paint test mode, the instrument takes the longest time to complete readings close to the Federal standard of 1.0 mg/cm². The table below shows the mean and standard deviation of actual reading times by reading level for paint samples during the November 2015 archive testing. The tested instruments reported readings to one decimal place. No significant differences in reading times by substrate were observed. These times apply only to instruments with the same source strength as those tested (2.0 mCi). Instruments with stronger sources will have shorter reading times and those with weaker sources, longer reading times, than those in the table.

Mean and Standard Deviation of Reading Times in Action Level Mode by Reading Level		
Reading (mg/cm²)	Mean Reading Time (seconds)	Standard Deviation (seconds)
< 0.7	3.48	0.47
0.7	7.29	1.92
0.8	13.95	1.78
0.9 – 1.2	15.25	0.66
1.3 – 1.4	6.08	2.50
≥ 1.5	3.32	0.05

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CLASSIFICATION OF RESULTS:

XRF results are classified as **positive** if they are **greater than or equal** to the stated threshold for the instrument (1.0 mg/cm²), and *negative* if they are *less than* the threshold.

DOCUMENTATION:

A report titled *Methodology for XRF Performance Characteristic Sheets* (EPA 747-R-95-008) provides an explanation of the statistical methodology used to construct the data in the sheets, and provides empirical results from using the recommended inconclusive ranges or thresholds for specific XRF instruments. The report may be downloaded at <http://www2.epa.gov/lead/methodology-xrf-performance-characteristic-sheets-epa-747-r-95-008-september-1997>.

This XRF Performance Characteristic Sheet (PCS) was developed by QuanTech, Inc., under a contract with the XRF manufacturer.

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