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Taylor, Dianna

From: McWilliams, Clark
Sent: Wednesday, December 09, 2015 10:23 AM
To: Taylor, Dianna
Subject: NABORS: Rev 100% Design and Estimate

DT-
AFIN: 03-000051
Permit: 0249-S1-R2
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D:\PROJFILE\NABORS\CLOSURE\ABA Response Package\007 Revised 100_Project Manual - Closure of Inactive NABORS Landfills.pdf
D:\PROJFILE\NABORS\CLOSURE\ABA Response Package\Closure of Inactive NABORS Landfills Plan Set - 11.20.15.pdf
D:\PROJFILE\NABORS\CLOSURE\AA_Copy of Low High Engineer's Estimate 12.3.15.xlsx

Thanks,
Clark McWilliams P.E. 501-682-0510
ADEQ – Solid Waste Management Division
12/9/15

PROJECT MANUAL – SPECIFICATIONS
CLOSURE OF INACTIVE N.A.B.O.R.S. LANDFILLS

1320 Landfill Road, Mountain Home, Arkansas 72653

DBA Project Number 9301601

Prepared for:
Arkansas Department of
Environmental Quality
5301 Northshore Drive
North Little Rock, Arkansas 72118

Prepared by:
SCS Aquaterra
7311 West 130th Street, Ste. 100
Overland Park, Kansas 66213
913-681-0030

SCS AQUATERRA

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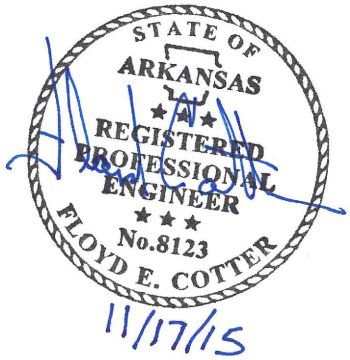

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INVITATION TO BID
Section 00 11 16 / Rev: August 2015

SCS Aquaterra	Closure of Inactive N.A.B.O.R.S. Landfills
7311 West 130th Street Overland Park, Kansas 66213 (913) 681-0030	DBA Project #: 9301601 Owner/Agency: Arkansas Department of Environmental Quality

1) You are invited to bid on a General Contract for the:
   Construction of: Closure of Inactive N.A.B.O.R.S. Landfills
   Located At: 1320 Landfill Road, Mountain Home, Arkansas 72653
   Project Owner: Arkansas Department of Environmental Quality
   Bid Type: Lump Sum Basis: Lowest Responsive and Responsible Bidder

2) There will be a Mandatory Pre-Bid Conference
   Date: TBD
   Time: 10:00 a.m.
   Location: 1320 Landfill Road, Mountain Home, Arkansas 72653

   The State reserves the right to schedule future meetings.
   Bids received from any bidder failing to attend any mandatory meeting(s) shall be declared non-responsive.

3) The Owner will receive bids until:
   Date: TBD
   Time: 3:30 p.m.
   Location: Division of Building Authority, Ground Floor Room G-05, 501 Woodlane Avenue, Little Rock, Arkansas 72201

   Bids may be mailed or delivered to the above address. Bids received after the date and time stated in the solicitation and will not be considered. Bids will be publicly opened and read aloud at the time and date mentioned. Interested parties are invited to attend. The Division of Building Authority, hereinafter termed DBA, unless designated to another entity, supervises the bidding and award of all construction contracts, approves contract change orders, request for final payment and ensures on-site observations are accomplished.

4) Obtaining contract documents through any source other than the Design Professional listed above or their representative(s) is not advisable due to the risks of receiving incomplete or inaccurate information. Contract documents obtained through the Design Professional or their representative(s) are considered the official version and take precedence should any discrepancies occur. The official version of the complete set of the contract documents should be examined and are obtainable from:
   Contract Documents should be exaimined and are obtainable from Arkansas Blueprint, 10110 W Markham, Little Rock, Arkansas 72205, (501) 312-0050.

5) Bid document deposit and refund information:
Bidders must purchase bidding documents through Arkansas Blueprint of a plan room. Bidding documents are non-returnable.

6) While contract documents can be examined at the following plan room(s), bidders should use caution in doing so:

Capitol Imaging, 1301 W. Capitol Ave., Little Rock, AR 72201, Phone Number (501) 376-2446, (800) 428-5890, www.capitolblue.com/planroom

McGraw Hill Construction Dodge Online Plans Room, http://construction.com/dodge, Phone Number (912) 351-4504

7) Bid Security in the amount of five (5) percent of the bid must accompany each bid in accordance with the Instructions to Bidders.

8) Bidders are hereby notified that any bidder who desires to enter into Contract for this work must comply with disclosure requirements pursuant to Governor Executive Order 98-04. Submission to the Owner and DBA of the completed Disclosure (DBA 00 73 73) form will be a condition of the Contract. The Owner cannot enter into any contract nor can DBA approve any contract, which does not obligate the Contractor to require the submission of Disclosure (DBA 00 73 73) forms for subcontracts exceeding $25,000.

9) Bidders are hereby notified that Arkansas Department of Labor prevailing wage rates will apply.

10) The State reserves the rights to reject any and all bids, and to waive any formalities. Bidders shall conform to the requirements of the Arkansas licensing laws and regulations for contractors, and shall be licensed before his bid is submitted unless the project is federally funded pursuant to Arkansas Code Annotated § 17-25-315.

11) Pursuant to Ark. Code Ann. § 22-9-203, the State encourages all small, minority, and women business enterprises to submit bids for capital improvements. Encouragement is also made to all general contractors that in the event they subcontract portions of their work, consideration is given to the identified groups.

12) Pursuant to Ark. Code Ann. § 19-11-105, the lowest responsible bidder shall certify prior to executing the contract that they do not employ or contract with any illegal immigrants. Bidders shall certify online at: https://www.ark.org/dfa/immigrant/index.php/user/login

To: **All Bidders**
From: **Division of Building Authority, Construction Section**
Re: **Common Bidding Mistakes**
Date: **7/22/2015**

The following list* are the eleven most common mistakes which occur in the bid submittal process and result in bid rejections.

1) Not listing the Subcontractor's name or the Contractors name (Mechanical, Plumbing, Electrical, Roofing) in the space provided on the bid form.

2) The listed Subcontractor's license has expired or is misclassified (when the subcontractor's work is $50k or more for work).

3) Bid Bond is not signed by a resident / non resident agent licensed within Arkansas.

4) Addenda are not acknowledged by the Contractor on the Bid Form.

5) Failure to submit any bid security or the issuing surety company for the Bid Bond is not qualified and authorized to do business within the State and is not listed on the current United States Department of the Treasury's listing of approved sureties.

6) Bid Bond or Bid Form is not signed by the Contractor or Contractors representative.

7) Expired Contractor's license or is misclassified for the work.

8) Bid Bond not accompanied by the Agent's Power of Attorney, or the name of the resident / non resident agent is not shown on the Power of Attorney.

9) Bid Security (Bid Bond or Cashiers Check) made out to the wrong entity (Obligee or Payee), the bid security must be made out to the Owner.

10) Failure to submit attachments, such as unit prices, with the bid form, if required by the bid documents.

11) Bidder fails to initial any revised entries on the submitted bid form. All changes shall be made by striking through the wrong entry and the corrected entry shall be inserted on the Bid Form and initialed.

*This is NOT an all inclusive checklist and is only being provided as informational assistance to bidders. Bidders should become familiar with all the bid documents, procedures, rules and laws governing bid submittals and state contracting processes.

INSTRUCTIONS TO BIDDERS
Section 00 21 13 / Rev: August 2015

1. **BIDDING DOCUMENTS**. Bidders may obtain complete sets of Contract Documents from issuing office designated in the Invitation to Bid. Complete sets of Contract Documents must be used in preparing bids; neither Owner nor Design Professional assume responsibility for errors or misinterpretations resulting from the use of incomplete sets of Contract Documents. Obtaining Contract documents through any source other than the Design Professional listed in the Invitation to Bid is not advisable due to the risks of receiving incomplete or inaccurate information, and the bidder runs the risk of basing bidder's proposal on such information. The documents obtained through the Design Professional or his representative(s) or DBA are considered the official version and take precedence if any discrepancies occur. The fact that documents used for bidding purposes are named "contract documents" does not diminish in any way the right of the State to reject any and all bids and to waive any formality.

2. **EXAMINATION OF DRAWINGS, SPECIFICATIONS AND SITE OF WORK**. Bidder shall examine the Contract Documents and visit the project site of work. Bidder shall become familiar with all existing conditions and limitations under which the Work is to be performed, and shall base bid on items necessary to perform the Work as set forth in the Contract Documents. Failure to do so is at the sole risk of the bidder. No allowance will be made to Bidder because of lack of such examination or knowledge. The submission of a Bid shall be construed as conclusive evidence that the Bidder has made such examination.

3. **INTERPRETATION OF CONTRACT DOCUMENTS DURING BIDDING**.

3.1 All references to the Owner shall be interpreted to mean the Agency for whom the work is being contracted.

3.2 If any person contemplating submitting a Bid is in doubt as to the true meaning of any part of the Contract Documents or finds discrepancies in or omissions from any part of the Contract Documents, he may submit to the Design Professional a written request for an interpretation or correction thereof not later than five (5) calendar days before Bid opening. In those instances where a Design Professional is not involved with the project, written requests for interpretation or correction may be made to the DBA Construction Section within the time frame stated above.

3.3 Address all communications regarding the Contract Documents to the Design Professional.

In those instances where a Design Professional is not involved, address all such communications to DBA Construction Section, 501 Woodlane Suite, G 05 Little Rock, AR 72201 (501-682-5574).

3.4 Interpretation or correction of the Contract Documents will be made only by Addendum and will be issued by fax transmission to, hand delivered to, electronic notification to or picked up by potential bidders who received plans and specifications from the official plan distribution entity. The Design Professional shall be responsible for issuance of all addenda and documentation relating to its issuance (not receipt). In those instances where a Design Professional is not involved, the DBA Construction Section shall distribute Addenda in the above referenced manner. Bidders are responsible for verifying if any Addenda were issued prior to bid submittal. The State will not be responsible for oral explanations or interpretation of the Contract Documents.

3.5 Addenda issued during the bidding period will be incorporated into the Contract Documents.

4. **SUBSTITUTIONS.**

4.1 Materials, products, and equipment described in the Contract Documents establish a standard of required function and a minimum desired quality or performance level, or other minimum dimensions and capacities, to be met by any proposed substitution. Acceptability of substitutions will not be considered during bidding period.

4.2 In some cases, prior approval of material or equipment, or both shall be obtained from Owner in order to obtain the desired color, size, visual appearance, and other features specified.

5. **TYPE OF BID**.

5.1 The Work under this Contract will be awarded under a stipulated sum contract to the lowest responsive and responsible base bid amount. No segregated bids, alternate bids, or assignments will be considered.

5.2 The estimate of quantities is approximate only and shall be the basis for receiving unit price bids for each item, but shall not be considered by the Bidder as the actual quantities that may be required for the completion of the proposed work. Bidder shall state a unit price for every item of work named in the Proposal. Bidder shall include, in the unit prices, furnishing of labor, materials, tools, equipment, and apparatus of every description to construct, erect, and finish the Work. The unit price bid for the items shall be shown numerically and in the appropriate spaces provided on the Bid Form. Such figures shall be clear and distinctly legible so that no question can arise as to their intent or meaning. Unit price bids and totals shown in the Bid Form shall not include costs of engineering, advertising, printing and appraising.

6. **PREPARATION OF BID.**

6.1 Bid shall be made on an unaltered Bid Form identical to the form included with the Contract Documents. Fill in all blank spaces and submit one original. Bidders shall not strike through or add language to the bid form unless Bidders are modifying language previously inserted by the bidders themselves. Bidders should contact the DBA Construction Section for questions or concerns regarding the bid form. If this solicitation requires bidding on all items, failure to do so will disqualify the bid. Bidder shall furnish all information required by the solicitation and bid documents. Bids shall be signed with name printed below the signature. The Contractor's license number issued by the Contractors Licensing Board shall be placed on the Bid Form whenever the total project amount is $50,000 or more.

Where Bidder is a corporation, bids shall be signed with the legal name of the corporation and the signature of an authorized officer of the corporation. Bids signed by an agent shall be accompanied by evidence of that agent's authority. The name of the state of incorporation, contractor's license number issued by the Contractors Licensing Board should be listed. Bids submitted by contractors who are not properly licensed shall be rejected.

6.2 Bids submitted by a "Joint Venture/Joint Adventure" shall be signed by representatives of each component part of the Joint Venture/Joint Adventure. The licenses of each component part of the Joint Adventure should also be listed in the bid submittal. Therefore, joint adventure bidders shall indicate at least two (2) signatures and should indicate two (2) licenses numbers on the Bid Form. Exception: Joint Ventures who have been properly licensed with the Arkansas Contractors Licensing Board as a "Joint Venture" need only to indicate the joint venture license number on the Bid Form. Joint Venture Bidders shall indicate at least two (2) signatures on the bid form even if they are licensed as a joint venture.

7. **BID GUARANTEE AND BONDS**.

7.1 Each bid proposal shall include a bid security in the amount of five percent of the total bid offered, if the bid is in excess of $20,000.00. The bidder will be required to submit a bid security, which includes enclosing a cashiers check payable to the order of the OWNER drawn upon a bank or trust company doing business in Arkansas or by a corporate bid bond in an amount equal to five (5) percent of the bid. The bidder shall include in the bid the bid bond amount so that the bid represents the total cost to the Owner of all work included in the contract. Bid bonds shall be made by a surety company qualified and authorized to do business in the State of Arkansas and are listed on the current United States Department of the Treasury's listing of approved sureties. The bid bond shall be executed by a resident or non-resident agent who is licensed by the Arkansas Insurance Commissioner to represent the surety company executing the bond. The agent shall file a power of attorney to act on the behalf of the bonding company with the bid bond. Bidders may utilize a DBA Bid Bond form, however they are not required to do so; other bid bond formats are acceptable.

In any event, regardless of the type of bid security or the format of the bid bond chosen by the Bidder, failure to submit a valid bid security in accordance with Arkansas laws and regulations, including a power of attorney with the bid bond, shall render the bidders proposal void.

7.2 The bid security shall indemnify the Owner against failure of the Contractor to execute and deliver the contract and necessary bond (Performance and Payment Bond) for faithful performance of the contract. The bid security shall provide that the contractor or surety must pay the damage, loss, cost and expense subject to the amount of the bid security directly arising out of the Contractor's default in failing to execute and deliver the contract and bonds.

7.3 Owner will have the right to retain the bid security of bidders to whom an award is being considered until the Contract has been executed and bonds if required, have been furnished, or until specified time has elapsed so that bids may be withdrawn, or all bids have been rejected.

7.4 Failure to execute the Contract and file an acceptable full payment and performance bond and proof of insurance within the time frame as stated in 6(b) of Section 00 41 13 Bid Form after the intent to award has been issued to the bidder shall be just cause for the cancellation of the award and forfeiture of the bid bond, which shall become the property of the agency, not as a penalty but in liquidated damages sustained. Award may then be made to the next lowest responsible bidder, or the work may be rebid and constructed under contract or otherwise as the State determines. The responsible low bidder who fails to execute the Contract and submit an acceptable payment and performance bond and proof of insurance will not be permitted to bid on any subsequent advertisement of that project.

8. **PERFORMANCE AND PAYMENT BOND**. Performance and Payment Bonds are not required for bids $20,000.00 or under, except for roofing projects. For work exceeding $20,000.00, the Contractor shall furnish a Performance and Payment Bond in the amount equal to 100 percent of contract price, on a form identical to the Performance and Payment Bond Form included with the Contract Documents as security for faithful performance of the Contract and payment of all obligations arising thereunder within the time frame as stated in 6(b) of Section 00 41 13 Bid Form after receipt of the Intent to Award. The bond shall be executed by a surety company qualified and authorized to do business in the State of Arkansas and are listed on the current United States Department of the Treasury's listing of approved sureties. The bond shall be executed by a resident or non-resident agent licensed by the State Insurance Commissioner, to represent the surety company and the agent shall file with the bond the power of attorney of the agent to act on behalf of the bonding company. The bond shall be written in favor of the Owner. Contractor shall file the bond with the Circuit Clerk in the county where the Work is to be performed.

Failure to deliver said bonds, as specified, shall be considered as having abandoned the Contract and the bid security will be retained as liquidated damages. The bidder shall include in the bid the Performance and Payment bond amount so that the bid represents the total cost to the Owner of all work included in the contract.

9. **LISTING OF SUBCONTRACTORS.**

9.1 **LISTING OF SUBCONTRACTORS**. Name of principal Subcontractors or Prime Contractor (Mechanical {HVACR}, Plumbing, Electrical and Roofing) shall be listed where indicated on the Bid Form in accordance with Ark. Code Ann. § 22-9-204 and the contract documents. All prime contractors, as a condition to perform construction work for and in the State of Arkansas, shall use no other Subcontractors, including his own forces when the Subcontractor's portion of the project is $50,000.00 or more, except those qualified and licensed by the Contractors Licensing Board in Mechanical (HVACR), Plumbing, Electrical and Roofing. Those principal Subcontractors or prime contractor listed in these spaces must be properly licensed for all work performed on or for the project that is for a combined total of $50,000 or more as determined by the Contractors Licensing Board (CLB). The bidder must also be properly licensed and use licensed Subcontractors for all other Work performed on or for the project that totals $50,000 dollars or more as classified and determined by the CLB.

A bidder should request clarification from the Design Professional (or from DBA Construction Section, if no Design Professional exists for the project), if the bidder determines a type of work (mechanical – indicative of HVACR; electrical; plumbing; roofing) is a component of the project, but space has not been provided on the bid form for the listing of such, if the bid form lists a type of Work that is not a component of the project or if the bidder has any question on how to fill out the proposal with respect to the listing of subcontractors. Clarification should be made in accordance with Instruction 3.2.

9.1.1 The Prime Contractor must make a decision as to which (mechanical –indicative of HVACR; electrical; plumbing; roofing) subcontractor or his own forces he intends to use for each principal discipline of work. The prime contractor shall place the name(s) of each subcontractor or his own forces he intends to perform the Work in the space provided on the Bid Form and indicate whether the amount of the listed Work is $50,000.00 or more. The prime contractor will also note on the bid form if the listed entity proposed to perform the Work will accomplish any other Work on the project and the cost of such Work. The prime contractor and/or the subcontractor listed on the bid form must be properly licensed by the Contractors Licensing Board (CLB) for any principal Work (mechanical –indicative of HVACR; electrical; plumbing; roofing), as well as any other proposed Work on the project.

If a Contractor or Subcontractor needs license classification guidance or wishes to verify classifications and/or licensees of subcontractors or their own forces they should contact the CLB prior to submitting the bid. If the bid form has a space for the prime contractor to list which subcontractor(s) or his own forces he intends to utilize to accomplish the disciplines of mechanical, electrical, plumbing, and/or roofing, the bidder must fill in the said blank space with the name of the contractor/subcontractor that will perform this work. Failure to complete the form correctly shall cause the bid to be declared non-responsive, and the bid will not receive consideration.

9.1.2 It shall be mandatory that any subcontractors listed on the Bid Form by the Prime Contractor are awarded a contract under Ark. Code Ann. § 22-9-204. Prime Contractors who submit a bid listing unlicensed subcontractors or use unlicensed subcontractors on a state project or any subcontractor not licensed by the Contractors Licensing Board who perform Work having a value of $50,000.00 or more on a state project are subject to a civil penalty, after notice and hearing, of not less than $250.00 nor more than $500.00 and may be suspended from bidding on state projects. In the event that one (1) or more of the subcontractors named by the prime contractor in his successful bid thereafter refuse to perform his contract or offered contract, the prime contractor may substitute another subcontractor, after having obtained prior approval from the design professional, the owner, and DBA.

9.2 License Requirement

a. No person shall perform Work on the contract without possessing an Arkansas State License for the Work they are performing from the appropriate governing Boards. Apprentices will be appropriately supervised according to the State governing Boards requirements.

b. All licensed craftsman shall have a copy of their license with them and shall be required to provide it to a DBA or Owner Representative upon request.

9.3 Pursuant to Ark. Code Ann. § 22-9-404, the Bidder may require subcontractors to provide a Performance and Payment Bond to the Bidder when the Subcontractor is the selected for their portion of the Work. If the Contractor requires a Subcontractor to furnish a Performance and Payment Bond, the Subcontractor shall be entitled to payment of ninety-five (95) percent of the earned progress payments when due, with the Contractor retaining five (5) percent to assure faithful performance of the construction subcontract. Upon the approval of the Contractor, if the Subcontractor completes fifty (50) percent of the construction subcontract the Contractor shall not retain any further monies.

10. **SUBMITTAL**. Submit bid on the Bid Form in an opaque, sealed envelope. Identify the envelope with: the words “Bid Documents”, project name and number, name of Bidder, and Arkansas Contractors License number, if required; only one bid shall be submitted per State Contractors license number. Submit bids in accordance with the Invitation to Bid. All blanks on the form shall be filled out in ink or be typewritten. Erroneous entries, alterations, and erasures shall be lined out, initialed by the Bidder, and the corrected entry inserted on the Bid Form.

11. **MODIFICATION, WITHDRAWAL AND SCRIVENERS’ ERROR**.

11.1 Modification and Withdrawal. Bidder may withdraw bid at any time before bid opening and may resubmit up to the date and time designated for receipt of bids. No bid may be withdrawn or modified after time has been called for the bid opening. Oral modifications to bids will not be considered. Bidder may submit written modifications to bid in writing, by telegraph, or by facsimile and must be received by DBA at any time prior to the expiration of the bidding time and date. All modifications shall be signed and no modification shall show the base bid amount. Telegraph or facsimile modifications shall require written confirmation over the Bidder's original signature within 24 hours after bid opening.

11.2 Scriveners' Error. Pursuant to Ark. Code Ann. § 19-4-1405 (e), bidders may request in writing to the DBA Director, to be relieved of their bid any time after the bid opening, but no later than 72 hours after receiving the intent to award, excluding Saturdays, Sundays and holidays. Scriveners' error is an error in the calculation of a bid which can be documented by clear and convincing written evidence and which can be clearly shown by objective evidence drawn from inspection of the original work papers, documents, or materials used in the preparation of the bid sought to be withdrawn; and the bid was submitted in good faith and the mistake was due to a calculation or clerical error, an inadvertent omission, or a typographical error as opposed to an error in judgment.

11.2.1 Failure to make a timely request constitutes a waiver by the bidder of the bidder's right to claim that the mistake in his or her bid was a scriveners' error.

12. **DISQUALIFICATION OF BIDDERS**. The State shall have the right to disqualify bids (before or after opening), which includes but is not limited to, evidence of collusion with intent to defraud or other illegal practices upon the part of the Bidder, to reject a bid not accompanied by the required bid security or by other data required by the Contract Documents, or to reject a Bid which is in any way incomplete or irregular.

13. **APPLICABLE LAWS**.

13.1 Labor. Contractors employed upon the work will be required to conform to the labor laws of the State of Arkansas and the various acts amendatory and supplementary thereto, and to all the laws, regulations, and legal requirements applicable thereto.

13.2 Discrimination. Bidder shall not discriminate against any employee, applicant for employment, or subcontractor as provided by law. Bidder shall be responsible for ensuring that all subcontractors comply with federal and state laws and regulations related to discrimination. Upon a final determination by a court or administrative body having proper jurisdiction that the Bidder has violated state or federal laws or regulations, the Owner or DBA, or both may impose a range for appropriate remedies up to and including termination of the Contract.

13.3 Taxes. Bidder shall include in the bid all state sales tax, social security taxes, state unemployment insurance, and all other items of like nature. It is the intent that the bid shall represent the total cost to the Owner of all work included in the contract. There are no provisions for a contractor to avoid taxes by using the tax exempt number of a state agency, board, commission or institutions. Said taxes shall be included in the bid price.

13.4 State licensing laws for Contractors shall be complied with.

13.5 Disclosure. Potential Bidders are hereby notified that any bidder who desires to enter into a contract not exempted from the disclosure requirements, that disclosure is a condition of the Contract and that the Owner cannot enter into any such contract, nor can DBA approve any such contract, for which disclosures are not made and the verbiage of paragraphs a, b, and c below will be included in the body of any contract awarded.

Potential Bidders are hereby notified that:

a. Disclosure is required to be a condition of any present or future subcontract for which the total consideration is greater than twenty-five thousand dollars ($25,000.00).

b. The Contractor shall require any present or future Subcontractor, for which the subcontract amount is greater than $25,000.00 to complete and sign the Contract and Grant Disclosure and Certification form. The Contractor shall ensure that any agreement, current or future between the Contractor and a Subcontractor for which the total consideration is greater than $25,000.00 shall contain the following:

Failure to make any disclosure required by Governor Executive Order 98-04, or any violation of any rule, regulation or adopted pursuant to that Order shall be material breach of the term of this subcontract. The party who fails to make the required disclosure or who violates the rule, regulation, or policy shall be subject to all legal remedies available to the contractor.

c. The Contractor shall transmit a copy of the Subcontractor's disclosure form to the agency and a statement containing the dollar amount of the subcontract within ten (10) days upon receipt of subcontractor's disclosure.

Note: A copy of the "Contract and Grant Disclosure and Certification Form" DBA 00 73 73 is included at the end of division zero.

13.5 Minority Participation: Pursuant to Ark. Code Ann. § 22-9-203, the State encourages all small, minority, and women business enterprises to submit bids for capital improvements. Encouragement is also made to all prime contractors that in the event they subcontract portions of their work, consideration is given to the identified groups.

13.6 The bidding, award and administration of the contract shall be made pursuant to Ark. Code Ann. §19-4-1401 et seq., Ark. Code Ann. § 22-9-101 et seq., Ark. Code Ann. § 22-2-101 et seq. and the Minimum Standards and Criteria. The interpretation and intent of these laws and rules take precedence in the event of any conflict with the bid or contract documents, or both. Clarification should be made in accordance with Instruction 3.2.

13.7 Pursuant to Ark. Code Ann. §19-11-105, no state agency may enter into or renew a public contract for services with a contractor who knows that the contractor or a subcontractor employs or contracts with an illegal immigrant to perform work under the contract.

Before executing a public contract, each prospective contractor shall certify in a manner that does not violate federal law in existence on January 1, 2007, that the contractor at the time of the certification does not employ or contract with an illegal immigrant. Online certification shall be made at: https://www.ark.org/dfa/immigrant/index.php/user/login

If a Contractor violates this section, the Owner shall require the Contractor to remedy the violation within sixty (60) days. Failure to remedy the violation within the sixty (60) days as required by law, the Owner shall terminate the contract for breach of the contract and the Contractor shall be liable to the Owner for actual damages.

If a contractor uses a Subcontractor at the time of certification, the Subcontractor shall certify in a manner that does not violate federal law in existence on January 1, 2007, that the subcontractor at that time of certification does not employ or contract with an illegal immigrant. Subcontractors shall submit the certification required to the Contractor within thirty (30) days after the execution of the subcontract. The Contractor shall maintain on file the certification of the Subcontractor throughout the duration of the term of the contract. If the Contractor learns that a Subcontractor is in violation of this section, the Contractor may terminate the contract with the Subcontractor, and the termination of the contract for a violation of this section shall not be considered a breach of the contract by the Contractor and Subcontractor. Contractor agrees the Owner's Representative or DBA shall have the right to request the Contractor's records of Subcontractors illegal immigrant disclosure statements during the course of the project.

14. **LIQUIDATED DAMAGES**. The amount of liquidated damages to be assessed shall be in accordance with the amount indicated in the Contract. Bidder understands and agrees that under the terms of the Contract to be awarded, if the Contractor fails to complete the work within the time limit specified in the Contract, the Contractor shall pay the Owner as Liquidated Damages, and not in the nature of a penalty the sum specified in the Bid Form for each day completion is delayed. It is further understood and agreed by bidder that the said sum fixed as Liquidated Damages is a reasonable sum considering the damages that Owner will sustain in the event of any delay in completion of the Work, and said sum is herein agreed upon and fixed as Liquidated Damages because of difficulty in ascertaining the exact amount of damages that may be sustained by such delay.

15. **PREBID CONFERENCE**. See Section 00 11 16 – Invitation to Bid

16. **OPENING**. Bids will be opened as identified in the Invitation to Bid.

17. **EVALUATION AND CONSIDERATION OF BIDS.**

17.1 It is the intent of the State to award a Contract to the lowest responsive qualified Bidder provided the bid has been submitted in accordance with the requirements of the Contract Documents and does not exceed the funds certified for the project by more than 25%. The State shall have the right to waive any formalities in a bid received and to accept the bid which, in the State's judgment, is in its best interests and upon approval of DBA. The State shall have the right to accept any or all bids for a period not to exceed the time frame as stated in 6(d) of Section 00 41 13 Bid Form.

17.2 Tie Bids. If two or more sealed bids are equal in amount, meet Bidding Document requirements, and are the lowest received by the time of the bid opening, then the apparent low bidder will be determined by lot (placing the name of the tie bidders into a container and drawing one name). The drawing will be conducted by DBA personnel and another person so designated by DBA in the presence of a witness and the tie bidders or representatives. The witness shall be an employee of the State of Arkansas. Documentation of the drawing shall be included on the bid tabulation and be signed by those present. Nothing in the above and foregoing will diminish the State's reserved right to reject any and all bids and to waive any formalities.

18. **EXECUTION OF CONTRACT**.

18.1 The apparent low Bidder shall be prepared, if so required by the Owner, to present evidence of experience, qualifications, and financial ability to carry out the terms of the Contract.

18.2 The successful Bidder will be required to execute an Agreement with the Owner on a form identical to the Agreement Form included with the Contract Documents and the Performance and Payment Bond and Certification of Insurance and a copy of the policies showing all endorsement, exclusions within the time frame as stated in 6(b) of Section 00 41 13 Bid Form after receipt of the Intent to Award. Failure of the Bidder to do so may result in the Bidder being rejected and could result in disqualification and forfeiture of bid bond. The owners notice to proceed shall not be issued until the insurance certificates and coverage have been reviewed and approved by the owner. The successful contractor will commence work within five (5) days of the start date listed on the notice proceed issued by the owner or DBA.

18.3 The successful Bidder will be required to furnish Owner with proof of insurance, as prescribed by the General Conditions and Supplementary General Conditions.

END OF DOCUMENT

BID FORM
Section 00 41 13 / Rev: August 2015

Bid Date:	TBD
Bid Time:	3:30 p.m.
Bid Opening Location:	Division of Building Authority, Ground Floor Room G-05, 501 Woodlane Avenue, Little Rock, Arkansas 72201
Bid To:	Arkansas Department of Environmental Quality
Bid From:	_____
	_____
DBA Project Number:	9301601
Project Name:	Closure of Inactive N.A.B.O.R.S. Landfills

1) Having carefully examined the Contract Documents for this project, as well as the premises and all conditions affecting the proposed construction, the undersigned proposes to provide all labor, materials, services, and equipment necessary for, or incidental to, the construction of the project in accordance with the Contract Documents within the time set forth, for the lump sum base bid of:

$ _____
Dollar Amount Is To Be Shown Numerically

2) Allowances:
Not Required

3) Unit Prices: Required — If the required quantities of the items listed are increased or decreased by change order, the unit prices set forth shall apply to such quantities. Dollar amount is to be shown numerically. See Attachment A for Unit Prices.

4) Trench Safety:
Not Required

$ Not Required
Dollar Amount Is To Be Shown Numerically

5) Completion Date: The Bidder agrees that the work will be complete in accordance with the contract documents and ready for Substantial Completion:

Number of Calendar Days: 120
On or Before Date: N/A

Please Note: Do not strike through or add language to the bid form. See Instruction to Bidders #6.1

6) The undersigned, in compliance with the Contract Documents for the construction of the above named project, does hereby declare:

a. That the undersigned understands that the State reserves the right to reject any and all bids and to waive any formality.

b. That if awarded the Contract, the undersigned will enter into an Agreement, on a form identical to the form included in the Contract Documents and execute required performance and payment bonds and proof of insurance within ten (10) days after receipt of the Intent to Award, will commence work within five (5) days after the start date of the Notice to Proceed, and will complete the Contract fully by Completion Date indicated. Should the undersigned fail to fully complete the work within the above stated time, he shall pay the Owner as fixed, agreed and liquidated damages and not as a penalty, the sum of:
Dollar amount of liquidated damages per day: $5,000 until work is completed or accepted.

c. The undersigned further agrees that the bid security payable to Owner and accompanying this proposal shall become the property of the Owner as liquidated damages if the undersigned fails to execute the Contract or to deliver the required bonds and proof of insurance to the Owner within the time frame as stated in paragraph 6 (b) from receipt of the Intent to Award as these acts constitute a breach of the Contractor's duties.

d. That this bid may not be withdrawn for a period of: 30 calendar days after the bid opening.

f. The names of subcontractors and the nature of the work to be performed by each one have been included on the Bid Form.

g. The following prevailing wage rates will apply:
If the project exceeds $75,000, the undersigned agrees to pay all prevailing hourly wages prescribed and mandated by Arkansas Code Annotated §22-9-301 et. seq.

h. Bids submitted by a "Joint Venture/Joint Adventure" shall be signed by representatives of each component part of the Joint Venture/Joint Adventure. The licenses of each component part of the Joint adventure should also be listed in the bid submittal. Therefore, joint adventure bidders shall indicate at least two (2) signatures and should indicate two (2) licenses numbers on the Bid Form. Exception: Joint Ventures who have been properly licensed with the Arkansas Contractors Licensing Board as a "Joint Venture" need only to indicate the joint venture license number on the Bid Form. Joint Venture Bidders shall indicate at least two (2) signatures on the bid form even if they are licensed as a joint venture.

7) The following document(s) is attached to and made a condition of this bid.

a. Bid Security

b. Attachment A Unit Prices

8) The undersigned acknowledges receipt of and inclusion as a part of the Contract Documents the following addenda:

#: _____ Dated: _____
#: _____ Dated: _____
#: _____ Dated: _____
#: _____ Dated: _____

Please Note: Do not strike through or add language to the bid form. See Instruction to Bidders #6.1

9) Listing of Mechanical, Plumbing, Electrical, and Roofing Subcontractors or the Prime Contractor if the portion of work will be performed with your own forces.

Important Please Note

Indicate the name(s) of each entity performing the listed work below and answer the follow-up questions. All Mechanical, Plumbing, Electrical, and Roofing Subcontractors or your own forces if applicable shall be listed regardless of qualifications, licensures or work amount. Bidders should consult the project manual on how to fill out this form. Failure to name the subcontractor or prime contractor in the space provided shall cause the bid to be declared non-responsive and the bid will not receive consideration.

Mechanical: _____

Plumbing: _____

Electrical: _____

Required - Is the amount of Electrical Work $50,000 or more? Yes _____ No _____ - Is the above listed subcontractor or prime contractor performing any other Work on the project? Yes _____ No _____ --- If yes, list the Work and the cost of all Work:

Roofing: _____

Important Notice: If the Bid Form notes any or all of the above Subcontractor's (Mechanical (HVACR), Electrical, Plumbing, and/or Roofing) as "**Required"**, you must list a subcontractor or list your own forces as applicable or your bid will be declared non-responsive.

Please Note: Do not strike through or add language to the bid form. See Instruction to Bidders #6.1

Bid Form Signature Page

Please Complete the Appropriate Section (Complete Only One)

☐ **Individual Entity of Company**

Legal Name of the Entity or Company _____ Contractors License Number _____

By: _____ _____

Signature of Authorized Officer of the Company Date

Print Name _____ Title _____ Phone Number _____

Street Address _____ City _____ State _____ Zip Code _____

☐ **Corporation (Must Include with bid a copy of the authorized officer's authority to sign)**

By: _____

Signed With Legal Name of the Corporation State of Incorporation Contractor License Number

By: _____ _____

Signature of Authorized Officer of the Corporation Date

Print Name _____ Title _____ Phone Number _____

Street Address _____ City _____ State _____ Zip Code _____

☐ **Joint Venture or Adventure**

1st Entity or Company (*legal Name*) _____ Contractors License Number _____

By: _____ _____

Signature of Authorized Officer of the Company Date

Print Name _____ Title _____ Phone Number _____

Street Address _____ City _____ State _____ Zip Code _____

2nd Entity or Company (*legal Name*) _____ Contractors License Number _____

By: _____ _____

Signature of Authorized Officer of the Company Date

Print Name _____ Title _____ Phone Number _____

Street Address _____ City _____ State _____ Zip Code _____

Bid Bond
Section 00 43 13 / Rev: August 2015

KNOW ALL PERSONS BY THESE PRESENTS:

That we, _____, as Principal,

and, _____, as Surety, a

corporation duly organized under the laws of _____, and who is

qualified and authorized to do business in the State of Arkansas and is listed on the current

United States Department of the Treasury's listing of approved sureties, and held and firmly bound

unto Arkansas Department of Environmental Quality, the State

of Arkansas and entities thereof as Obligee (owner/agency), in the sum of five (5) percent of the amount of the bid and for payment of which in lawful money of the United States, well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THE ABOVE OBLIGATION IS SUCH THAT, WHEREAS, Principal has submitted a Bid for the work on Division of Building Authority Project number/name: 9301601 Closure of Inactive N.A.B.O.R.S. Landfills

NOW, THEREFORE, if Principal is not released from his bid as defined in the Bidding Documents and, if selected as the apparent lowest responsible Bidder, Principal shall, within the time period specified in the Bidding Documents, do the following:

(1) Enter into a written agreement in accordance with the Bid Document.

(2) File a performance and payment bond, which guarantees faithful performance and payment for labor and materials as required by the Bid Documents, in the County where the work is to be performed and provide said bond to the obligee.

(3) Furnish certificates of insurance and all other items as required by the Bidding Documents.

In the event of the disqualification of said Bid due to failure of Principal to enter into such agreement and furnish such bonds, certificates of insurance, and all other items as required by the bidding documents, Principal and Surety shall pay obligee the damage, loss, cost, and expenses subject to the amount of the bid security directly arising out of the Principal's default in failing to execute and deliver the contract and the performance/payment bond. Liability shall be limited to five (5) percent of the amount of the bid.

This bid bond is given in accordance with Arkansas laws and regulations, including Arkansas Code Ann. §19-4-1405, §22-9-203 and §22-9-402. This bid bond is binding upon the above named parties, and their successors, heirs, assigns and personal representatives. Executed by the parties who individually represent that each voluntarily enters into and has the authority to enter into this agreement.

IN WITNESS WHEREOF, we have hereunto set our hands this _____ day of _____, 20___.

Principal Company Name: _____

Contractor Name: _____

Signature*: _____

Title: _____

Surety Name: _____

Surety NAIC Number: _____

Resident/Non-Resident Agent Name: _____

Signature: _____

License Number*: _____

*** Bids shall be rejected if a proper bid bond/power of attorney is not submitted. Bid Bonds must be executed by a resident/non-resident agent licensed by the Arkansas Insurance Commissioner to represent the surety which have qualified and are authorized to do business in Arkansas and is listed on the current United States Department of the Treasury's listing of approved sureties. The Power of Attorney of the agent to act on behalf of the surety shall be submitted with this Bid Bond.**

Section 00 43 22 / Bid Form Attachment A Unit Prices					
Item/Spec	**Description**	**Quantity**	**Unit**	**Cost/Unit**	**Total for Item**
1/Div 01	Mobilization / Demobilization	1	LS		
2/015713	Provide and Maintain Stormwater/Erosion Control Structures	1	LS		
3/014000	Construction Quality Assurance	1	LS		
4/012010	Provide Temporary Leachate Disposal	1	LS		
5/311000	Clear Existing Vegetation in Pond Basin	3	AC		
6/312316	Excavate Soil to Sedimentation Pond Base Elevations	7,260	CY		
7/310513	Place Structural Fill for Dam	7,000	CY		
8/312513	Install Outlet Structure, Discharge Pipe, Overflow Weir, and Riprap	1	LS		
9/310513	Strip grub and stockpile organic containing soil from Area 1-2	36,000	CY		
10/312324	Excavate and Relocate Waste/Soil Mix from Area 1-2	1	LS		
11/312324	Excavate and Relocate/Regrade Waste/Soil Mix in Area 1-3	1	LS		
12/312324	Excavate and Relocate/Regrade Waste/Soil Mix in Class 4	1	LS		
13/332300	Driller Mobilization	1	LS		
14/332300	Vertical Gas Extraction Well Drilling and Installation	1,208	LF		
15/332300	Provide and Install LFG Wellheads	37	EA		
16/332300	10'x10' Wellbore Seal	21	EA		
17/400533	Provide and Install 4" HDPE LFG Piping	1,625	LF		
18/400533	Provide and Install 8" HDPE LFG Piping	10,050	LF		
19/400533	Provide and Install 12" HDPE LFG Piping	770	LF		
20/400533.16	Provide and Install 12" Butterfly Valve	4	EA		
21/400533.16	Provide and Install 8" Butterfly Valve	19	EA		
22/400533	Provide and Install HDPE Access Riser with Fiberglass Lid	10	EA		
23/400533	Provide and Install HDPE Condensate Knockout	3	EA		
24/400533	Provide and Install Dual Containment Condensate Sump with Pump	4	EA		
25/400533	Provide and Install 4" HDPE Condensate and 2" Air Lines	4,025	LF		

Section 00 43 22 / Bid Form Attachment A Unit Prices					
Item/Spec	**Description**	**Quantity**	**Unit**	**Cost/Unit**	**Total for Item**
26/221519	Air Compressor, Concrete Pad, and 10'x10' Shed	1	LS		
27/334213	Provide and Install 24" CMP Road Crossing	5	EA		
28/431343.13	Provide and Install Candlestick Flare, Skid, Electrical, and Pad	1	LS		
29/432236.13	Provide and Install Leachate Evaporator	1	EA		
30/333613.16	Fiberglass Tanks and Valve Connections	8	EA		
31/033000	Provide and Install Concrete Secondary Containment and Evaporator Pad	210	CY		
32/400533	Provide and Install 2"x4" Dual Contained HDPE Forcemain	7,500	LF		
33/400533.16	Provide and Install Air Release Valves and Protective Concrete Vaults	11	EA		
34/221429	Pumps (Includes control panels, lines, and 5 spare pumps)	14	EA		
35/221429	Manholes with Pumps (Includes Panels and Lines)	2	EA		
36/400533.16	Valves (Includes Forcemain and Condensate Knockout)	20	EA		
37/431343	Heat Tracing and Insulation for Exposed Forcemain	220	LF		
38/334213	Provide Protective CMP at Flare Pad and Road Crossings	300	LF		
39/024119	Demolition	1	LS		
40/310513	Soil Screening (Includes material for Class 1 and Class 4)	193,600	CY		
41/310513	Prepare Subgrade	41	AC		
42/329113	Install 6-inch Grading Layer	33,074	CY		
43/310519.23	Provide and Install Geosynthetic Clay Liner	1,785,960	SF		
44/310519.16	Provide and Install LLDPE 40 mil Textured Geomembrane	1,785,960	SF		
45/310519.16	Provide and Install Geocomposite Drainage Layer	1,785,960	SF		
46/310519.16	Excavate and Backfill Geosynthetics Anchor Trench	8,310	LF		
47/310513	Install 12-inch Protective Cover Layer	66,148	CY		
48/310513	Install 6-inch Vegetative Layer	33,074	CY		
49/312323	Prepare Subgrade	7	AC		
50/310513	Install 18-inch Compacted Soil Layer (Max. Permeability 1 x 10-5 cm/sec)	16,940	CY		

Section 00 43 22 / Bid Form Attachment A Unit Prices					
Item/Spec	**Description**	**Quantity**	**Unit**	**Cost/Unit**	**Total for Item**
51/310513	Install 6-inch Vegetative Layer	5,646	CY		
52/310513	Install Tack-on Terraces	16,000	LF		
53/312513	Provide and Install HDPE Down Chutes	2,700	LF		
54/313700	Provide and Install Energy Dissipaters (Includes Geotextile and Rip-Rap)	10	EA		
55/329219	Seeding, Fertilizing, Mulching	80	AC		
56/323113	Provide and Install Perimeter Fencing	7,800	LF		
57/012010	Install Three Phase Power	1	LS		
58/320516	Access Road Construction/Rehabilitation	1	LS		
59/312213	Ditch Construction	1	LS		
60/312213	Soil Borrow Area Grading	30	AC		
61/400533	4" HDPE Forcemain Piping	2,000	LF		
62/431343.13	Leachate Injection Port	162	LF		
63/221429	Leachate Recirculation Pump	1	EA		

AGREEMENT FORM
Section 00 52 13 / Rev: August 2015

THIS AGREEMENT entered into this _____ by and between _____ hereinafter referred to as the Contractor, and Arkansas Department of Environmental Quality hereinafter referred to as the Owner, and the Department of Finance and Administration, Division of Building Authority (DBA),

WITNESSETH:

1) That for and in consideration of the payment by the owner in the amount of $ - to be made as set forth in the Contract Documents, the Contractor hereby agrees to furnish all tools, labor, equipment, and materials, and to build and construct that certain project in Baxter County, designated as

Project # : 9301601

Project Name: Closure of Inactive N.A.B.O.R.S. Landfills

consisting of construction, more specifically described in the Contract Documents attached hereto and incorporated herein by reference. Contract Documents include the following: the Agreement Form (this instrument); the Invitation to Bid; Instruction to Bidders; Bid Form; all Addenda; Performance and Payment Bond; General and Supplementary Conditions; Drawings and Specifications, Drawings listed in the Specifications; Notice to Proceed; Negotiated Changes Documents; and Change Orders. All capital improvements shall be in exact accord with the Contract Documents filed with the Construction Section Office, Division of Building Authority, located in Little Rock, on: TBD

The Division of Building Authority (DBA) Construction Section shall have direct contract supervision. Said capital improvements shall be to the satisfaction of the DBA Construction Section, and in accordance with the laws of the State of Arkansas, and the work shall be subject to inspection and approval at all times by the appropriate state and federal agencies.

2) Owner may at any time during the progress of the work alter, change, subtract from, or add to said Contract Documents without violating this Agreement or the terms thereof. Said changes, alterations, subtractions, or additions shall be set forth in writing in a document referred to as a "Change Order." Said document shall not be effective unless approved by the DBA. Once effective, the Change Order shall be attached hereto and incorporated herein by reference and shall be made a condition or term of the Contract Documents. Nothing contained in the Change Order shall be construed to waive the sovereign immunity of the State or entities thereof.

3) The Contractor agrees, for the consideration set forth in the Bid Form, to begin work within the time frame stated in 6 (b) of Section 00 41 13 Bid Form after a Notice to Proceed is issued and to complete the work:

In: 120 Calendar Days

On or Before: N/A

If the Contractor fails to complete the work within the time limit herein specified, he shall pay to the Owner, as liquidated damages and not in the nature of a penalty, the sum specified in the Bid Form of for each calendar day delayed, it being understood and agreed between the parties hereto that the said sum fixed as liquidated damages is a reasonable sum, considering the damages that the Owner will sustain in the event of any such delay, and said amount is herein agreed upon

and fixed as liquidated damages because of difficulty of ascertaining the exact amount of damages that may be sustained by such delay. The said sum shall be deducted from the amount of the contract.

4) Should Contractor be delayed in the execution or completion of the work by the act, neglect or default of the State, or by any damage by fire, weather conditions or other casualty or event for which the contractor is not responsible, or by general strikes or lockouts caused by acts of employees, then any extended period shall be determined and fixed by the Owner with approval given by DBA Construction Section. Said extended period shall be the time for a period equivalent to the time lost by reason of any or all of the causes aforesaid, but no such allowance shall be made unless a claim therefore is presented in writing to the Owner or DBA Construction Section within seven calendar days of the occurrence of the event causing the delay.

5) It is mutually agreed between the parties that in the performance of this contract, Contractor is acting independently and in no sense as Agent of the State. Contractor shall not let, assign, or transfer this contract or any interest therein, without the written consent of the Owner and DBA.

6) It is agreed and understood between the parties hereto that the Contractor shall accept and the Owner will pay for the work, at the prices stipulated in the Contract Documents, such payment to be in the form of legal tender, and the payment shall be made at the time and in the manner set forth in the Contract Documents.

7) Any laborer or mechanic employed by the Contractor or any Subcontractors for this project, directly on site for the work covered by the Contract Documents, shall be paid a rate of wages required by the Contract Documents. If the Owner or DBA, or both discovers that wages less than the rate of wages specified by the Contract Documents have been or are being paid, then the Owner or DBA, after giving written notice to the Contractor, will terminate the Contractor's right to proceed with the project work or such part of the work as to which there has been a failure to pay the required wages and to prosecute the work to completion by contract or otherwise, and the Contractor and his sureties shall be liable to the Owner for any excess costs occasioned thereby.

8) Contractor shall promptly repair, at his own expense and to the satisfaction of the Owner and DBA Construction Section, damage done by him or his employees or agents at the work site, or to the public property or buildings, or both, and will save the State harmless from all claims of any person for injury to person or to property occasioned by his act, or the acts of his employees or agents, while in the execution of the work specified.

9) The Owner or DBA, or both may terminate this agreement to the extent Owner's funds are no longer available for expenditures under this agreement.

10) Failure to make any disclosure required by Governor's Executive order 98-04, or any violation of any rule, regulation, or policy adopted pursuant to that Order, shall be a material breach of terms of this contract. Any contractor, whether an individual or entity, who fails to make the required disclosure or who violates any rule, regulation, or policy shall be subject to all legal remedies available to the Agency.

a) The contractor shall prior to entering any agreement with any subcontractor, for which the total consideration is greater than $25,000.00, require the subcontractor to complete a Contract and Grant Disclosure and Certification Form. The contractor shall ensure that any agreement, current or future between the contractor and a subcontractor for which the total consideration is greater than $25,000.00 shall contain the following:
Failure to make any disclosure required by Governor Executive Order 98-04, or any violation of any rule, regulation or adopted pursuant to that Order, shall be a material breach of the term of this subcontract. The party who fails to make the required disclosure or who violates the rule, regulation, or policy shall be subject to all legal remedies available to the contractor.

b) The Contractor shall, within ten days of entering into any agreement with a subcontractor, transmit to Division of Building Authority; a copy of the Contract and Grant Disclosure and Certification Form (00 73 73) completed and signed by the subcontractor and a statement containing the dollar amount of the subcontractor.

c) The terms and conditions regarding the failure to disclose and conditions which constitutes material breach of contract and rights of termination and remedies under the Executive Order 98-04 are hereby incorporated within.

11) Nothing in this Contract shall be construed to waive the sovereign immunity of the STATE OF ARKANSAS or any entities there of.

Executed by the parties who individually represent that each have the authority to enter into this Contract.

Contractor: Legal Name of the Entity or Company

Signature of Authorized Officer of the Company | Date

Print Name | Title | Email Address

Street Address | City | State | Zip Code

Arkansas Department of Environmental Quality
Owner: Agency Name

Signature of Authorized Officer of the Agency | Date

Print Name | Title | Email Address

5301 Northshore Drive | North Little Rock, Arkansas, 72118
Street Address | City | State | Zip Code

Approved: Department of Finance and Administration, Division of Building Authority

By: _____ Date: _____

PERFORMANCE AND PAYMENT BOND
Section 00 61 13 / Rev: August 2015

1) We _____, (Principal), and

_____, (Surety), are held and firmly bound, jointly

and severally, unto Arkansas Department of Environmental Quality , as Obligee (Owner), in the initial Contract amount of $ - said amount to be deemed a Performance Bond payable to Owner and in the separate amount of $ - said amount to be deemed a Payment Bond payable to proper claimants such amounts subject to the terms of this Performance Bond and Payment Bond Agreement. The Principal and Surety state that the Surety is a solvent corporate surety company authorized to do business in the State of Arkansas and is listed on the current United States Department of Treasury's listing of approved sureties.

Principal has by written agreement dated _____ entered into a capital improvement contract (Contract) with the Owner for:
Closure of Inactive N.A.B.O.R.S. Landfills

Project # 9301601 .The above referenced Contract is incorporated herein by reference.

2) Under this Performance Bond and Payment Bond Agreement, the Principal and Surety shall be responsible for the following:

a. Performance Bond

i. The Principal shall faithfully perform the above referenced Contract, which is incorporated herein by reference.

ii. In the event that the Principal defaults in its performance of its obligations under the Contract, the Principal and the Surety, jointly and severally, shall indemnify and save harmless the Owner from all cost and damage which the Owner may suffer by reason of Principal's failure to perform the Contract. Said indemnification shall include, but not be limited to, full reimbursement and repayment to the Owner for all outlays and expenses which the Owner may incur in making good any such default of the Contract by the Principal.

b. Payment Bond

i. Principal shall pay all persons all indebtedness for labor or material furnished or performed under the Contract and in doing so this obligation shall be null and void.

ii. In the event that Principal fails to pay for such indebtedness, such persons shall have a direct right of action against the Principal and Surety, jointly and severally, under this obligation, subject to the Owner's priority.

3) This Performance Bond and Payment Bond is given in accordance with Arkansas laws and rules, including Ark. Code Ann. § 18-44-501 et seq., §19-4-1401 et seq., and § 22-9-401 et seq. The Surety guarantees that the Principal shall comply with Ark. Code Ann. § 22-9-301 et seq. by payment and full compliance with all prevailing hourly wage contract provisions where the contract amount exceeds the amount provided by law.

Any changes made in the terms of the Contract, including but not limited to, the amount of the Contract, or in the work to be performed pursuant to the Contract or the giving by the Owner of any extension of time for the performance of the Contract, or any other forbearance on the part of either the Owner or the Principal to the other shall not in any way release the Principal and the Surety or Sureties or either or any of them, their heirs, personal representatives, successors or assigns from their liability hereunder, notice to and consent of the Surety or Sureties of any such change, extension or forbearance being are hereby voluntarily waived. In no event shall the aggregate liability of the Surety exceed the greater amount of the Contract, including DBA approved change orders.

This Performance Bond and Payment Bond Agreement is binding upon the above named parties, and their successors, heirs, assigns and personal representatives.

Executed by the parties who individually represent that each voluntarily enters into and has the authority to enter into this agreement.

By: _____
Contractor's (Principal) Signature Date

By: _____
Arkansas Resident Agent or Non-Resident Agent Signature (attach Power of Attorney Date

_____ _____
Agent's License Number Surety Company's NAIC Number

_____
Print Agent's Name Date

_____
Street Address

_____
City County State Zip Code

_____
Business Phone Number Fax Number

CERTIFICATE OF SUBSTANTIAL COMPLETION

Section 00 65 16 / Rev: August 2015

Project Name: Closure of Inactive N.A.B.O.R.S. Landfills

DBA Project Number: 9301601 Owner/Agency: Arkansas Department of Environmental Quality

DEFINITION OF DATE OF SUBSTANTIAL COMPLETION:

The Date of Substantial Completion of the Work, or designated portion thereof, is the date certified by the Design Professional and approved by the Owner and DBA when the Work is sufficiently complete, in accordance with the Contract Documents, so the Owner can occupy or utilize the Work or designated portion thereof for the use for which it is intended, as expressed in the Contract Documents. Check the appropriate box below to denote a full or partial substantial completion.

☐ **PARTIAL SUBSTANTIAL COMPLETION**

The partial substantial completion includes the following area(s):

The Work performed under this Contract has been reviewed and found to be substantially complete. The Date of Substantial Completion for the above portion(s) of the Project is hereby established as: _____, which is the date of commencement of applicable warranties required by the Contract Documents, and assumption by the Owner of responsibility for maintenance, security, heat, utilities, damage to the Work and insurance excepting as stated below.

☐ **FULL SUBSTANTIAL COMPLETION**

The Work performed under this Contract has been reviewed and found to be substantially complete. The Date of Substantial Completion for the Project is hereby established as: _____, which is the date of commencement of applicable warranties required by the Contract Documents, and assumption by the Owner of responsibility for maintenance, security, heat, utilities, damage to the Work and insurance excepting as stated below.

The responsibilities of the Owner and the Contractor shall be as follows: (Note - Owner's and Contractor's legal and insurance counsel should determine and review insurance requirements and coverage; Contractor shall secure consent of the Surety Company, if any.)

A list of punch list items to be completed or corrected, prepared by the Contractor and verified and amended by the Architect/Engineer is attached hereto. The failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. The date of commencement of warranties for items on the attached list will be the date of final completion and inspection/acceptance by the Architect/Engineer, Owner and DBA.

In the case of a full substantial completion the Owner and Contractor understand and agree that all items listed on the attached punch list must be completed within 30 calendar days from the date of substantial completion. Failure to complete the punch list items within the above referenced timeframe may result in notification to and request for action of the Surety Company's Performance and Payment Bond.

Certification of Design Professional:

Firm Name: SCS Aquaterra

Address: 7311 West 130th Street
Overland Park, Kansas 66213

Signature Title Date

Approval of Contractor:

Company Name: _____

Address: _____

_____

Signature Title Date

Approval of Owner-Agency:

Agency Name: Arkansas Department of Environmental Quality

Address: 5301 Northshore Drive
North Little Rock, Arkansas, 72118

Signature Title Date

Approval of Department of Finance and Administration, Division of Building Authority:

Signature Title Date

Cc: Surety Company

Section 00 65 19 / Certificate of Final Completion – Capital Improvement Project

DBA Project Number: 9301601 Project Name: Closure of Inactive N.A.B.O.R.S.

We, the undersigned parties, state:

1) The date of final completion for the above referenced project is herein established as: _____
Pursuant to Arkansas Code Annotated §22-9-604, retainage shall be released within thirty (30) days of the final completion date. The establishment of the final completion date shall not be deemed to relieve the Contractor of its obligation contained in the contract documents including but not limited to providing all close out documents for final payment.

2) All known details of the project are resolved and there is no uncompleted work left, no Contractor claims or outstanding progress payment(s).

3) The project punch list items, excluding warranty work is complete.

4) The substantial completion certificate previously executed established the twelve (12) month warranty period for projects and a twenty four (24) month warranty for roofing projects, or both. Sixty (60) days prior to the warranty expiration the parties listed below shall conduct a final warranty inspection; this report will be delivered to the Contractor who will correct all defects identified in the Design Professionals or Owners follow-up inspection reports.

Contractor:

_____
Contractor Company/Corporation Name

_____
By: Contractor Authorized Representative

_____
Print Name Date

Design Professional:

SCS Aquaterra
Design Professional Firm Name

_____
By: Design Professional Authorized Representative

_____
Print Name Date

State Agency, Board & Commission:

Arkansas Department of Environmental Quality
Owner/Agency Name

_____
By: Agency Authorized Representative

_____
Print Name Date

Division of Building Authority

_____
By: DBA Observer or Authorized Representative

_____
Print Name Date

Release of Claims
Section 00 65 19.13 / Rev: August 2015

Comes the undersigned, who does hereby swear and affirm that:

1. My name is: _____, and

I am doing business as: _____

and my legal address is: _____

_____

2. Except as stated in Paragraph Four (4) below, pursuant to Contract # : 9301601

which was executed on: _____, on the following project:
Closure of Inactive N.A.B.O.R.S. Landfills

I have paid and have otherwise satisfied all obligations for all furnished materials and equipment, all work, labor and services performed, and for all known claims against the Contractor arising in any manner in connection with the performance of the above referenced contract for which the Owner might in any way be held responsible.

3. Except as stated in Paragraph Four (4) below, to the best of my knowledge, information and belief, the releases or waivers of Claims, attached hereto and incorporated herein, includes the above referenced contract, all subcontractors, all suppliers of materials and equipment, and all performers of work, labor or services who have or may have claims against the Owner arising in any manner out of the performance of the Contract.

4. The Exceptions are: (if none exists, then indicate "none". The Contractor shall furnish a written explanation to the Owner for each exception.)

_____

_____

_____ _____
Affiant's Signature Date

Verification

STATE OF ARKANSAS >
>
COUNTY OF: _____

Subscribed and Sworn To before me this _____ day of _____ 20____

_____
Notary Public

My Commission Expires: _____.

Consent of Surety
Section 00 65 19.19 / Rev: August 2015

Comes the undersigned, who does hereby swear and affirm that:

1. My name is _____ and I am an authorized

representative of _____ a surety company.

2. With regards to the Project Closure of Inactive N.A.B.O.R.S. Landfills

DBA Project # 9301601 ; Contract Date _____

_____ Contractor, and the Project Owner

Arkansas Department of Environmental Quality ; I hereby approve the final payment to the Contractor. I agree that the final payment to the Contractor shall not relieve the Surety Company of any of its obligation as set forth in the contract with the State of Arkansas and this Contractor.

_____ _____
AFFIANT SIGNATURE DATE

VERIFICATION

STATE OF ARKANSAS >
>
COUNTY OF: _____
Subscribed and Sworn To before me this _____ day of _____ 20____

_____
Notary Public

My Commission Expires: _____.

Division of Building Authority
General Conditions
Section 00 72 13 / Rev: August 2015

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End of TOC

ARTICLE 1 -- GENERAL PROVISIONS

1.1 DEFINITIONS

1.1.1 Contract Documents: Contract Documents consist of Agreement; Invitation to Bid; Instruction to Bidders; the Bid Form; the Bid and the Performance and Payment Bonds; General and Supplementary Conditions; Specifications; Drawings; Addenda issued prior to execution of the Contract; Front End Documents; all DBA approved Change Orders; Wage Rate Determinations; other documents listed or referred to in the Agreement; and modifications issued after execution of the Contract and signed by Contractor and Owner, and approved by DBA.

1.1.2 Contract: The Contract Documents form the Contract for construction. The Contract Documents will not be construed to create a contractual relationship between the Design Professional and Contractor, between the Owner and a Subcontractor, between the Owner and Design Professional, or between entities other than the Owner and Contractor; however, a contractual relationship does exist between the Contractor and the agency referred to as Owner, and DBA for approval purposes.

1.1.3 Work: Construction and services required by the Contract Documents whether completed or partially completed, include tools, labor, equipment, supplies, transportation, handling, and incidentals provided by the Contractor.

1.1.4 Project: The total capital improvement project described in the Contract Documents.

1.1.5 Drawings: Graphic and textual portions of the Contract Documents showing the design, location, and dimensions and size of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

1.1.6 Specifications: Written requirements for materials, equipment, systems, standards, and workmanship for the Work, and performance of related services.

1.1.7 Project Manual: Volume, which may include the bidding requirements, forms, contracting requirements, and the Specifications.

1.1.8 Owner: The person or entity identified as such in the Contract Agreement, referred to throughout the Contract Documents as singular in number. The term Owner means the Owner which is a party to this contract.

1.1.9 Contractor: The person or entity identified as such in the Contract Agreement, referred to throughout the Contract Documents as singular in number. The Contractor means the person or other entity entering into the contract with the Owner. The term Contractor means the Prime Contractor or the Prime Contractor-authorized representative.

1.1.10 Design Professional (Architect/Engineer/Consultant): The person or entity identified as such in the Agreement, lawfully licensed to practice architecture or engineering or another field of expertise and under contract to Owner to provide design service, advice, and consultation, referred to throughout the Contract Documents as if singular in number. The term Design Professional means the Architect/Engineer/ Consultant or the authorized representative.

1.1.11 Subcontractor: Any person, firm, or corporation with a direct contract with the Contractor who acts for or in behalf of the Contractor in executing a portion of the Work. The term Subcontractor is referred to as singular in number and means the Subcontractor or the Subcontractor-authorized representative.

1.1.12 Inspector: A duly authorized representative of the Owner, DBA and Design Professional, designated for detailed inspection and/or observations of materials, construction, workmanship, and methods of construction.

1.1.13 Sites: The particular location of that part of the project being considered.

1.1.14 State: The Owner or DBA, or both

1.1.15 Day(s): Unless specifically referred to as calendar days, “day(s)” refers to a period of time meaning “work” days.

1.2 INTENT

1.2.1 The intent of the Contract Documents is to set forth the standards of construction, the quality of materials and equipment, the guarantees that are to be met, and to include items necessary for proper execution and completion of the Work. The Contract Documents are complementary and what is required by one will be as binding as if required by all. Performance by the Contractor shall be required to the extent consistent with the Contract Documents and reasonably inferable as necessary to produce indicated results.

1.2.2 Organization of the Specifications into divisions, sections, and articles, and arrangement of Drawings will not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

1.2.3 Unless otherwise stated in the Contract Documents, words which have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

1.3 CAPITALIZATION

1.3.1 Terms capitalized in the Contract Documents include those which are specifically defined, the titles to numbered sections and articles, identified references to paragraphs, and the titles of other published documents.

1.4 **INTERPRETATION**

1.4.1 Whenever in these Contract Documents the words "as ordered", "as directed", "as required", "as permitted", "as allowed", or words or phrases of like importance are used, it shall be understood that the order, direction, requirement, permission, or allowance of the Owner and Design Professional is intended.

1.4.2 Whenever in these Contract Documents the word "product" is used, it shall be understood that the materials, systems, and equipment will be included.

1.4.3 Whenever in these Contract Documents the word "provide" is used, it shall be understood that it means to "furnish and install".

1.4.4 The Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an", but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

ARTICLE 2 -- OWNER

2.1 **LAND**

2.1.1 The Owner will provide the lands shown on the Drawings upon which the Work shall be performed. The Owner will provide a right-of-way for access to the project site.

2.1.2 The Owner will provide base lines for the location of the principle component parts of the Work with a suitable number of benchmarks adjacent to the Work.

2.2 **RIGHT OF ENTRY BY OWNER**

2.2.1 The Owner and his authorized representative will have the right to enter the property or location on which the Work shall be constructed. The Owner further reserves the right to construct or have his authorized agents construct such work as the Owner will desire, so long as these operations do not interfere with or delay the work being constructed under this Contract.

2.3 **OWNER'S RIGHT TO CARRY OUT THE WORK**

2.3.1 If the Contractor defaults or neglects to perform the Work in accordance with the Contract Documents, including the requirements with respect to the schedule of completion, and fails after ten days written notice from the Owner to correct the deficiencies, or fails to work diligently to correct the deficiencies. The Owner may deduct the cost thereof from the payment then or thereafter due the Contractor.

ARTICLE 3 -- CONTRACTOR

3.1 GENERAL

3.1.1 The Contractor shall perform the Work in accordance with the Contract Documents.

3.1.2 The Contractor shall furnish labor, materials, equipment, and transportation necessary for the proper execution of the work unless specifically noted otherwise. The Contractor shall do all the work shown on Drawings and described in Specifications and all incidental work considered necessary to complete the project in a substantial and acceptable manner, and to fully complete the work or improvement, ready for use, occupancy and operation by the Owner. Drawings and Specifications shall be interpreted by the Design Professional or the Owner if no Design Professional exists for the project.

3.1.3 The Contractor shall cooperate with the Owner, Design Professional, Inspectors, and with other contractors on the Project. Contractor shall allow inspectors acting in an official capacity, to have access to the project site.

3.1.4 The Contractor shall determine that the final and completed work on the project is in accordance with the Contract Documents. The failure of the Design Professional to find or correct errors or omissions in the use of materials or work methods during the progress of the work shall not relieve the Contractor from his responsibility to correct all the defects in the Work.

3.1.5 The Contractor shall assist in making final inspections and shall furnish such labor and equipment as may be required for the final tests of equipment, piping, and structures.

3.2 REVIEW OF FIELD CONDITIONS

3.2.1 Before ordering material or doing Work, the Contractor shall verify all measurements involved and shall be responsible for the correctness of same. No extra charge or compensation will be allowed on account of difference between actual dimensions and the measurements indicated on Drawings; differences which may be found shall be submitted to Design Professional for consideration before proceeding with the Work.

3.2.2 Drawings may show the location or existence of certain exposed and buried utilities as well as existing surface and subsurface structures. The Owner assumes no responsibility for failure to show any or all such utilities and structures on the Drawings or to show such in the exact location. It is mutually agreed such failure will not be considered sufficient basis for claims for extra work or for increasing the pay quantities in any manner unless the obstruction encountered necessitates substantial changes in the lines or grades or requires the building of a special structure.

3.3 REVIEW OF CONTRACT DOCUMENTS

3.3.1 The Contractor shall study and compare Drawings, Specifications, and other instructions as a Construction Professional, not as a Design Professional and shall report to the Design Professional at once any error, inconsistency, or omission discovered.

3.3.2 In the event of conflict among the Contract Documents, interpretations will be based on the following order of precedence, stated highest to lowest:

a. The Agreement

b. This Division Zero (0) shall control in the event of conflict between this Division Zero (0) and other Divisions.

c. Addenda to Drawings and Specifications with those of later date having precedence.

d. Drawings and Specifications

3.3.3 Since the Contract Documents are complementary, the Contractor shall take no advantage of any apparent error or omission in the Drawings and Specifications. The Owner or Design Professional shall furnish interpretations as deemed necessary for the fulfillment of the intent of the Drawings and Specifications.

3.3.4 Discrepancies found between the Drawings and Specifications and actual site conditions or any errors or omissions in the Drawings or Specifications shall be immediately reported to the Design Professional or in the case where a Design Professional is not on the Project, the Owner shall be notified, who shall address such error or omission in writing. Work done by the Contractor after discovery of such discrepancies, errors, or omissions shall be at the Contractor's risk and expense.

3.3.5 The Contractor shall keep on the work site a copy of the drawings and specifications and shall at all times give the Owner, Design Professional, and DBA access thereto. Anything mentioned in the specifications and not shown on the drawings, or shown on the drawings and not mentioned in the specifications, shall be of like effect as if shown or mentioned in both. In case of differences between the drawings and specifications the more stringent document will prevail.

3.4 REQUEST FOR SUPPLEMENTARY INFORMATION

3.4.1 The Contractor shall make timely requests of the Owner or Design Professional for additional information required for the planning and production of the Work. Such requests shall be submitted as required, but shall be filed in ample time to permit appropriate action to be taken by all parties involved so as to avoid delay. Contractor understands and agrees that it is Contractor’s duty to determine the need for, and to request said additional information in writing from the Design Professional by such date as allows Design Professional to provide the information to the Contractor by a date that will not adversely affect Contractor’s ability to complete the Work by the date specified in the Contract.

3.4.2 Additional instructions may be issued by the Design Professional during the progress of the Work to clarify the Drawings and Specifications or as may be necessary to explain or illustrate changes in the Work.

3.5 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

3.5.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work. The Owner or their designated representative may duplicate, use, and disclose in any manner and for any purpose shop drawings delivered under this contract.

3.5.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

3.5.3 Samples are physical examples that illustrate materials, equipment, or workmanship and establish standards by which the Work will be judged.

3.5.4 The Contractor shall provide shop drawings and other submittals, settings, schedules, and other drawings as may be necessary for the prosecution of the Work in the shop and in the field as required by the Drawings, Specifications, or Design Professional instructions. The Contractor shall coordinate all such drawings, submittals etc. and review them for accuracy, completeness, and compliance with other contract requirements.

Any deviation from the contract documents shall be disclosed upon submission to the Owner/Design Professional. Approval shall not relieve the Contractor from responsibility for any errors or omissions in such drawings, nor from responsibility for complying with the requirements of this contract. Any work done before receiving approval from the Owner/Design Professional will be at the Contractor's risk.

3.6 LABOR AND MATERIALS

3.6.1 Except as otherwise specifically stated in the Contract, the Contractor shall provide, but not be limited to, all materials, labor, tools, equipment, water, light, heating and cooling, power, transportation, superintendence, temporary construction of every nature, taxes legally collectible because of the work, and all other services and facilities of every nature whatsoever necessary to complete the Work in accordance with the Contract Documents in an orderly and efficient manner. The sequence of construction operations shall follow the schedule of construction as approved by the Design Professional. The Work shall not be discontinued by the Contractor without approval of the Design Professional. Should prosecution of the Work be discontinued for any reason, the Contractor shall notify the Design Professional at least twenty-four hours in advance of resuming the Work.

3.6.2 All equipment, material, and articles furnished under this contract shall be new and of most suitable materials grade for the purpose intended, unless otherwise specifically provided in this contract. Materials and equipment furnished under this Contract will be subject to inspection by the Owner's authorized representative or by independent laboratories. Defective material, equipment, or workmanship may be rejected at any time before the acceptance of the Work even though the defective material, equipment, or workmanship may have been previously overlooked and estimated for payment. The Contractor shall replace defective equipment and material in accordance with the Contract Documents at no additional cost to the Owner.

3.6.3 The Contractor shall provide materials and supplies not subject to conditional sales agreements, or other agreement reserving unto the seller any right, title, or interest therein. All materials and supplies shall become the property of the Owner upon final acceptance of this Contract by the Owner.

3.6.4 If shop tests are to be conducted, the Contractor shall notify the Owner of such tests so a representative may witness tests, if desired.

3.6.5 The Contractor may make substitutions only with the consent of the Owner, after evaluation by the Design Professional, and in accordance with a Change Order.

3.7 UNAUTHORIZED WORK

3.7.1 Work done without lines and grades having been given or work done beyond the lines or not in conformity with the grades shown on the Drawings or as provided by the Owner, except as provided herein, and work completed without proper inspection and supervision or any extra or unclassified work completed without written authority and prior agreement shall be at the Contractor's risk. Such unauthorized work, at the option of the Design Professional, may not be measured and paid for and may be ordered removed at the Contractor's expense.

3.8 SUPERINTENDENCE

3.8.1 The Contractor shall supervise and direct the Work. The Contractor shall be solely responsible for construction means, methods, techniques, sequences, and procedures and for coordinating portions of the Work under the Contract.

3.8.2 The Contractor shall employ a qualified superintendent during the duration of the Project who is acceptable to the Owner, Design Professional and DBA Construction. The superintendent shall be maintained on the Project site and shall be present on the site at all times work is in progress. The superintendent shall be capable of reading and understanding the Drawings and Specifications and shall have full authority to act in behalf of the Contractor. All directions and instructions given to the Superintendent shall be considered as given to the Contractor and shall be as binding as if given to the Contractor.

3.8.3 Workmanship shall be performed by workmen experienced in their trade and skilled and experienced for the class of work to which assigned. Any person, including supervisory personnel, who does not show and exhibit skill and proficiency in said work shall be removed by the Contractor and replaced by a competent and experienced workman.

3.8.4 The Contractor shall, at all times, be responsible for the conduct and discipline of his employees and all Subcontractors and their employees. Disorderly, incompetent or intemperate persons, or persons who commit any crimes or trespass on public or private property in the vicinity of the Work must not be allowed to continue working upon the project which the Contractor has with the State. Any superintendent, foreman or workman employed by the Contractor or a Subcontractor who unreasonably refuses or neglects to comply with the instructions of the Owner, Design Professional, or Inspector, shall, at the written request of the Owner or Design Professional, be removed from the work site and shall not be allowed to work further on any portion of the work or another State Project without the approval of the Owner.

3.8.5 The Contractor shall coordinate Work by the various trades to provide uniform and symmetrical layout and spacing of the exposed components which will affect the finished design and appearance. Where spacing and related locations are not specifically shown on Drawings or where in doubt, the Contractor shall consult the Design Professional prior to installation of that part of the Work.

3.9 PERMITS, FEES, AND NOTICES

3.9.1 The Contractor shall purchase and secure all applicable permits and licenses and give all notices necessary and incidental to the prosecution of the Work. However, in accordance with Ark. Code Ann. §22-9-213, public works construction projects conducted by DBA or other state agencies are exempt from permit fees or inspection requirements of county or municipal ordinances.

3.9.2 When new construction under the Contract crosses highways, railroads, streets or utilities under the jurisdiction of the state, county, city, or other public agency, public utility, or private entity, the Contractor shall secure written permission from the proper authority before executing such new construction. A copy of this written permission shall be filed with the Owner before any work is completed. The Contractor shall furnish a release from the proper authority before final acceptance of the Work. Any bonds required for this Work shall be secured and paid for by the Contractor.

3.10 SAMPLES AND TESTS

3.10.1 The Contractor shall provide samples, materials, and equipment necessary or required for testing as outlined in the various sections of the Specifications or as directed by the Owner. The Contractor shall pay all costs for testing. Should materials, methods, or systems fail to meet specified standards, the Contractor shall pay all costs for additional testing as required by the Owner.

3.10.2 All tests shall be made by a laboratory approved by the Owner.

3.11 LOCATION, GRADIENT, AND ALIGNMENT

3.11.1 Based upon the site information provided by the Owner and verified by the Contractor, the Contractor shall develop and make detailed surveys necessary for construction including slope stakes, batter boards, and other working points, lines and elevations. The Contractor shall verify the figures before laying out the work and will be held responsible for any error resulting from its failure to do so.

3.11.2 The Contractor shall report any errors, inconsistencies, or omissions to the Design Professional as a request for information.

3.11.3 The Contractor shall preserve benchmarks, reference points and stakes, and in the case of destruction thereof by the Contractor, shall be responsible for damage or mistakes resulting from unnecessary loss or disturbance.

3.12 LAND

3.12.1 Additional land and access thereto not shown on Drawings that may be required for temporary construction facilities or for storage of materials shall be provided by the Contractor at his expense with no liability to the Owner. The Contractor shall confine his equipment and storage of materials and the operation of his workmen to those areas shown on the Drawings and described in the Specifications, and such additional areas which he may provide or secure as approved by the Owner.

3.12.2 The Contractor shall not enter upon private property for any purpose without first obtaining permission.

3.12.3 The Contractor shall be responsible for the preservation of and prevent damage or injury to all trees, monuments, and other public property along and adjacent to the street and right-of-way. The Contractor shall prevent damage to pipes, conduits and other underground structures, and shall protect from disturbance or damage all monuments and property marks until an authorized agent has witnessed or otherwise referenced their location, and shall not remove monuments or property marks until directed.

3.13 LIMITS OF WORK

3.13.1 The Contractor shall conduct Work and operations so as to cause a minimum of inconvenience to the public. At any time when, in the opinion of the Owner or Design Professional, the Contractor is obstructing a larger portion of a road, street, or other public right-of-way than is necessary for the proper execution of the Work, the Design Professional may require the Contractor to finish the sections on which work is in progress before work is commenced on any new sections.

3.14 WARRANTY

3.14.1 In addition to any other warranties in this contract, the Contractor warrants that Work performed under this contract conforms to the contract requirements and is free of any defect in equipment, material, or workmanship performed by the Contractor or any Subcontractor or supplier. The Contractor shall warrant that all Work, materials, and equipment furnished will be free from defects in design, materials, and workmanship and will give successful service under the conditions required.

The warranty period for Work, materials, and equipment furnished by the Contractor shall be one year from the date of the written acceptance of the Work as stated in the Substantial Completion Form approved by the Contractor, Owner, Design Professional and DBA or the date that the DBA approves the final payment request, unless a longer period is agreed upon.

3.14.2 Warranty of Title: The Contractor warrants good title to all materials, supplies, and equipment incorporated in the Work and agrees to deliver the premises together with all improvements thereon free from any claims, liens or charges, and agrees further that neither it nor any other person, firm or corporation shall have any right to a lien upon the premises or anything appurtenant thereto.

3.15 PATENTS AND ROYALTIES

3.15.1 If the Contractor is required or desires to use any design, device, material or process covered by letters, patent, or copyright, he shall provide for such use by suitable legal agreement with the patents or Owner. It is mutually understood and agreed that without exception the Contract Sum shall include all royalties or costs arising from patents, trademarks, and copyrights in any way involved in the Work.

The Contractor and the surety shall defend, indemnify, and save harmless the Owner and all its officers, agents and employees from all suits, actions, or claims of any character, name and description brought for or on account of infringement or alleged infringement by reason of the use of any such patented design, device, material or process of any trademark or copyright used in connection with the Work agreed to be performed under this Contract, and shall indemnify the Owner for any cost, expense, or damage which it may be obliged to pay by reason of any action or actions, suit or suits which may be commenced against the Owner for any such infringement or alleged infringement at any time during the prosecution of the Work contracted for herein.

It is mutually agreed that the Owner may give written notice of any such suit to the Contractor, and thereafter, the Contractor shall attend to the defense of the same and save and keep harmless the Owner from all expense, counsel fees, cost liabilities, disbursements, recoveries, judgments, and executions in any manner growing out of, pertaining to, or connected therewith.

3.16 **CLEANING UP**

3.16.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove from and about the Project waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials, not purchased for or by the Owner.

3.16.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the cost thereof shall be charged to the Contractor.

ARTICLE 4 -- ADMINISTRATION OF CONTRACT

4.1 **DESIGN PROFESSIONAL AUTHORITY**

4.1.1 The Design Professional will interpret the requirements of the Contract Documents and decide matters concerning performance there under on request of the Owner or Contractor.

4.1.2 The Design Professional will provide administration of the Contract as described in the Contract Documents and will be the Owner's representative. The Design Professional will decide any and all questions as to the acceptability of materials or equipment furnished, work performed, interpretation of the Drawings and Specifications, rate of progress of the Work, acceptability of the quality of workmanship provided, and other questions as to the fulfillment of the Contract by the Contractor.

4.1.3 The Design Professional will prepare all change orders on the form specified by DBA. The Design Professional may authorize minor changes in the Work not involving adjustment in Contract Sum or extension of Contract Time and not inconsistent with the intent of the Contract Documents.

4.1.4 The Design Professional and his authorized representatives, Owner and DBA will have the right to enter the property or location on which the Work shall be constructed.

4.2 **CLAIMS**

4.2.1 Definition: A claim is a demand or assertion by one of the parties seeking adjustment, or interpretation of Contract terms, payment of money, extension of time, or other relief with respect to the terms of the Contract. The term includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. Claims will be initiated by written notice. The responsibility to substantiate claims shall rest with the party making the claim.

4.2.2 Claims of the Contractor or the Owner: Claims regarding the Work of the Contract shall be referred initially to the Design Professional for a decision. The Design Professional will review claims, and 1) reject in whole or in part; 2) approve the claim; 3) suggest a compromise; 4) advise the parties that the Design Professional is unable to resolve the claim.

4.2.3 Claims for Concealed or Unknown Conditions: If new and unforeseen items of work are discovered, which cannot be covered by any item or combination of items for which there is a Contract Sum, then the Contractor shall notify the Design Professional as quickly as reasonably possible and shall not continue working on the discovered new or unforeseen items without express written permission from the Design Professional. The Contractor shall complete such work and furnish such materials as may be required for the proper completion or construction of the work contemplated upon written Change Order from the Design Professional as approved by the Owner and DBA. Work shall be performed in accordance with the Contract Documents.

4.2.4 Claims for Extensions of Time: The Contractor shall provide written notice to Design Professional within seven calendar days stating the cause of the delay and request an extension of Contract Time. The Design Professional will act on the request in writing. The extension of time shall be for a period equivalent to the time lost by reasons indicated. No extension of time shall be effective until included in a Change Order approved by the Owner, Design Professional and DBA.

4.2.5 Claims for Changes in the Work: The Contractor shall provide written notice to Design Professional within seven calendar days after the receipt of instructions from the Owner, as approved by the Design Professional and DBA to proceed with changes in the Work and before such Work is commenced. Changes in the Work shall not be commenced before the claim for payment has been approved, except in emergencies endangering life or property. The Contractor's itemized estimate sheets showing labor and material shall be submitted to the Design Professional. The Owner's order (Change Order) for changes in the Work shall specify any extension of the Contract Time and one of the following methods of payment:

a. Unit prices or combinations of unit prices, which formed the basis of the original Contract.

b. A lump sum fee based on the Contractor's estimate, approved by the Design Professional and accepted by the Owner.

c. The applicable methods of computation as set forth in 7.2.2.3.

4.2.6 Claims for Additional Costs: In case of an emergency which threatens loss or injury of property or safety of life, the Contractor shall be allowed to act, without previous instructions from the Design Professional, in a diligent manner. The Contractor shall notify the Design Professional immediately thereafter. Any claim for compensation by the Contractor due to such extra work shall be promptly submitted, but in no case more than 7 calendar days following the event causing the emergency, to the Design Professional for consideration.

The amount of reimbursement claimed by the Contractor on account of any emergency action shall be determined in the manner provided under these General Conditions. No agreement to pay costs for additional work shall be effective until included in a Change Order approved by the Owner, Contractor, the Design Professional and DBA.

ARTICLE 5 -- SUBCONTRACTORS

5.1 ASSIGNMENT OF CONTRACT

5.1.1 Neither the Owner nor the Contractor shall have the right to sublet, sell, transfer, assign, or otherwise dispose of the "Contract" or any portion thereof without written consent of the other party. No assignment, transfer, or subletting, even with the proper consent, shall relieve the Contractor of his liabilities under this Contract. Should any Assignee or Subcontractor fail to perform the work undertaken by him in a satisfactory manner, the Owner, with DBA approval, has the right to annul and terminate the Assignee's or Subcontractor's contract on the project.

5.2 SUBCONTRACTS

5.2.1 The subcontracting of the whole or any part of the Work to be done under this Contract will not relieve the Contractor of his responsibility and obligations. All transactions of the Owner or Design Professional shall be with the Contractor. Subcontractors will be considered only in the capacity of employees or workmen and shall be subject to the same requirements as to character and competency.

5.2.2 The Contractor shall discharge or otherwise remove from the project any Subcontractor that the Owner or the Design Professional has reasonably determined as incompetent or unfit.

5.2.3 The Contractor may not change those Subcontractors listed on the proposal without the written approval of the Owner, Design Professional and DBA. The Contractor shall submit written evidence, which includes but is not limited to, that the substituted contractor is costing the same amount of money or less and if costing less, that the saving will be deducted from the total contract of the prime contractor and rebated to the Owner prior to any approval. The Contractor shall submit his request to the Design Professional who then shall review the request, if approved, the request and approval shall be forwarded to the Owner. The Owner shall then review the request and accompanying paperwork and if approved, shall forward the approval and the accompanying documents to DBA. DBA shall review all of the documents.

DBA shall provide written notification to the Contractor, Design Professional and Owner as its determination. The Contractor shall not be relieved of any liabilities under this Contract, but shall be fully responsible for any Subcontractor or work by said Subcontractor where Subcontractor is employed by the Contractor to perform work under this Contract. Nothing contained in the Contract Documents shall create contractual relations between any Subcontractor and the State.

5.2.4 No officer, agent, or employee of the Owner, including the Design Professional, shall have any power or authority to bind the Owner or incur any obligation in his behalf to any Subcontractor, material supplier or other person in any manner whatsoever.

ARTICLE 6 - CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

6.1 OTHER CONTRACTS

6.1.1 The Owner reserves the right to award other contracts in connection with the Project. The Contractor shall cooperate with the other contractors with regard to the storage of materials and equipment, access to the site, and execution of their work. It shall be the Contractor's responsibility to inspect the work of other contractors which will affect the work of this Contract and to report to the Owner irregularities which will not permit him to complete his work in a satisfactory manner or in the time allotted. Failure to so report shall constitute an acceptance of the work of other contractors.

6.2 DEPENDENCE ON OTHERS

6.2.1 If any part of the Contractor's work depends for proper execution or results upon the work of the Owner or any separate contractor, the Contractor shall, prior to proceeding with the work, promptly report to the Design Professional any apparent discrepancies or defects in such other work that render it unsuitable for such proper execution and results. Failure of the Contractor to so report shall constitute an acceptance of the work.

ARTICLE 7 -- CHANGES IN THE WORK

7.1 GENERAL

7.1.1 The Owner may, as the need arises, without invalidating the Contract, order changes in the work in the form of additions, deletions, or modifications. Compensation to the Contractor for additional work or to the Owner for deductions in the work and adjustments for the time of completion shall be adjusted at the time of ordering such change.

7.1.2 Additional work shall be done as ordered in writing by the Owner. The order shall state the location, character, and amount of extra work. All such work shall be executed under the conditions of the Contract, subject to the same inspections and tests.

7.1.3 The Design Professional and the Owner reserve and shall have the right to make changes in the Contract Documents and the character or quantity of the work as may be considered necessary or desirable to complete fully and acceptably the proposed construction in a satisfactory manner.

7.2 CHANGE ORDERS

7.2.1 A Change Order is a written instrument, prepared by the Design Professional/DBA and approved by the Design Professional, the Contractor, the Owner, and DBA, stating their agreement upon the following, separately or in any combination thereof:

a. Description and details of the work.

b. Amount of the adjustment in the Contract Sum.

c. Extent of the adjustment in the Contract Time.

d. Terms and conditions of the Contract Documents.

7.2.2 Change Order requests by the Contractor shall be submitted in a complete itemized breakdown, acceptable to the Owner, Design Professional and DBA. Nothing contained in the change order shall be construed to waive the sovereign immunity of the State or entities thereof.

7.2.2.1 Where unit prices are stated in the Contract, Contractor should submit an itemized breakdown showing each unit price and quantities of any changes in the Contract Amount. The value of all such additions and deductions shall then be computed as set forth in Paragraph 7.2.2.3.

7.2.2.2 The Contractor shall present an itemized accounting together with appropriate supporting data for the purposes of considering additions or deductions to the Contract Amount. Supporting data shall include but is not limited to the following:

a. Costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and worker or workmen's compensation insurance;

b. Cost of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed;

c. Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;

d. Costs of premiums for all bonds and insurance, permit fees, and sales, use of similar taxes related to the Work; and

e. Additional costs of supervision and field office personnel directly attributable to the change. (General Conditions)

The burden of proof of cost rests upon the Contractor. Contractor agrees that DBA or Owner's Representative shall have the right, at reasonable times, to inspect and audit the books and records of Contractor to verify the propriety and granting of such cost.

7.2.2.3 Compute requests for changes be they additions or deductions as follows:

a. For work performed by the Contractor which results in an overall increase in the contract sum: example

Net Cost of Materials	a. _____
State Sales Tax	b. _____
Net Placing Cost including Owner approved General Conditions	c. _____
W.C. Insurance Premium and FICA Tax	d. _____
Subtotal of a+b+c+d:	_____
Overhead and Profit, shall not exceed 12% x (a+b+c+d)	e. _____
Allowable Bond Premium	f . _____
TOTAL COST	
a+b+c+d+e+f :	_____

b. The amount of credit to be allowed by the contractor to the owner for a deletion or change which results in a net decrease in the contract sum shall be actual net cost as computed as outlined in 7.2.2.3.a (a. through e.) and confirmed by the design professional. Credit for work deleted shall be computed as outlined in 7.2.2.3.a (a. through e.), except the Contractor's share of overhead and profit percentage is not less than seven (7) percent.

c. For added work performed by Subcontractors: Subcontractors shall compute their work as outlined in 7.2.2.3.a (a. through e.) to the cost of that portion of the work (Change) that is performed by the Subcontractor. The Contractor overhead and profit change shall not exceed five (5) percent plus the allowable bond premium.

d. The amount of credit to be allowed by the Contractor to the Owner for a deletion or change which results in a net decrease in the contract sum by a Subcontractor shall be actual net cost as computed as outlined in 7.2.2.3.a (a. through e.) and confirmed by the Design Professional for work deleted by a Subcontractor: Subcontractors shall compute their work as outlined in 7.2.2.3.a (a. through e.), except that the overhead and profit shall be not less than seven (7) percent and the Contractor's overhead and profit shall be not less than five (5) percent.

7.3 **PAYMENT FOR CHANGES IN THE WORK**

7.3.1 All changes in the Work will be paid for in the manner indicated in Article 4, Paragraph 4.2, and the compensation thus provided shall be accepted by the Contractor as payment in full for the use of small tools, superintendent's services, premium on bond, and all other overhead expenses incurred in the prosecution of such work.

7.3.2 The Owner shall not be deemed to have agreed to any costs for additional work, to have agreed to additional time for completion, or to have agreed to any other change in the terms and conditions of the Contract Documents until Owner, Design Professional and Contractor have executed a Change Order to this Contract, and the Change Order is approved by DBA.

ARTICLE 8 -- TIME

8.1 **DEFINITIONS**

8.1.1 Contract Time is the period of time identified in the Contract Documents for Substantial Completion of the Work, including authorized adjustments made as part of Change Orders agreed to by the Owner, Contractor, Design Professional and DBA.

8.1.2 Date for commencement of the Work is the fifth calendar day following the start date listed on the Notice to Proceed, unless otherwise stated in the Contract.

8.1.3 Date of Substantial Completion is the date certified by the Design Professional, the Owner and DBA.

8.2 **PROGRESS**

8.2.1 Time limits identified in the Contract Documents are of the essence of the Contract. The Contractor confirms that the Contract Time is a reasonable period of time for performing the Work.

8.3 **HOLIDAYS**

8.3.1 New Year's Day, Robert E. Lee/Dr. Martin Luther King's Birthday, President’s Birthday, Memorial Day, Independence Day, Labor Day, Veteran's Day, Thanksgiving Day and the day thereafter, Christmas Eve and Christmas Day will be considered as being legal holidays; no other days will be considered unless declared by the Governor of the State of Arkansas through an Executive Order or Proclamation. No Design Professional clarifications, observations, or State inspections will be provided on legal holidays, Saturdays and Sundays, and no work shall be performed on these days except in an emergency or with written approval in advance by the Design Professional and Owner.

8.4 DELAYS

8.4.1 Delays beyond the Contractor's control occasioned by an act or omission on the part of the Owner, strikes, fires, additions to the work, delays by any separate contractor employed by the Owner, extremely abnormal weather conditions, or other delays beyond the Contractor’s control may, if agreed to by Change Order by the Contractor, Owner, Design Professional and DBA entitle the Contractor to an extension of time in which to complete the work. While such delays may be just cause for an extension of the Contract Time, the Contractor shall not have a claim for damages for any such cause or delay.

ARTICLE 9 -- PAYMENTS AND COMPLETION

9.1 CONTRACT SUM

9.1.1 The Contractor shall accept the compensation, as herein provided, in full payment for furnishing all materials, equipment, labor, tools, and incidentals necessary to complete the Work and for performing all Work contemplated and embraced under the Contract. Also, for loss or damage arising from the nature of the Work, from the action of the elements or from any unforeseen difficulties which may be encountered during the prosecution of the Work until the final acceptance by the Design Professional and Owner; and for all risks of every description connected with the prosecution of the Work; for all expenses incurred in consequence of the suspension or discontinuance of the Work as specified; and for any infringement of patent, trademark, or copyright, and for completing the Work according to the Contract Documents. Neither the payment of any estimate nor of any retained percentage shall relieve the Contractor of any obligation to make good any defective work or material.

9.1.2 No moneys payable under Contract or any part thereof, except the estimate for the first month or period, shall become due and payable if the Owner so elects until the Contractor shall satisfy the said Owner that he has fully settled or paid for all materials and equipment used in or on the Work and labor done in connection therewith, and the Owner, if he so elects, may pay any or all such bills wholly or in part and deduct the amount or amounts so paid from any monthly or final estimate excepting the first estimate.

9.1.3 In the event the surety on any contract or payment bond given by the Contractor becomes insolvent, or is placed in the hands of a receiver, or has the right to do business in a state revoked as provided by law, the Owner may at its election withhold payment of any estimate filed or approved by the Design Professional until the Contractor shall give a good and sufficient bond in lieu of the bond so executed by such surety. Any and all subsequent bonds shall be filed with the Circuit Clerk of the County in which the Work is being performed.

9.2 SCHEDULE OF VALUES

9.2.1 The Contractor shall submit to the Design Professional a schedule of values for each part of the Work. The schedule shall be a complete breakdown of labor and materials for the various parts of the Work including an allowance for profit and overhead. The total of these amounts shall equal the Contract Sum. The approved schedule of values shall be used as a basis for the monthly payments to the Contractor. In applying for the monthly payment, the Contractor shall show a detailed account of work accomplished in conformity with the schedule.

9.3 MEASUREMENT OF QUANTITIES

9.3.1 The Contractor shall be paid for all Work performed under the Contract based on Design Professional computations of as-built quantities and the Contractor's Contract Sum. This payment shall be full compensation for furnishing all supplies, materials, tools, equipment, transportation, and labor required to do the Work; for all loss or damage, because of the nature of the Work, from the action of the elements or from any unforeseen obstruction or difficulty which may be encountered in the prosecution of the Work and for which payment is not specifically provided for all or any part of the Work; and for well and faithfully completing the Work in accordance with the Contract Documents. The method of computation and payment for each item shall be as set forth in the Specifications or the Supplementary Conditions.

9.4 REQUESTS FOR PAYMENT

9.4.1 The Contractor may submit periodically, but not more often than once each month, a Request for Payment for work completed. When unit prices are specified in the Contract Documents, the Request for Payment shall be based on the quantities completed.

9.4.2 Unless otherwise provided in the Contract Documents, payments will be made on account of materials or equipment not incorporated in the Work to date but delivered and suitably stored at the site, and if approved in advance by the Owner, payments may similarly be made for materials or equipment suitably stored at some other location agreed upon in writing. Payments for materials or equipment stored on or off the site shall be conditioned upon submission by the Contractor of bills of sale or such other procedures satisfactory to the Owner and the Design Professional to establish the Owner's title to such materials or equipment or otherwise protect the Owner's interest including applicable insurance and transportation to the site for those materials and equipment stored off the site.

9.4.3 The Contractor shall furnish the Design Professional all reasonable facilities and job tickets required for obtaining the necessary information relative to the progress and execution of the Work and the measurement of quantities. Each Request for Payment shall be computed from the Work completed on all items listed in the approved schedule of values less five (5) percent (retainage) of the adjusted Contract Sum and less previous payments to the Contractor on the Contract. Retainage may be waived pursuant to the process and procedures as stated in 9.5.2.

9.5 PERIODIC ESTIMATES FOR PAYMENT

9.5.1 Unless otherwise stated in the Specifications or Supplementary Conditions, the Owner shall cause the Design Professional to prepare an Estimate for Payment to the Contractor each month. The Design Professional will make the estimate for the materials complete in place and the amount of work performed in accordance with the Contract between the twenty-fifth day of the month and the fifth day of the succeeding month.

9.5.2 From the total of the amount estimated to be paid, an amount equal to five (5) percent of the total completed shall be retained from each payment request. The Owner may waive withholding retainage of the progress payments if both of the Design Professional and Owner agree the Work is fifty (50) percent complete and the Contractor has provided the Work in a satisfactory manner. Nothing in the proceeding sentence shall be construed as prohibiting the Owner from maintaining the withholding of retainage (5%) throughout the entire project. All sums withheld by the Owner and requested in a Final Pay Request prepared by the Owner or Contractor will be paid to the Contractor within 30 days after the Contract has been completed and the work approved by DBA. No retainage will be withheld on that amount of the progress payment pertaining to the cost of materials stored at the site or within a bonded warehouse.

9.6 PAYMENT FOR INCREASED OR DECREASED QUANTITIES

9.6.1 When alterations in the quantities of work not requiring Contract modifications are ordered and performed, the Contractor shall accept payment in full at the Contract Sum, for the actual quantities of work accomplished. No allowance will be made for anticipated profits. Increased or decreased work involving Contract modifications shall be paid for as stipulated in such Contract modifications.

9.7 DESIGN PROFESSIONAL'S ACTION ON A REQUEST FOR PAYMENT (See also 9.9)

9.7.1 The Owner shall cause the Design Professional to, within five working days plus time required for transmittal from one party to another, act on a Request for Payment by the Contractor in one of the following:

a. Approve the Request for Payment as submitted by the Contractor, and transmit same to the Owner.

b. Approve an adjusted amount, as the Design Professional will decide is due the Contractor informing the Contractor in writing of the reason for the adjusted amount, and transmit same to the Owner.

c. Withhold the Request for Payment submitted by the Contractor informing the Contractor, Owner and DBA in writing of the reason for withholding the request.

9.8 **ACTION ON A REQUEST FOR PAYMENT AND FINAL PAYMENT**
(See also 9.9)

9.8.1 The Owner will, within five working days plus transmittal time between the various state agencies involved, act on a Request for Payment (not Final) after approval by the Design Professional by one of the following:

a. Approve the Request for Payment as approved by the Design Professional and process the payment.

b. Approve payment of an adjusted amount as the Owner will decide is due the Contractor, informing the Contractor and the Design Professional in writing of the reason for the adjusted amount of payment.

c. Withhold the Request for Payment informing the Contractor and the Design Professional in writing of the reason for withholding the payment.

9.8.2 The State shall process payments in accordance with Ark. Code Ann. §19-4-1411, which establishes the time limits for the Design Professional, the Owner, and the Department of Finance and Administration. It also authorizes the Chief Fiscal Officer of the State to investigate any complaints of late payments and assess penalties for late payment. Complaints shall be addresses to: Chief Fiscal Officer of the State: Department of Finance and Administration; 1509 West Seventh Street, Suite 401; Post Office Box 3278; Little Rock, AR 72203-3278.

9.8.3 The Design Professional or the State may withhold payment for contested issues, including but not limited to, defective work on the project; evidence indicating the probable filing of claims by other parties against the Contractor related to the project; damage caused to another contractor; reasonable evidence that Work cannot be completed for the unpaid balance of the Contract Sum or within Contract Time or failure of the Contractor to make payments on materials, equipment or labor to subcontractors. It is the responsibility of the contesting party to notify the Contractor in writing that payment has been contested and the reasons why. The notification must be done within the timeframe specified for processing of payment under Ark. Code Ann. §19-4-1411.

9.9 PAYMENT FOR UNCORRECTED WORK

9.9.1 Should the Design Professional direct the Contractor not to correct work that has been damaged or that was not performed in accordance with the Contract Documents, an equitable deduction from the Contract Sum shall be made to compensate the Owner for the uncorrected work. The Design Professional shall determine the amount of the equitable deduction.

9.10 PAYMENT FOR REJECTED MATERIALS AND WORK

9.10.1 The removal of rejected Work and materials and the re-execution of acceptable work by the Contractor shall be at the expense of the Contractor. The Contractor shall pay the cost of replacing the work of other contractors destroyed or damaged by the removal of the rejected work or materials and the subsequent replacement with acceptable work.

9.11 DATE OF SUBSTANTIAL COMPLETION

9.11.1 A Certificate of Substantial Completion, which shall establish the Date of Substantial Completion, shall state the responsibilities of the Owner and the Contractor for security, maintenance, heat, utilities, damage to work, and insurance and shall fix the time within which the Contractor shall complete the items listed therein. Warranties required by the Contract Documents shall commence on the Date of Substantial Completion, unless another timeframe is stated in the Certificate of Substantial Completion. The Certificate of Substantial Completion shall not become effective until approved by DBA.

9.12 FINAL COMPLETION AND PAYMENT BY OWNER

9.12.1 The Contractor shall furnish a letter from the Design Professional attached to the Contractor's final estimate, which shall include all retainage withheld, certifying that the Design Professional has received and approved all guarantees, bonds, maintenance and operation manuals, air balance data, shop drawings, catalog data, and record documents specified in the Contract Documents.

9.12.2 Before final payment, the Contractor shall furnish to the Design Professional executed copies of the Release of Claims and Consent of the Performance and Payment Bond Surety for Final Payment. Items listed in this Section Nine (9) shall be submitted with and at the same time as the final estimate to the Design Professional and shall be promptly delivered by the Design Professional to the Owner. No final payment or release of retained amounts shall be made without complete compliance with this Section Nine (9), and approval by the Owner and DBA of the Final Pay Request, which shall include payment of all retained amounts.

9.12.3 Any claim by the Contractor to the Owner for interest on a delinquent final payment shall only be made pursuant to Ark. Code Ann. § 22-9-205.

9.13 PARTIAL OCCUPANCY OR USE

9.13.1 The Owner may occupy or use any completed or partially completed portion of the Work provided such use or occupancy is consented to by the insurer and authorized. The Contractor will prepare a list of items to be completed or corrected before partial acceptance. Upon receipt of the Contractor's list, the Design Professional will make an inspection to determine whether the Work or portion thereof is substantially complete. No portion of the work shall be considered substantially complete unless described in a Certificate of Substantial Completion Form approved by the Contractor, Owner, Design Professional and DBA.

9.13.2 The Design Professional will prepare a Certificate of Substantial Completion which shall establish the date of Substantial Completion, shall state the responsibilities of the Owner and the Contractor for security, maintenance, heat, utilities, damage to Work and insurance, identify work items to be corrected or completed by the Contractor and shall fixing the time within which the Contractor shall complete the items listed therein. Warranties required by the Contract Documents shall commence on the Date of Substantial Completion, unless another timeframe is stated in the Certificate of Substantial Completion. No retained amounts shall be paid until the Contractor, Design Professional, Owner and DBA approve a Certificate of Final Completion for all of the Work unless specifically provided for by this contract, and all other conditions for final acceptance of this Work are met to the satisfaction of the Owner and DBA.

9.13.3 If the contract documents allow for phased work and those phased sections of the project are completed, the retained amounts shall be paid in direct proportion to the value of the part of the capital improvement project completed as approved by the Contractor, Design Professional, Owner, and DBA and all other conditions of this Section Nine (9) are met by the Contractor.

9.14 FINAL INSPECTION

9.14.1 Tests, inspections, and approvals of portions of the Work required by the Contract Documents, laws, ordinances, or any public authority having jurisdiction shall be made at the appropriate time. The Contractor shall give the Design Professional timely notice of when and where tests and inspections shall be made so that the Design Professional may be present. The Contractor shall make arrangements for the testing and inspection with an independent testing laboratory.

9.14.2 The Contractor shall ensure that the final completed work is in accordance with the Contract Documents. Required certificates of testing and inspection shall be secured by the Contractor and delivered to the Design Professional, unless otherwise required by the Contract Documents. The Design Professional (or Owner, in the absence of a design professional) will coordinate the scheduling of the final inspection with all parties, to include specifically the DBA Observer. Upon completion of all work, including but not limited to the punch list items, all parties will execute the Certificate of Final Completion form setting forth the final completion date.

9.15 ASSIGNMENT OF WARRANTIES

9.15.1 All warranties of materials and workmanship running in favor of the Contractor shall be transferred and assigned to the Owner on completion of the Work and at such time as the Contractor receives final payment.

9.15.2 In case of warranties covering work performed by Subcontractors, such warranties shall be addressed to and in favor of the Owner. The Contractor shall be responsible for delivery of such warranties to the Owner prior to final acceptance of the work.

9.15.3 Delivery of guarantees or warranties shall not relieve the Contractor from any obligation assumed under any provision of the Contract. All warranties shall be for one year from the date of Substantial Completion of the Project, unless noted differently in the contract documents or extended otherwise.

9.16 ACCEPTANCE AND FINAL PAYMENT

9.16.1 Upon receipt of written notice that the Work is ready for final inspection, the Design Professional together with the Owner and DBA will conduct such inspection and when the Design Professional determines the work is acceptable to the Design Professional, Owner and DBA the Design Professional shall certify his acceptance to the Owner. Final Payment shall be the Contract Sum plus approved Change Order additions less approved Change Order deductions and less previous payments made. The Contractor shall furnish evidence that he has fully paid all debts for labor, materials, and equipment incurred in connection with the Work.

The Owner, upon approval by the Design Professional of all documentation to be provided by the contractor in accordance with this Section 9, and approval by the Design Professional, Contractor, Owner and DBA of the Certificate of Final Completion will accept the Work and release the Contractor, except as to the conditions of the Performance and Payment Bond, any legal rights of the Owner, required guarantees and correction of faulty work after Final Payment, and shall authorize payment of the Contractor's final Request for Payment. The Contractor must allow sufficient time between the time of completion of the work and approval of the final Request for Payment for the Design Professional to assemble and check the necessary data.

9.16.2 Acceptance of final payment by the Contractor shall constitute waiver of all claims by the Contractor except those previously made in writing and identified by the Contractor as unsettled at the time of the final Request for Payment. Any claims for interest on delinquent payments shall be made pursuant to Ark. Code Ann.§ 22-9-205.

ARTICLE 10 -- PROTECTION OF PERSONS AND PROPERTY

10.1 GENERAL

10.1.1 The Contractor shall at all times exercise precaution for the safety of employees on the Project and of the public, and shall comply with all applicable provisions of federal, state and municipal safety laws and applicable building and construction codes. The Contractor shall provide and maintain passageways, guard fences, lights, and other facilities for protection required by all applicable laws. All machinery, equipment, and other physical hazards shall be guarded in accordance with all federal, state or municipal laws or regulations.

10.1.2 The Work, from commencement to completion, and until written acceptance by the Design Professional, Owner and DBA or to such earlier date or dates when the Owner may take possession and control in accordance with Section Nine (9) of these General Conditions, shall be under the charge and control of the Contractor and during such period of control by the Contractor, all risks in connection therewith shall be borne by the Contractor. The Contractor shall make good and fully repair all damages to the Project by reason of the Contractor's negligence, and make good on all injuries to persons caused by any casualty or cause by reason of the Contractor's negligence. The Contractor shall adequately protect adjacent Property as provided by law and the Contract Documents. The Contractor shall hold the Owner and DBA harmless from any and all claims for injuries to persons or for damage to property during the control by the Contractor of the project or any part thereof.

10.1.3 The Contractor shall at all times so conduct the Work as to ensure the least possible obstruction to traffic, to the general public, and the residents in the vicinity of the Work, and to ensure the protection of persons and property. No road, street, or highway shall be closed to the public except with the permission of the Owner and proper governmental authority. Fire hydrants on or adjacent to the Work shall be kept accessible to fire fighting equipment at all times. The local fire department shall be notified of the temporary closing of any street.

ARTICLE 11 -- INSURANCE AND BONDS

11.1 INSURANCE REQUIREMENTS

11.1.1 The Contractor shall purchase and maintain in force during this Contract such insurance as is specified within the Contact Documents, from an insurance company authorized to write the prescribed insurance in the jurisdiction where the Project is located as will protect the Contractor, his subcontractors, and the Owner from claims for bodily injury, death, or property damage which may arise from operations under this Contract, and will protect him from claims set forth which may arise out of or result from the contractor's operations under the Contract, whether such operations be by himself or by anyone directly or indirectly employed by any of them, or by anyone for whose acts may of them be liable.

The Contractor shall not commence work under this Contract until he has obtained all the insurance required, has filed the Certificate of Insurance with the Owner, and the certificate has been approved by the Owner. Each insurance policy shall contain a clause providing that it shall not be canceled by the insurance company without written notice to the Owner of intention to cancel in accordance with Ark. Code Ann. § 23-66-206. The Contractor is required to provide liability insurance with the additional insured endorsement that is primary non-contributory. All policies shall contain a waiver of the Contractor's right of subrogation against the State of Arkansas, its departments, agencies, boards, commissions, colleges and its officers, officials, agents, and employees for losses arising from work performed by or on behalf of the Contractor.

11.1.2 Workers' Compensation and Employers' Liability Insurance in statutory limits shall be secured and maintained as required by the laws of the State of Arkansas. This insurance shall cover all employees who have performed any of the obligations assumed by the Contractor under these Contract Documents including Employers' Liability Insurance. This insurance shall protect the Contractor against any and all claims resulting from injuries, sickness, disease, or death to employees engaged in work under this Contract.

11.1.3 Commercial General Liability Insurance, shall be secured and maintained in force during the period of the Contract. Prior to blasting, the Contractor shall furnish Certificate of Insurance, which shall certify that damage caused by blasting is within the coverage of his Commercial General Liability Insurance to the full limits thereof. Coverage for “completed operations” shall not be excluded under this commercial general liability Insurance section.

11.1.4 Commercial Automobile Liability Insurance shall be secured and maintained in force during this contact. Liability coverage shall include coverage for hired and non-owned automobiles.

11.1.5 Umbrella Liability shall be secured and maintained in force during term of the Contract. The Contractor shall provide a Umbrella Liability Insurance to provide additional coverage over and above the Commercial General Liability, Commercial Business Automobile Liability and the Workers' Compensation and Employers' Liability to satisfy the Contract minimum limits. The umbrella coverage shall follow form with the Umbrella limits required as shown in section 00 73 16 Insurance Requirements.

11.1.6 Pollution Liability Insurance shall cover the Owner costs and liabilities attributable to bodily injury; property damage, including loss of use of damaged property or of property that has not been physically injured; clean-up cost; and defenses, including costs and expenses (including attorney's fees) incurred in the investigation, defense or settlement of claims.

If coverage is written on a claims-made basis, Contractor represents that any retroactive dates applicable to coverage under the policy precedes the effective date of the letter; and that continuous coverage will be maintained or an extended discovery period will be exercised for a period of three (3) years or as required by law beginning from the time that services under the contract are completed.

If the scope of work as defined in this Contract includes the disposal of any hazardous or non-hazardous materials from the Projects site, the Contractor must furnish to the Owner evidence of pollution liability insurance maintained by the disposal site operator for losses arising from the insured facility accepting waste under this Contract. Such coverage must be maintained in amounts conforming with applicable laws, rules and regulations.

Remediation: Remediation Contractor shall provide liability insurance for the removal or remediation of asbestos including the transportation and disposals of asbestos waste materials from the Project site.

11.1.7 Builder's Risk or Installation Floater Policy: The Contractor shall procure and maintain during the life of this Contract Builder's Risk or Installation Floater Insurance, and any extended coverage which shall cover damage for the capital improvement project. Perils to be insured are fire, lightning, malicious mischief, explosion, riot and civil commotion, smoke, sprinkler leakage, water damage, windstorm, hail, vandalism, and property theft on the insurable portion of the Project on a 100 percent completed value basis against damage to the equipment, structures, or material. Builders' risk policy shall include coverage for system testing and materials. The Owner and the Contractor, as their interests may appear, shall be named as the Insured. The Builders' Risk is not void if partial occupancy is required and a permission to occupy endorsement has been included when applicable. Builders' risk policy shall include "soft cost endorsement" in the amount of 10 percent of the total contract value.

Contractors will use the following information as guidance for the type of policy to procure which include but not limited to the following:

a) All new building construction and major renovations will require Builders Risk insurance;
b) Equipment installations, small renovations, utility installations, paving projects will require an Installation Floater Policy. If a determination cannot be made by the Contractor as the type of Coverage required, the contractor shall provide a written request to the Owner for clarification.

11.1.8 Proof of Insurance: The Contractor shall maintain the insurance coverage required by this contract (see Section 00 73 16 Insurance Requirements) throughout the term of this contract, and shall furnish the Owner with certificates of insurance which indicate the name of the insurance companies, the NAIC numbers, insured names, producer / agent names, telephone numbers, policy numbers, limits and types of coverage, effective and expiration dates of policies.

The Contractor shall supply the Owner updated replacement certificates not less than thirty days prior to the expiration date or renewal date of any insurance policies reflected on such certificates. Such certificates shall also contain substantially the following statement: "The insurance covered by this certificate will not be canceled, or materially altered except proper written notice pursuant Ark. Code Ann. § 23-66-206 has been received by the Owner." The notice to proceed shall not be issued until the insurance certificates have been approved by the Owner.

11.1.9 Additional Requirements: All policies shall be provided by insurers qualified to write the respective insurance in the State of Arkansas, and be in such form and include such provision as are generally considered standard provisions for the type of insurance involved. The Contractor will be financially responsible for all deductibles or self-insured retentions.

Equipment and Materials: The Contractor shall be responsible for any loss, damage, or destruction of its own property or that of any Subcontractor’s equipment and materials used in conjunction with the Work. The Contractor will purchase at Contractor's own sole costs and expense such policy to cover Contractor's owned property.

Subcontractor's: The Contractor shall require all Subcontractors to provide and maintain general liability, automobile and workers’ compensation insurance coverage substantially similar to those required of the Contractor. The Contractor shall require certificates of insurance from all Subcontractors as evidence of coverage. Contractor will be the responsible party for any and all claims by Subcontractors if Subcontractor fails to have appropriate insurance.

11.2 **BONDS**

11.2.1 Performance and Payment Bond: The Contractor shall, at the time of execution of the Contract, furnish bonds covering faithful performance of the Contract and the payment of obligations. Performance and Payment bonds, and any amendments thereto, shall be filed with the circuit clerk office in the County Courthouse of the county where the work shall be performed.

ARTICLE 12 -- UNCOVERING AND CORRECTION OF WORK

12.1 **EXAMINATION OF COMPLETED WORK**

12.1.1 If any portion of the work should be covered contrary to the request of the Owner, Design Professional, or Inspector or to requirements specifically expressed in the Contract Documents, it must, if required in writing by the Owner, Design Professional, or Inspector, be uncovered for his observation and replaced at the Contractor's expense.

12.2 **DEFECTIVE WORK**

12.2.1 Defective work, whether through the use of defective materials, the result of poor workmanship, or any other cause, shall be removed within ten days after notice is given by the Owner or Design Professional. The Work and affected materials and equipment shall be removed and replaced as necessary to comply with the Contract Documents without additional cost to the Owner. The fact that the defective work may have been previously overlooked by the Design Professional shall not constitute acceptance.

12.3 **REJECTED MATERIALS**

12.3.1 Materials which do not conform to the requirements of the Contract Documents, are not equal to samples approved by the Design Professional, or are in any way unsuited or unsatisfactory for the purpose for which intended, shall be rejected. Defective materials shall be removed within ten days after notice by the Design Professional. The materials shall be replaced with new materials as necessary to comply with the Contract Documents at no additional cost to the Owner. The fact that the defective material may have been previously overlooked by the Design Professional shall not constitute acceptance.

12.3.2 Should the Contractor fail to remove and replace rejected material within the specified ten days after written notice to do so, the Owner may remove and replace the material and deduct the cost from the Contract Sum.

12.4 **CORRECTION OF FAULTY WORK AFTER FINAL PAYMENT**

12.4.1 The approval of the final Request for Payment by the Design Professional and the making of the Final Payment by the Owner to the Contractor shall not relieve the Contractor of responsibility to correct faulty materials or workmanship promptly after receipt of written notice from the Owner until the end of the Contractor's warranty or performance and payment bond obligations or both. The Owner shall give such notice of faulty materials or workmanship promptly, after discovery of the condition. If the Contractor fails to correct the defects, promptly, after receipt of written notice from Owner, the Owner may have the work corrected at the Contractor's expense.

ARTICLE 13 -- MISCELLANEOUS PROVISIONS

13.1 **GOVERNING LAW**

13.1.1 The Contract shall be governed by the laws and regulations of the STATE OF ARKANSAS. Venue for any administrative action or judicial proceedings shall be Pulaski County, Arkansas. Nothing in these General Conditions shall be construed to waive the sovereign immunity of the STATE OF ARKANSAS or any entities thereof.

13.1.2 The Contractor shall give all notices and comply with all federal, state, and local laws, ordinances, and regulations in any manner affecting the conduct of the Work. The Contractor shall indemnify and save harmless the Owner and DBA against any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order, or decree whether by himself or his employees.

13.1.3 The Contractor shall comply with the laws of the local, state, and federal government regarding wages and hours of labor.

13.2 **WRITTEN NOTICE**

13.2.1 Consider as served when delivered in person or sent by certified or registered mail to the individual, firm, or corporation or to the last business address of such known to him who serves the notice. Failure to accept or receive the hand delivered, certified, or registered mail does not negate the consideration of serving.

13.2.2 The written Notice to Proceed with the Work shall be issued by the Design Professional after the execution of the Contract by the Owner. The Contractor shall begin and prosecute the Work uninterruptedly in a manner that will complete the Work within the time limits stated in the Contract.

13.3 **TESTS AND INSPECTIONS**

13.3.1 All materials and each and every part of the Work shall be subject at all times to inspection by the Owner, Design Professional, or the Inspector. The Contractor shall be held to the intent of the Contract Documents in regard to quality of materials, equipment, and workmanship, and the diligent execution of the Contract. The inspection may extend to and include plant, shop, or factory inspection of material furnished. The Contractor agrees to allow Federal or State inspectors, acting in an official capacity, to have access to the job site.

13.3.2 The Owner, Design Professional, DBA and the Inspector shall be allowed access to all parts of the Work and shall be furnished with such information and assistance by the Contractor as is required to make a complete and detailed inspection for ascertaining if the Work as performed is in accordance with the requirements and the Contract Documents.

13.3.3 Inspectors shall only have authority to suspend any work in a life-threatening situation, which is being improperly done, subject to the final decision of the Owner or Design Professional. Inspectors shall have no authority to permit deviations, or to relax provisions of the Contract Documents without the written permission or instruction of the Owner, DBA or Design Professional, or delay the Contractor by failing to work with reasonable promptness.

13.4 **VERBAL AGREEMENTS**

13.4.1 No verbal objection, order, claim, or notice by any of the parties involved to the other parties shall affect or modify any of the terms or obligations contained in the Contract Documents. None of the terms or provisions of the Contract Documents shall be considered waived or modified unless the waiver or modification thereof is in writing, and agreed upon by the parties in the form of a Change Order approved by the Owner, Design Professional, Contractor and DBA, and no evidence shall be introduced in any proceeding of any other waiver or modification.

ARTICLE 14 -- TERMINATION OR SUSPENSION OF THE CONTRACT

14.1 **SUSPENSION OF WORK**

14.1.1 The Work or any portion thereof may be suspended at any time by the Owner provided that the Owner gives the Contractor written notice of the suspension. The notice shall set forth the date on which the Work is to be suspended and the date on which the Work is to be resumed. The Contractor shall resume the Work upon written notice from the Owner within ten days after the date set forth in the notice of suspension.

14.1.2 The Owner will have the authority to suspend the work, wholly or in part, for such period of time as deemed necessary. The suspension may be due to unsuitable weather, or such other conditions as are considered unfavorable for the proper prosecution of the Work, or the failure on the part of the Contractor to fulfill the provisions of the Contract. Failure to supply material, equipment, or workmanship meeting the requirements of the Contract Documents shall be just cause for suspension of the Work. The Contractor shall not have the right to suspend operations without the Design Professional or Owner's permission.

14.2 TERMINATION BY OWNER FOR CAUSE

14.2.1 The Owner will have the right to terminate the Contract upon giving ten days written notice of the termination to the Contractor and the Contractor's surety, in the event of any default by the Contractor and upon written notice from the Design Professional to the Owner that sufficient cause exists to justify such action. In the event of termination of the Contract, the Owner may take possession of the Work and of all materials, tools, and equipment and construction equipment and machinery thereon and may finish the work by whatever method he may select. However, Owner will not have the right to terminate without providing Contractor with reasonable opportunity to cure such default to Owner's reasonable satisfaction. If the Owner does not elect to use his own forces, the surety shall furnish a competent licensed contractor within 10 working days from the written notice to the surety.

14.2.2 It shall be considered a default by the Contractor whenever he shall become insolvent; declare bankruptcy assigns assets for the benefit of his creditors; fails to provide qualified superintendence, proper materials, competent Subcontractors, competent workmen; fails to make prompt payments for conforming labor, materials, or equipment; disregards or violates provisions of the Contract Documents; disregards the Owner's, Design Professional's, or DBA instructions; fails to prosecute the Work according to the approved schedule of completion, including extensions thereof as provided for by approved Change Orders; and fails to start the Work on the date established in the Notice to Proceed.

14.3 TERMINATION BY OWNER FOR CONVENIENCE

The Owner will have the right to terminate the Contract for Convenience and without cause upon giving ten days written notice of the termination to the Contractor and Contractor's surety and DBA. Once notice is received, the Contractor shall: cease all operations as indicated by the written notice and take necessary actions or at the Owner's direction as indicated by the written notice, for the protection and preservation of the work; and terminate existing Subcontractors and purchase orders upon the effective termination date as indicated in the notice and not enter into any contracts involving Subcontractors or purchase orders.

If the contract is terminated upon the convenience of the Owner, the Contractor is entitled to receive payment for the work executed and accepted by the Owner, and the overhead and profit credit amount of 1% of the work that was left to be performed in the contract unless the termination was due to the Owner's loss of funding in which case no amount for overhead and profit will be credited.

ARTICLE 15 – DISPUTE RESOLUTION

15.1 CONTRACTUAL DISPUTES

15.1.1 In the event that a dispute, claim or controversy between the Owner and the Contractor arises regarding the requirements of the Contract, the performance of the Work, payment due the Contractor, the terms of any Change Order, or otherwise, the Contractor shall not stop, suspend or delay the Work or any part of the Work to be performed under the Contract, or under any Change Order, or as ordered by the Owner. The Contractor shall continue to diligently prosecute the Work to completion, including work required in any Change Order or as directed by the Owner.

15.2 MEDIATION

15.2.1 In the event of any dispute regarding the Contractor and the Owner (hereinafter referred to as party/parties for this section only) under this Agreement, the party shall provide written notification to the DBA Construction Section.

15.2.2 If the Owner or the Contractor are unable to negotiate a settlement of the dispute amongst themselves, the parties may participate in mediation. Mediation shall be voluntary, non-binding and all proceedings in connection with such shall be subject to this Agreement and applicable provisions of Arkansas law. A request for mediation must be made in writing to the other party and the parties shall agree upon the location of the mediation. A Mediator mutually agreed upon by the parties shall conduct the mediation process. Any mediation fees shall be borne equally between the parties. The parties shall coordinate mediation and the Owner shall notify DBA of any mediation prior to it taking place. DBA Construction Administrator or his designee may view any and all mediation proceedings. Any settlements arising out of the voluntary mediation process must be approved by DBA.

15.2.3 Notwithstanding anything to the contrary contained herein, if any dispute arises between the Parties, whether or not it requires at any time the use of dispute resolution procedures described above, in no event, nor for any reason, shall the Contractor, Architect, or Engineer interrupt the provision of services/performance to the Owner, or perform any other action that prevents, slows down, or reduces, in any way, the provisions of the Agreement unless: (a) authority to do so is granted by the Owner and approved by DBA or (b) the Agreement has been terminated by the State. Nothing in these contract documents, including the use of mediation, shall be construed to waive the sovereign immunity of the State of Arkansas or any entities thereof.

15.3 **ARBITRATION**

15.3.1 In the event of any dispute regarding the Contractor and the Owner (hereinafter referred to as party/parties for this section only) under this Agreement, the party shall provide written notification to the DBA Construction Section.

15.3.2 If the Owner or the Contractor are unable to negotiate a settlement of the dispute amongst themselves, the parties may participate in arbitration. Arbitration shall be voluntary, binding and all proceedings in connection with such shall be subject to this Agreement and applicable provisions of Arkansas law. A request for arbitration must be made in writing to the other party and the parties shall agree upon the Arbitrator, process and procedures and the location of arbitration. Any arbitration fees shall be borne equally between the parties. The parties shall coordinate arbitration and the Owner shall notify DBA of any arbitration prior to it taking place. DBA Construction Administrator or his designee may view any and all arbitration proceedings. Any settlements arising out of the voluntary arbitration process must be approved by DBA.

15.3.3 Notwithstanding anything to the contrary contained herein, if any dispute arises between the Parties, whether or not it requires at any time the use of dispute resolution procedures described above, in no event, nor for any reason, shall the Contractor, Architect, or Engineer interrupt the provision of services/performance to the Owner, or perform any other action that prevents, slows down, or reduces, in any way, the provisions of the Agreement unless: (a) authority to do so is granted by the Owner and approved by DBA or (b) the Agreement has been terminated by the State. Any award rendered by the arbitrator shall be final with the approval of DBA. Nothing in these contract documents, including the use of arbitration, shall be construed to waive the sovereign immunity of the State of Arkansas or any entities thereof.

END OF DOCUMENT

Insurance Requirements
Section 00 73 16 / Rev: August 2015

Article 11 - Insurance and Bonds
(see General Conditions Article 11 for additional information)

1) Subparagraph 11.1.1, add the following sentence:

The amount of such insurance shall be not less than the following or any limits required by law.

2) Subparagraph 11.1.2, add the following clause:

11.1.2.1 Workers' Compensation

a. State		Statutory
b. Applicable Federal		Statutory
c. Employers' Liability	Per Accident:	$100,000
	Disease, Policy Limit:	$500,000
	Disease, Each Employee:	$100,000

3) Subparagraph 11.1.3, add the following clause:

11.1.3.1 Commercial General Liability

General Aggregate:	Per Project Aggregate:	$2,000,000
Completed Operations: (to be maintained for one year after final payment)	Aggregate:	$1,000,000
Personal Injury:	Each Occurrence:	$1,000,000
Each Occurrence Limit:	Each Occurrence:	$1,000,000

4) Subparagraph 11.1.4, add the following clause:

11.1.4.1 Automobile Liability: (including, non-owned and hired vehicles)	Combined Single Limit:	$1,000,000

5) Subparagraph 11.1.5, add the following clause:

11.1.5.1 Umbrella Liability:	Each Occurrence:	$0

6) Subparagraph 11.1.6, add the following clause:

11.1.6.1 Pollution Liability:	Per Loss:	$2,000,000
	Aggregate:	$50,000,000

7) Subparagraph 11.1.7, add the following clause:

11.1.7.1 Builder's Risk or Installation Floater Policy:	$ = Contract Amount

8) Contractor shall deliver to the Owner a copy of each Insurance certificate and any other requested supporting document for the Owners review and approval prior to the issuance of the Notice to Proceed and any work being performed.

Please Note: Policy Certificates of Insurance shall state "The insurance covered by this certificate will not be cancelled, or materially altered except after proper written notice pursuant Ark. Code Ann. § 23-66-206 has been received by the Owner."

End of Document

Wage Rate Requirements
Section 00 73 43 / Rev: August 2015

A) The Contractor agrees to pay all prevailing hourly wage rates per the attached prevailing wage rate schedule, as follows, prescribed and mandated by the Arkansas Department of Labor, pursuant to Ark. Code Ann. §22-9-301 et. Seq. Decision number:
15-295

B) The Contractor is responsible for completing and returning the attached statement of intent to pay prevailing wages form, to the Arkansas Department of Labor, Prevailing Wage Division, 10421 West Markham, Little Rock, Arkansas 72205.

C) The form must be submitted within 30 days of the Notice to Proceed.

Contract and Grant Disclosure and Certification Form

Failure to complete all of the following information may result in a delay in obtaining a contract, lease, purchase agreement, or grant award with any Arkansas State Agency

Subcontractor: Subcontractor Name:

☐ **Yes** ☐ **No**

Taxpayer ID Name: Is This For: ☐ **Goods?** ☐ **Services?** ☐ **Both?**

Your Last Name: First Name: M.I.

Address:

City: State: Zip Code: Country:

AS A CONDITION OF OBTAINING, EXTENDING, AMENDING, OR RENEWING A CONTRACT, LEASE, PURCHASE AGREEMENT, OR GRANT AWARD WITH ANY ARKANSAS STATE AGENCY, THE FOLLOWING INFORMATION MUST BE DISCLOSED

FOR INDIVIDUALS *

Indicate below if: you, your spouse or the brother, sister, parent, or child of you or your spouse is a current or former: member of the General Assembly, Constitutional Officer, State Board or Commission Member, or State Employee:

Position Held	Mark (x)		Name of Position of Job Held	For How Long?		What is the person(s) name and how they relate to you? (i.e. Jane Q. Public, Spouse, John Q. Public, Jr., child, etc.)	
	Current	Former	(senator, representative, name of board/ commission, data entry, etc.)	From MM/YY	To MM/YY	Person's Name(s)	Relation
General Assembly							
Constitutional Officer							
State Board or Commission Member							
State Employee							

☐ **None of the above applies**

FOR AN ENTITY (BUSINESS) *

Indicate below if any of the following persons, current or former, hold any position of control or hold any ownership interest of 10% or greater in the entity: member of the General Assembly, Constitutional Officer, State Board or Commission Member, State Employee, or the spouse, brother, sister, parent, or child of a member of the General Assembly, Constitutional Officer, State Board or Commission Member, or State Employee. Position of control means the power to direct the purchasing policies or influence the management of the entity.

Position Held	Mark (x)		Name of Position of Job Held	For How Long?		What is the person(s) name and what is his/her % of ownership interest and/or what is his/her position of control?		
	Current	Former	(senator, representative, name of board/ commission, data entry, etc.)	From MM/YY	To MM/YY	Person's Name(s)	Ownership Interest (%)	Position of Control
General Assembly								
Constitutional Officer								
State Board or Commission Member								
State Employee								

☐ **None of the above applies**

* Note: Please list additional disclosures on separate sheet of paper if more space is needed.

Contract and Grant Disclosure and Certification Form

Failure to make any disclosure required by Governor's Executive Order 98-04, or any violation of any rule, regulation, or policy adopted pursuant to that Order, shall be a material breach of the terms of this contract. Any contractor, whether an individual or entity, who fails to make the required disclosure or who violates any rule, regulation, or policy shall be subject to all legal remedies available to the agency.

As an additional condition of obtaining, extending, amending, or renewing a contract with a state agency I agree as follows:

1. Prior to entering into any agreement with any subcontractor, prior or subsequent to the contract date, I will require the subcontractor to complete a **Contract and Grant Disclosure and Certification Form**. Subcontractor shall mean any person or entity with whom I enter an agreement whereby I assign or otherwise delegate to the person or entity, for consideration, all, or any part, of the performance required of me under the terms of my contract with the state agency.

2. I will include the following language as a part of any agreement with a subcontractor:

Failure to make any disclosure required by Governor's Executive Order 98-04, or any violation of any rule, regulation, or policy adopted pursuant to that Order, shall be a material breach of the terms of this subcontract. The party who fails to make the required disclosure or who violates any rule, regulation, or policy shall be subject to all legal remedies available to the contractor.

3. No later than ten (10) days after entering into any agreement with a subcontractor, whether prior or subsequent to the contract date, I will mail a copy of the **CONTRACT AND GRANT DISCLOSURE AND CERTIFICATION FORM** completed by the subcontractor and a statement containing the dollar amount of the subcontract to the state agency.

I certify under penalty of perjury, to the best of my knowledge and belief, all of the above information is true and correct and that I agree to the subcontractor disclosure conditions stated herein.

Signature _____ Title _____ Date _____

Vendor Contact Person _____ Title _____ Phone Number _____

Agency Use Only

Agency Number	Agency Name	Agency Contact Person	Contact Phone #	Contract or Grant Number
930 - 1601	Arkansas Department of Environmental Quality	Clark McWilliams	(501)-682-0744	9301601

* Note: Please list additional disclosures on separate sheet of paper if more space is needed.

BIDDING ADDENDA
Section 00 91 13 / Rev: August 2015

Date:

Addendum Number:

Project Number: 9301601

Agency Name: Arkansas Department of Environmental Quality

The proposed contract documents for this work are modified as follows:

1 **INVITATION TO BID**

2 **SPECIFICATIONS**

3 **DRAWINGS**

SECTION 010001
SUPPLEMENTAL CONDITIONS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Instructions to Bidders in addition to those in Section 002113

2. Clarifications to Bidders

1.2 INSTRUCTIONS TO BIDDERS

A. Mobilization Bid Rationale (Pay Item 1):

1. Description – The preparatory work and operations, including, but not limited to, those necessary for the movement of personnel, equipment, supplies, trash receptacles and incidentals to the project site; for the establishment of the Contractor's offices, buildings, and other facilities necessary to undertake the work on the project. This item shall also include other work and operations that must be performed, or for expenses incurred, before beginning work on the various Contract items on the project site. In no case shall the amount bid for the item of "Mobilization" exceed 5% of the total contract amount for all other items listed in the proposal.

2. Incidental Items – It shall also include pre-construction costs that are necessary direct costs to the project and are of a general nature rather than directly attributable to other pay items under the Contract.

3. Partial Payment Provisions – Allowable partial payments will be based on the percentage of the original Contract earned exclusive of the item of Mobilization according to the following schedule:

Percentage of Original Contract Amount Earned	Percentage of Bid Price for Mobilization Allowed
First Progress Amount	25
10	50
25	100

B. Qualifications of Bidders

1. To demonstrate qualifications to perform the Work, each Bidder must be prepared to submit within 5 days after bid opening, upon the Owner's request, detailed written evidence such as financial data, present commitments, and other such data as may be called for. Each Bid must contain evidence of Bidder's qualification to do business in the State of Arkansas.

C. Disqualification of Bidders

1. Any one or more of the following may be considered as sufficient for the disqualification of bidders and the rejection of Bids.

   a. More than one Bid Form for the same work from an individual, firm, partnership, or corporation under the same or different names.

   b. Evidence of collusion among bidders. Participants in such collusion may receive no recognition as bidders for any future work.

   c. Unbalanced Bid Forms in which the prices for some items are out of proportion to the prices for other items, or changes written in, or amendments by letter, or failure to submit a unit price for each item of work for which a bid price is required by the Bid Form, or failure to include all required contract documents.

   d. Lack of competency as revealed by the financial statement, experience, plant, and equipment statements submitted. Lack of responsibility as shown by past work judged from the standpoint of workmanship and progress.

   e. Uncompleted work which, in the judgment of Owner, might hinder or prevent the prompt completion of additional work if awarded.

   f. Being in arrears on existing contracts, in litigation with Owner, or having defaulted on a previous contract.

D. Consideration of Bidders

1. After the bids are opened and read, the quantities will be extended and totaled in accordance with the bid prices of the accepted Bids. This review of the Bids will confirm the low bidder.

2. In evaluating Bids, Owner will consider the qualifications of Bidders, whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices, and other data as may be requested in the Bid Form or prior to the Notice of Selection. All Bidders shall be required to have performed a minimum of four contracts of similar scope or other equivalent work within the past 5 years. Furthermore, earthwork contractor shall have successfully completed and documented a minimum of 500,000 square feet of clay liner or final cover barrier construction consistent with the requirements of this section during the last 3 years.

3. Owner may consider the qualifications and experience of Subcontractors, Suppliers, and other persons and organizations proposed for those portions of the Work as to which the identity of Subcontractors, Suppliers, and other persons and organizations must be submitted as provided in the Supplemental Conditions. The Owner also may consider the operating costs, maintenance requirements, performance data, and guarantees of major items of materials and equipment proposed for incorporation in the Work when such data are required to be submitted prior to the Intent to Award.

1.3 CLARIFICATIONS

A. Allowances

1. The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities against which the Contractor makes reasonable objection.

2. Unless otherwise provided in the Contract Documents:

   a. Allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts.

   b. Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum and not in the allowances.

   c. Whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect the difference between actual costs and the allowances.

3. Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

B. Adverse Weather Definition

1. Adverse Weather is defined as the occurrence of one or more of the following conditions, which prevents exterior construction activity or access to the site within 24 hours:

   a. Precipitation (rain, snow, or ice) totaling or exceeding 0.10 inch liquid measure.

   b. Temperatures that do not rise above 32 degrees Fahrenheit by 10:00 a.m.

   c. Temperatures that do not rise above that specified for the day's construction activity by 10:00 a.m., if any is specified.

   d. Sustained wind in excess of 25 miles per hour.

   e. Standing snow in excess of 1 inch.

   g. Inappropriate "dry-out" or "mud" days qualify for rain days above the standard baseline only if there is a hindrance to site access or site work, such as excavation, backfilling, hauling, or testing. "Mud" days qualify at a rate no greater than 1 make-up for each day or consecutive days of rain beyond the standard baseline that total 0.10 inch or more, liquid measure, unless specifically recommended otherwise by the Owner.

C. Adverse Weather Extension of Time

1. If the basis exists for an extension of time, an extension of time on the basis of Weather may be granted only for the number of Weather Delay Days in excess of the number of days listed as the Standard Baseline for that month.

2. The Owner has reviewed information based on weather data collected from 1981 to 2010 from the National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Center and determined a Standard Baseline of average climatic range for the State of Arkansas. Information was acquired from the following: http://www.currentresults.com/Weather/Arkansas/average-arkansas-weather.php.

3. Standard Baseline shall be regarded at the normal and anticipatable number of calendar days for each month during which construction activity shall be expected to be prevented and suspended by cause of adverse weather. Suspension of construction activity for the number of days each month as listed in the Standard Baseline is included in the Work and is not eligible for extension of Contract Time. Standard Baseline is as follows:

Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
6	7	9	9	13	9	8	7	8	8	7	7

D. Field Orders

A Field Order is defined as a written order issued by the Design Professional that requires minor changes in the Work but does not involve a change in the Contract Price or Contract Time.

The Design Professional may authorize minor variations in the Work from the requirements of the Contract Documents that do not involve an adjustment in the Contract Price and Contract Time and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding to both Owner and Contractor, who shall perform the Work promptly.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

Not Used

END OF SECTION

SECTION 011000

SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Work covered by the Contract Documents.

2. Use of premises.

3. Specification formats and conventions.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: Closure of Inactive NABORS Landfills

1. Project Location: 1320 Landfill Road
Mountain Home, Arkansas 72701

B. OWNER: Arkansas Department of Environmental Quality (ADEQ)

OWNER's Representative:
Clark McWilliams, P.E.
Solid Waste Management Division
Arkansas Department of Environmental Quality
5301 Northshore Drive
North Little Rock, Arkansas 72118-5317
(501) 682-0510

C. Design Professional:
SCS Aquaterra
7311 West 130th Street, Ste. 100
Overland Park, Kansas 66213
(913) 681-0030

D. The Work consists of the following:

The work to be performed for this Contract includes, but is not necessarily limited to, relocation of approximately 231,600 cubic yards of waste overfill, the construction of approximately 41 acres of composite Class 1 landfill cover, approximately 7 acres of Class 4 landfill cover, an active landfill gas collection system, leachate forcemain and storage system, leachate evaporator, road construction, storm water structures, erosion control structures, silt fence, fencing and outer grading at the Site.

Work items may include:

- Mobilizing and demobilizing to and from site.
- Providing and maintaining stormwater/erosion control structures.
- Providing Construction Quality Assurance (CQA) in accordance with the CQA Plans. The Contractor will provide documentation in the form of a typical CQA report that meets ADEQ requirements and will document the quality of construction for all components of the projects.
- Providing temporary leachate collection, hauling, and disposal services until the designed leachate disposal system is operational.
- Clearing existing vegetation in the pond basin.
- Excavating soil to sedimentation pond base elevations.
- Placing structural fill for the dam.
- Providing and installing sedimentation pond outlet structure as indicated on the Construction Drawings.
- Stripping and stockpiling of organic containing soil from Area 1-2.
- Performing soil screening to obtain the type and volume of soil specified for each construction component.
- Strip, grub and stockpile organic containing soil from Area 1-2.
- Waste relocation from Area 1-2 (Class 1) to Area 1-3 (Class 1) to achieve top of intermediate cover elevations.
- Waste relocation/regarding within Area 1-3 (Class 1) to achieve top of intermediate cover elevations.
- Waste relocation within Class 4 to achieve top of intermediate cover elevations.
- Vertical gas extraction well driller mobilization.
- Providing and installing HDPE vertical gas extraction wells, wellheads, and wellbore seals.
- Providing and installing HDPE piping, fittings, valves, sumps, condensate sump pumps, header access risers, and appurtenances as indicated on the Construction Drawings for the gas collection and control system in Area 1-2 and Area 1-3.
- Providing and installing a rotary screw air compressor, concrete pad, and shed for connection to the landfill gas air line.
- Providing and installing leachate and LFG gas system encasements as indicated on the Construction Drawings.
- Installing a pad for the LFG flare, leachate evaporator, and leachate tank farm.
- Providing and installing landfill gas flare and skid.
- Providing and installing a leachate evaporator.
- Providing and installing a centralized leachate tank farm with concrete reinforced secondary containment.

- Providing and installing a dual-contained HDPE leachate forcemain piping, fittings, valves, and appurtenances as indicated on the Construction Drawings. New leachate forcemain piping to be connected to the existing leachate collection systems Area 1-1, Area 1-2, Area 1-3, and Class 4.
- Providing and installing air release valves and protective concrete vaults.
- Providing and replacing existing electric leachate collection pumps.
- Providing 5 spare electric leachate collection pumps.
- Providing and installing vertical leachate extraction manholes and pumps as indicated on the Construction Drawings.
- Demolishing existing leachate storage tanks and secondary containments as shown on the Construction Drawings.
- Screening of borrow soil for use in the final cover systems.
- Class 4 final cover installation including the following:
    - Installing a 6-inch grading layer
    - Constructing an 18-inch low permeability soil layer (max. permeability $1x10^{-5}$ cm/sec)
    - Installing a 6-inch vegetative layer
- Area 1-2 and Area 1-3 (Class 1) final cover installation including the following:
    - Installing a 6-inch grading layer
    - Providing and installing a geosynthetic clay liner
    - Providing and installing a 40 mil LLDPE textured geomembrane
    - Providing and installing a drainage geocomposite
    - Installing a 12-inch protective cover layer
    - Installing a 6-inch vegetative layer
    - Excavating and backfilling a geosynthetic anchor trench around the perimeter of Area 1-2 and Area 1-3
- Installing tack-on terraces on Class 4, Area 1-2, and Area 1-3 final cover systems.
- Performing earthwork cut and fill to construct perimeter stormwater channels.
- Providing and installing HDPE pipe down chutes and energy dissipaters on Class 4, Area 1-2, and Area 1-3 final cover systems.
- Performing earthwork cut and fill and provide and installing aggregate for access road improvements indicated on the Construction Drawings.
- Providing and installing perimeter access control fencing and appurtenances.
- Providing and installing seeding and revegetation.
- Performing site grading of disturbed areas and borrow area.
- Providing three phase power to operate the leachate evaporator and landfill gas flare.
- Providing and installing leachate injection ports on Area 1-3 as shown on the Construction Drawings.

- Providing a leachate pump and HDPE piping for use as temporary leachate recirculation.

E. Project will be constructed under a single prime contract.

1.3 USE OF PREMISES

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

1.4 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are organized into Divisions and Sections using the 49-division format and the Construction Specifications Institute's "Master Format" numbering system.

1. Division 01: Sections in Division 01 govern the execution of the Work of all Sections in the Specifications.

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

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

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

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

PART 2 – PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 012010
MEASUREMENT AND PAYMENT

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes requirements for measurement and payment for items listed on the bid form included in Section 004322, "Bid Form Attachment A Unit Prices." The bid form includes line items for unit prices and lump sum prices.

1.2 DEFINITIONS

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

B. Lump sum is an amount stated on the Bid Form, as the total price for the materials or services described in the measurement and payment item description, specified in the project manual, and indicated on the Construction Drawings.

1.3 MEASUREMENT AND PAYMENT ITEM DESCRIPTIONS

A. General

1. Mobilization/Demobilization includes: materials, equipment, and labor required for equipment mobilization/demobilization, project management, submittals (including Waste Relocation Plan), construction reports, field office, sanitary facilities, waste services, utilities (e.g., water, electricity, phone), temporary roads and paved areas, site enclosure fence, barricades and warning signs, protection of vegetation, dust and pollution control, final cleaning, project closeout, and record documents.

   Payment for Mobilization/Demobilization will be lump sum, with 25% of the fee after mobilization, 50% after earning 10% of the original contract amount and 100% after earning 25% of the original contract amount.

2. Stormwater/Erosion Controls includes: materials, equipment, and labor required to obtain an Arkansas Construction General Permit for Stormwater Discharges Associated with Construction (including Storm Water Pollution Prevention Plan) and to provide controls (silt fence, mulch, socks) as determined necessary to comply with the General Permit and SWPPP. Additionally, includes inspections and maintenance of controls.

Payment for Stormwater/Erosion Controls will be lump sum on a percent complete basis.

3. Provide Construction Quality Assurance includes: materials, equipment, and labor required to provide an independent CQA manager, conduct testing, and submit reports specified in the CQA Plan.

   Payment for Construction Quality Assurance will be lump sum.

4. Provide Temporary Leachate Disposal includes: materials, equipment, and labor required to provide leachate disposal from the existing leachate collection system until the new leachate collection system is operational.

   Payment for Construction Quality Assurance will be lump sum

B. Sedimentation Pond/Dam

5. Clear Existing Vegetation in Pond Basin includes materials, equipment, and labor required to materials, equipment, and labor required to remove vegetation including roots, apply herbicide, segregate and stockpile topsoil, dispose of vegetation, and excavate and fill to rough grade pond basin.

   Payment for Clear Existing Vegetation in Pond Basin will be unit price for each acre.

6. Excavate Soil to Sedimentation Pond Base Elevations includes: materials, equipment, and labor required for excavation of soil to elevations shown on the construction drawings and stockpiling excavated soil on site.

   Payment for Excavate Soil to Sedimentation Pond Base Elevations will be a unit price for each cubic yard.

7. Place Structural Fill for Dam includes: materials, equipment, and labor required to prepare, haul, place, compact, and test structural fill to construct the dam to the elevations shown on the construction drawings.

   Payment for Place Structural Fill for Dam will be a unit price for each cubic yard.

8. Install Outlet Structure, Discharge Pipe, Overflow Weir, and Riprap includes: materials, equipment, and labor required to install outlet pipe, anti-seep collars, riser pipe, riprap for culvert discharge, and concrete overflow weir.

   Payment for Install Outlet Structure, Discharge Pipe, Overflow Weir, and Riprap will be lump sum.

C. Waste Relocation

9. Strip, Grub, and Stockpile includes: materials, equipment, and labor required to segregate and stockpile existing organic containing cover soil in Area 1-2 for use in the final cover system(s).

   Payment for Strip, Grub, and Stockpile will be unit price for each cubic yard removed.

10. Excavate and Relocate Waste/Soil Mix from Area 1-2 includes: materials, equipment, and labor required to remove landfill material to the elevations shown on the construction drawings, and transport, place, and compact waste material in Area 1-3 to the elevations shown on the construction drawings.

    Payment for Excavate and Relocate Waste/Soil Mix from Area 1-2 will be lump sum.

11. Excavate and Relocate/Regrade Waste/Soil Mix in Area 1-3 includes: materials, equipment, and labor required to remove landfill material to the elevations shown on the construction drawings, and transport, fill, and compact waste material within Area 1-3 to the elevations shown on the construction drawings.

    Payment for Excavate and Relocate Waste/Soil Mix within Area 1-3 will be lump sum.

12. Excavate and Relocate Waste/Soil Mix in Class 4 includes: materials, equipment, and labor required to remove landfill material to the elevations shown on the construction drawings, and transport, fill, and compact waste material within Class 4 to the elevations shown on the construction drawings.

    Payment for Excavate and Relocate Waste/Soil Mix within Class 4 will be lump sum.

D. Gas Collection and Control System

13. Driller Mobilization/Demobilization includes: materials, equipment, and labor required to mobilize/demobilize driller equipment, submittals, and equipment decontamination.

    Payment for Driller Mobilization/Demobilization will be lump sum after mobilization.

14. Vertical Gas Extraction Well Drilling and Installation includes: materials, equipment, and labor required to drill the well boreholes, install 6-inch HDPE perforated and solid pipe and pipe caps, and place crushed stone, clay,

bentonite, and soil backfill.

Payment for Vertical Gas Extraction Well Drilling and Installation will be a unit price for each vertical foot of drilling (below ground surface).

15. Provide and Install LFG Wellheads includes: materials, equipment, and labor required to install wellhead assembly, including coupling, union with orifice plate, well riser, flexible hose, powerlock clamp, and HDPE reducer.

    Payment for Provide and Install LFG Wellheads will be a unit price for each wellhead.

16. Install 10'x10' Wellbore Seal includes: materials, equipment, and labor required to install wellbore seal to seal well pipe to landfill cover liner.

    Payment for 10'x10' Wellbore Seal will be a unit price for each wellbore seal.

17. Provide and Install 4" HDPE LFG Piping includes: materials, equipment, and labor required to excavate trenches, place bedding material, install 4" HDPE piping, backfill trench, place warning tape, and repair landfill cover.

    Payment for Provide and Install 4" HDPE LFG Piping will be a unit price per linear foot of piping.

18. Provide and Install 8" HDPE LFG Piping includes: materials, equipment, and labor required to excavate trenches, place bedding material, install 8" HDPE piping, backfill trench, place warning tape, and repair landfill cover.

    Payment for Provide and Install 8" HDPE LFG Piping will be a unit price per linear foot of piping.

19. Provide and Install 12" HDPE LFG Piping includes: materials, equipment, and labor required to excavate trenches, place bedding material, install 12" HDPE piping, backfill trench, place warning tape, and repair landfill cover.

    Payment for Provide and Install 12" HDPE LFG Piping will be a unit price per linear foot of piping.

20. Provide and Install 12" Butterfly Valve and Vault includes: materials, equipment, and labor required to install header isolation valves including butterfly valve, valve support timbers, stainless steel flexible metal hose, valve casing, stem casing, compacted backfill, granular material, HDPE outer vault casing, valve actuator, and outer casing pipe cover.

    Payment for Provide and Install 12" Butterfly Valve will be a unit price per valve.

21. Provide and Install 8” Butterfly Valve and Vault includes: materials, equipment, and labor required to install header isolation valves including butterfly valve, valve support timbers, stainless steel flexible metal hose, valve casing, stem casing, compacted backfill, granular material, HDPE outer vault casing, valve actuator, outer casing pipe cover, warning tape, and repair of landfill cover to match existing conditions.

    Payment for Provide and Install 8” Butterfly Valve will be a unit price per valve.

22. Provide and Install HDPE Access Riser includes: materials, equipment, and labor required to install HDPE Access Riser including monitoring port, tubing, reducer Tee (if required), HDPE blind flange neoprene gasket, HDPE pipe, warning tape, and repair of landfill cover to match existing conditions.

    Payment for Provide and Install HDPE Access Riser with Fiberglass Lid will be unit price per Access Riser.

23. Provide and Install HDPE Condensate Knockout includes: materials, equipment, and labor required to excavate; install access risers with HDPE blind flanges with neoprene gaskets, HDPE pipe and elbows, pancake reducer, and HDPE gravity line and Tee; backfill excavation with washed gravel; and repair cover to match existing conditions.

    Payment for Provide and Install HDPE Condensate Knockout will be unit price for each knockout.

24. Provide and Install Dual Containment Condensate Sump with Pump includes: materials, equipment, and labor required to install outer HDPE pipe, inner 6” perforated HDPE pipe, inner 6” vacuum break HDPE pipe riser, 2” air supply elbow and pipe, HDPE condensate discharge pipe and elbow, monitoring port, equalizer line and ball valve, HDPE flange, and pneumatic pump.

    Payment for Provide and Install Dual Containment Condensate Sump with Pump will be unit price per sump and pump.

25. Provide and Install 4” HDPE Condensate and 2” Airlines includes: materials, equipment, and labor required to excavate trench, place bedding material, install HDPE piping and airline, backfill trench, and place warning tape.

    Payment for Provide and Install 4” HDPE Condensate and 2” Airlines will be a unit price per linear foot of piping.

26. Provide and Install 10 HP Rotary Screw Air Compressor and Shed includes: materials, equipment, and labor required to compact subgrade and install gravel pad beneath shed, construct shed, provide and install air compressor, and connect air lines.

Payment for 10 HP Rotary Screw Air Compressor and Shed will be lump sum.

27. Provide and Install CMP Road Crossing includes: materials, equipment, and labor required to excavate, place and compact pipe bedding, place filter fabric, lay pipe, backfill, and install culvert end gratings.

    Payment for Provide and Install CMP Road Crossing will be unit price for each road crossing.

28. Provide and Install Candlestick Flare Skid, Electrical, Fencing and Pad includes: materials, equipment, and labor required to compact subgrade and install gravel pad beneath flare skid, provide and install fully assembled candlestick flare and blowers with knockout pot on structural skid, connect piping, supply and connect fully assembled electrical control panel, and provide Operation and Maintenance (O&M) manual and testing plan.

    Payment for Provide and Install Candlestick Flare Skid, Electrical, Fencing and Pad will be lump sum.

E. Leachate Disposal System

29. Provide and Install Leachate Evaporator includes: materials, equipment, and labor required to provide and install fully assembled blowers with knockout pot on structural skid, provide and install leachate evaporator, connect piping, supply and connect fully assembled electrical control panel, and provide O&M manual and testing plan.

    Payment for Provide and Install Leachate Evaporator will be lump sum.

30. Provide and Install 10,500 Gallon Fiberglass Tanks includes: materials, equipment, and labor required to provide, deliver, and install fiberglass tanks on concrete containment pad and connect piping.

    Payment for Provide and Install 10,500 Gallon Fiberglass Tanks will be unit price for each tank.

31. Provide and Install Concrete Secondary Containment and Evaporator Pad includes: regrading, compact subgrade, place and compact granular fill, and construct concrete containment pad.

    Payment for Provide and Install Concrete Secondary Containment and Evaporator Pad will be unit price for each cubic yard of concrete.

32. Provide and Install 2”x4” Dual Contained HDPE Forcemain includes: materials, equipment, and labor required to excavate trench, place bedding material,

install dual contained HDPE piping, backfill trench, and place warning tape.

Payment for Provide and Install 2”x4” HDPE Forcemain will be a unit price for each linear foot of piping.

33. Provide and Install Air Release Valves includes: materials, equipment, and labor required to provide and install air release valves.

    Payment for Provide and Install Air Release Valves will be unit price for each valve.

34. Provide and install 1.0 HP Leachate Pumps includes: materials, equipment, and labor required to provide and install sump pumps in existing leachate sumps, new condensate sumps, and new leachate storage tanks complete with piping, fittings, and valves including float switches and high level alarms; and to connect pumps to piping and switches to contacts for remote alarm and disabling pump operation. Additionally, a total of five spare leachate pumps will be provided.

    Payment for Provide and install 1.0 HP Leachate Pumps will be unit price for each pump.

35. Provide and Install Vertical Leachate Manholes: materials equipment and labor required to install proposed vertical leachate manholes, pumps, control panels, float switches, and high level alarms; and to connect pumps to piping switches to contacts for remote alarm and disabling pump operation.

    Payment for Provide and Install Vertical Leachate Manholes will be unit price for each manhole setup.

36. Provide 2”x4” Dual Contained Check Valve: materials equipment and labor required to provide 2”x4” Dual Contained Check Valves.

    Payment for Provide 2”x4” Check Valves will be unit price per valve.

37. Provide Heat tracing and insulation for Exposed Forcemain: materials, equipment, and labor required to provide heat tape for any exposed forcemain during the cold season as needed.

    Payment for providing Heat Tape for Exposed Forcemain During Cold Season will be unit price per each linear foot of exposed forcemain covered.

38. Provide Protective CMP at Flare Pad and Road Crossings: materials, equipment, and labor required to provide and construct protective CMP around forcemain 3’ beneath grade at flare pad and road crossings where vehicular traffic is possible.

Payment for providing Protective CMP at Flare Pad will be unit price per each linear foot of CMP pipe.

39. Demolition includes: materials, equipment, and labor required to demolish leachate tanks and reinforced concrete containment as listed on the Demolition Schedule including delivery of Owner-identified items to be salvaged.

    Payment for Demolition will be lump sum.

F. Class 1 Final Cover System

40. Soil Screening Class 1 and Class 4 includes: materials, equipment, and labor required to Screen soil to remove particles larger than 1 inch.

    Payment for Soil Screening Class 1 and 4 will be unit price for each cubic yard of soil prior to screening.

41. Prepare Subgrade includes: materials, equipment, and labor required to place and compact intermediate cover.

    Payment for Prepare Subgrade will be unit price for each acre.

42. Install 6-inch Grading Layer includes: materials, equipment, and labor required to place 6-inch screened soil grading layer.

    Payment for Install 6-inch Grading Layer will be unit price for each cubic yard of screened soil.

43. Provide and Install Geosynthetic Clay Liner includes: materials, equipment, and labor required to provide and install geosynthetic clay liner including placement, overlapping of seams, and repairs.

    Payment for Provide and Install Geosynthetic Clay Liner will be unit price for each square foot of installed geosynthetic clay liner.

44. Provide and Install 40 mil LLDPE Textured Geomembrane includes: materials, equipment, and labor required to provide and install the geomembrane including placement, seaming, repairs, and plywood protection.

    Payment for Provide and Install 40 mil LLDPE Textured Geomembrane will be unit price for each square foot of installed geomembrane.

45. Provide and Install Geocomposite Drainage Layer includes: materials, equipment, and labor required to provide and install Geocomposite Drainage layer including placement, roll joining, and repairs.

Payment for Provide and Install Geo-composite Drainage Layer will be unit price for each square foot of installed geocomposite.

46. Excavate and Backfill Geosynthetics Anchor includes: materials, equipment, and labor required to excavate and backfill the trench with compacted low permeability soil layer.

    Payment for Excavate and Backfill Geosynthetics Anchor will be unit price for each linear foot.

47. Install 12” Protective Cover Layer includes: materials, equipment, and labor required to place the protective soil cover layer using screened soil and low ground pressure equipment.

    Payment for Install 12” Protective Cover Layer will be unit price for each cubic yard of screened soil.

48. Install 6” Vegetative Layer includes: materials, equipment, and labor required to place topsoil using low ground pressure equipment.

    Payment for Install 6” Vegetative Layer will be unit price for each cubic yard of topsoil.

G. Class 4 Final Cover System

49. Prepare Subgrade includes: materials, equipment, and labor required to place and compact intermediate cover.

    Payment for Prepare Subgrade will be unit price for each acre.

50. Install 18” Compacted Soil Layer Class 4 includes: materials, equipment, and labor required to screen, place, and compact the low permeability soil layer.

    Payment for Install 18” Compacted Soil Layer Class 4 will be unit price for each cubic yard of screened soil.

51. Install 6” Vegetative Layer Class 4 includes: materials, equipment, and labor required to place topsoil using low ground pressure equipment.

    Payment for Install 6” Protective Cover Layer will be unit price for each cubic yard of vegetative soil.

H. Stormwater Controls/Site Cleanup

52. Install Tack-on Terraces includes: materials, equipment, and labor required to place and compact structural fill for tack-on terraces.

    Payment for Install Tack-on Terraces will be unit price for each linear foot of terrace.

53. Provide and Install HDPE Down Chutes includes: materials, equipment, and labor required to provide and install HDPE corrugated pipe for down chutes, including flared end, protective cover layer of screened soil, and energy dissipater.

    Payment for Provide and Install HDPE Down Chutes will be unit price for each linear foot of HDPE down chutes.

54. Provide and Install Energy Dissipaters includes: materials, equipment, and labor required to provide and install the geotextile and rip-rap required for energy dissipation.

    Payment for Provide and install energy dissipaters will be unit price for each energy dissipater.

55. Seeding, Fertilizing, Mulching includes: materials, equipment, and labor required to seed, mulch, fertilize, place erosion fabric, and protect with stakes and string vegetated areas.

    Payment for Seeding, Fertilizing, Mulching will be unit price for each acre.

56. Provide and Install Perimeter Fencing includes materials, equipment, and labor required to provide and install fence panels, truss rods, brace rails, top rails or tension wires, tie wires or clips, fence posts, barbed wire, and concrete bases.

    Payment for Provide and Install Perimeter Fencing will be unit price for each linear foot of fencing.

57. Install Three Phase Power includes: materials, equipment, and labor required to provide Three Phase Power to the site.

    Payment for Install Three Phase Power will be lump sum.

58. Access Road Construction/Rehabilitation includes: materials, equipment, and labor required construct/repair, grade, and surface perimeter roads.

    Payment for Access Road Construction/Rehabilitation will be lump sum.

59. Ditch Construction includes: materials, equipment, and labor required to construct the ditches outside of Area 1-2, Area 1-3, and Class 4.

Payment for Ditch Construction will be lump sum.

60. Soil Borrow Area Grading includes: materials, equipment, and labor required to grade the borrow area to drain toward the sedimentation pond.

    Payment for Soil Borrow Area Grading will be unit price for each acre of borrow area.

A. Leachate Recirculation System

61. Provide and Install 4" HDPE Recirculation Forcemain includes: materials, equipment, and labor required to install HDPE piping.

    Payment for Provide and Install 4" HDPE Recirculation Forcemain will be a unit price for each linear foot of piping.

62. Leachate Injection Port includes: pressure testing, materials, equipment, and labor required to provide and install 36" perforated and solid HDPE pipe and blind flange.

    Payment for Leachate Injection Port will be unit price per linear foot of injection port pipe.

63. Leachate Recirculation Pump includes: materials, equipment, pad, electrical work, appurtenances needed for connection to leachate storage tank, and labor required for providing the pump for recirculation.

    Payment for Leachate Recirculation Pump will be lump sum.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 012200
UNIT PRICES

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 DEFINITIONS

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

1.3 PROCEDURES

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

B. Measurement and Payment: Refer to Section 012010, Measurement and Payment, for description of methods of measurement and payment for work that requires establishment of unit prices.

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

D. List of Unit Prices: A list of unit prices is included in Section 004322, Bid Form Attachment A Unit Prices. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 013100
PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. Project meetings.

2. Requests for Interpretation (RFIs).

B. See Section 017300, Execution, for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.

1.2 DEFINITIONS

A. RFI: Request from Contractor seeking interpretation or clarification of documents.

1.3 COORDINATION

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.

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. Project closeout activities

1.4 PROJECT MEETINGS

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

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Design Professional of scheduled meeting dates and times.

2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.

3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Design Professional, within five days of the meeting.

B. Preconstruction Conference: Schedule a preconstruction conference before starting construction, at a time convenient to Owner and Design Professional, but no later than 15 days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.

1. Attendees: Authorized representatives of Owner, Design Professional, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Discuss items of significance that could affect progress, including the following:

a. Tentative construction schedule

b. Phasing

c. Critical work sequencing and long-lead items

d. Designation of key personnel and their duties

e. Procedures for processing field decisions and Change Orders

f. Procedures for RFIs

g. Procedures for testing and inspecting

h. Procedures for processing Applications for Payment

i. Distribution of the Contract Documents

j. Submittal procedures

k. Preparation of Record Documents

l. Use of the premises

m. Work restrictions

n. Owner's occupancy requirements

o. Responsibility for temporary facilities and controls

p. Construction waste management and recycling

q. Parking availability

r. Office, work, and storage areas

s. Equipment deliveries and priorities

t. Health and Safety

u. Security

v. Progress cleaning

w. Working hours

3. Minutes: Design Professional will record and distribute meeting minutes.

C. Progress Meetings: Conduct progress meetings at regular intervals.

1. Attendees: In addition to representatives of Owner and Design Professional, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status

of Project.

a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

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 operations
3) Status of submittals
4) Deliveries
5) Access
6) Site utilization
7) Temporary facilities and controls
8) Work hours
9) Hazards and risks
10) Progress cleaning
11) Quality and work standards
12) Status of correction of deficient items
13) Field observations
14) RFIs
15) Status of proposal requests
16) Pending changes
17) Status of Change Orders
18) Pending claims and disputes
19) Documentation of information for payment requests

3. Minutes: Record the meeting minutes.

4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.

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.

1.5 REQUESTS FOR INTERPRETATION (RFIs)

A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.

1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response.

2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:

1. Project name

2. Date

3. Name of Contractor

4. Name of Design Professional

5. RFI number, numbered sequentially

6. Specification Section number and title and related paragraphs, as appropriate

7. Drawing number and detail references, as appropriate

8. Field dimensions and conditions, as appropriate

9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.

10. Contractor's signature

11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to

fully describe items needing interpretation.

C. Hard-Copy RFIs:

1. Identify each page of attachments with the RFI number and sequential page number.

D. Design Professional's Action: Design Professional will review each RFI, determine action required, and return it. Allow seven working days for Design Professional's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.

1. The following RFIs will be returned without action:

a. Requests for approval of submittals

b. Requests for approval of substitutions

c. Requests for coordination information already indicated in the Contract Documents

d. Requests for adjustments in the Contract Time or the Contract Sum

e. Requests for interpretation of Design Professional's actions on submittals

f. Incomplete RFIs or RFIs with numerous errors

2. Design Professional's action may include a request for additional information, in which case Design Professional's time for response will start again.

3. Design Professional'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 Order Proposal according to Division 01 Section "Change Order."

a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Design Professional in writing within 10 days of receipt of the RFI response.

E. On receipt of Design Professional's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Design Professional within seven days if Contractor disagrees with response.

F. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log monthly. Include the following:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Design Professional.
4. RFI number including RFIs that were dropped and not submitted.
5. RFI description.
6. Date the RFI was submitted.
7. Date Design Professional's response was received.
8. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

Not Used

END OF SECTION

SECTION 013200
CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Contractor's Construction Schedule.

2. Submittals Schedule.

3. Daily construction reports.

4. Field condition reports.

B. See Section 007213, General Conditions for submitting the Schedule of Values.

1.2 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.

2. Predecessor Activity: An activity that precedes another activity in the network.

3. Successor Activity: An activity that follows another activity in the network.

1.3 SUBMITTALS

A. Submittals Schedule: Submit three copies of schedule. Arrange the following information in a tabular format:

1. Scheduled date for first submittal.

2. Specification Section number and title.

3. Submittal category (action or informational).

4. Name of subcontractor.

5. Description of the Work covered.

6. Scheduled date for Design Professional's final release or approval.

B. Contractor's Construction Schedule: Submit three copies of initial schedule, large enough to show entire schedule for entire construction period.

1. Submit an electronic copy of schedule, using software indicated, on CD-R, and labeled to comply with requirements for submittals. Include type of schedule (Initial or Updated) and date on label.

C. Daily Construction Reports: Submit three copies at weekly intervals.

D. Field Condition Reports: Submit three copies at time of discovery of differing conditions.

1.4 COORDINATION

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

B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from parties involved.

2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE

A. Preparation: Submit a Submittal Schedule, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.

1. Coordinate Submittals Schedule with list of subcontracts, the Schedule

of Values, and Contractor's Construction Schedule.

2. Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for the Notice of Award to date of Final Completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Activities: Treat each work item or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 30 days, unless specifically allowed by Design Professional.

2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.

3. Submittal Review Time: Include review and resubmittal times indicated in Section 013300, Submittal Procedures, in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.

4. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Design Professional's administrative procedures necessary for certification of Substantial Completion.

C. 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.

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

Completion, and Final Completion**.**

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

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal Gantt-chart- type, Contractor's Construction Schedule within 30 days of date established for the Notice to Proceed. Base schedule on the Preliminary Construction

Schedule and whatever updating and feedback was received since the start of Project.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

1. For construction activities that require 3 months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

2.4 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. Equipment at Project site.

3. Material deliveries.

4. High and low temperatures and general weather conditions.

5. Accidents.

6. Stoppages, delays, shortages, and losses.

B. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a request for interpretation. Include a detailed description of the differing conditions, together with recommendations for changing the

Contract Documents.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. 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 Actual Completion percentage for each activity.

B. Distribution: Distribute copies of approved schedule to Design Professional, 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.

END OF SECTION

SECTION 013300
SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

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

B. See Section 013200, Construction Progress Documentation, for submitting schedules and reports, including Contractor's Construction Schedule.

C. See Section 014000, Quality Requirements, for submitting test and inspection reports.

D. See Section 017839, Project Record Documents, for submitting Record Drawings, Record Specifications, and Record Product Data.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Design Professional's response.

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

1.3 SUBMITTAL PROCEDURES

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

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

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

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

B. Submittals Schedule: Comply with requirements in Section 013200, Construction Progress Documentation, for list of submittals and time

requirements for scheduled performance of related construction activities.

C. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Design Professional'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 10 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Design Professional 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 10 days for review of each resubmittal.

D. Identification: Place a permanent label or title block on each submittal for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.

2. Provide a space approximately 4 by 6 inches on label or beside title block to record Contractor's review and approval markings and action taken by Design Professional.

3. Include the following information on label for processing and recording action taken:

   a. Project name.

   b. Date.

   c. Name and address of Design Professional.

   d. Name and address of Contractor.

   e. Name and address of subcontractor.

   f. Name and address of supplier.

   g. Name of manufacturer.

   h. Submittal number or other unique identifier, including revision identifier.

      1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential

number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).

i. Number and title of appropriate Specification Section.

j. Drawing number and detail references, as appropriate.

k. Location(s) where product is to be installed, as appropriate.

l. Other necessary identification.

E. Deviations: Highlight, encircle, or otherwise specifically identify deviations from the Contract Documents on submittals.

F. Additional Copies: Unless additional copies are required for final submittal, and unless Design Professional observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

G. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Design Professional will return submittals, without review, received from sources other than Contractor.

H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.

2. Note date and content of revision in label or title block and clearly indicate extent of revision.

3. Resubmit submittals until they are marked "Approved" or "Approved as Noted."

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

J. Use for Construction: Use only final submittals with mark indicating "Approved" or "Approved as Noted " taken by Design Professional.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

A. General: Prepare and submit Action Submittals required by individual Specification Sections.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.

2. Mark each copy of each submittal to show which products and options are applicable.

3. Include the following information, as applicable:

a. Manufacturer's written recommendations.

b. Manufacturer's product specifications.

c. Manufacturer's installation instructions.

d. Manufacturer's catalog cuts.

e. Compliance with specified referenced standards.

f. Testing by recognized testing agency.

4. Number of Copies: Submit three copies of Product Data, unless otherwise indicated. Design Professional will return two copies. Mark up and retain one returned copy as a Project Record Document.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

a. Dimensions.

b. Identification of products.

c. Fabrication and installation drawings.

d. Templates and patterns.

e. Schedules.

f. Notation of coordination requirements.

g. Notation of dimensions established by field measurement.

h. Relationship to adjoining construction clearly indicated.

i. Seal and signature of professional engineer if specified.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 24 by 36 inches.

D. Product Schedule or List: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location.

1. Number of Copies: Submit three copies of product schedule or list, unless otherwise indicated. Design Professional will return two copies.

E. Submittals Schedule: Comply with requirements specified in Section 013200, Construction Progress Documentation.

F. Application for Payment: Comply with requirements specified in Section 007213, General Conditions.

G. Schedule of Values: Comply with requirements specified in Section 007213, General Conditions.

2.2 INFORMATIONAL SUBMITTALS

A. General: Prepare and submit Informational Submittals required by other Specification Sections.

1. Number of Copies: Submit two copies of each submittal, unless otherwise indicated. Design Professional will not return copies.

2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

3. Test and Inspection Reports: Comply with requirements specified in Section 014000, Quality Requirements.

B. Contractor's Construction Schedule: Comply with requirements specified in Section 013200, Construction Progress Documentation.

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

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

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

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

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

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

I. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

J. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

K. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer.

L. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Design Professional.

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

3.2 DESIGN PROFESSIONAL'S ACTION

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

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

1. Approved,

2. Approved as Noted,

3. Resubmit, or

4. Disapproved.

The submittal stamp also will include the following statement: “Review of this document has been made only for conformance with the design concept of the project and approval or disapproval as noted shall not relieve the contractor from responsibility for any errors therein or for furnishing the materials and equipment of proper dimension, size, quantity, quality, and all performance characteristics to meet the requirement and intent of the contact document.”

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

D. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

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

END OF SECTION

SECTION 014000
QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

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

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specified tests, inspections, and related actions do not limit Contractor's other quality assurance/quality control (QA/QC) procedures that facilitate compliance with the Contract Document requirements.

2. Requirements for Contractor to provide quality-assurance and -control services required by Design Professional, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

C. See Divisions 02 through 43 Sections and Construction Quality Assurance (CQA) Plans for specific test and inspection requirements.

1.2 DEFINITIONS

A. Constructions Quality Assurance (CQA): A planned system of activities that provides the Owner and permitting agency assurance that the facility was constructed as specified in the design. CQA includes inspections, verifications, audits, and evaluations of materials and workmanship necessary to determine and document the quality of the constructed facility. CQA refers to the measures taken to assess if the contractor or installer is in compliance with the permit requirements and construction drawings and technical specifications for a project. Services do not include contract enforcement activities performed by Design Professional.

B. CQA Manager: A professional engineer licensed to practice in Arkansas retained by the Contractor to provide on-site construction oversight, quality assurance testing, and a final report demonstrating that the requirements of permit requirements and construction drawings and technical specifications have been met.

C. Construction Quality Control (CQC): A planned system of inspections that is

used to directly monitor and control the quality of a construction project. CQC is normally performed by the Contractor and is necessary to achieve quality in the constructed or installed system. CQC refers to measures taken by the contractor or installer to determine compliance with the requirements for material and workmanship as stated in the plans and specifications for the project.

D. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.

E. Product Testing: Tests and inspections that are performed by a National Recognized Testing Laboratory (NRTL), a National Voluntary Laboratory Accreditation Program (NVLAP), or other testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.

F. Source QA/QC Testing: Tests and inspections that are performed at the source, i.e., borrow area, plant, mill, factory, or shop.

G. Field QA/QC Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

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

I. 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, and similar operations.

1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.

1.3 CONFLICTING REQUIREMENTS

A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently

equal, to Design Professional for a decision 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 Design Professional for a decision before proceeding.

1.4 SUBMITTALS

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

B. Reports: Prepare and submit certified written reports that include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.

13. Recommendations on retesting and reinspecting.

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

1.5 QUALIFICATIONS

A. General: Contractor shall provide an independent CQA Manager and specific QA/QC and CQC inspectors in accordance with the CQA Plans and individual Specifications Sections.

B. General: Qualifications paragraphs in this section establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

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

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

E. 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.

F. 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 are similar to those indicated for this Project in material, design, and extent.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required

by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.

2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. 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.

1.6 QA/QC

A. Owner Responsibilities: Where QA/QC 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 inspecting they are engaged to perform.

2. 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.

B. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform QA/QC services required of Contractor by authorities having jurisdiction, whether specified or not.

1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.

   a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.

3. Where QA/QC services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each QA/QC service.

4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.

5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. 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.

D. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide QA/QC services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

E. Testing Agency Responsibilities: Cooperate with Design Professional and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Design Professional and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.

2. Determine the location 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 QA/QC 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 any duties of Contractor.

F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar QA/QC services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.

2. Incidental labor and facilities necessary to facilitate tests and inspections.

3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.

4. Facilities for storage and field curing of test samples.

G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.

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

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

END OF SECTION

SECTION 015000
TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

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

B. Related Section:

1. Section 017300 - Execution.

1.2 USE CHARGES

A. General: Cost or use charges for temporary facilities shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Design Professional, testing agencies, and authorities having jurisdiction.

1.3 SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

1.4 QUALITY ASSURANCE

A. Electric Service: Comply with National Electrical Contractors Association (NECA), National Electrical Manufacturers Association (NEMA), and Underwriters Laboratories (UL) standards and regulations for temporary electric service. Install service to comply with National Fire Protection Association (NFPA) 70.

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

PART 2 - PRODUCTS

2.1 TEMPORARY FACILITIES

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

B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and

equipped to accommodate materials and equipment for construction operations.

2.2 EQUIPMENT

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

B. Heating, Ventilation, Air Conditioning (HVAC) Equipment: Provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.

2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities 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. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

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. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.

C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

E. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

1. Install electric power service overhead, unless otherwise indicated.

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. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install one telephone line for each field office.

1. Provide additional telephone lines for the following:

a. Provide a dedicated telephone line for each facsimile machine and computer in each field office.

2. At each telephone, post a list of important telephone numbers including police and fire departments, Contractor's home office, Design Professional's office, Owner's office, and subcontractors' field and home offices.

3. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

H. Electronic Communication Service: Provide temporary electronic communication service, including electronic mail in field office.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas within construction limits indicated on Drawings.

C. 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.

D. Parking: Provide temporary parking areas for construction personnel.

E. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.

2. Remove snow and ice as required to minimize accumulations.

F. Project Identification and Temporary Signs: Provide Project identification. Install signs where indicated to inform public and individuals seeking entrance to Project. Unauthorized signs are not permitted.

1. Provide temporary, directional signs for construction personnel and visitors.

2. Maintain and touchup signs so they are legible at all times.

G. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with Section 017300, Execution for progress cleaning requirements.

3.4 DUST CONTROL

A. Provide dust-control treatment, such as water, that is nonpolluting and nontracking to minimize dust from construction operations and provide positive means to prevent airborne dust from dispersing into the atmosphere. Reapply treatment as required to minimize dust. Chemical dust suppressants shall not be used. Dust suppressants shall be approved by the Design Professional before use.

3.5 POLLUTION CONTROL

A. Provide methods, means and facilities required to prevent contamination of soil, water or atmosphere by the discharge of noxious substances from construction operations.

B. Provide equipment and personnel to perform emergency measures required to contain any spillages and to remove contaminated soils or liquids created by Contractor's operations. Excavate and dispose of such contaminated soil as directed by the Design Professional, and replace with suitable compacted fill and topsoil.

C. Take special measures to prevent harmful substances from entering public waters. Prevent release of disposal of wastes, effluents, chemicals, or other such substances adjacent to streams or in sanitary or storm sewers.

D. Provide systems for control of atmospheric pollutants. Contractor shall make every effort to prevent:

1. Toxic concentrations of chemicals.

2. Harmful dispersal of pollutants into the atmosphere.

E. Use an outside service company or 100-gallon fuel cell mounted in a pickup truck or a combination of the two to fuel and service onsite vehicles and equipment. Onsite storage of fuel in bulk containers is not permitted.

3.6 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

B. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.

C. Storm Water Control: Comply with authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of storm water from heavy rains.

D. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

E. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.

1. Extent of Fence: As required to enclose portion of Site determined sufficient to accommodate construction operations.

F. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

3.7 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.

C. Termination and Removal: Remove each temporary facility when need for its service has ended, or no later than Substantial Completion. 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. At Substantial Completion, comply with final cleaning requirements specified in Section 017700, Closeout Procedures.

END OF SECTION

SECTION 015713
TEMPORARY EROSION AND SEDIMENT CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes requirements for temporary erosion and sediment controls to ensure protection of adjacent and downstream surface water and drainage facilities.

B. Contractor is responsible for obtaining authorization for storm water discharges associated with construction activity under Arkansas' National Pollutant Discharge Elimination System (NPDES) General Permit No. ARR150000, which includes requirements for a Storm Water Pollution Prevention Plan (SWPPP) for Construction Activity, notice of intent, and notice of termination.

C. The construction drawings include an Erosion Control Plan indicating proposed erosion and sediment controls (e.g., silt fence, mulch socks). The controls shown are the Design Professional's recommendations. Contractor is responsible for final determination of the controls to use and compliance with the SWPPP and the NPDES General Permit for Stormwater Discharges Associated with Construction Activity.

1.2 SUBMITTALS

A. Stormwater Pollution Prevention Plan for Construction Activity: Prepare SWPPP in accordance with the ADEQ requirements and template provided by ADEQ Water Division.

B. Proof of coverage under Permit No. ARR150000, including copies of the Notice of Intent and letter of authorization from ADEQ Water Division.

PART 2 - PRODUCTS

1.3 MATERIALS

A. Materials may be new or used, suitable for intended purpose, but must comply with requirements of local codes and standards.

1.4 CONSTRUCTON AIDS

B. Provide construction aids, equipment, and materials required to implement and maintain erosion and sediment controls.

PART 3 - EXECUTION

1.5 INSTALLATION, GENERAL

A. Locate erosion and sediment controls where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify controls as required by progress of the Work.

B. Do not remove until controls are no longer needed or are replaced by completed permanent site stabilization controls.

1.6 EROSION AND SEDIMENT CONTROLS

A. Plan and execute construction and earthwork using methods to control surface drainage from cuts and fills and from borrow and waste disposal areas to prevent erosion and sedimentation, and:

1. Hold the number and size of areas of bare soil or waste exposed at one time to a minimum.

2. Provide temporary control measures such as mulch socks, silt fences, etc., as specified in the SWPPP, generally as shown on the Drawings, and as directed by the Construction Manager.

B. Maintain erosion and sediment control measures to the satisfaction of the Design Professional and remove them only when the site is appropriately stabilized, as determined by the Construction Manager.

C. Periodically inspect earthwork to detect any evidence of the start of erosion, and apply corrective measures as required to control erosion.

D. Erosion and sediment control structure locations may be added and adjusted at the discretion of the Construction Manager throughout the construction period.

E. Inspect erosion and sediment control structures in accordance with one of the following schedules, as per Arkansas' General Permit No. ARR150000:

1. At least once every 7 calendar days

2. At least once every 14 calendar days and within 24 hours of the end of a storm event of 0.50 inches or greater (a rain gauge must be installed and maintained onsite).

F. Remove excess, accumulated sediments existing along the control structures and transport to areas designated by the Construction Manager.

G. Remove temporary erosion and sediment controls:

1. When the need for the controls has ended and site stabilization is achieved.

2. At completion of the Project.

END OF SECTION

SECTION 017300
EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.

2. Field engineering and surveying.

3. Progress cleaning.

4. Protection of installed construction.

5. Correction of the Work.

B. Related Sections:

1. Section 017700 - Closeout Procedures.

1.2 SUBMITTALS

A. Certificates: Submit certificate signed by an Arkansas-licensed land surveyor certifying that location and elevation of improvements comply with requirements.

B. Certified Surveys: Submit three hard copies and one electronic copy (on CD) signed and stamped by an Arkansas-licensed land surveyor for the following:

1. Class 4: Top of intermediate cover, top of low permeability layer, top of final cover.

2. Area 1-2 and Area 1-3 (Class 1): Top of intermediate cover, top of grading layer, top of final cover.

3. All other installed or constructed work items (leachate collection system components, gas management components, etc).

C. Final Property Survey: Submit three hard copies and one electronic copy (on CD) showing the Work performed and record survey data, including elevations of the final, completed landfill cap.

1.3 QUALIFICATIONS

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.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of underground utilities and other construction affecting the Work.

3.2 PREPARATION

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

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product.

C. 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 Design Professional. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.3 CONSTRUCTION LAYOUT

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

B. General: Engage an Arkansas-licensed land surveyor to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels as needed to locate each element of Project.

2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.

3. Inform installers of lines and levels to which they must comply.

4. Check the location, level and plumb, of every major element as the Work progresses.

5. Notify Design Professional when deviations from required lines and levels exceed allowable tolerances.

6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including grading, fill and topsoil placement, utility slopes, and invert elevations.

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

3.4 FIELD ENGINEERING

A. 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.

B. 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.

C. Certified Survey: On completion of subgrade layer and barrier soil layer, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

D. Final Property Survey: Prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by an Arkansas-licensed land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.

1. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

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

C. 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.

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

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

3.6 PROGRESS CLEANING

A. General: 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 materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F.

3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

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

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.

D. Waste Disposal: Burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

E. Provide maintenance on completed construction as frequently as necessary through the remainder of the construction period.

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

3.7 PROTECTION OF CONSTRUCTION

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

3.8 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates.

END OF SECTION

SECTION 017419
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for the following:

1. Salvaging nonhazardous demolition material.

2. Recycling nonhazardous demolition material.

3. Disposing of nonhazardous demolition material and non-hazardous construction waste.

B. Related Sections:

1. Section 024119 - Selective Structure Demolition

2. Section 017700 - Closeout Procedures

3. Section 312324 – Waste Relocation

4. Section 015000 – Temporary Facilities and Controls

1.2 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction operations. Construction waste includes packaging.

B. Demolition Waste: Building and site improvement materials resulting from demolition operations not identified by Owner for salvage for Owner use. Demolition waste includes cleared vegetation.

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

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.

G. Waste Relocation: Placement of demolition or construction waste in on-site waste disposal units as specified in Section 312324.

1.3 REQUIREMENTS

A. Construction and demolition waste will be managed according to the following hierarchy, as feasible.

1. Construction and demolition waste shall be salvaged and reused.
2. Construction and demolition waste shall be salvaged or recycled.
3. Construction and demolition waste shall be relocated on-site to existing waste management units.
4. Construction and demolition waste shall be properly disposed of at an off-site landfill or incinerator.

B. Construction waste and waste generated by the Contractor's employees during construction shall be collected in waste container(s) and disposed of at an off-site, permitted waste disposal facility.

1.4 SUBMITTALS

A. Waste Management Plan: Submit 3 copies of plan within 14 days of date established for commencement of the Work.

1.5 WASTE MANAGEMENT PLAN

A. General: Develop plan for waste identification and management.

B. Waste Identification: Indicate anticipated types and quantities of salvageable/ recyclable waste, demolition waste, landfill material from offsite and the buffer zone, and site-clearing waste generated by the Work. Include estimated quantities and assumptions for estimates.

C. Waste Management Work Plan: List each type of waste and whether it will be salvaged, recycled, or incorporated into the landfill. Include estimated total quantity of each type of waste and handling procedures.

1. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.

2. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.

3. Incorporated Materials: Indicate how landfill materials will be incorporated into waste relocation according to Section 312324.

4. Handling Procedures: Include method that will be used for separating salvageable/recyclable waste and designated location on Project site where materials separation will be located.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement waste management plan as approved by Owner. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

B. Waste Management Coordinator: Assign a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.

C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.

D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads and other adjacent occupied and used facilities.

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, and sold.

2. Comply with Section 015000, Temporary Facilities and Controls, for controlling dust and dirt, environmental protection, and noise control.

END OF SECTION

SECTION 017700
CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Inspection procedures.

2. Final cleaning.

B. Related Sections:

1. Section 007213, General Conditions.

2. Section 017839, Project Record Documents for submitting Record Drawings, Record Specifications, and Record Product Data.

3. Divisions 02 through 43 - All Sections.

1.2 SUBMITTALS

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.

2. Advise Owner of pending insurance changeover requirements.

3. Prepare and submit Project Record Documents, damage or settlement surveys, property surveys, and similar final record information.

4. Terminate and remove temporary facilities from Project site, along with construction tools and similar elements.

5. Complete final cleaning requirements.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Design Professional will either proceed with inspection or notify Contractor of unfulfilled requirements. Design

Professional 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 Design Professional, that must be completed or corrected before certificate will be issued.

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

2. Results of completed inspection will form the basis of requirements for Final Completion.

1.3 FINAL COMPLETION

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

1. Submit a final Application for Payment according to Section 007213, General Conditions.

2. Submit certified copy of Design Professional's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Design Professional. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.

3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Design Professional will either proceed with inspection or notify Contractor of unfulfilled requirements. Design Professional will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

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

1.4 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit three copies of list. Include name and identification of each 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.

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 FINAL CLEANING

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

B. Cleaning: Employ experienced workers for final cleaning.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.

b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.

c. Remove tools, construction equipment, machinery, and surplus material from Project site.

d. Leave Project clean and ready for occupancy.

C. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury construction debris or excess materials on Owner's property, except in areas specified in the Contract Documents or approved by Design Professional. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION

SECTION 017839
PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

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

1. Record Drawings.

2. Record Specifications.

B. Related Sections:

1. Divisions 02 through 43 – All Sections.

1.2 SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit copies of Record Drawings as follows:

a. Final Submittal: Submit one set of marked-up Record Prints, and the following:

1) Record CAD Drawing Files and Plots: Two sets.

B. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of blue- or black-line white prints of the Drawings and Shop Drawings.

1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is subcontractor or similar entity, to prepare the marked-up Record Prints.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.

b. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.

2. Mark the Construction Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Construction Drawings.

3. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.

4. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

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

1. Format: AutoCAD Release 2000 or later.

2. Incorporate changes and additional information previously marked on Record Prints. Delete, redraw, and add details and notations where applicable.

3. Refer instances of uncertainty to Design Professional for resolution.

4. Design Professional will furnish Contractor one set of CAD Drawings of the Construction Drawings for use in recording information.

a. Design Professional makes no representations as to the accuracy or completeness of CAD Drawings as they relate to the Construction Drawings.
b. CAD Software Program: The Drawings are available in AutoCAD 2014 Civil 3D.

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

1. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.

2. Record CAD Drawings: Organize CAD information into separate electronic files that correspond to each sheet of the Drawings. Name each file with the sheet identification. Include identification in each CAD file.

3. Identification: As follows:
   a. Project name.
   b. Date.
   c. Designation "PROJECT RECORD DRAWINGS."
   d. Name of Design Professional.
   e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.

3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.

4. Note related Change Orders and Record Drawings where applicable.

2.3 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and

modifications to Project Record Documents as they occur; do not wait until the end of Project.

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

END OF SECTION

SECTION 024119
SELECTIVE STRUCTURE DEMOLITION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Demolishing designated construction as identified on the Construction Drawings.
   2. Cutting and alterations for completion of the Work.
   3. Protecting items designated to remain.
   4. Removing demolished materials.

B. Related Sections:
   1. Section 015000 - Temporary Facilities and Controls
   2. Section 015713 - Temporary Erosion and Sediment Controls
   3. Section 017300 - Execution
   4. Section 017419 - Construction Waste Management and Disposal
   5. Section 312324 - Waste Relocation

1.2 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Demolition Schedule: Indicate overall schedule and interruptions required for utility and building services.

C. Shop Drawings:
   1. Indicate demolition and removal sequence.
   2. Indicate location of items designated for reuse and Owner's retention.
   3. Indicate location and construction of temporary work.

1.3 CLOSEOUT SUBMITTALS

A. Section 017300 - Execution: Requirements for submittals.

B. Project Record Documents: Accurately record actual locations of capped utilities, concealed utilities discovered during demolition, and subsurface obstructions.

1.4 QUALITY ASSURANCE

A. Conform to applicable provisions of federal, state, and municipal code for demolition work, dust control, products requiring electrical disconnection and re-connection.

B. Conform to applicable provisions of federal, state, and municipal code for procedures when hazardous or contaminated materials are discovered.

C. Obtain required permits from authorities having jurisdiction.

D. Perform Work in accordance with applicable federal, state, and municipal regulations.

1.5 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.

1.6 SEQUENCING

A. Section 013200 – Construction Progress Documentation: Contractor's Schedule.

B. Sequence activities in the following order:
   1. Leachate forcemain installation.
   2. Tank farm installation.
   3. Existing leachate tank and secondary containment removal.

C. Owner will conduct salvage operations before demolition begins to remove materials Owner chooses to retain.

1.7 SCHEDULING

A. Section 013200 – Construction Progress Documentation: Contractor's Schedule.

B. Schedule Work to coincide with new construction.

C. Cooperate with Owner in scheduling noisy operations and waste removal that may impact Owners operation in adjoining spaces.

D. Coordinate utility and building service interruptions with Owner.
   1. Schedule tie-ins to existing systems to minimize disruption.

1.8 PROJECT CONDITIONS

A. Conduct demolition to minimize interference with adjacent properties.

B. Cease operations immediately if remaining structure appears to be in danger and notify Design Professional. Do not resume operations until directed.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 PREPARATION

A. Notify affected utility companies before starting work and comply with their requirements.

B. Mark location and termination of utilities.

C. Erect, and maintain temporary barriers and security devices, including warning signs and lights, and similar measures, for protection of the Owner and existing improvements indicated to remain.

D. Provide temporary bracing and shoring required to ensure safety of existing, remaining structures.

3.2 SALVAGE REQUIREMENTS

A. Coordinate with Owner to identify building components and equipment required to be removed and delivered to Owner.

B. Label components and equipment Owner designates for salvage.

C. Protect designated salvage items from demolition operations until items can be removed.

D. Deliver salvaged items to Owner. Obtain signed receipt from Owner.

3.3 DEMOLITION

A. Conduct demolition to minimize interference with adjacent properties.

B. Cease operations immediately when structure appears to be in danger and notify Design Professional.

C. Disconnect and remove designated utilities within demolition areas.

D. Cap and identify abandoned utilities at termination points when utility is not completely removed. Annotate Record Drawings indicating location and type of service for capped utilities remaining after demolition.

E. Demolish in orderly and careful manner. Protect existing improvements.

F. Dispose of demolished materials in accordance with Section 017419, Construction Waste Management and Disposal.

G. Remove materials as Work progresses. Upon completion of Work, leave areas in clean condition.

H. Remove temporary Work.

3.4 SCHEDULES

A. Remove, store and protect the following materials and equipment:
   1. Existing leachate sump pumps.

B. Demolish the following materials and equipment:
   1. Existing leachate storage tanks.
   2. Existing concrete pads for leachate storage tanks.

END OF SECTION

SECTION 033000
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SUMMARY

A. Section includes cast-in-place concrete for the following:

1. Equipment pads.
2. Thrust blocks.
3. Secondary containment.
4. Fence poles, etc.

B. Related Sections:

1. Section 310513 Soils for Earthwork.
2. Section 310516 Aggregates for Earthwork.
3. Section 312213 Rough Grading

1.2 REFERENCES

A. American Concrete Institute (ACI):

1. ACI 301, Specifications for Structural Concrete.
2. ACI 304, Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete.
3. ACI 305, Recommended Practice for Hot Weather Concreting.
4. ACI 306, Recommended Practice for Cold Weather Concreting.
5. ACI 308.1 - Standard Specification for Curing Concrete.
6. ACI 315, Manual of Standard Practice for Detailing Reinforced Concrete Structures.
7. ACI 318 - Building Code Requirements for Structural Concrete.
8. ACI 347, Recommended Practice for Concrete Formwork.

B. American Society for Testing and Materials (ASTM) International

1. ASTM A 36, Structural Steel.
2. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
3. ASTM C33 - Standard Specification for Concrete Aggregates.
4. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

5. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
6. ASTM C150 - Standard Specification for Portland Cement.
7. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.
8. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
9. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
10. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
11. ASTM C330 - Standard Specification for Lightweight Aggregates for Structural Concrete.
12. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.
13. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
14. ASTM C685/C685M - Standard Specification for Concrete Made By Volumetric Batching and Continuous Mixing.
15. ASTM C989 - Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars.
16. ASTM C1116 - Standard Specification for Fiber-Reinforced Concrete and Shotcrete.
17. ASTM D6690 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
18. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.

C. Concrete Reinforcing Steel Institute (CRSI), Manual of Standard Practice, including ASTM Standards referred to herein.

1.3 SUBMITTALS

A. Shop Drawings: Submit for approval the following:

1. Copies of manufacturer's specifications with application and installation instructions for proprietary materials and items, including admixtures, joint devices and bonding agents.
2. Drawings for fabrication, bending, and placement of concrete reinforcement. Comply with ACI 315, Chapters 1 through 8. Show

bar schedules, stirrup spacing, diagrams of bent bars, arrangements and assemblies, as required for the fabrication and placement of concrete reinforcement.

3. List of concrete materials and concrete mix designs proposed for use. Identify mix ingredients and proportions, including admixtures. Identify chloride content of admixtures and whether or not chloride was added during manufacture. Include the results of all tests performed to qualify the materials and to establish the mix designs in accordance with ACI 301, Part 3.9. Submit written report to Design Professional for each proposed concrete mix at least 15 days prior to start of work. Do not begin concrete production until mixes have been reviewed and are acceptable to Design Professional. Mix designs may be adjusted when material characteristics, job conditions, weather, test results or other circumstances warrant. Do not use revised concrete mixes until submitted to Design Professional and accepted by Design Professional.

4. Submit separate mix designs when admixtures are required for the following:

   a. Hot and cold weather concrete work.
   b. Air entrained concrete work.

B. Laboratory Test Reports: Submit copies of laboratory test reports for concrete cylinders, materials and mix design tests signed and sealed by a Licensed Professional Engineer in the State of Arkansas. Design Professional's review will be for general information only. Production of concrete to comply with specified requirements is the responsibility of Contractor.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver concrete reinforcement materials to the site bundled, tagged and marked. Use metal tags indicating grade, bar size, lengths, and other information corresponding to markings shown on placement diagrams.

B. All materials used for concrete must be kept clean and free from all foreign matter during transportation and handling and kept separate until measured and placed in the mixer. Bins or platforms having hard clean surfaces shall be provided for storage. Suitable means shall be taken during hauling, piling and handling to insure that segregation of the coarse and fine aggregate particles does not occur and the grading is not affected.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with the applicable concrete codes listed in Section 1.2 of this document.

B. Conform to ACI 305 when concreting during hot weather.

C. Conform to ACI 306.1 when concreting during cold weather.

D. Acquire cement and aggregate from one source for Work.

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type II.

B. Concrete Aggregates: ASTM C 33.

1. Fine Aggregate: Clean, sharp, natural sand free from loam, clay, lumps or other deleterious substances. Dune sand, bank run sand and manufactured sand are not acceptable.

2. Coarse Aggregate: Clean, uncoated, processed aggregate containing no clay, mud, loam, or foreign matter, as follows:

   a. Crushed stone, processed from natural rock or stone.
   b. Washed gravel, either natural or crushed. Use of slag and pit or bank run gravel is not permitted.
   c. Size to be in accordance with ASTM C 33, Nos. 57 or 67, unless directed by the Design Professional.

C. All concrete used for pipe backfilling shall consist of Portland cement per ASTM C 150, Type II. The aggregate shall be fine aggregate as per ASTM C 33.

D. Water: Clean, potable, and not detrimental to concrete.

E. Air-Entraining Admixture: ASTM C 260.

F. Water-Reducing Admixture: ASTM C494/C494M. Only use admixtures which have been tested and accepted in mix designs, and have been accepted by the Design Professional. Calcium chloride admixtures will not be accepted.

2.2 FORM MATERIALS

A. Provide form materials with sufficient stability to withstand pressure of placed concrete without bow or deflection.

B. Exposed Concrete Surfaces: Acceptable panel-type to provide continuous, straight, smooth as cast surfaces. Use largest practical sizes to minimize form joints.

C. Unexposed Concrete Surfaces: Suitable material to suit project conditions.

D. Provide 3/4-inch chamfer at all exposed corners.

2.3 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A 615, Grade 60.

B. Welded Wire Fabric: ASTM A 185.

C. Supports for Reinforcement: Bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcement in place.

1. Use wire bar type supports complying with CRSI recommendations, except as specified below. Do not use wood, brick, or other unacceptable materials.

2. For slabs on grade, use supports with sand plates or horizontal runners where base materials will not support chair legs.

2.4 RELATED MATERIALS

A. Membrane-Forming Curing compound: ASTM C 309, Type I.

PART 3 EXECUTION

3.1 FORMWORK

A. Formwork: Construction shall take place so that concrete members and structures are correct size, shape, alignment, elevation and position, complying with ACI 347.

B. Provide openings in formwork to accommodate Work of other trades. Accurately place and securely support items built into forms.

C. Clean and adjust forms prior to concrete placement. Apply form release agents or wet forms, as required. Retighten forms during and after concrete placement if required to eliminate mortar leaks.

3.2 REINFORCEMENT, JOINTS, AND EMBEDDED ITEMS

A. Comply with the applicable recommendations of specified codes and standards, and CRSI, Manual of Standard Practice, for details and methods of reinforcement placement and supports.

B. Clean reinforcement to remove loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.

C. Position, support, and secure reinforcement against displacement during formwork construction or concrete placement. Locate and support reinforcing by metal chairs, runners, bolsters, spacers and hangers, as required.

1. Place reinforcement to obtain the minimum concrete coverages as shown and as specified in ACI 318. Arrange, space, and securely tie bars and bar supports together with 16 gage wire to hold reinforcement accurately in position during concrete placement operations. Set with ties so that twisted ends are directed away from exposed concrete surfaces.

2. Reinforcing steel shall not be secured to forms with wire, nails or other ferrous metal. Metal supports subject to corrosion shall not touch formed or exposed concrete surfaces.

D. Provide sufficient numbers of supports of strength required to carry reinforcement. Do not place reinforcing bars more than 2 inches beyond the last leg of any continuous bar support. Do not use supports as bases for runways for concrete conveying equipment or similar construction loads.

E. Splices: Provide standard reinforcement splices by lapping ends, placing bars in contact, and tying tightly with wire. Comply with requirements shown for minimum lap of spliced bars.

F. Install welded wire fabric in as long lengths as practical, lapping at least one mesh.

G. Concrete shall not be placed until the reinforcing steel is inspected and approved by the Design Professional. All concrete placed in violation of this provision will be rejected.

H. Joints: All efforts shall be made to avoid cold joints. The Contractor shall schedule an appropriate crew and coordinate with the supplier to ensure no cold joints are made, a formed construction joint shall be used wherever cold joints may be required such as at existing expansion joints, end of day pour, etc. Provide construction, isolation, and control joints as indicated on the Construction Drawings or otherwise required. Saw-cut joints shall be 3/16” wide by full depth of topping and filled with joint sealant. Locate construction joints so as not to impair the strength and appearance of the structure. Place isolation and control joints in slabs on ground to stabilize differential settlement and random cracking.

I. Installation of Embedded Items: Set and build into the concrete such anchorage devices and embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting diagrams, templates and instructions provided under other Sections and other contracts for locating and setting.

3.3 CONCRETE AND PLACEMENT

A. Proportioning and Design of Mix:

1. Minimum compressive strength at 28 days: 4000 psi.
2. Maximum water cement ratio by weight: 0.45.
3. Minimum cement content: 564 pounds per cubic yard.
4. Normal weight: 145 pounds per cubic foot.
5. Use air-entraining admixture in all concrete: provide not less than 4 percent or more than 8 percent entrained air for concrete exposed to freezing and thawing, and from 2 percent to 4 percent for other concrete.
6. Calcium Chloride: Do not use calcium chloride in concrete. Do not use admixtures containing calcium chloride.

B. Job-Site Mixing: Use drum type batch machine mixer, mixing not less than 1-1/2 minutes for one cubic yard or smaller capacity. Increase mixing time at least 15 seconds for each additional cubic yard or fraction thereof.

C. Ready-Mixed Concrete: ASTM C 94.

D. Concrete Placement: Comply with ACI 304, placing concrete in a continuous operation within planned joints or sections. Do not begin placement until work of other trades affecting concrete is completed.

E. Protect concrete from physical damage or reduced strength due to weather extremes during mixing, placement, and curing.

1. In cold weather comply with ACI 306.
2. In hot weather comply with ACI 305.

3.4 CONCRETE CONSOLIDATION

A. General: Concrete shall be consolidated by means of internal vibrators operated by competent workmen, so that concrete is worked around reinforcement and other embedded items and into all parts of forms.

B. Vibrators: Vibrators shall have a minimum head diameter of at least 2 inches, a minimum centrifugal force of 700 pounds and a minimum frequency of 8,000 vibrations per second.

C. Vibrators for Confined Areas: In confined areas, the specified vibrators shall be supplemented by others having a minimum head diameter of 1 1/2 inches, a minimum centrifugal force of 300 pounds and a minimum frequency of 9,000 vibrations per second.

D. Spare Vibrator: One spare vibrator for each three in use shall be kept on Site during all concrete placing operations.

E. Use of Vibrators: Vibrators shall be inserted and withdrawn at points approximately 18 inches apart. The duration of each insertion shall be from 5 to 15 seconds. Concrete shall not be transported in the forms by means of vibrators.

3.5 CONCRETE FINISH

A. Concrete slabs exposed to view shall receive a steel trowel finish without local depressions or high points.

B. Concrete slabs to receive concrete topping or overlay shall receive a floated finish.

C. All concrete slabs to be troweled shall receive a floated finish.

D. Floated Finish: After concrete has been placed, consolidated, struck off and leveled, it shall not be worked further until water sheen has disappeared and the surface has hardened sufficiently to permit floating, the planeness of the slab shall be checked with a 10 foot straightedge applied at no less than two angles. The slab shall then be refloated to a uniform smooth texture.

E. Troweled Finish: After floating, slabs to receive a troweled finish shall be power troweled and finally hand troweled. The first troweling after power floating shall produce a smooth surface, relatively free of defects. Surfaces shall be hand troweled after the surface has hardened sufficiently. Hand troweling shall produce a surface which is thoroughly consolidated, free from trowel marks, uniform in texture and appearance and plane to a Class A tolerance.(See 3.8 G below)

F. Broom Finish: After hand troweling, a stiff steel bristle broom finish shall be applied to all exposed concrete surfaces to receive vehicle traffic.

G. Finishing Tolerance: Surfaces shall be true planes within the following limits:

1. Class A: 3/16 inch in 10 feet as determined by a 10 - foot straightedge placed anywhere on the slab in any direction.

3.6 QUALITY OF CONCRETE WORK

A. Make all concrete solid, compact and smooth, and free of laitance, cracks and cold joints.

B. All concrete for liquid retaining structures, and all concrete in contact with earth, water, or exposed directly to the elements shall be watertight.

C. Cut out and properly replace to the extent ordered by Design Professional, or repair to the satisfaction of Design Professional, surfaces which contain cracks or voids, are unduly rough, or are in any way defective. Patches or plastering will not be acceptable.

D. Repair, removal, and replacement of defective concrete as directed by the Design Professional shall be at no additional cost to the Owner.

E. The finish grades shall conform to those shown on the Construction Drawings and shall not vary by 3/16” within 10 feet.

3.7 CURING AND PROTECTION

A. Protect all concrete work against damage from elements and defacement of any nature during construction operations. Special curing operations shall be implemented for concrete slabs to receive overlay concrete and overlay concrete as described below.

B. Upon initial set, concrete surfaces to receive overlay and overlay concrete surface shall be fogged to ensure a continuous water cure. Fogging shall continue until wet burlene cure can be implemented. Floor surfaces to receive overlay shall be continuous wet burlene cured for a period not less than 28 days after placement.

C. Other concrete surfaces may be membrane-cured.

D. All concrete surfaces shall be protected from the direct rays of the sun to prevent checking and crazing.

3.8 TESTING

A. Source Quality Control:

1. Concrete Testing Service:
   a. The QC Geotechnical Laboratory or other laboratory selected by the Contractor and approved by the Design

Professional shall perform materials evaluation, testing and design of concrete mixes.

b. The QC Geotechnical Laboratory or other laboratory selected by the Contractor and approved by the Design Professional shall also evaluate concrete delivered to and placed at the Site.

2. Certificates, signed by concrete producer and the QC Site Manager, may be submitted in lieu of material testing when acceptable to Design Professional.

3.9 QUALITY CONTROL DURING CONSTRUCTION

A. Contractor and Contractor's installer shall examine the substrate and the conditions under which work is to be performed and notify Design Professional of unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to Design Professional.

B. The Contractor shall cooperate in making of such tests to the extent of allowing free access to the work for the selection of samples.

C. Perform sampling and testing during concrete placement, as follows:

1. Sampling: ASTM C 172.
2. Slump: ASTM C 143, one test for each load at point of discharge.
3. Air Content: ASTM C 31, one for each set of compressive strength specimens.
4. Compressive Strength: ASTM C 39, one set for each 50 cubic yards or fraction thereof of each class of concrete; 1 specimen tested at 7 days, 2 specimens tested at 28 days.

D. Report test results in writing to Design Professional on same day tests are made.

END OF SECTION

SECTION 221429
SUMP PUMPS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Installing sump pumps in existing leachate sumps, new condensate sumps, and new leachate storage tanks.

B. Related Sections:
   1. Section 400533 – High Density Polyethylene Process Pipe
   2. Section 221519 – General Service Packaged Air Compressors and Receivers

1.2 DEFINITIONS

A. Sump Pump: Submersible pump to transport leachate for disposal.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. UL Compliance: Comply with UL 778 for motor-operated water pumps.

1.4 PROJECT CONDITIONS

A. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth moving operations.

PART 2 PRODUCTS

2.1 SUMP PUMPS

A. Furnish materials in accordance with federal, state, and municipal standards.

B. Impeller: Statically and dynamically balanced, 316 stainless steel, design for leachate handling, and keyed and secured to shaft.

C. Casing: 316 Stainless steel.

D. Mechanical Seal: Silicon carbide.

E. Shaft: 316 Stainless steel, with factory-sealed, grease-lubricated ball bearings.

F. Motor: Hermetically sealed, capacitor-start type; with built-in overload protection; lifting eye or lug; and three-conductor, waterproof power cable of length required and with grounding plug and cable-sealing assembly for connection at pump.

G. Controls:
1. Enclosure: NEMA 250, Type 3X; wall-mounted.
2. Float switches.
3. High-Water Alarm: Rod-mounted, NEMA 250, Type 6 enclosure with mercury-float switch; and contacts for remote alarm and disabling pump operation.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verification of existing conditions before starting work.

B. Verify connections, size, and location are as indicated on Drawings.

3.2 INSTALLATION

A. Install sump pumps in accordance with Drawings and manufacturer's instructions.

B. Provide necessary piping, fittings, and valves as indicated on Drawings.

3.3 FIELD QUALITY CONTROL

A. Sections 014000 - Quality Requirements, 017300 – Execution, and 017700 Closeout Procedures: Field inspecting, testing, adjusting, and balancing.

B. Upon completion of installation, examine, adjust and test each pump for proper operation.

C. Test each pump with clean water through minimum of four complete cycles.

3.4 MANUFACTURER'S FIELD SERVICES

A. Section 014000 - Quality Requirements: Requirements for manufacturer's field services.

B. Provide services of manufacturer's representative for period of not less than 5 man days to inspect installations and for performance testing.

END OF SECTION

SECTION 221519
GENERAL SERVICE PACKAGED AIR COMPRESSOR AND RECEIVERS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes providing and installing air compressor and compressor enclosure and appurtenances.

1.2 SUBMITTALS

A. The Contractor shall prepare and submit to the Construction Manager for review and approval manufacturer's literature, shop drawings, or other information pertaining to the assembly, operation, lubrication, adjustments, and other maintenance and repairs of the compressor installed under this Section, together with detailed parts lists, plans, and/or photographs.

B. The Contractor shall also prepare and submit shop drawings showing the layout, orientation and dimensions of the air compressor and compressor enclosure to be installed.

PART 2 PRODUCTS

2.1 AIR COMPRESSOR

A. The Contractor shall furnish and install one horizontal tank mounted, two stage, electric driven air compressor package. The air compressor shall be capable of delivering 55 scfm of air at 100 psi. Size the dryer to allow for twice the compressor capacity.

B. The air compressor package shall come equipped with the following features:

1. 230/460 volt three phase motor.
2. Mounted and wired motor starter with overload protection (including heater elements).
3. Air cooled after cooler.
4. Desiccant air dryer with appropriate filtration mounted and plumbed on extended table, including manual by-pass valves.
5. 120-gallon receiver tank.
6. Factory set pressure switch at 90 psi cut-in, 120 psi cut-out.
7. Combination oil coalescing filter and pressure regulator with gauge.

8. Electronic tank drain.
9. Low oil shutoff safety switch.
10. OSHA approved belt guard.
11. Dual control operation.

C. The air compressor unit shall be a Curtis Toledo Model No. 10HT D 12, or approved equal.

D. The compressor tank, air dryer drain outlet, and other components recommended by the manufacturer shall be heat traced to prevent freezing in winter months. Heat tracing tape shall be powered from the 120 VAC outlet within the compressor enclosure.

2.2 SPARE PARTS

A. The Contractor shall provide one additional inlet filter and recharge pack for the air compressor.

2.3 COMPRESSOR ENCLOSURE

A. The compressor shall be located within a weatherproof enclosure located adjacent to the blower/flare skid. The enclosure and equipment pad shall be sized to contain the compressor and appurtenances as indicated on the Construction Drawings. The enclosure shall have one louvered window and one 120 VAC outlet. The enclosure shall be constructed of weather resistant (pressure treated) lumber or other suitable materials as approved by the Construction Manager.

PART 3 EXECUTION

3.1 AIR COMPRESSOR AND ENCLOSURE

A. The air supply line from the compressor to the pneumatic pumps shall be located in the same trench as the header piping at a minimum depth as shown on the Construction Drawings.

B. Weather resistant enclosure shed shall be constructed to house the compressor.

END OF SECTION

SECTION 262416
PANELBOARDS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes distribution and branch circuit panelboards and electronic grade branch circuit panelboards.

1.2 REFERENCES

A. Institute of Electrical and Electronics Engineers:
   1. IEEE C62.41 - Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.

B. National Electrical Manufacturers Association:
   1. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches.
   2. NEMA FU 1 - Low Voltage Cartridge Fuses.
   3. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC.
   4. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices.
   5. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
   6. NEMA PB 1 - Panelboards.
   7. NEMA PB 1.1 - General Instructions for Proper Installation, Operation, and Maintenance of Panelboards Rated 600 Volts or Less.

C. International Electrical Testing Association:
   1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

D. National Fire Protection Association:
   1. NFPA 70 - National Electrical Code.

E. Underwriters Laboratories Inc.:
   1. UL 67 - Safety for Panelboards.
   2. UL 1283 - Electromagnetic Interference Filters.
   3. UL 1449 - Transient Voltage Surge Suppressors.

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.

C. Product Data: Submit catalog data showing specified features of standard products.

1.4 CLOSEOUT SUBMITTALS

A. Sections 017300 - Execution and 017700 - Closeout Procedures: Requirements for submittals.

B. Project Record Documents: Record actual locations of panelboards and record actual circuiting arrangements.

C. Operation and Maintenance Data: Submit spare parts listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

1.6 MAINTENANCE MATERIALS

A. Sections 017300 - Execution and 017700 - Closeout Procedures: Requirements for maintenance products.

B. Furnish two of each panelboard key. Panelboards keyed alike to Owner's current keying system.

PART 2 PRODUCTS

2.1 DISTRIBUTION PANELBOARDS

A. Manufacturers:
   1. Appleton Electric Co.
   2. GE Electrical.
   3. Siemens.
   4. Square D.

B. Service Conditions:
   1. Temperature: above 104 degrees F.

C. Panelboard Bus: Aluminum, current carrying components, ratings as indicated on Drawings. Furnish copper ground bus in each panelboard.

D. Minimum integrated short circuit rating: 100,000 amperes rms symmetrical for 240 volt panelboards.

E. Cabinet Front: Surface door-in-door type, fastened with concealed trim clamps, hinged door with flush lock, metal directory frame, finished in manufacturer's standard gray enamel.

2.2 ELECTRONIC GRADE PANELBOARD

A. Integral Surge Suppresser:
   1. Component recognized in accordance with UL 1449 and UL 1283.
   2. Independently tested with category C3 high exposure waveform (20 kV-1.2/50us, 10kA-8/20 us) per IEEE C62.41.
   3. Furnish copper bus bars for surge current path.
   4. Construct using surge current modules (MOV based). Each module fused with user replaceable 200,000 AIR rated fuses. Status of each module monitored on front cover of panelboard enclosure and on module.
   5. Furnish with audible alarm activated when one of surge current modules has failed. Furnish alarm on/off to silence alarm and alarm push-to-test switch to test alarm. Locate switches and alarm on front cover of panelboard enclosure.
   6. Meet or exceed the following criteria:
      a. Maximum single impulse current rating not less than 160 kA for each phase.
      b. Pulse Lift Test: Capable of protecting against and surviving 5000 IEEE C62.41 Category C transients without failure or degradation.
      c. Clamping voltage not exceeding the following:

Voltage	L-N	N-G	L-G
208Y/120	500 V	500 V	500 V
480Y/277	1000 V	1000 V	1000 V

   7. Furnish response time no greater than five nanoseconds for individual protection modes.
   8. Designed to withstand maximum continuous operating voltage (MCOV) of not less than 115 percent of nominal RMS voltage.

9. Furnish visible indication of proper suppresser connection and operation. Lights indicate operable phase and module.
10. Furnish minimum EFI/RFI filtering of 34 dB at 100 kHz with insertion loss ratio of 50: 1 using Mil Std. 220A methodology.

B. Panelboard:
1. UL 67 listed and TVSS device UL 1449 Component Recognized. TVSS device meets UL 1449. Furnish panelboard markings with clamp voltage at TVSS terminals and clamp voltage at panelboard line terminals.
2. Top or bottom feed as indicated on Drawings. Furnish circuit directory inside door.
3. Construct box of galvanized steel. Box size as indicated on Drawings.
4. Main bus constructed of aluminum or copper and rated for load current.
5. Furnish interior with branch circuit breakers. Furnish one 60 amp circuit breaker, with appropriate number of poles, as dedicated disconnect for TVSS.
6. Furnish standard rated, neutral assembly with aluminum neutral bus.
7. Furnish with insulated ground bus and safety ground bus.
8. Furnish wiring gutters in accordance with NEC.
9. Field connections to panelboard: main breaker type.
10. Construct with flush mounted trim and NEMA Type 1 enclosure.
11. Furnish with branch breaker positions and nominal current rating as indicated on Drawings.

2.3 LOAD CENTERS

A. Manufacturers:
1. Appleton Electric Co.
2. GE Electrical.
3. Siemens.
4. Square D.

B. Product Description: Circuit breaker load center, with bus ratings as indicated on Drawings.

C. Minimum Integrated Short Circuit Rating: 10,000 amperes rms symmetrical.

D. Molded Case Circuit Breakers: NEMA AB 1, plug-on type thermal magnetic trip circuit breakers, with common trip handle for poles, listed as

Type SWD for lighting circuits, Class A ground fault interrupter circuit breakers. Do not use tandem circuit breakers.

E. Enclosure: Rainproof.

F. Box: Flush type with door, and lock on door. Finish in manufacturer's standard gray enamel.

PART 3 EXECUTION

3.1 EXISTING WORK

A. Disconnect abandoned panelboards and load centers. Remove abandoned panelboards and load centers.

B. Maintain access to existing panelboard and load centers remaining active and requiring access. Modify installation or provide access panel.

C. Clean and repair existing panelboards and load centers to remain or to be reinstalled.

3.2 INSTALLATION

A. Install panelboards and load centers in accordance with NEMA PB 1.1.

B. Install panelboards and load centers plumb.

C. Install recessed panelboards and load centers flush with wall finishes.

D. Height: 6 feet to top of panelboard and load center; install panelboards taller than 6 feet with bottom no more than 4 inches above floor.

E. Install filler plates for unused spaces in panelboards.

F. Provide typed circuit directory for each branch circuit panelboard and load center. Revise directory to reflect circuiting changes to balance phase loads.

G. Install spare conduits out of each recessed panelboard to accessible location.

3.3 FIELD QUALITY CONTROL

A. Sections 014000 - Quality Requirements, 017300 – Execution, and 017700 - Closeout Procedures: Field inspecting, testing, adjusting, and balancing.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform circuit breaker inspections and tests listed in NETA ATS, Section 7.6.

D. Perform switch inspections and tests listed in NETA ATS, Section 7.5.

E. Perform controller inspections and tests listed in NETA ATS, Section 7.16.1.

3.4 ADJUSTING

A. Sections 017300 - Execution and 017700 - Closeout Procedures: Requirements for starting and adjusting.

B. Measure steady state load currents at each panelboard feeder; rearrange circuits in panelboard to balance phase loads to within 20 percent of each other. Maintain proper phasing for multi-wire branch circuits.

END OF SECTION

SECTION 262923
VARIABLE-FREQUENCY MOTOR CONTROLLERS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes variable frequency controllers.

1.2 REFERENCES

A. Institute of Electrical and Electronics Engineers:
   1. IEEE C62.41 - Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.

B. National Electrical Manufacturers Association:
   1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
   2. NEMA FU 1 - Low Voltage Cartridge Fuses.
   3. NEMA ICS 7 - Industrial Control and Systems: Adjustable Speed Drives.
   4. NEMA ICS 7.1 - Safety Standards for Construction and Guide for Selection, Installation, and Operation of Adjustable Speed Drive Systems.

C. International Electrical Testing Association:
   1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate front and side views of enclosures with overall dimensions and weights shown; conduit entrance locations and requirements; and nameplate legends.

C. Product Data: Submit catalog sheets showing voltage, controller size, ratings and size of switching and overcurrent protective devices, short circuit ratings, dimensions, and enclosure details.

D. Test Reports: Indicate field test and inspection procedures and test results.

E. Manufacturer's Field Reports: Indicate start-up inspection findings.

1.4 CLOSEOUT SUBMITTALS

A. Section 017700 - Closeout Procedures: Closeout procedures.

B. Operation and Maintenance Data: Submit instructions complying with NEMA ICS 7.1. Include procedures for starting and operating controllers, and describe operating limits possibly resulting in hazardous or unsafe conditions. Include routine preventive maintenance schedule.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience, and with service facilities within 100 miles of project.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store in clean, dry space. Maintain factory wrapping or provide additional canvas or plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided. Handle carefully to avoid damage to components, enclosure, and finish.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Conform to NEMA ICS 7 service conditions during and after installation of variable frequency controllers.

1.8 WARRANTY

A. Sections 017300 - Execution and 017700 - Closeout Procedures: Product warranties and product bonds.

B. Furnish five year manufacturer warranty for variable frequency controller.

1.9 MAINTENANCE SERVICE

A. Sections 017300 - Execution and 017700 - Closeout Procedures: Maintenance service.

B. Furnish service and maintenance of variable frequency controller for one year from Date of Substantial Completion.

1.10 MAINTENANCE MATERIALS

A. Sections 017300 - Execution and 017700 - Closeout Procedures: Spare parts and maintenance products.

B. Furnish two of each air filter.

PART 2 PRODUCTS

2.1 VARIABLE FREQUENCY CONTROLLER

A. Manufacturers:
1. Dynamics Corp. of America.
2. Reliance Electric Co.
3. Technology Dynamics Inc.

B. Product Description: NEMA ICS 7, enclosed variable frequency controller suitable for operating indicated loads. Select unspecified features and options in accordance with NEMA ICS 7.1.

C. Ratings:
1. Rated Input Voltage: 208 volts, three phase, 60 Hertz.
2. Motor Nameplate Voltage: 200 volts, three phase, 60 Hertz.
3. Displacement Power Factor: Between 1.0 and 0.95, lagging, over entire range of operating speed and load.
4. Operating Ambient: 0 degrees C to 40 degrees C.

D. Design Features:
1. Employ microprocessor-based inverter logic isolated from power circuits.
2. Employ pulse-width-modulated inverter system.
3. Design for ability to operate controller with motor disconnected from output.
4. Design to attempt five automatic restarts following fault condition before locking out and requiring manual restart.

E. Safeties and Interlocks:
1. Includes undervoltage release.
2. Door Interlocks: Mechanical means to prevent opening of equipment with power connected, or to disconnect power when door is opened; include means for defeating interlock by qualified persons.
3. Safety Interlocks: Terminals for remote contact to inhibit starting under both manual and automatic mode.

4. Control Interlocks: Furnish terminals for remote contact to allow starting in automatic mode.
5. Manual Bypass: Includes contactor, motor running overload protection, and short circuit protection for full voltage, non-reversing operation of motor. Includes isolation switch to allow maintenance of inverter during bypass operation.
6. Emergency Stop: Use dynamic brakes for emergency stop function.
7. Disconnecting Means: Integral [fused disconnect switch with clips for NEMA FU 1, Class J fuses on line side of each controller.

F. Fabrication:
1. Wiring Terminations: Match conductor materials and sizes as indicated on Drawings.
2. Enclosure: NEMA 250, Type 1, suitable for equipment application in places accessible only to qualified personnel.
3. Finish: Manufacturer's standard enamel.

2.2 TRANSIENT VOLTAGE SUPPRESSION DEVICES

A. Product Description: IEEE C62.41, factory-mounted transient voltage surge suppressor, selected to meet requirements for medium exposure and to coordinate with system circuit voltage.

2.3 SOURCE QUALITY CONTROL

A. Shop inspect and perform standard productions tests for each controller.

B. Make completed controllers available for inspection at manufacturer’s factory prior to packaging for shipment. Notify Engineer at least seven days before inspection is allowed.

C. Allow witnessing of factory inspections and tests at manufacturer’s test facility. Notify Engineer at least seven days before inspections and tests are scheduled.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 013100 – Project Management and Coordination: Coordination and project conditions.

B. Verify building environment is maintained within service conditions required by manufacturer.

3.2 EXISTING WORK

A. Disconnect and remove abandoned controllers.

B. Clean and repair existing controllers to remain or to be reinstalled.

3.3 INSTALLATION

A. Install in accordance with NEMA ICS 7.1.

B. Tighten accessible connections and mechanical fasteners after placing controller.

C. Install fuses in fusible switches.

D. Select and install overload heater elements in motor controllers to match installed motor characteristics.

E. Neatly type label inside controller door identifying motor served, nameplate horsepower, full load amperes, code letter, service factor, and voltage/phase rating. Place label in clear plastic holder.

3.4 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.16 and NEMA ICS 7.1.

3.5 MANUFACTURER'S FIELD SERVICES

A. Section 014000 - Quality Requirements: Manufacturer’s field services.

B. Prepare and startup variable frequency controller.

3.6 DEMONSTRATION AND TRAINING

A. Furnish 8 hours of instruction each for two persons, to be conducted at project site with manufacturer's representative.

END OF SECTION

SECTION 310513
SOILS FOR EARTHWORK

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Structural Fill
   2. Barrier Soil
   3. Topsoil materials.

B. Related Sections:
   1. Section 014000 - Quality Requirements
   2. Section 015000 - Temporary Facilities and Controls
   3. Section 015713 - Temporary Erosion and Sediment Controls
   4. Section 310516 - Aggregates for Earthwork
   5. Section 312213 - Rough Grading
   6. Section 312317 - Trenching
   7. Section 313700 - Riprap

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
   1. ASTM D422 – Standard Test Methods for Particle-Size Analysis of Soils.
   2. ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3)).
   3. ASTM D1557 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lb/ft^3 (2,700 kN-m/m^3))
   4. ASTM D2216 – Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.
   5. ASTM D2487 – Standard Test Method for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
   6. ASTM D4318 – Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

7. ASTM D5084 – Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible-Wall Permeameter.
8. ASTM D6938 – Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.3 QUALITY ASSURANCE

A. Quality Assurance/Quality Control shall be provided as specified in Construction Quality Assurance Plan and the Technical Specifications.

B. The Contractor shall be responsible for reworking or removing and replacing nonconforming soil and other construction materials that do not meet the requirements of the Technical Specifications and the Construction Drawings as directed by the Design Professional.

C. The Contractor shall be responsible for all survey work required to complete construction in accordance with the required lines and elevations as described in the Technical Specifications and as shown on the Construction Drawings.

1.4 SUBMITTALS

A. The Contractor shall submit proposed material sources to the Design Professional for approval before construction.

B. The Contractor shall submit soil test results for structural fill, barrier soil, and topsoil before construction.

C. The Contractor shall submit Test Fill results for the barrier soil layer for approval prior to construction.

D. Laboratory and field tests during construction shall be submitted to the Design Professional within 24 hours of receipt of laboratory data or field test performance.

PART 2 PRODUCTS

2.1 GENERAL

A. All fill and topsoil material must be approved by the Design Professional.

B. Excavated materials from the project construction areas may be used as fill material as directed by the Design Professional.

C. The final surface of all excavated areas and all areas designated to receive fill will be prepared and accepted in accordance with the Technical Specifications and Construction Quality Assurance Plan. The final surface will also be free of loose material, clods and any other debris including grade stakes and hubs.

D. Natural subgrade soils or compacted fill softened by frost, flooding, weather or any other natural or man-made events will be removed and replaced or re-compacted in accordance with the requirements specified herein.

E. Fill will not be placed on snow, ice, or frozen ground surfaces.

2.2 STRUCTURAL FILL

A. Structural fill materials will refer to materials used for subgrade construction, the construction of berms, and backfilling trenches.

B. Structural fill shall be tested for laboratory compaction by ASTM D698 prior to construction in locations where compaction specifications are applicable.

C. Structural fill materials shall be removed from the borrow area as directed by the Design Professional.

D. Structural fill materials will be free of debris, roots, organic matter, frozen matter, roots, wood, peat, cinders, rubbish, stones having any dimension greater than two (2) inches or any other deleterious materials.

2.3 BARRIER SOIL MATERIALS

A. Barrier soil materials will refer to materials used for the construction of the compacted soil liner.

B. Barrier soil materials will be moisture conditioned and installed by the Contractor and tested by the CQA Manager to verify compliance with the Technical Specifications and the Construction Drawings.

C. Provide borrow soil materials when sufficient satisfactory soil materials are not available from onsite. Due to project location and availability of acceptable barrier soil material, it is anticipated that soil screening will be required to meet the specifications for the barrier soil.

D. Barrier Soil Fill: Soil Classification — Groups SC, CL, or CH according to ASTM D 2487, or a combination of these groups. Rock/gravel fragments larger than 1 inch in diameter may not be used as barrier soil

fill. Barrier soil fill shall have fines content of soil (material passing a #200 sieve) greater than 30 percent. Soils shall have a Plasticity Index (PI) greater than 10, and material greater than the #4 sieve must compose less than 20 percent of soil by weight. Soil clods must be less than 4 inches.

2.4 TOPSOIL MATERIALS

A. Topsoil shall consist of friable sandy loam with soil particles within the following percentages: clay; 0-25; silt; 25-50; sand; 50-70; decomposed organic matter; 5-10 and reasonably free of grass, roots, weeds sticks, stones and other foreign materials.

2.5 SOURCE QUALITY CONTROL

A. Testing and Analysis of Structural Fill: Perform in accordance with ASTM D698.

B. Testing and Analysis of Barrier Soil

1. Barrier soil fill taken at the borrow source during pre-construction testing shall be tested at the rate of one test per every 20,000 cubic yards of material, or more frequently if visual observations indicate a change in material characteristics, or deemed so by the geotechnical technician. Soil from the borrow source shall be tested before transportation to the landfill site.

2. Bulk sample testing shall include:

    a. Moisture Content (ASTM D854)
    b. Particle Size (ASTM D1140, D442)
    c. Atterburg Limits (ASTM D4318)
    d. Laboratory Compaction (ASTM D698)
    e. Laboratory Hydraulic Conductivity at a specified compaction (ASTM D5084)

C. Testing and Analysis of Topsoil Material: Perform in accordance with ASTM D422 and testing by an agricultural testing laboratory for nitrogen, phosphorus, potash, soluble salt content, organic matter content, and pH.

PART 3 EXECUTION

3.1 PLACEMENT AND COMPACTION

A. The Design Professional will be notified at least forty eight (48) hours prior to Contractor placing any fill material.

B. The Contractor shall place and compact fill in accordance with industry standard construction practices and procedures.

C. Hauling and spreading equipment will not be considered compaction equipment.

D. Exposed areas to receive fill, backfill, or embankment shall be proof-rolled to detect localized zones of excessively wet, unstable, organic, or low bearing capacity materials to the extent as follows:

1. Proof roll as a single-pass operation with conventional compaction equipment during subgrade preparation and prior to placement of fill, and as a spot check process without the need for complete coverage per unit area of tire. Soft spots shall be over excavated, backfilled, and compacted with suitable material.

E. The Contractor shall perform a Test Fill of the Barrier Soil Layer in accordance with the Construction Quality Assurance Plan. The Test Fill results must be accepted by the Design Professional before beginning construction of the Barrier Soil layer.

F. The Contractor shall be responsible for maintaining proper lift thickness. The maximum loose lift thickness shall not exceed eight (8) inches.

G. Soil utilized for structural components shall be compacted to a minimum of 95 percent of the maximum dry density as determined by field testing performed in accordance with ASTM D6938 by the CQA Manager.

H. Barrier soil fill taken at the borrow source during construction testing shall be tested at the rate of one test per every 5,000 cubic yards of material, or more frequently if visual observations indicate a change in material characteristics, or deemed so by the geotechnical technician. Soil from the borrow source shall be tested before transportation to the landfill site.

1. Bulk sample testing shall include:

    a. Moisture Content (ASTM D854)
    b. Particle Size (ASTM D1140, D442)
    c. Atterburg Limits (ASTM D4318)
    d. Laboratory Compaction (ASTM D698)
    e. Laboratory Hydraulic Conductivity at a specified compaction (ASTM D5084)

I. The barrier soil compacted soil layer shall be compacted to at least 90 percent of the maximum dry density at a moisture content at or exceeding

the optimum moisture content or as directed by the Design Professional. Compaction shall be field tested at a rate of one test per 10,000 square feet in accordance with ASTM D6938 by the CQA Manager.

J. The barrier soil compacted soil layer must achieve a hydraulic conductivity of 1 x 10^{-5} cm/sec or less as determined on an undisturbed soil sample by ASTM D5084. Tests shall be conducted every 40,000 square feet.

K. Temperature probes, if warranted, should be installed at 3" increments in the top foot of the barrier layer to monitor soil temperature and confirm the barrier soil is not damaged due to freeze/thaw cycles. If the temperature reading in any probe drops below 32 degrees F, the vegetative layer shall be removed, clay material exposed, and the clay damaged by the freeze thaw cycle shall be re-compacted within the "acceptable zone" and the entire liner system shall be recertified.

L. If the compacted barrier soil layer is not protected or instrumented while the ambient air temperature drops below 27 degrees F at the nearest national weather station observation point, the top lift of the compacted clay material shall be repaired by removing the vegetative layer, exposing the barrier soil layer, re-compacting the clay damaged by the freeze thaw cycle within the "acceptable zone", and recertifying the construction of the barrier soil system in accordance with this plan.

M. Each accepted lift will be left rough or scarified at least two (2) inches before placing the next overlying lift.

N. Final surfaces will be graded to the lines and elevations shown on the Construction Drawings.

O. Final surfaces will be smooth drum rolled free of loose material, clods, and other debris including grade stakes and hubs.

P. Compact each lift so that the in-place dry unit weight and moisture content are within the acceptable placement zone as indicated by the CQA Manager.

Q. The structural fill material for the anchor trench backfill material will be nominally compacted to the satisfaction of the Design Professional.

R. The Contractor shall place the protective cover layer and vegetative layer so as not to damage the underlying geosynthetics. Low ground pressure equipment shall be used to spread the overlying soil. Any damage to the geosynthetics will be repaired at the Contractor's expense.

3.2 STOCKPILING

A. Stockpile materials on site as designated by Design Professional.

B. Stockpile in sufficient quantities to meet Project schedule and requirements.

C. Separate differing materials with dividers or stockpile apart to prevent mixing.

D. Stockpile topsoil 8 feet high maximum.

E. Prevent intermixing of soil types or contamination.

F. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

3.3 STOCKPILE CLEANUP

A. Leave unused materials in neat, compact stockpile.

B. When borrow area is indicated, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION

SECTION 310516
AGGREGATES FOR EARTHWORK

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Coarse aggregate materials.
2. Fine aggregate materials.

B. Related Sections:

1. Section 015000 – Temporary Facilities and Controls
2. Section 015713 - Erosion and Sediment
3. Section 310513 - Soils for Earthwork
4. Section 312213 - Rough Grading
5. Section 312317 - Trenching
6. Section 313700 - Riprap

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:

1. AASHTO M147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses.
2. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:

1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
3. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft3 (2,700 kN-m/m3)).
4. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).

5. ASTM D4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Samples: Submit, in air-tight containers, 10 lb. sample of each type of aggregate to testing laboratory.

C. Materials Source: Submit name of imported materials suppliers.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

A. Furnish each aggregate material from single source throughout the Work.

B. Perform Work in accordance with federal, state, and municipal standards.

PART 2 PRODUCTS

2.1 COARSE AGGREGATE MATERIALS

A. Coarse Aggregate (Gravel): Angular crushed washed non-calcareous stone; free of shale, clay, friable material and debris; graded in accordance with ASTM C136.

2.2 FINE AGGREGATE MATERIALS

A. Fine Aggregate (bedding): Conforming to Arkansas Department of Transportation standards for pipe bedding.

2.3 SOURCE QUALITY CONTROL

A. Section 014000 - Quality Requirements: Testing and inspection services.

B. Coarse Aggregate Material - Testing and Analysis: Perform in accordance with ASTM C136.

C. Fine Aggregate Material - Testing and Analysis: Perform in accordance with ASTM D698.

D. When tests indicate materials do not meet specified requirements, change material and retest.

PART 3 EXECUTION

3.1 STOCKPILING

A. Stockpile materials on site at locations designated by Design Professional.

B. Stockpile in sufficient quantities to meet Project schedule and requirements.

C. Separate different aggregate materials with dividers or stockpile individually to prevent mixing.

D. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

3.2 STOCKPILE CLEANUP

A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION

SECTION 310519.13
GEOTEXTILES FOR EARTHWORK

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: The work to be performed under this Section shall include installing geotextile associated with construction energy dissipaters and maintenance and access roads, as shown on the Construction Drawings or as directed by the Design Professional.

B. Related Sections:

1. Section 310513 – Soils for Earthwork
2. Section 310516 – Aggregates for Earthwork

1.2 QUALITY ASSURANCE/QUALITY CONTROL

A. Quality Assurance (QA) and Quality Control (QC) shall be performed in conformance with the Construction Quality Assurance Plan.

1.3 SUBMITTALS

A. Prior to procurement of the geotextile, the Contractor shall submit to the Design Professional the following information for approval:

1. Origin and identification of the raw materials used to manufacture the geotextile (including polymer density and type, and ultraviolet radiation (UV) stability).
2. A copy of QC certificate regarding the raw materials issued by the producer of the raw materials.
3. A copy of QC certificate issued by the manufacturer of the geotextile that the geotextile is continuously inspected for uniformity, damage, imperfections, and foreign materials. A history of the nature and frequency of repair, the method of repair and remediation, and results of re-testing of the geotextile shall be reported. In addition, the manufacturer recommended method of transportation, loading and unloading of the geotextile should be submitted.
4. Samples of the proposed material. The material samples shall, at a minimum, consist of a piece of material three feet in length, by the whole width of the roll.
5. The Contractor shall submit the following to the Design Professional for evaluation and acceptance of each material and manufacturer prior to use:

a. Proposed product model and manufacturer.

b. Manufacturer published Minimum Average Roll Values (MARVs) for the material properties specified.

c. Manufacturer's QC testing protocol for the product including tests performed and frequency.

d. Results of manufacturer QC testing for the material produced for this project.

e. Manufacturer affidavit of compliance that the material conforms to the physical properties specified.

f. Manufacturer data including roll dimensions, storage requirements, handling requirements, and installation instructions.

g. Bill of Lading indicating the rolls were delivered to the Site.

6. The Contractor shall provide samples of material from actual material delivered to the site to the Design Professional for independent QA Testing as required by the Design Professional.

7. A sample of the proposed sewn seam to be tested by the QC Geosynthetic Laboratory in accordance with ASTM D4884 - Test Method for Strength of Sewn or Thermally Bonded Seams of Geotextiles. The sample shall include at least five feet of seam and three feet of width, such that five specimens of the seam for ASTM D4884 testing can be obtained from the sample.

8. Certified minimum values (i.e., values equal to the mean value minus two standard deviations obtained from routine testing on the product) by the QC Geosynthetic Laboratory for the properties listed in Parts 2.2, 2.3 and 2.4.

B. The frequency of testing shall be as specified in Part 3.3 of this Section as well as the Construction Quality Assurance Plan. The manufacturer shall submit his proposed testing program to the Design Professional for approval.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Provide wrapping to protect geotextile during shipping and storage and should not be removed until just before installation.

B. Protect geotextile from exposure to UV and moisture.

C. Geotextile materials shall be stored such that they are not in direct contact with ground and ponded liquid. Any materials that become saturated by stormwater runoff, ponding or direct precipitation will be evaluated by the

Design Professional for possible rejection. Rejected materials will be removed from the site and replaced at no additional cost to the Owner.

D. Deliver, store and handle in accordance with the manufacturer's recommendations.

E. Geotextile shall be lifted off the ground when moving.

F. Contractor shall use a front end loader fitted with a tapered pole for loading and unloading geotextile.

PART 2 PRODUCTS

2.1 MATERIALS

A. Contractor shall demonstrate that the properties (excluding seam strength) of the materials specified in the tables under Parts 2.2, 2.3 and 2.4 of this Section do not deviate more than the specified percentage from values of average test results obtained from the manufacturer testing program and NOT compared to the values listed in these tables. Acceptable evidence may consist of comparing average values of at least five tests before and after exposure or any other method proposed by the Contractor that is acceptable to the Design Professional. In any case, values shall not fall below the values listed in the tables in Parts 2.2, 2.3 and 2.4 of this Section.

2.2 6-OZ NON-WOVEN GEOTEXTILE

A. Non-woven geotextile for the shall have the following minimum properties:

Properties	**Value[1]**	**Test Method[4]**
Mass Per Unit Area	6.0 oz/sy	ASTM D 5261
Permeability	0.1 cm/sec	ASTM D 4491
Grab Strength @ 50% Elongation[2]	170 lb	ASTM D 4632
Tear Strength[3]	65 lb	ASTM D 4533
CBR Puncture Strength	90 lb	ASTM D 4833
UV Resistance @ 500 hours	70 percent, minimum	ASTM D 7238
Apparent Opening Size	No. 70 US Standard Sieve	ASTM D 4751

2.3 4-OZ WOVEN GEOTEXTILE

A. Woven geotextile used for service roadways shall have the following minimum properties:

Properties	**Value[1]**	**Test Method[4]**
Mass Per Unit Area	4.0 oz/sy	ASTM D 5261

Properties	Value[1]	Test Method[4]
Grab Strength @ 50% Elongation[2]	150 lb	ASTM D 4632
Tear Strength[3]	60 lb	ASTM D 4533
CBR Puncture Strength	80 lb	ASTM D 6241
UV Resistance @500hrs	70 percent, minimum	ASTM D 7238
Permittivity	0.90 /sec	ASTM D 4491
Apparent Opening Size	40 US sieve	ASTM D 4751

2.4 10-OZ NON-WOVEN GEOTEXTILE

A. Non-woven geotextile for the stepped-gabion downchutes, open channel downchutes, rip rap-lined swales and discharge aprons shall have the following minimum properties:

Properties	Value[1]	Test Method[4]
Mass Per Unit Area	10.0 oz/sy	ASTM D 5261
Permittivity	1.2 sec^{-1}	ASTM D 4491
Grab Strength @ 50% elongation[2]	270 lb	ASTM D 4632
Tear Strength[3]	100 lb	ASTM D 4533
CBR Puncture Strength	725 lb	ASTM D 6241
UV Resistance @500hrs	70 percent, minimum	ASTM D 7238
Apparent Opening Size	100 US Standard Sieve	ASTM D 4751

(1) All values represent minimum average roll value (MARV) (i.e., MARVs in a lot should meet or exceed the values in this table).

(2) Minimum values for both machine and cross machine direction with 1-inch clamp on constant rate extension (CRE) machine.

(3) Minimum value measured in machine and cross machine direction.

(4) Latest revision of each test.

B. The Contractor shall submit to the Design Professional engineering calculations, shop drawings, proposed quality assurance and quality control measures, product information, laboratory test results and all other necessary and applicable data to the satisfaction of the Design Professional.

PART 3 EXECUTION

3.1 INSTALLATION

A. Prior to deployment, the geotextile shall be protected from UV exposure, precipitation, mud, dirt, puncture, cutting or any other damaging or deleterious conditions. The rolls shall be shipped and stored in opaque and watertight wrappings. The wrappings shall be removed just before the installation but no more than one hour prior to installation. After

installation, the geotextile shall not be exposed to sunlight for more than 30 days. Geotextile exposed to sunlight for more than 30 days will be removed from the site and replaced at no additional cost to the Owner.

B. Where applicable, the areas to be blanketed with geotextile shall be prepared in accordance with NYSDOT Specifications, Section 203-3.01.G, Subgrade Area.

C. The geotextile shall be unrolled in overlapping strips as recommended by the manufacturer and directed by the Design Professional.

D. The geotextile shall not be placed on top of fill material until the geotextile has been inspected and approved by the Design Professional.

E. Care shall be taken in installing geotextile to avoid excessive stretching and tearing of the material.

F. All non-woven geotextile seams for energy dissipaters shall be overlapped a minimum of 6 inches and sewn according to manufacturer's recommendations and procedures, and as approved by the Design Professional. The woven geotextiles for roadways shall be overlapped a minimum of 1 foot. Seams on side-slopes shall be oriented perpendicular to the slope contours. End-of-roll seams shall be offset a minimum of 5 feet between adjacent rolls ends. Cross-slope seams shall be avoided as much as possible. All geotextile seams shall be sewn, not layered.

G. Any fabric damaged during its installation or during placement of cover materials shall be replaced by the Contractor at no additional cost to the Owner, as specified in Part 3.4 of this Section.

H. Upon complete installation of geotextile fabrics, and prior placement of overlying materials, the QC Manager shall inspect the installed geotextile fabrics for physical damage, satisfactory sewing of seams and/ or proper seam overlap in accordance with the installation instructions.

I. The Contractor shall mark any damaged area requiring repair.

J. The Contractor shall inspect all repairs prior to overlying material placement.

3.2 PRODUCT QUALIFICATION TESTING

A. Quality Control Testing:

1. The Contractor shall perform the initial QC Testing specified herein for each manufacturer and model of geotextile material prior to approval of material for use.

2. The Contractor shall perform testing for each manufacturer and model of geotextile materials for the parameters listed in Parts 2.2, 2.3, and 2.4 of this Section.

3. The Contractor shall submit a three-foot long by the total roll width sample to Design Professional for QA testing.

3.3 QUALITY CONTROL DURING CONSTRUCTION

A. Quality Control Testing:

1. The Contractor shall perform the QC Testing specified herein at the frequency specified for each manufacturer and model of the geotextile material.

2. The Contractor shall collect representative samples from geotextile materials delivered to the Site and test them at a rate of 1 per 200,000 square feet of materials for the parameters listed in Parts 2.2, 2.3 and 2.4 of this Section.

3. Each sample shall be a minimum of 2 feet long by the roll width and representative of geotextile installed. The Contractor shall mark the sample with the roll number and lot number from which the sample was taken

4. The QC Geosynthetics Laboratory shall forward copies of all material test results to both the Design Professional and the Contractor.

3.4 PROTECTION

A. Any geotextile damaged during its installation or during placement shall be repaired or replaced at the discretion of the Design Professional and at no additional cost to the Owner.

B. If woven geotextile for service roadways should be damaged during any step of the installation, a piece of geotextile material shall be cut and placed over the damaged area with a 2 feet minimum overlap.

C. The Contractor shall protect the work described in this Section before, during, and after installation, and shall protect the installed work covered by other Sections.

D. Any damage mark, hole or tear in non-woven geotextile fabric shall be repaired as follows:

1. A fabric patch shall be sewn into place using a double sewn lock stitch (¼-inch to ¾-inch apart and no closer than 1-inch form any edge) or as directed by the Design Professional.

2. On slopes with a grade less than 10 percent, the Contractor may use a fabric patch spot leistered in place with a minimum of 12 inches overlap in all directions.

3. Should any damaged area exceed 10 percent of the width of the roll, the roll shall be cut and overlapped to form a new seam.

4. Any defects in a fused seam will be covered a minimum of one foot on all sides with a new piece of geotextile and temporarily bonded (lystered) in-place, as approved by the Design Professional.

END OF SECTION

SECTION 310519.16
GEOMEMBRANES FOR EARTHWORK

PART 1 GENERAL

1.1 SUMMARY

A. This section includes the material properties and deployment of linear low density polyethylene (LLDPE) geomembrane for the final cover.

B. Related Sections:
1. Section 310513 - Soils for Earthwork
2. Section 310519.23 - Geosynthetic Clay Liners
3. Section 310519.26 - Geocomposites

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. ASTM D 1004 Test Method for Initial Tear Resistance of Plastic Film and Sheeting
2. ASTM D 1238 Standard Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer
3. ASTM D 1505 Test Method for Density of Plastics by the Density-Gradient Technique
4. ASTM D 1603 Test Method for Carbon Black in Olefin Plastics
5. ASTM D 3895 Standard Test Method for Oxidative-Induction Time of Polyolefins by Differential Scanning Calorimetry
6. ASTM D 4833 Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products
7. ASTM D 5199 Standard Test Method for Measuring Nominal Thickness of Geotextiles and Geomembranes
8. ASTM D 5397 Standard Test Method for Evaluation of Stress Crack Resistance of Polyolefin Geomembranes Using Notched Constant Tensile Load Test
9. ASTM D 5596 Standard Test Method for Microscopic Evaluation of the Dispersion of Carbon Black in Polyolefin Geosynthetics
10. ASTM D 5994 Standard Test Method for Measuring Core Thickness of Textured Geomembranes
11. ASTM D 6392 Standard Test Method for Determining the Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods

12. ASTM D 6693 Standard Test Method for Determining Tensile Properties of Nonreinforced Polyethylene and Nonreinforced Flexible Polypropylene Geomembranes

B. Geosynthetic Research Institute

1. GRI GM 17 Test Properties, Testing Frequency and Recommended Warranty for Liner Low Density Polyethylene (LLDPE) Smooth and Textured Geomembranes

1.3 DEFINITIONS:

A. Roll: One roll is defined as a length of geomembrane material delivered to the site, packaged or rolled in some manner as to prevent kinks, creases, pinholes or cold bends in the material.

B. Blanket: One blanket is defined as a combination of rolls or parts of rolls fabricated into a single sheet using factory seams prior to delivery to the site. Prefabricated geomembrane panels or blankets will not be approved for this project.

C. Panel: a roll or a portion of a roll.

D. Field Panel: a panel cut in the field.

1.4 QUALITY ASSURANCE/QUALITY CONTROL

A. Quality Assurance (QA) and Quality Control (QC) shall be performed in conformance with the Construction Quality Assurance Plan.

1.5 SUBMITTALS

A. Prior to procurement and shipping of the geomembrane material, the Geosynthetic Installer shall submit to the Design Professional the following documentation for approval:

1. Proposed product model and manufacturer.
2. Origin and identification of raw materials used to manufacture the geomembrane material.
3. Copies of quality control certificates issued by the producer of the raw materials used to manufacture the geomembrane material, which include at a minimum, specific gravity and melt flow index.
4. Certified test results from the geomembrane manufacturer that the geomembrane meets or exceeds the test values specified herein.
5. Manufacturer published Minimum Average Roll Values (MARVs) for the material properties specified.

6. Manufacturer's Quality Control testing protocol for the product including test performed and frequency. At minimum, the manufacturer shall provide QC testing of the type and frequency as required.
7. Results of QC Geosynthetic Laboratory's in-plant QC testing for the material produced for the Project.
8. Manufacturer's affidavit of compliance that material conforms to the physical properties specified.
9. Manufacturer data including roll dimensions, storage requirements, handling requirements, and installation instructions.
10. Bill of Lading indicating rolls of geomembrane delivered to the Site.
11. The geomembrane manufacturer/fabricator shall certify that the geomembrane was continuously inspected for uniformity, damage, imperfections, holes, cracks, thin spots, and foreign materials. Additionally, the geomembrane shall be inspected for tears, punctures and blisters. Any imperfections shall be immediately repaired and reinspected.
12. A copy of the Geosynthetic Installer's QC plan regarding the installation of the geomembranes, which shall include, as a minimum requirement, the following information:
    a. Installation procedures.
    b. Field seaming procedures.
    c. Defects documentation and repair procedures.
13. Certified results of interface friction tests for the 40 mil LLDPE textured geomembrane performed in accordance with ASTM D5321 (latest revision), performed under saturated conditions, with a 24-hour saturation period prior to the test, Determining the Shear Strength of Soil-Geosynthetic and Geosynthetic-Geosynthetic Interfaces by Direct Shear, between the proposed 40 mil LLDPE textured geomembrane material and the following:
    a. Proposed geosynthetic clay liner.
    b. Proposed double sided geocomposite drainage layer.
    c. Proposed fill soil.

    The interface friction test for the 40 mil LLDPE textured geomembrane shall be performed with all the components of the Final Cover System for which interface friction is of concern. The Contractor shall take particular note that this test shall be repeated for every proposed geosynthetic clay liner, geocomposite, geomembrane and soil combination used in the construction.

14. Certified results of QC testing from the 40 mil LLDPE textured geomembrane manufacturer for the properties listed herein. The frequency of the QC testing performed by the manufacturer shall be as specified in Part 3 of this Section.

15. A copy of the Manufacturer and Installer warranties, in effect for a minimum period of twenty (20) years for the material and five (5) years for the workmanship of the 40 mil LLDPE textured geomembrane.

B. Prior to commencement of the installation, the Contractor shall provide to the Design Professional the following submittals from the Geosynthetic Installer. All submittals shall be approved by the Design Professional prior to beginning installation of the geomembrane.

1. A drawing showing the panel installation layout identifying proposed locations of all field seams as well as any variance or additional details which deviate from the Construction Drawings. Approval of this drawing by the Design Professional does not relieve the Contractor of his responsibility to install and lay out the geomembrane in accordance with the Contract Documents. The layout shall be adequate for use as a construction plan and shall include dimensions, details, etc.

2. Geomembrane installation schedule.

3. A list of qualified personnel performing field seaming operations along with pertinent experience information. All personnel performing seaming operations shall be qualified by experience or by successfully passing seaming tests. Seaming personnel shall meet the qualifications specified in the Construction Quality Assurance Plan. The most experienced seamer (Master Seamer) shall provide direct supervision, as required, over less experienced seamers. No field seaming shall take place without the Master Seamer being present to oversee the seaming.

4. Name and model of all seaming apparatus to be used, as well as any alternative processes for the Design Professional's approval.

5. Copies of all applicable test results as required throughout Part 3 of this Section and the Construction Quality Assurance Plan.

6. All laboratory and field testing equipment and instrumentation will have current calibrations. Copies of all calibration certifications will be provided to the Design Professional prior to performing testing.

7. Geosynthetics manufacturer transportation, storage and handling recommendations.

8. Contractor’s Daily QC log and Report of Seams form format to be used during geomembrane installation. The log will include the

welding technician, the associated welder used and the welded seam.

9. Method of construction procedures for excavation and backfilling of anchor trenches with backfill material, including method of placement, equipment, and personnel.

C. The Contractor is required to obtain prior written permission from the Design Professional to bring any chemicals onto the Site. The Contractor will submit current Safety Data Sheets (SDS) in accordance with the Hazard Communication Standard under 29 CFR 1910.1200(g) to the Design Professional for evaluation on the use of the chemicals and will properly store and handle any and all chemical agents used in the work in accordance with SDS requirements. No chemicals will be allowed on the Site without a current SDS record in the Contractor's project office and a copy submitted to the Design Professional.

D. The Contractor shall provide the Design Professional with red-line and as-built drawing(s) of the installed geomembrane, as part of the required drawings. These drawing(s) shall designate the locations of all field seams, construction repairs, destructive test locations, coupon test locations, repaired factory defects, patches, panel number with direction rolled, and panel remnant locations. The locations noted on the drawings shall be located, and the drawings signed and sealed, by the Contractor's Surveyor.

1.6 TRANSPORTATION, STORAGE AND PROTECTION:

A. Transportation of geomembranes is the responsibility of the Contractor. The Contractor shall be liable for all damages to the materials incurred prior to and during transportation to the Site.

B. Handling and storage of the geomembrane prior to installation at the Site is the responsibility of the Contractor. During storage, the geomembrane shall be protected from excessive heat or cold, puncture, cutting, or other damaging or deleterious conditions. The geomembrane shall be stored in accordance with additional requirements of the geomembrane manufacturer. Stored geomembrane materials shall be elevated; no materials shall be stored directly on the ground surface.

C. Rolls of geomembrane that are to remain in stockpiles for more than 15 days shall be covered and protected from the elements and UV exposure. Rolls of geomembrane material that will be deployed in less than 15 days do not require additional UV protection. Deployed 40 mil LLDPE textured geomembrane can be left exposed for up to 45 calendar days without covering; however, after 45 calendar days of exposure, the Contractor will be required to test and repair additional destructive samples to verify the deployed materials are still in conformance with the

specifications, as directed by the Design Professional and at no additional cost to the Owner. The Contractor shall be liable for all damages to the materials incurred prior to Final Acceptance of the Project by the Owner.

PART 2 PRODUCTS

2.1 40 MIL LLDPE TEXTURED GEOMEMBRANE - TEXTURED ON BOTH SIDES

A. QC requirements of the 40 mil LLDPE textured geomembrane are detailed below. Additional QC requirements are specified in the Construction Quality Assurance Plan. The Contractor shall strictly comply with all QC requirements.

B. 40 mil LLDPE textured geomembrane shall be manufactured from new, first-quality, high molecular weight polyethylene resin.

C. 40 mil LLDPE textured geomembrane shall be textured on both sides and meet the following specifications:

LLDPE PROPERTIES	QUALIFIERS	TEST VALUES(1)	TEST METHOD OR STANDARD
Core thickness	minimum average	40 mils	ASTM D5994(2)
	lowest individual	40 mils	ASTM D5994 (2)
Density	maximum	0.939 g/cm^3	ASTM D1505 or D792B(2)
Melt flow index	maximum	≤1 g/10 min	ASTM D1238, Cond. E(2)
Tensile properties:			
1. Break Strength	minimum average	60 lb/in	ASTM D6693 Type (2) IV
2. Break Elongation	minimum average	250 percent	ASTM D6693 (2) Type IV
Tear resistance	minimum average	22 lb	ASTM D1004
Puncture resistance	Minimum average	44 lb	ASTM D4833(2)
Carbon black content	range	2.0-3.0 percent	ASTM D4218(2)
Carbon black dispersion	9 in category 1 or 2; 1 in Category 3		ASTM D5596(2)

Note:
(1) All values given are minimum average roll values unless otherwise designated.

D. Reclaimed polymer shall not be added to the resin. In addition, the 40 mil LLDPE textured geomembrane shall:

1. Contain a maximum of 1 (one) percent by weight of additives, fillers, or extenders (not including carbon black).
2. Be produced so as to be free of holes, blisters, undispersed raw materials or any sign or contamination by foreign matter.
3. Be manufactured in a single layer (that is, thinner layers shall not, be welded together to produce the final required thickness).

E. Labels for each roll of geomembrane shall be applied by the manufacturer on the roll core (before the material is rolled) and on the outside of the completed roll of geomembrane and these labels shall identify, at a minimum:

1. The thickness of the material.
2. The length and width of the roll and panel.
3. The manufacturer along with the date and time of manufacture.
4. Directions to unroll the material.
5. Product identification.
6. Lot number.
7. Roll number.

Any roll of geomembrane where the core roll number and the outside roll number do not match shall be removed from the Site at no cost to the Owner and replaced with approved materials.

F. Quality Control Testing:

1. Prior to acceptance of any geosynthetic or soil material, the Contractor will provide documentation verifying conformance with this Section.
2. The Contractor will provide representative samples of all geosynthetic and soils materials to test all geosynthetic to geosynthetic and geosynthetic to soil interfaces within the cap cross section.
3. The Contractor will test all geosynthetics to geosynthetics and geosynthetic to soil interfaces for each soil source utilized for the Project.

G. The interface friction angle testing for the 40 mil LLDPE textured geomembrane shall be performed in accordance with ASTM D5321, Standard Test Method for Determining the Shear Strength of Soil-Geosynthetic and Geosynthetic-Geosynthetic Interfaces by Direct Shear.

Normal stresses of 1, 2, and 3 psi along with a displacement rate of 0.04 inches per minute shall be used. Interfaces tested shall be wet. Soil components shall be the same as used for full scale construction and shall be compacted to the same moisture-density requirements specified for full scale field placement. Geosynthetics shall be the same materials as those proposed for use during full scale construction. Geosynthetics shall be oriented such that the shear force is parallel to the down slope orientation of these components in the field. A minimum residual interface friction angle of 28 degrees is required for all interfaces.

H. The minimum interface friction angle assumes zero adhesion. However, adhesion may be considered in confirming compliance with the interface friction angle criteria by using the secant angle approach as addressed in ASTM D7702-11, Standard Guide for Consideration When Evaluating Direct Shear Results Involving Geosynthetics. Alternatively, compliance with the interface friction angle may be based on the total peak interface shear strength measured for each normal stress tested, which includes the adhesion contribution.

I. In addition, the following conditions shall be incorporated into the testing:

1. The shear box shall be a minimum of 12-inch square in the plan direction, and each half of the shear box shall be a minimum of three inches in depth.
2. The embankment fill material will be compacted to 95% maximum Standard Proctor Dry Density (ASTM D698).
3. The geosynthetics and soil materials shall be placed in the same sequence and orientation as the constructed cap cross section. The particular interface in question will be connected to the respective upper and lower shear frame.
4. All samples will be normally consolidated under the applied load.
5. The direction of shear for each interface tested shall be in the direction of the manufacture (machine direction) for each geosynthetic sample, unless otherwise specified.
6. Break elongation is calculated using a gage length of 2.0 inches at 2.0 in/min.
7. All tests shall be continued until a constant shearing force is recorded.
8. All tests shall be conducted with the soil and geosynthetics in a saturated condition by saturating the specimen in water for 24 hours prior to testing.

J. The actual test methods and equipment used to conduct the test will be submitted to the Design Professional by the Contractor for approval prior to any testing.

K. The Contractor shall submit to the Design Professional, engineering calculations, shop drawings, proposed quality assurance and quality control measures, product information, laboratory test results, laboratory qualification certifications and all other necessary and applicable data to the satisfaction of the Design Professional.

PART 3 EXECUTION

3.1 PREPARATION FOR 40 MIL LLDPE TEXTURED GEOMEMBRANE INSTALLATION

A. All QA/QC testing and other requirements specified shall be performed at the intervals specified.

B. QC Testing: Any materials whose sample minimum average roll values do not meet the requirements in this Section shall be rejected and replaced, at no additional cost to the Owner.

C. Anchor Trench Systems:

1. Prior to the placement of 40 mil LLDPE textured geomembrane, the geosynthetic installer shall verify:

   a. The Contractor's Surveyor has verified all lines and grades in areas of placement.

2. The anchor trench shall be excavated prior to geomembrane placement, to the lines and grades shown on the Construction Drawings. The trench shall have a configuration as shown on the Construction Drawings.

3. Barrier protection material shall not be placed on the geosynthetics (above the geomembrane) until the geosynthetics are securely anchored in the anchor trench.

4. Uncompacted embankment fill shall not be allowed beneath the 40 mil LLDPE textured geomembrane.

5. The anchor trench shall be backfilled with barrier protection material and compacted to 90 percent of the Standard Proctor Dry Density, ASTM D698. Care shall be taken when backfilling the trenches to prevent any damage to the 40 mil LLDPE textured geomembrane.

6. Slightly rounded corners shall be provided in the trench where the 40 mil LLDPE textured geomembrane adjoins the trench so as to avoid sharp bends in the 40 mil LLDPE textured geomembrane.

3.2 GEOMEMBRANE QUALIFICATION TESTING

A. Quality Control Testing:

1. The Contractor shall perform the initial QC Testing specified herein for each manufacturer of geomembrane material prior to approval of material for use.

2. The Contractor shall perform the following testing for each manufacturer of 40 mil LLDPE textured geomembrane material to demonstrate the material meets the requirements listed in the table:

Test	Frequency	Specification
Interface friction tests (ASTM D5321): Geocomposite – Embankment Fill Geomembrane – Geocomposite Geomembrane – GCL GCL – Embankment Fill	Initial test (one time) (LLDPE only)	 18º 28º 28º 18º
Oxidative Induction Time, over the full range of normal stresses (minimum average, ASTM D 3895, 200ºC, 1 atm O_2)	Manufacturer certification (LLDPE and HDPE only)	>100 minutes
UV Resistance (minimum average, ASTM D 7238 and D5885 at 150ºC, 500 psi O_2)	Manufacturer certification (LLDPE and HDPE only)	35% retained after 1600 hours
2% Secant Modulus (maximum, ASTM D5323)	Manufacturer certification (LLDPE only)	2400 lb/inches
Axi-Symmetric Break Resistance Strain (minimum, ASTM D5617)	Manufacturer certification (LLDPE only)	30%

3.3 QUALITY CONTROL DURING CONSTRUCTION

A. Quality Control Testing:

1. The Contractor shall perform the QC Testing specified herein at the frequency specified for each manufacturer of geomembrane material:

2. The Contractor shall collect representative samples from geomembrane material manufactured for the project at the following frequency:

LLDPE	
Core thickness (ASTM D5994)	1 per 40,000 sf manufactured
Asperity Height (GRI GM-12)	1 per 40,000 sf manufactured
Density (ASTM D1505 or D792B	1 per 40,000 sf manufactured
Melt flow index (ASTM D1238)	1 per 40,000 sf manufactured
Tensile properties (ASTM D6693, Type IV)	1 per 40,000 sf manufactured

Tear resistance (ASTM D1004)	1 per 40,000 sf manufactured
Puncture resistance (ASTM D4833)	1 per 40,000 sf manufactured
Carbon black content (ASTM D4218)	1 per 40,000 sf manufactured
Carbon black dispersion (ASTM D5596)	1 per 40,000 sf manufactured

B. Field Quality Control During Installation:

1. The Contractor shall perform the Quality Control Testing at the Site as specified herein at the frequency specified for all geomembrane installed.

2. The Contractor shall conduct the following testing of installed geomembrane material at the following frequencies:

Field QC Test	Frequency
Seam peel and shear testing (ASTM D 6392)	4 times per shift
Trial seam peel and shear testing (ASTM D 6392)	5 per trial seam
Non-destructive field seam testing(ASTM D 6392)	Continuously over entire seam length
Destructive seam testing, including 5 peel and 5 shear tests and 1 sample to QC lab for seam strength and peel adhesion tests (ASTM D6392)	Continuously at a minimum of 1 sample per 500 lf of seam length
Additional field testing and lab testing upon Design Professional's request and/or test failure	As necessary

3.4 LLDPE TEXTURED GEOMEMBRANE DEPLOYMENT

A. Layout Drawings:

1. The layout drawings shall include dimensions, details, sequencing, etc. The layout drawings, as modified and/or improved by the Design Professional, shall become part of these Specifications.

2. The layout drawings shall be developed to minimize the number of panel cross-seams.

B. Panel Identification:

1. A field panel is the unit area of 40 mil LLDPE textured geomembrane which is to be seamed in the field (i.e., a field panel is a blanket, roll or a portion of roll cut in the field).

2. Each field panel shall be given a unique identification code (number or letter-number) consistent with the layout drawings. This identification code shall be agreed upon by the Design Professional and Contractor. The field panel identification code shall be related, through a table or chart prepared by the Contractor, to the original constituent rolls.

C. Field Panel Placement:

1. Field panels shall be installed as approved or modified by the Design Professional at the location and positions indicated in the layout drawings.
2. Field panels shall be placed one at a time, and each field panel shall be seamed immediately after its placement in order to minimize the number of unseamed field panels exposed to wind.

D. Weather Conditions for Seaming:

1. Field seaming is prohibited during precipitation, in presence of moisture that cannot be dried prior to seaming, or when winds are in excess of 20 miles per hour.
2. No seaming is authorized when the ambient air temperature, the panel temperature or the underlying ground temperature is 32°F or colder.
3. Unless authorized in writing by the Design Professional, no seaming shall be attempted when the ambient air temperature or the panel temperature is below 40°F or above 104°F.
4. Between 40°F and 50°F, seaming is possible if the 40 mil LLDPE textured geomembrane is preheated by either sun or hot air device, and if there is not excessive cooling resulting from wind.
5. Above 50°F, no preheating is required.
6. In all cases, the geomembrane shall be clean, dry and protected from wind damage.

E. LLDPE textured geomembrane deployment or seaming shall not be performed with ponded water either above or below the geomembrane panels, or in excessively windy conditions.

F. The Contractor shall ensure that:

1. No equipment used shall damage the 40 mil LLDPE textured geomembrane in any way.
2. No personnel working on the 40 mil LLDPE textured geomembrane shall smoke, wear damaging shoes, or engage in other activities which could damage the 40 mil LLDPE textured geomembrane.
3. Generators or other small equipment used during the deployment of the geomembrane, that are located on top of the deployed geomembrane must be located on a protective sheet of geomembrane. No maintenance or repairs (including refueling) of the generators will be allowed on the deployed geomembrane.

4. The method used to unroll the panels shall not cause scratches or crimps in the 40 mil LLDPE textured geomembrane and shall not damage the underlying Final Subgrade.

5. The prepared surface underlying the 40 mil LLDPE textured geomembrane shall not be allowed to deteriorate after acceptance, and shall remain acceptable up to the time of 40 mil LLDPE textured geomembrane placement.

6. The method used to place the panels shall minimize wrinkles (especially differential wrinkles between adjacent panels).

7. Adequate temporary loading and/or anchoring (e.g., sand bags, non-radial tires), not likely to damage the 40 mil LLDPE textured geomembrane, shall be placed to prevent uplift by wind. In case of high winds, continuous loading is recommended along edges of the seamed and unsecured rolls to minimize the risk of wind flow above or under the panels.

8. No vehicular traffic shall be allowed directly on the 40 mil LLDPE textured geomembrane.

G. Any field panel or portion thereof which, in the opinion of the Design Professional, becomes seriously damaged (torn, twisted, or crimped) shall be replaced at no cost to the Owner. Less serious damage may be repaired for reuse at the Design Professional's option. Damaged panels or portions of damaged panels which have been rejected shall be removed from the work area.

3.5 FIELD SEAMING OF LLDPE

A. In general, seams shall be oriented perpendicular to the elevation contour lines of the slope.

B. No cross-seam shall be located less than 15 feet from an anchor trench, the toe of the slope or the crest of an adjacent slope, except where approved by the Design Professional.

C. 40 mil LLDPE panel lengths shall be a minimum of 50 feet, except where two panels are intersecting at an angle that require a triangular panel piece. In corners and odd-shaped geometrical locations, the number of field seams shall be minimized.

D. No cross-seams shall be located in the areas of potential stress concentrations.

E. All seams shall be double fusion seams unless field conditions make this impossible. Only then may extrusion welds be used.

F. No solvent or adhesive shall be used to seam the 40 mil LLDPE textured geomembrane.

G. Overlapping and Temporary Bonding:

1. The panels of 40 mil LLDPE textured geomembrane shall be overlapped by a minimum of 3 inches for extrusion welding and 5 inches for fusion welding, but in any event, sufficient overlap shall be provided to allow peel tests to be performed on the seam.

2. The procedure used to temporarily bond (lystering) adjacent panels together shall not damage the 40 mil LLDPE textured geomembrane. In particular, the temperature of the air at the nozzle of any spot welding apparatus shall be controlled such that the 40 mil LLDPE textured geomembrane is not damaged.

H. Seam Preparation:

1. Prior to seaming, the seam area shall be clean and free of moisture, dust, dirt, debris of any kind, and foreign material.

2. If seam overlap abrading is required, the process shall be completed according to geomembrane manufacturer's instructions within one hour of the seaming operation and in a way that does not damage the 40 mil LLDPE textured geomembrane.

3. Seams shall be aligned with the fewest possible number of wrinkles and "fishmouths".

I. Seaming Equipment and Products:

1. Approved processes for field seaming are extrusion welding and fusion welding. Only equipment which has been specifically approved by make and model shall be used. Proposed alternative processes shall be documented and submitted for approval.

2. The extrusion welding apparatus shall be equipped with gauges giving the temperature in the apparatus and at the nozzle. The Contractor shall provide documentation regarding the extrudate to the Design Professional and shall certify that the extrudate is consistent with this Section, and in any event is comprised of the same resins as the 40 mil LLDPE textured geomembrane sheeting. The Contractor shall maintain at least one spare operable seaming apparatus on Site. Equipment used for seaming shall not damage the 40 mil LLDPE textured geomembrane, and the 40 mil LLDPE textured geomembrane shall be especially protected from damage in heavily trafficked areas. The extruder shall be purged prior to beginning a seam until all heat-degraded extrudate has been removed from the barrel. Whenever the extruder is stopped, the barrel shall be purged of all heat degraded extrudate. A smooth

insulation plate or fabric shall be placed beneath the hot welding apparatus after usage. Splash protection shall be provided beneath the equipment. Any corners of panels or areas where two or more seams meet shall be capped with a minimum 1 foot diameter patch.

3. The fusion welding apparatus shall be self-propelled, automated devices. The fusion welding apparatus shall be equipped with gauges giving the applicable temperature and pressures. The Contractor shall maintain at least one spare operable seaming apparatus on site. The Contractor shall log ambient temperature, the seaming operator, seaming apparatus, and 40 mil LLDPE textured geomembrane surface temperatures as well as seaming apparatus pressures. Equipment used for seaming shall not damage the 40 mil LLDPE textured geomembrane, and the 40 mil LLDPE textured geomembrane shall be protected from damage in heavily trafficked areas. For cross seams associated with fusion welding, the edge of the cross seams shall be abraded to a smooth-incline (top and bottom) prior to welding. A smooth insulating plate or fabric shall be placed beneath the hot welding apparatus after usage. A movable protective layer may be used directly below each overlap of 40 mil LLDPE textured geomembrane that is to be seamed to prevent buildup of moisture between the sheets.

J. Trial Seams:

1. Trial seams shall be made on fragment pieces of 40 mil LLDPE textured geomembrane by the geosynthetic installer to verify that seaming conditions are adequate. Such trial seams shall be made at the beginning of each seaming period, and at least once each four hours, for each seaming apparatus used that day. Also, each seamer shall make at least one trial seam, each day. Trial seams shall be made under the same conditions as actual seams. The trial seam sample shall be at least five (5) feet long by one (1) foot wide for extrusion welded seams and ten (10) feet long by one (1) foot wide for fusion welded seams(after seaming) with the seam centered lengthwise. Seam overlap shall be as previously indicated.

2. Five adjoining specimens, each 1.0 inch wide, shall be cut from the trial seam sample by the Contractor. The specimens shall be tested respectively in shear and peel using a field tensiometer, and shall not fail in the seam. If a specimen fails, the entire operation shall be repeated. If the additional specimen fails, the seaming apparatus or seamer shall not be accepted and shall not be used for seaming until the deficiencies are corrected and two consecutive successful trial seams are achieved. No production seaming shall be allowed until a passing result is observed by the CQA Manager.

3. The CQA Manager or their representative shall observe all test seam procedures. The remainder of the successful test seam sample shall be assigned a number and marked accordingly by the Contractor, who shall also log the date, hour, ambient temperature, number of seaming unit, welding temperatures, equipment speed, name of seamer, and pass or fail description. The sample itself shall be labeled and submitted to the Design Professional.

4. All test seam equipment shall be as close to the operations as possible to permit continuous observation of construction activities by the Design Professional or his designated representative.

K. The general seaming procedure used by the Contractor shall be as follows:

1. Extend seaming to the outside edge of panels to be placed in the anchor trench.

2. As required, a firm substrate shall be provided by using a flat board, a conveyor belt, or similar hard surface directly under the seam overlap to achieve proper support.

3. Fishmouths or wrinkles at the seam overlaps shall be cut along the ridge of the wrinkle in order to achieve a flat overlap. The cut fishmouths or wrinkles shall be seamed and patched with an oval or round patch of the same 40 mil LLDPE textured geomembrane extending a minimum of six (6) inches beyond the fishmouth or wrinkle in all directions.

4. All seams shall be marked by the seamer with the seamer's name, date, equipment number, and starting time. The geomembrane installer shall mark each seam with a number to identify the seam. This number shall be used by the installer to record all QA/QC data associated with the seam.

5. All T-seams or intersections where 3 or more panels are joined shall be capped with a patch at least 6 inches beyond the intersection in all directions.

6. Contractor shall take and field test one 1-inch wide sample from the start and stop of each seam welded. Samples shall be one inch wide and shall be tested in peel and shear. Any seam failed shall be reconstructed.

7. Areas of seams which show evidence of overheating or degradation of geomembrane properties due to seaming shall be patched or replaced by the Contractor at no expense to the Owner.

3.6 NON-DESTRUCTIVE SEAM CONTINUITY TESTING

A. The Contractor shall non-destructively test all field seams, including seams for the penetration boots, over their full length using a vacuum test unit (for single fusion seams and extrusion seams only), air pressure (for double fusion seams only), or other method approved by the Design Professional. Continuity testing shall be carried out as the seaming work progresses, not at the completion of all field seaming. The installer shall complete any required repairs in accordance with this Section.

B. Testing will be performed in accordance with ASTM D6392 (latest revision) – Standard Test Method for Determining the Integrity of Non-reinforced Geomembrane Seams Produced Using Thermo-Fusion Methods.

C. Vacuum Box Testing:

1. Inspect all field seams for unbonded areas by applying a vacuum to a soaped section of seam.
2. Apply the vacuum by a vacuum box equipped with a vacuum gage, a clear glass view panel in the top, and a soft rubber gasket on the periphery of the open bottom. The vacuum box shall be similar to the Series A 100 Straight Seam Tester as supplied by the American Parts and Service Company, 2201 West Commonwealth Avenue, P.O. Box 702, Alhambra, California 91802.
3. Thoroughly soap a section of the seam, place the inspection box over the soaped seam section and seal the gasket sealed to the geomembrane.
4. Apply a vacuum of between eight (8) and ten (10) inches of mercury (Hg) to the box for not less than thirty (30) seconds by use of a gasoline or electric driven power-vacuum pump apparatus. Mark areas that bubble (unbonded areas) for repair by the Contractor and retest as required until passing results are achieved.
5. Box shall have a minimum overlap of three (3) inches when advancing to the next test.

D. Air Pressure Testing: Test all double fusion seams with an air pressure test by sealing both ends and applying air to a pressure between twenty-five (25) and thirty (30) psi. Seam failure will be determined if loss of pressure exceeds two (2) psi, over five minutes, or does not stabilize. Two gauges shall be used to measure continuity of the air channel, one at each end. Both gauges shall be observed and recorded. Pressure differential between the two gauges shall be no more than 1 psi. The seam tester shall record on the report forms and on the geomembrane the tester name, the start and end times and pressures at each gauge, and the result of the test.

3.7 DESTRUCTIVE TESTING OF LLDPE

A. Destructive seam tests shall be performed on samples collected from selected locations. The purpose of these tests is to evaluate seam strength and integrity. Seam destructive testing shall be carried out as the seaming work progresses, not at the completion of all field seaming.

B. Destructive test samples shall be collected at a minimum frequency of one test location per 500 feet of seam length. Samples, in addition to the minimum frequency, shall be taken by the Contractor as required by the Design Professional. Test locations shall be determined during seaming, and may be prompted by suspicion of excess crystallization, contamination, offset seams, or any other potential cause of imperfect seaming. The CQA Manager shall be responsible for choosing the locations. The Contractor shall not be informed in advance of the locations where the seam samples will be taken. The Owner reserves the right to increase the frequency in accordance with actual performance results of samples taken.

C. Samples shall be cut by the Contractor at identified locations designated by the CQA Manager as the seaming progresses in order to obtain laboratory test results before the 40 mil LLDPE textured geomembrane is covered by another material. Each sample shall be numbered and the sample number and location identified on the panel layout drawing. All holes in the 40 mil LLDPE textured geomembrane resulting from the destructive seam sampling shall be immediately repaired in accordance with the repair procedures described in this Section. The continuity of the new seams in the repaired area shall be tested according to the same requirements and procedures as used on other seams in this Section.

D. The samples shall be at least 1 foot wide by 4 feet and 4 inches long with the seam centered lengthwise. Two 1-inch wide strips shall be cut at each end of the sample and these shall be tested in the field. The remaining sample shall be cut into three parts and distributed as follows:

1. One portion 1.5 foot long to the Contractor for QC Geosynthetic Laboratory testing.
2. One portion 1.0 feet long for the Design Professional for QA Geosynthetic Laboratory testing.
3. One portion 1.5 feet long to the Design Professional for archive storage.

E. The four 1-inch wide strips shall be tested in the field, by hand or tensiometer, for peel and shear respectively, and shall not fail in the seam. If any field test sample fails to pass, then the repair procedures outlined in this Section shall be followed.

1. The Contractor shall provide and operate a portable tensiometer at the Site during field seaming operations to be able to perform the field peel and shear tests.

F. Testing by the QC Geosynthetic Laboratory shall include "Seam Strength" and "Peel Adhesion" (ASTM D6392 (latest revision) [Standard Test Method for Determining the Integrity of Non-reinforced Geomembrane Seams Produced Using Thermo-Fusion Methods] with a 1-inch wide strip. The minimum acceptable values to be obtained in these tests are those indicated below per GRI GM-19:

PROPERTY	40 mil LLDPE VALUE
Seam Shear Strength	60 lb/ in (min.) FTB(1)
Shear Elongation	50% at break
Hot Wedge Seams	
Peel Strength	50 lb/in (min.) FTB(1)
Peel Separation	25 % between edge of seam and grip where break occurs.
Extrusion Fillet Seams	
Peel Strength	44 lb/in (min.) FTB(1)
Peel Separation	25 % between edge of seam and grip where break occurs.
Testing Shear Rate	20 inches/minute

(1) FTB - Film Tear Bond

At least 5 specimens shall be tested for each test method. Specimens shall be selected alternately by test from the samples (i.e., peel, shear). The Contractor shall provide the CQA Manager with test results no more than 24 hours after the samples are received at the QC Geosynthetic Laboratory. Both halves of split wedge seams shall be tested.

G. The following procedures shall apply whenever a sample fails the destructive test, whether the test is conducted by the QC Geosynthetic Laboratory, the QA Geosynthetic Laboratory, or by field tensiometer. The Contractor shall have two options:

1. The Contractor can reconstruct the seam between any two test locations having passed testing.

2. The Contractor can trace the welding path to an intermediate location, 10 feet minimum from the location of the failed test (in each direction) and take a small sample for an additional field test at each location. If these additional samples pass the tests, then full laboratory samples shall be taken. If these laboratory samples pass the tests, then the seam shall be reconstructed between these locations. If either sample fails, then the process shall be repeated to establish the zone in which the seam should be reconstructed. In

any case, all acceptable seams shall be bounded by two locations from which samples passing laboratory destructive tests have been taken. In cases where the reconstructed seam exceeds 130 feet, a sample taken from within the reconstructed zone shall pass destructive testing. Whenever a sample fails, additional testing may be required for seams that were formed by the same seamer and/or seaming apparatus or seamed during the same time shift.

3.8 DEFECTS AND REPAIRS

A. Identification: All seams and non-seam areas of the 40 mil LLDPE textured geomembrane shall be examined by the Contractor for identification of defects, holes, blisters, undispersed raw materials and any sign of contamination by foreign matter. The surface of the 40 mil LLDPE textured geomembrane shall be clean at the time of examination. The surface shall be swept or washed by the Contractor if the amount of dust or mud inhibits examination. The Contractor shall ensure that this examination of the 40 mil LLDPE textured geomembrane precedes any seaming of that section.

B. Evaluation: Each suspect location both in seam and non-seam areas shall be non-destructively tested using the methods described in this Section, as appropriate. Each location which fails the non-destructive testing shall be marked by the CQA Manager and repaired by the Contractor. Work shall not proceed with any materials which will cover locations which have been repaired until QC Geotechnical Laboratory test results with passing values are available.

C. Repair Procedure:

1. Any portion of the 40 mil LLDPE textured geomembrane exhibiting a flaw, or failing a destructive or non-destructive test, shall be repaired by the Contractor. Several procedures exist for the repair of these areas. The final decision as to the appropriate repair procedure shall be agreed upon between the Design Professional and the Contractor. The procedures available include:

    a. patching, used to repair large holes, tears, undispersed raw materials, and contamination by foreign matter;

    b. abrading and reseaming, used to repair small sections of extruded seams;

    c. spot seaming, used to repair small tears, pinholes, or other minor, localized flaws;

    d. capping, used to repair large lengths of failed seams;

    e. topping, used to repair areas of inadequate seams, which have an exposed edge; and

f. removing bad seam and replacing with a strip of new material seamed into place (used with large lengths of fusion seams).

2. In addition, the following provisions shall be satisfied:

a. Surfaces of the 40 mil LLDPE textured geomembrane which are to be repaired shall be abraded no more than one hour prior to the repair.

b. All surfaces shall be clean and dry at the time of repair.

c. All seaming equipment used in repairing procedures shall be approved by the Design Professional.

d. The repair procedures, materials, and techniques shall be approved in advance of the specific repair by the Design Professional and Contractor.

e. Patches or caps shall extend at least 6 inches beyond edge of the defect, and all corners of patches shall be rounded with a radius of at least 3 inches.

f. The 40 mil LLDPE textured geomembrane should be appropriately cut to avoid gas buildup beneath the geomembrane and prior to placement of the drainage net layer and the barrier protection materials as approved by the Design Professional. A minimum of 1 vent per acre can be cut, with more vents cut if ballooning of the surface becomes apparent. Prior to placement of barrier protection materials, the vent cuts shall be repaired and tested in accordance with this Section.

D. Verification of Repairs: Each repair shall be numbered and logged. Each repair shall be non-destructively tested using the methods described in Part 3.06 of this Section, as appropriate. Repairs which pass the non-destructive test shall be taken as an indication of an adequate repair. Large repairs may be of sufficient extent to require destructive test sampling, at the discretion of the Design Professional. Failed tests indicate that the repair or portion thereof, at the direction of the Design Professional, shall be redone and retested until a passing test result is obtained.

E. Large Wrinkles: When seaming of the 40 mil LLDPE textured geomembrane is completed (or when seaming of a large area of the 40 mil LLDPE textured geomembrane is completed) and prior to placing overlying materials, the QA Geosynthetics Inspector shall identify all excessive 40 mil LLDPE textured geomembrane wrinkles. The Contractor shall cut and reseam all wrinkles so identified, at no additional cost to the Owner. The seam thus produced and reseamed shall be tested like any other seam, in accordance with this Section.

3.9 MATERIALS IN CONTACT WITH THE GEOMEMBRANE

A. The following provisions require the Contractor to take all necessary precautions so that the installations of these materials do not damage the geomembranes.

B. Placement of barrier protection material on the 40 mil LLDPE textured geomembrane shall not be performed at an ambient temperature below 32°F or above 104°F. Equipment used for placing barrier protection material shall not be driven directly on the 40 mil LLDPE textured geomembrane. A minimum thickness of 1 foot of barrier protection material is required between a low ground pressure tracked vehicles and the 40 mil LLDPE textured geomembrane. The maximum ground pressure of tracked equipment shall not exceed 4.7 psi. Rubber-tire vehicles shall not be operated unless there is a minimum of 3 feet of material above the 40 mil LLDPE textured geomembrane (i.e., on gravel roads only).

C. Appurtenances:

1. Installation of the 40 mil LLDPE textured geomembrane in appurtenant areas, and connection of the 40 mil LLDPE textured geomembrane to appurtenances shall be made according to this Section. Extreme care shall be taken while seaming around appurtenances since destructive testing may not be feasible in these areas. The Contractor shall ensure that the 40 mil LLDPE textured geomembrane has not been visibly damaged while making connections to appurtenances.
2. All clamps, slips, bolts, nuts, or other fasteners used to secure the geomembranes to each appurtenance shall be 304 stainless steel and equally durable to the 40 mil LLDPE textured geomembrane.
3. Connection to existing HDPE Geomembrane: New 40 mil LLDPE textured geomembrane shall not be fusion- or extrusion-welded to existing or new 60 mil HDPE membrane, but such connections will instead be installed as shown on the Construction Drawings.

3.10 FINAL COVER SYSTEM ACCEPTANCE

A. The Contractor shall retain all ownership and responsibility for the geomembrane in the Final Cover System until acceptance by the Owner.

B. The geomembrane shall be accepted by the Owner when:

1. The installation is finished;
2. All documentation of installation is completed including the geosynthetic installer and the CQA Manager final reports;

3. Verification of the adequacy of all field seams and repairs, including associated testing, is complete; and

4. Written certification documents, including all QC Geosynthetic Laboratory testing results, as-built panel record drawings, signed and sealed by the Contractor's Surveyor, have been received and approved by the Design Professional.

END OF SECTION

SECTION 310519.23
GEOSYNTHETIC CLAY LINER (GCL)

PART 1 GENERAL

1.1 Summary

A. The Contractor shall furnish all labor, materials, testing, surveying and incidentals required to supply, install and test geosynthetic clay liner (GCL) material, including installation of GCL final cover system as shown on the Construction Drawings and specified herein or as directed by the Design Professional.

B. Related Sections:

1. Section 310513 - Soils for Earthwork
2. Section 310519.16 - Geomembranes for Earthwork
3. Section 310519.26 - Geocomposites

1.2 REFERENCES

A. ASTM D 4632 (latest version), Grab Breaking Load and Elongation of Geotextiles.

B. ASTM D 5084 (latest version), Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter.

C. ASTM D 5887 (latest version), Measurement of Index Flux Through Saturated Geosynthetic Clay Liner Specimens Using a Flexible Wall Permeameter.

D. ASTM D 5888 (latest version), Storage and Handling of Geosynthetic Clay Liners.

E. ASTM D 5889 (latest version), Quality Control of Geosynthetic Clay Liners.

F. ASTM D 5890 (latest version), Swell Index of Clay Mineral Component of Geosynthetic Clay Liners.

G. ASTM D 5891 (latest version), Fluid Loss of Clay Component of Geosynthetic Clay Liners.

H. ASTM D 5993 (latest version), Measuring Mass per Unit of Geosynthetic Clay Liners.

1.3 SUBMITTALS

A. The Contractor shall submit the following items to the Design Professional for approval prior to procuring the GCL:

1. Manufacturer certified raw and roll material data sheets indicating that the material conforms to the requirements of this Section.
2. Manufacturer qualifications and QC manual which describes testing procedures, frequency of testing and acceptance/rejection criteria for QC testing. At a minimum, the manufacturer shall provide QC testing of the type and frequency as required.
3. Drawings showing layout of GCL sheets, anchor trench details and pipe penetration details. Layout diagram indicating the location of pre-assembled panels. Shop drawings need not identify each sheet and panel by number.
4. Complete description of field seaming procedures.
5. Work plan for GCL installation including manpower and equipment requirements.
6. Samples of GCL proposed for use.
7. Detailed description of field testing methods to be performed.
8. Interface friction angle test results, if required.
9. Reference list supplied by GCL manufacturer indicating the appropriate experience level as required.
10. Reference list supplied by the GCL installer indicating the appropriate experience level as required.
11. Manufacturer warranty.
12. Provide 6 copies of an affidavit, certifying that all GCL materials furnished for this project comply with all requirements specified in the Contract Documents. No GCL shall be shipped until the affidavits are submitted.

B. Prior to the installation of any GCL material, the Contractor shall submit for approval to the Design Professional information obtained from the manufacturer and/or QC geosynthetic testing laboratory, as specified in the CQA Plan.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Delivery, storage, and handling of GCL shall be in accordance with ASTM D 5888. The QC Geosynthetic Inspector shall be present during delivery and unloading of the GCL. Rolls shall be packaged in an opaque, waterproof, protective covering and wrapped around a central core. Tears in the packaging shall be repaired to restore a waterproof

protective barrier around the GCL. Unloading of rolls from the delivery vehicles shall be done preventing damage to the GCL and its packaging.

B. Storage: Field storage shall be in flat, dry areas where water cannot accumulate and the GCL rolls can be protected from damage. Storage of the rolls on blocks or pallets will not be allowed unless the GCL rolls are fully supported as approved by the Design Professional. Stacks of GCL rolls shall be no greater than three high. Rolls shall be covered with a waterproof tarpaulin or plastic sheet if stored outdoors. Rolls shall be stored in a manner that prevents sliding or rolling.

C. Handling: Rolls shall not be dragged, lifted by one end, or dropped to the ground from the delivery vehicle. A pipe or solid bar of sufficient strength to support the full weight of the roll without significant bending shall be used for all unloading and handling activities. The diameter of the pipe shall be small enough to be easily inserted through the core of the GCL roll. Chains shall be used to link the ends of the core pipe or bar to the ends of a spreader bar. The spreader bar shall be wide enough to prevent the chains from rubbing against the ends of the GCL roll. Alternatively, a stinger bar protruding from the end of a forklift or other equipment may be used. The stinger bar shall be at least three-fourths the length of the core and also must be capable of supporting the full weight of the GCL without significant bending. If recommended by the manufacturer, a sling handling method utilizing appropriate loading straps may be used.

D. Bagged bentonite, to be used for seaming, penetration or repairs, shall be stored and handled in accordance with the manufacturer recommendations. Bentonite shall be stored in a manner that provides complete protection from the weather so that the bentonite does not come into contact with moisture at any time prior to installation.

1.5 Quality ASSURANCE/QUALITY CONTROL

A. Quality Assurance (QA) and Quality Control (QC) shall be performed in conformance with the Construction Quality Assurance Plan.

1.6 QUALIFICATIONS

A. Manufacturer: GCL shall be the product of a GCL Manufacturer who has produced the proposed GCL using the same bentonite, polyethylene geomembrane and/or geotextile and adhesive for at least 5 completed projects and shall have produced a minimum of 1,000,000 square feet of the proposed GCL.

B. Installer: The installer shall have installed GCL at a minimum of 5 projects of comparable scope and complexity and shall have installed a minimum of 1,000,000 square feet of the proposed GCL

1.7 WARRANTY

A. The manufacturer's warranty shall state that GCL material meets all requirements of the Contract Documents and that for the intended use the GCL is warranted for 20 years against deterioration. The Geosynthetics Installer's warranty shall state that the GCL shall not fail due to improper installation within 5 years.

PART 2 PRODUCTS

2.1 General

A. Single Source:
All GCL material shall be obtained from a single material supplier and all GCL rolls shall be manufactured by a single GCL manufacturer.

Any accessory bentonite used for sealing seams, penetrations or repairs shall be the same granular bentonite used in the production of the GCL itself.

2.2 GCL materials:

GCL shall be a reinforced (needle-punched) system of sodium bentonite between one non-woven geotextile (top layer) and one woven geotextile (bottom layer), that meets the following minimum average roll values (MARV) criteria as a composite system:

MATERIAL PROPERTY	TEST METHOD	TEST FREQUENCY	REQUIRED VALUES
GEOTEXTILE PROPERTIES (TOP AND BOTTOM)			
Nonwoven, Mass/Unit Area	ASTM D 5261	1/25,000 yd^2 (1/20,000m^2)	6.0 oz/yd^2 MARV
BENTONITE PROPERTIES			
Swell Index	ASTM D5890	1/load or 1/50 tons	24 mL/2g min.
Fluid Loss	ASTM D5891	1/load or 1/50 tons	18 mL max.
Mass/Area	ASTM D5993	1/40,000 SF	0.75 lbs/sf.
FINISHED GCL PROPERTIES			
Mass/Area	ASTM D 5993	1/5,000 yd^2	0.81 lb/ft^2
Tensile Strength	ASTM D6768	25,000 yd^2	23 lbs/in
Peel Strength	ASTM D6496	1/5,000 yd^2	2.1 lb/in
Moisture Content	ASTM D5993	1/5,000 yd^3	35% max.
Index Flux	ASTM D5887	30,000 yd^2	1 x 10^{-6} cm/sec max
Permeability (cm/sec)	ASTM D5887	30,000 yd^2	5 x 10^{-9} max
Internal Shear Strength	ASTM D 6243	Periodically	500 psf Typical

MATERIAL PROPERTY	TEST METHOD	TEST FREQUENCY	REQUIRED VALUES

A. The GCL shall be reinforced with high strength fabric thread similar to the carrier geotextile to provide internal shear strength reinforcing. The internal shear reinforcing mechanism shall resist failure due to thread pullout over long-term creep situations.

B. The geotextiles shall allow sufficient bentonite flow-through such that the permeability of the overlap seams is equal to or less than the permeability of the body of the GCL sheet without the addition of granular or paste bentonite.

C. The bentonite shall be continuously adhered to both geotextiles to ensure that the bentonite will not be displaced during handling, transportation, storage and installation, including cutting, patching and fitting around penetrations.

PART 3 EXECUTION

3.1 INSTALLATION

A. GCL shall be installed as soon as practical after delivery to Site.

B. GCL shall not be deployed if it is frozen or at temperatures below 32°F.

C. Rolls shall be delivered to the work area in their original packaging. Immediately prior to deployment, the packaging shall be carefully removed without damaging the GCL.

D. GCL which has been hydrated prior to being covered by an overlying geomembrane or a minimum of 12 inches of cover soil shall be removed and replaced. Hydrated GCL is defined as material which has become soft as determined by squeezing the material with finger pressure or material which has exhibited swelling, and as determined by the Design Professional.

E. Method of Placement:

1. Use no equipment that could damage the GCL by handling, trafficking, leakage of fluid or other means;
2. Prohibit all personnel on the GCL from smoking, wearing damaging shoes, or engaging in other activities which could damage the GCL;
3. Use methods to unroll the panels that do not cause tears, folds or crimps in the GCL and do not damage the underlying layers;

4. Use methods to place the panels that minimize wrinkles (especially differential wrinkles between adjacent panels);
5. Place adequate loading (e.g. sand bags), not likely to damage the GCL, to prevent uplift by wind; and
6. Equipment and materials which can damage the GCL shall not be allowed to travel directly on it.

F. The Geosynthetic Installer shall use an appropriate material as a slip sheet to protect the GCL as approved by the Design Professional.

G. Deployed GCL panels shall lie flat on the subgrade surface, with no wrinkles or folds.

H. Only as much GCL as can be covered at the end of the covering day shall be deployed. The GCL shall not be left uncovered overnight and the edges of the GCL shall be protected from moisture.

I. Weather Conditions:

1. GCL placement shall not be done during any precipitation, in the presence of excessive moisture (e.g. fog, dew or frost) in an area of ponded water or in the presence of excessive winds.
2. The Contractor shall verify that the above conditions are fulfilled. Additionally the Contractor shall verify that the supporting subgrade has not been damaged by weather conditions.

J. Damaged panels or portions of panels which have been rejected shall be marked and removed from the work area. The damaged materials shall become the property of the Contractor. The Contractor shall remove damaged GCL from Site at its own expense.

3.2 SEAMS PREPARATION

A. Prior to seaming, confirm that the seam area is clean and free of moisture, dust, dirt, debris of any kind, and foreign material; and clean area as necessary to permit seaming.

B. Overlap panels as specified by the manufacturer or by a minimum of six (6) inches, if not specified. End of roll overlapped seams shall have a minimum overlap of 24 inches, if not specified by manufacturer.

C. Seams shall be aligned with the fewest possible number of wrinkles.

3.3 SEAMING EQUIPMENT AND PRODUCTS

A. General: Use only processes for field seaming which have been recommended by the manufacturer and approved by the Design Professional.

B. Weather Conditions for Seaming:

1. Field seaming in prohibited during precipitation, in presence of moisture, or in the presence of high winds as determined by the Design Professional.

2. In all cases, the GCL shall be kept dry and protected from wind and moisture damage.

C. General Seaming Procedure:

1. Extend seaming to the outside edge of panels to be placed in the anchor trench.

2. Wrinkles at the seam overlaps shall be cut along the ridge of the wrinkle in order to achieve a flat overlap. The cut wrinkles shall be seamed and patched with an oval or round patch of the same GCL extending a minimum of 24 inches beyond the wrinkle in all directions.

3. Seams at the ends of the panels should be constructed such that they are shingled in the direction of the grade to prevent the potential for runoff flow to enter the overlap zone.

4. Bentonite-enhanced seams shall be constructed by overlapping the adjacent panels, exposing the underlying edge, and then applying a continuous bead or fillet of granular sodium bentonite along a zone defined be the edge of the underlying panel and the 6-inch overlap. The minimum application rate at which the bentonite is to be applied is ¼ lb per linear foot (i.e., 0.4 kg/m) or as recommended by the GCL manufacturer.

5. Cutting the GCL should be performed using a sharp utility knife. Frequent blade changes are recommended to avoid irregular tearing of the geotextile components of the GCL during the cutting process.

6. The GCL shall be sealed around penetrations and structures embedded in the subgrade in accordance with the Construction Drawings. Granular bentonite or bentonite mastic shall be used liberally (approximately 2 lb/linear foot or 3 kg/m) to seal the GCL to these structures.

7. A secondary collar of GCL should be placed around the penetrations. It is helpful to first trace an outline of the penetration on the GCL and then to cut a “star” pattern in the collar to enhance the collar’s fit around the penetration.

3.4 DEFECTS AND REPAIRS

A. Sweep the GCL surface prior to inspection. Inspect all seams and non-seam areas of the geomembrane for defects, holes and any sign of contamination by foreign matter. Mark and repair each location which requires corrective actions.

B. Repair procedures should be agreed upon between the Design Professional and Contractor/QC Site Manager. Unless otherwise agreed, the procedures shall be as follows:

1. Defective seams shall be repaired by reconstruction as described below.
2. Tears shall be repaired by patching.
3. Larger holes and contamination by foreign matter shall be repaired by patches.
4. Patches shall be round or oval in shape, and made of the same GCL and extended a minimum of 24 inches beyond the edge of defects in each direction.
5. Patches shall be applied using approved methods only.

C. If the GCL is subjected to premature hydration, the GCL installer shall notify the Design Professional. The Design Professional shall make a determination as to whether or not the material is acceptable. If the material is not acceptable, the unacceptable areas shall be cut, removed and repaired according to the requirements of this Section.

END OF SECTION

SECTION 310519.26
GEOCOMPOSITES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: The work to be performed under this Section shall include installing geocomposite associated with construction of the final cover systems, downchutes, gravel drains, discharge aprons, anchor trenches, and maintenance and access roads, as shown on the Construction Drawings or as directed by the Design Professional.

B. Related Sections:

1. Section 310513 – Soils for Earthwork
2. Section 310519.16 – Geomembranes for Earthwork
3. Section 310519.23 – Geosynthetic Clay Liner (GCL)

1.2 QUALITY ASSURANCE/QUALITY CONTROL

A. Quality Assurance (QA) and Quality Control (QC) shall be performed in conformance with the Construction Quality Assurance Plan and this Section.

1.3 SUBMITTALS

Approval is required for all submittals. Submit the following in accordance with Section 013300 Submittal Procedures:

A. SD-03 Product Data

1. Sampling and Testing
2. Manufacturer's quality control manual.
3. Penetrations
4. Penetration details.
5. Construction Quality Control (QC) Laboratory
6. Qualifications of laboratory.

B. SD-04 Samples

1. Geosynthetic Drainage Layer
2. Seams and Overlaps
3. One properly identified 24 by 24 inch minimum size geosynthetic drainage layer sample; fasteners proposed for use; and the method of seaming and overlapping.

C. SD-06 Test Reports

1. Sampling and Testing
2. Construction quality control test results.
3. Geosynthetic Drainage Layer
4. Manufacturer's quality control test results.

D. The frequency of testing shall be as specified in Part 3.7 of this Section as well as the Construction Quality Assurance Plan. The manufacturer shall submit his proposed testing program to the Design Professional for approval.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Provide wrapping to protect geocomposite during shipping and storage and should not be removed until just before installation.

B. Protect geocomposite from exposure to UV and moisture.

C. Geocomposite materials shall be stored such that they are not in direct contact with ground and ponded liquid. Any materials that become saturated by stormwater runoff, ponding or direct precipitation will be evaluated by the Design Professional for possible rejection. Rejected materials will be removed from the site and replaced at no additional cost to the Owner.

D. Deliver, store and handle in accordance with the manufacturer's recommendations.

E. Geocomposite shall be lifted off the ground when moving.

F. Contractor shall use a front end loader fitted with a tapered pole for loading and unloading geocomposite.

G. Each roll shall be labelled with the manufacturer's name, product identification, lot number, roll number, and roll dimensions.

PART 2 PRODUCTS

2.1 MATERIALS

A. The polymer used to manufacture the geonet component of the geosynthetic drainage layer shall be polyethylene which is clean and free of any foreign contaminants. Regrind material which consists of edge trimmings and other scraps may be used to manufacture the geonet; however, post-consumer recycled materials shall not be used. Conform the geosynthetic drainage layer to the property requirements listed in Table 1. Component criteria for the geonet alone and geotextile alone are also listed in Table 2 and Table 3. The geonet used shall be covered on both sides

with nonwoven geotextile. Create geocomposite by heat bonding the geotextile to the geonet. The geotextile shall not be bonded to the drainage net within 6 inches of the edges of the rolls. Where applicable, Table 1 property values represent minimum average roll values (MARV). The value for AOS represents the maximum average roll value (MaxARV).

B. Geonet shall have the following properties:

Properties	**Value(1)**	**Test Method(4)**
Thickness, min avg,	250 mil	ASTM D 5199
Polymer Density, min avg	0.940 g/cc	ASTM D 1505
Carbon Black Content	2 percent	ASTM D 1603 ASTM D 4218
Tensile Strength, min avg, Note 2	55 lbs/in	ASTM D 5035 ASTM D 7179

C. Geotextile shall have the following properties:

Properties	**Value(1)**	**Test Method(4)**
Mass/Unit Area, MARV	6.0 oz/SY	ASTM D 5261
Grab Strength, MARV	160 lbs	ASTM D 4632
Grab Elongation, MARV	50 percent	ASTM D 4632
Tear Strength, MARV	65 lbs/in	ASTM D 4533
Puncture Strength, MARV	90 lbs.	ASTM D 4833
Permittivity	1.5/sec	ASTM D 4491
AOS(O95), MaxARV	0.212 mm	ASTM D 4751
UV Stability, percent retained (500 hrs.)	50 percent	ASTM D 4355

D. Geocomposite shall have the following properties:

Properties	**Value(1)**	**Test Method(4)**
Transmissivity, Note 4	0.001 m^2/s	ASTM D 4716

Note 1: The diameter of the presser foot shall be 2.22 inches and the pressure shall be 2.9 psi. For other thickness options, see manuacturer's literature.

Note 2: This is the average peak value for five equally spaced machine direction tests across the roll width.

Note 3: Manufacturer's historical data.

Note 4: Measure manufacturing quality control transmissivity tests using a gradient of 0.02 under a normal load of 240 psf, water at 70 degrees F. Use

a minimum seating period of 15 minutes. Perform the test between rigid end plates. Minimum MQC testing frequency is including attached geotextiles.

Note 5: Average of five tests across the roll width. Discounting the outer 305 mm of each side of the roll, collect samples at the 10, 30, 50, 70, and 90 percent positions across the roll width. Test both sides for double sided geocomposites.

PART 3 EXECUTION

3.1 INSTALLATION

3.2 SURFACE PREPARATION

A. Prior to placement of the geosynthetic drainage layer, the subgrade shall be smooth and free of all materials which could damage the drainage layer.

3.3 PLACEMENT

A. The geosynthetic drainage layer shall not be damaged during placement. Unroll the drainage layer in the direction of maximum slope, keeping the net flat against the subgrade to minimize wrinkles and folds. The drainage layer shall not be dragged across textured geomembrane if a geotextile is attached to the surface facing the geomembrane. Place adequate ballast (e.g. sandbags) to prevent uplift by wind prior to covering.

3.4 SEAMS AND OVERLAPS

A. Geonet Side Seams

Overlap geonet side seams a minimum of 4 inches. Side seam fastener spacing shall be a maximum of 5 feet. In anchor trenches, fastener spacing shall be a maximum of 1 foot.

B. Geonet End Seams

Overlap geonet end seams a minimum of 1 foot. End seam fastener spacing shall be a maximum of 1 foot. Adjoining rolls across the roll width should be shingled down in the direction of the slope and joined together with cable ties spaced every foot along the roll width.

C. Geonet Fasteners

Tie geonet rolls together with plastic fasteners once per every five linear feet in machine direction and once per every linear foot in the transverse direction. The fasteners shall be a contrasting color from the geonet and attached geotextiles. Metallic fasteners will not be allowed.

D. Geotextile Seams

The geotextile component of the geocomposite shall be sewn using manufacturer approved methods. Thread used to sew panels of geotextile together shall be polymeric thread with physical and chemical-resistance properties that equal or exceed those of the geotextile. The thread color shall contrast with the geotextile color and shall be approved for use by the geotextile manufacturer.

E. Geotextile Cap Strips

Place geotextile cap strips over any exposed edges of geocomposite. Cap strips shall be a minimum of 2 feet in width and shall be thermally bonded to the geotextile component of the geocomposite.

F. Stacked Geosynthetic Drainage Layers

When geosynthetic drainage layers are to be stacked, stagger roll ends and edges so that joints do not lie above one another.

G. Corners

In the corners of landfill liner side slopes, install an extra layer of drainage layer material from the top to the bottom of the slope.

H. Penetrations

Mechanically attach a geotextile apron to pipes and other appurtenances penetrating through the drainage layer so that soil is prevented from getting into the drainage layer. The apron of the attached geotextile shall extend out from the pipe or appurtenance a minimum of 2 feet. The apron geotextile shall be thermally bonded to the geonet.

3.5 REPAIRS

A. Geonet Damage

Make repairs by placing a patch of the geosynthetic drainage layer over the damaged area. Extend the patch a minimum of 2 feet beyond the edge of the damage. Use approved fasteners, spaced every 6 inches around the patch, to hold the patch in place. If more than 25 percent of the roll width is damaged, approval must be obtained to repair or replace the damaged roll.

B. Geotextile Damage

Repair damaged geotextile by placing a patch of geotextile over the damaged area with a minimum of 12 inches of overlap in all directions. The geotextile patch shall be thermally bonded in place.

3.6 PRODUCT QUALIFICATION TESTING

A. Quality Control Testing:

1. The Contractor shall perform the initial QC Testing specified herein for each manufacturer and model of geocomposite material prior to approval of material for use.
2. The Contractor shall perform testing for each manufacturer and model of geocomposite materials for the parameters listed in Parts 2.1 of this Section.
3. The Contractor shall submit a three-foot long by the total roll width sample to Design Professional for QA testing.

3.7 QUALITY CONTROL DURING CONSTRUCTION

A. Quality Control Testing:

1. The Contractor shall perform the QC Testing specified herein at the frequency specified for each manufacturer and model of the geotextile material.
2. The Contractor shall collect representative samples from geotextile materials delivered to the Site and test them at a rate of one sample per 100,000 square feet or one sample per lot, whichever is more frequent for the parameters listed in Part 2.1 of this Section.
3. Each sample shall be a minimum of 2 feet long by the roll width and representative of geotextile installed. The Contractor shall mark the sample with the roll number and lot number from which the sample was taken
4. The QC Geosynthetics Laboratory shall forward copies of all material test results to both the Design Professional and the Contractor.

3.8 PROTECTION

A. Cover the geosynthetic drainage layer with the specified materials within 15 days of placement. Place cover soil from the bottom of the slope upward and shall not be dropped directly onto the drainage layer from a height greater than 2 feet. The cover soil shall be pushed out over the geosynthetic drainage layer in an upward tumbling motion so that wrinkles in the drainage layer do not fold over. No equipment shall be operated on the top surface of the geosynthetic drainage layer without permission from the Design Professional. The initial loose soil lift thickness shall be a minimum of 12 inches. Traffic compaction shall consist of a minimum of 2 passes over all areas. Use equipment with ground pressures no greater than 7 psi to place the first lift of soil. The ground pressure shall not exceed 5 psi for placing and compacting select fill on landfill perimeter side slopes. A minimum of 18 inches of soil shall be maintained between construction equipment with a ground pressure greater than 7 psi and the drainage layer. Equipment placing cover soil shall not stop abruptly, make sharp turns, spin their wheels, or travel at speeds exceeding 5 mph. Temporary haul roads for

large construction equipment during select fill placement over geosynthetics are to be overbuilt to a depth of 4 feet to dissipate wheel loads.

END OF SECTION

SECTION 311000
SITE CLEARING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Removing surface debris.
   2. Removing designated trees, shrubs, and other plant life.
   3. Excavating topsoil.

B. Related Sections:
   1. Section 312213 - Rough Grading
   2. Section 312318 - Rock Removal
   3. Section 017419 – Construction Waste Management and Disposal

1.2 QUALITY ASSURANCE

A. Perform Work in accordance with applicable federal, state, and municipal standards.

B. Conform to applicable state regulations for environmental requirements, disposal of debris, and burning debris on site.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing plant life and waste disposal units designated to remain are tagged or identified.

B. Identify waste area for placing removed materials.

3.2 PREPARATION

A. 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.

3.3 PROTECTION

A. Locate, identify, and protect utilities indicated to remain, from damage.

B. Protect bench marks, survey control points, and existing structures from damage or displacement.

3.4 CLEARING

A. Remove trees and shrubs within marked areas indicated. Remove stumps, main root ball, root system to depth of 12 inches below grade.

B. Clear undergrowth and deadwood, without disturbing subsoil.

C. Apply herbicide to remaining stumps to inhibit growth.

3.5 WASTE MANAGEMENT

A. Manage removed debris and vegetation in accordance with Section 017419, Construction Waste Management and Disposal.

B. Stockpile rock as directed by Design Professional.

3.6 TOPSOIL EXCAVATION

A. Excavate topsoil from areas to be further excavated or regraded without mixing with foreign materials for use in finish grading.

B. Do not excavate wet topsoil.

C. Stockpile in area designated on site to depth not exceeding 8 feet and protect from erosion.

D. Do not remove topsoil from site.

END OF SECTION

SECTION 312213
ROUGH GRADING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Excavating topsoil.
2. Excavating subsoil.
3. Cutting, grading, filling, rough contouring, and compacting, site for pads.

B. Related Sections:
1. Section 024119 – Selective Structure Demolition
2. Section 310513 - Soils for Earthwork
3. Section 310516 - Aggregates for Earthwork
4. Section 311000 - Site Clearing
5. Section 312316 - Excavation
6. Section 312317 - Trenching
7. Section 312318 - Rock Removal
8. Section 312323 - Fill

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:
1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
3. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method.
4. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft3 (2,700 kN-m/m3)).
5. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
6. ASTM D2419 - Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.

7. ASTM D2434 - Standard Test Method for Permeability of Granular Soils (Constant Head).
8. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
9. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.3 CLOSEOUT SUBMITTALS

A. Sections 017300 - Execution and 017700 - Closeout Procedures: Requirements for submittals.

B. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with applicable federal, state, and municipal standards.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify survey bench mark and intended elevations for the Work are as indicated on Drawings.

3.2 PREPARATION

A. 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.

B. Identify required lines, levels, contours, and datum.

C. Notify utility company to remove and relocate utilities.

D. Protect utilities indicated to remain from damage.

E. Protect bench marks, survey control point, and existing structures, from excavating equipment and vehicular traffic.

3.3 TOPSOIL EXCAVATION

A. Excavate topsoil from areas to be further excavated or regraded without mixing with foreign materials for use in finish grading.

B. Do not excavate wet topsoil.

C. Stockpile in area designated on site to depth not exceeding 8 feet and protect from erosion.

D. Do not remove topsoil from site.

3.4 SUBSOIL EXCAVATION

A. Excavate subsoil from areas to be further excavated or regraded.

B. When excavating through roots, perform Work by hand and cut roots with sharp axe.

C. Stockpile subsoil in area designated on site to depth not exceeding 8 feet and protect from erosion.

D. Benching Slopes: Horizontally bench existing slopes greater than 1:4 to key placed fill material to slope to provide firm bearing.

E. Stability: Replace damaged or displaced subsoil as specified for fill.

3.5 FILLING

A. Fill areas to contours and elevations with unfrozen materials.

B. Place material in continuous layers as follows:
   1. Structural Fill: Maximum 8 inches compacted depth.
   2. Low Permeability Soil: Maximum 6 inches compacted depth.

C. Maintain optimum moisture content of fill materials to attain required compaction density.

D. Make grade changes gradual. Blend slope into level areas.

E. Repair or replace items indicated to remain damaged by excavation or filling.

3.6 TOLERANCES

A. Section 014000 - Quality Requirements: Tolerances.

B. Top Surface of Subgrade: Plus or minus 1/10 foot from required elevation.

3.7 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

END OF SECTION

SECTION 312316
EXCAVATION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Soil densification.
   2. Excavating for site structures.

B. Related Sections:
   1. Section 310513 - Soils for Earthwork: Stockpiling excavated materials.
   2. Section 310516 - Aggregates for Earthwork: Stockpiling excavated materials.
   3. Section 312213 - Rough Grading: Topsoil and subsoil removal from site surface.
   4. Section 312317 - Trenching: Excavating for utility trenches.
   5. Section 312318 - Rock Removal: Removal of rock during excavating.
   6. Section 312323 - Fill.

1.2 REFERENCES

A. ASTM International:
   1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
   2. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method.
   3. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
   4. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

B. Local utility standards when working within 24 inches of utility lines.

1.3 QUALITY ASSURANCE

A. Perform Work in accordance with applicable federal, state, and municipal standards.

1.4 QUALIFICATIONS

A. Prepare excavation protection plan under direct supervision of Professional Engineer experienced in design of this Work and licensed in the State of Arkansas.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 PREPARATION

A. 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.

B. Identify required lines, levels, contours, and datum.

C. Notify utility companies to remove and relocate utilities.

D. Protect utilities indicated to remain from damage.

E. Protect bench marks, survey control points, and existing structures from excavating equipment and vehicular traffic.

3.2 EXCAVATION

A. Underpin adjacent structures which may be damaged by excavation work.

B. Excavate subsoil to accommodate site structures and construction operations.

C. Excavate to working elevation for piling work.

D. Grade top perimeter of excavation to prevent surface water from draining into excavation.

E. Trim excavation. Remove loose matter.

F. Notify Engineer of unexpected subsurface conditions.

G. Correct areas over excavated with structural fill specified in Section 312323 as directed by Engineer.

H. Stockpile subsoil in area designated on site to depth not exceeding 8 feet and protect from erosion.

I. Repair or replace items indicated to remain damaged by excavation.

3.3 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Request visual inspection of bearing surfaces by Engineer before installing subsequent work.

3.4 PROTECTION

A. Prevent displacement or loose soil from falling into excavation; maintain soil stability.

B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

C. Protect structures, utilities and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth operations.

END OF SECTION

SECTION 312317
TRENCHING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Excavating trenches for utilities.
2. Compacted fill from top of utility bedding to subgrade elevations.
3. Backfilling and compaction.

B. Related Sections:
1. Section 033000 - Cast-In-Place Concrete: Concrete materials
2. Section 310513 - Soils for Earthwork: Soils for fill
3. Section 310516 - Aggregates for Earthwork: Aggregates for fill
4. Section 312213 - Rough Grading: Topsoil and subsoil removal from site surface
5. Section 312316 - Excavation: General building excavation
6. Section 312318 - Rock Removal: Removal of rock during excavating
7. Section 312323 - Fill: General backfilling
8. Section 313700 - Riprap

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:
1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
3. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method.
4. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft3 (2,700 kN-m/m3)).
5. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.

6. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
7. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.3 DEFINITIONS

A. Utility: Any buried pipe, duct, conduit, or cable.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with applicable federal, state, and municipal standards.

1.5 QUALIFICATIONS

A. Prepare excavation protection plan under direct supervision of Professional Engineer experienced in design of this Work and licensed in the State of Arkansas.

1.6 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.7 COORDINATION

A. Section 013100 – Project Management and Coordination: Coordination and project conditions.

B. Verify Work associated with lower elevation utilities is complete before placing higher elevation utilities.

PART 2 PRODUCTS

2.1 FILL MATERIALS

A. Structural Fill: As specified in Section 310513.

B. Granular Fill: As specified in Section 310516.

2.2 ACCESSORIES

A. Geotextile Fabric: Non-biodegradable, non-woven.
   1. Alkzo Nobel Geosynthetic Co.
   2. Huesker, Inc.
   3. TC Mirafi.

4. Tenax Corp.
5. Tensar Earth Technologies, Inc.

PART 3 EXECUTION

3.1 LINES AND GRADES

A. Lay pipes to lines and grades indicated on Drawings.
   1. Engineer reserves right to make changes in lines, grades, and depths of utilities when changes are required for Project conditions.

B. Use laser-beam instrument with qualified operator to establish lines and grades.

3.2 PREPARATION

A. 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.

B. Identify required lines, levels, contours, and datum locations.

C. Protect bench marks and existing structures from excavating equipment and vehicular traffic.

D. Maintain and protect above and below grade utilities indicated to remain.

3.3 TRENCHING

A. Excavate subsoil required for utilities to utility service.

B. Remove lumped subsoil, boulders, and rock up of 1/6 cubic yard, measured by volume.

C. Do not advance open trench more than 200 feet ahead of installed pipe.

D. Cut trenches to width indicated on Drawings. Remove water or materials that interfere with Work.

E. Excavate trenches to depth indicated on Drawings. Provide uniform and continuous bearing and support for bedding material and pipe utilities.

F. When Project conditions permit, slope side walls of excavation starting 2 feet above top of pipe. When side walls can not be sloped, provide sheeting and shoring to protect excavation as specified in this section.

G. When subsurface materials at bottom of trench are loose or soft, excavate to greater depth as directed by Engineer until suitable material is encountered.

H. Cut out soft areas of subgrade not capable of compaction in place. Backfill with fill as specified in Section 312323 and compact to density equal to or greater than requirements for subsequent backfill material.

I. Correct areas over excavated areas with compacted backfill as specified for authorized excavation or replace with fill concrete as directed by Engineer.

J. Stockpile subsoil in area designated on site to depth not exceeding 8 feet and protect from erosion.

3.4 SHEETING AND SHORING

A. Sheet, shore, and brace excavations to prevent danger to persons, structures and adjacent properties and to prevent caving, erosion, and loss of surrounding subsoil.

B. Support trenches more than 5 feet deep excavated through unstable, loose, or soft material. Provide sheeting, shoring, bracing, or other protection to maintain stability of excavation.

C. Design sheeting and shoring to be left in place as part of the completed Work, cut off minimum 18 inches below finished grade.

D. Repair damage caused by failure of the sheeting, shoring, or bracing and for settlement of filled excavations or adjacent soil.

E. Repair damage to new and existing Work from settlement, water or earth pressure or other causes resulting from inadequate sheeting, shoring, or bracing.

3.5 BACKFILLING

A. Backfill trenches to contours and elevations with unfrozen fill materials.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.

C. Place fill material in continuous layers and compact.

D. Employ placement method that does not disturb or damage foundation perimeter drainage or utilities in trench.

E. Maintain optimum moisture content of fill materials to attain required compaction density.

F. Do not leave more than 50 feet of trench open at end of working day.

G. Protect open trench to prevent danger to personnel.

3.6 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

3.7 PROTECTION OF FINISHED WORK

A. Sections 017300 - Execution and Section 017700 - Closeout Procedures: Protecting finished work.

B. Reshape and re-compact fills subjected to vehicular traffic during construction.

END OF SECTION

SECTION 312318
ROCK REMOVAL

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Removing discovered rock during excavation.

B. Related Sections:
   1. Section 312213 - Rough Grading
   2. Section 312316 - Excavation
   3. Section 312317 - Trenching
   4. Section 313700 - Riprap

1.2 DEFINITIONS

A. Site Rock: Solid mineral material with volume in excess of 1/3 cu yd or solid material that cannot be removed with 3/4 cu yd capacity excavator without drilling.

1.3 SUBMITTALS

A. Submit location and estimated widths and depths of rock removal to Design Professional for approval.

1.4 SCHEDULING

A. Section 013100 – Project Management and Coordination: Coordination and project conditions.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 013100 – Project Management and Coordination: Coordination and project conditions.

B. Verify site conditions and note subsurface irregularities affecting Work of this section.

3.2 PREPARATION

A. Identify required lines, levels, contours, and datum.

3.3 ROCK REMOVAL BY MECHANICAL METHOD

A. Excavate and remove rock by mechanical method.
   1. Drill holes and use expansive tools, wedges, or mechanical disintegration compound to fracture rock.

B. Cut away rock at bottom of excavation to form level bearing.

C. Remove shaled layers to provide sound and unshattered base.

D. In utility trenches, excavate to 6 inches below invert elevation of pipe and 24 inches wider than pipe diameter.

E. Remove excavated materials from site.

F. Correct unauthorized rock removal in accordance with backfilling and compacting requirements of Section 312323 as directed by Design Professional.

G. Stockpile rock as directed by Design Professional.

3.4 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Request visual inspection of foundation bearing surfaces by Design Professional before installing subsequent work.

END OF SECTION

SECTION 312323
FILL

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Fill under slabs-on-grade.
   2. Fill for over-excavation.

B. Related Sections:
   1. Section 033000 - Cast-In-Place Concrete: Concrete materials
   2. Section 310513 - Soils for Earthwork: Soils for fill
   3. Section 310516 - Aggregates for Earthwork: Aggregates for fill
   4. Section 312213 - Rough Grading: Site filling
   5. Section 312316 - Excavation
   6. Section 312317 - Trenching: Backfilling of utility trenches
   7. Section 313700 - Riprap

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
   1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
   2. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method.
   3. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft3 (2,700 kN-m/m3)).
   4. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
   5. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
   6. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
   7. ASTM D4253 - Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.

PART 2 PRODUCTS

2.1 FILL MATERIALS

A. Subsoil Fill: As specified in Section 310513.

2.2 ACCESSORIES

A. Geotextile Fabric: Non-biodegradable, non-woven.
   1. TC Mirafi.
   2. Tensar Earth Technologies, Inc.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify subdrainage, dampproofing, or waterproofing installation has been inspected.

B. Verify underground tanks are anchored to their own foundations to avoid flotation after backfilling.

C. Verify structural ability of unsupported walls to support loads imposed by fill.

3.2 PREPARATION

A. Compact subgrade to density requirements for subsequent backfill materials.

B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with structural fill and compact to density equal to or greater than requirements for subsequent fill material.

C. Scarify subgrade surface to depth of 6 inch.

D. Proof roll to identify soft spots; fill and compact to density equal to or greater than requirements for subsequent fill material.

3.3 BACKFILLING

A. Backfill areas to contours and elevations with unfrozen materials.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.

C. Place fill material in continuous layers and compact.

D. Employ placement method that does not disturb or damage other work.

E. Maintain optimum moisture content of backfill materials to attain required compaction density.

F. Backfill simultaneously on each side of unsupported foundation walls until supports are in place.

G. Slope grade away from building minimum 5 percent slope for minimum distance of 10 ft, unless noted otherwise.

H. Make gradual grade changes. Blend slope into level areas.

3.4 TOLERANCES

A. Section 014000 - Quality Requirements: Tolerances.

3.5 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Perform laboratory material tests in accordance with ASTM D1557.

C. Perform in place compaction tests in accordance with the following:
   1. Density Tests: ASTM D1556.
   2. Moisture Tests: ASTM D3017.

D. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

3.6 PROTECTION OF FINISHED WORK

A. Sections 017300 - Execution and 017700 - Closeout Procedures: Protecting finished work.

B. Reshape and re-compact fills subjected to vehicular traffic.

END OF SECTION

SECTION 312324
WASTE RELOCATION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Soil densification.
   2. Excavating for site structures.

B. Related Sections:
   1. Section 015000 – Temporary Facilities and Controls
   2. Section 015713 – Temporary Erosion and Sediment Controls
   3. Section 310513 - Soils for Earthwork
   4. Section 310519.16 - Geomembranes for Earthwork
   5. Section 310519.23 - Geosynthetic Clay Liners
   6. Section 310519.26 – Geocomposites
   7. Section 312316 - Excavation

1.2 REFERENCES

A. Arkansas Pollution Control and Ecology Commission Regulation No. 27 Licensing of Operators at Solid Waste Management Facilities and Illegal Dumps Control Officers, February 24, 2006.

B. Arkansas Pollution Control and Ecology Commission Regulation No. 22 Solid Waste Management Rules, March 28, 2007.

1.3 SUBMITTALS

A. Contractor shall submit a Waste Relocation Plan to the Design Professional. The plan shall outline procedures and schedule for relocation of waste from Area 1-2 to Area 1-3, as well as waste relocation within Area 1-3 and Class 4. Methods shall minimize impacts associated with exposed waste, including, but not limited to, storm water impacts, odor, vectors, and explosive gases.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with applicable federal, state, and municipal standards. Waste management during relocation shall conform to Arkansas Pollution Control and Ecology Commissions Regulation No. 22, including, but not limited to for Class 1 landfills:
   1. Reg. 22.413 – Cover Material Requirements

2. Reg. 22.414 – Disease Vector Control
3. Reg. 22.415 – Explosive Gases Control
4. Reg. 22.416 – Air Criteria
5. Reg. 22.418 – Run-on/Run-off Control Systems

And for Class 4 landfills:

6. Reg. 22.609 – Cover Material Requirements
7. Reg. 22.610 – Disease Vector Control
8. Reg. 22.611 – Explosive Gases Control
9. Reg. 22.612 – Air Criteria
10. Reg. 22.614 – Run-on/Run-off Control Systems

1.5 QUALIFICATIONS

A. Contractor shall have a Class 1 Level C licensed Operator on site during waste relocation. Operator shall be licensed in accordance with License as required by Arkansas Pollution Control and Ecology Commission Regulation No. 27.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 WASTE REMOVAL

A. Waste shall be removed from the locations and to the elevations indicated on the Construction Drawings.

B. Existing soil cover shall be removed and stockpiled for reuse, if feasible.

C. Waste removal shall be scheduled to minimize exposed waste.

D. Water shall be used to minimize dust and blowing debris.

E. Erosion control measures shall be used to minimize run-on and run-off from exposed waste.

F. Spillage and airborne waste shall be minimized during transport. Waste blown or spilled from transport vehicles shall be recovered promptly and added to relocated waste.

G. Stockpiled cover soil or imported fill shall be used to provide 12 inches of daily cover for exposed waste.

H. Benchmarks, survey control points, and existing structures shall be protected from excavating equipment and vehicular traffic.

3.2 REMOVED WASTE RELOCATION

A. Removed waste shall be placed in the locations and to the elevations indicated on the Construction Drawings.

B. Waste placement shall be scheduled to minimize exposed waste.

C. Water shall be used to minimize dust and blowing debris.

D. Erosion control measures shall be used to minimize run-on and run-off from exposed waste in accordance with Sections 015000 and 015713.

E. Erosion control measures shall be used to minimize run-on and run-off from exposed waste.

F. Waste blown or spilled from transport vehicles shall be recovered promptly and added to relocated waste.

G. Waste shall be mechanically compacted using two to three passes of a sheepsfoot roller.

H. Stockpiled soil or imported fill shall be used to provide 12 inches of daily cover for exposed waste.

I. Benchmarks, survey control points, and existing structures shall be protected from excavating equipment and vehicular traffic.

3.3 FIELD QUALITY CONTROL

A. Survey final elevations to verify grades.

END OF SECTION

SECTION 312513
EROSION CONTROLS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Diversion Channels.
   2. Rock Energy Dissipator.
   3. Sediment Ponds.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO T88 - Standard Specification for Particle Size Analysis of Soils.
   2. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
   1. ASTM C127 - Standard Test Method for Specific Gravity and Absorption of Coarse Aggregate.
   2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
   3. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft3 (2,700 kN-m/m3)).
   4. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
   5. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Product Data: Product Data: Submit data on geotextile.

1.4 CLOSEOUT SUBMITTALS

A. Sections 017300 - Execution and 017700 - Closeout Procedures: Requirements for submittals.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with applicable federal, state, and municipal standards.

1.6 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.

PART 2 PRODUCTS

2.1 ROCK AND GEOTEXTILE MATERIALS

A. Furnish materials in accordance with applicable federal, state, and municipal standards.

B. Rock: Sound, hard and angular shape; well graded; without shale seams, structural defects and foreign substances; with width and thickness greater than one third its length; minimum specific gravity of 2.5, as determined in accordance with ASTM C127, bulk saturated, and surface dry basis; size and gradation in accordance with NCSA Class, Size No. R7 within the following limits:

Square Opening inches (mm)	Percent Passing NCSA Size No.					
	R8	R7	R6	R5	R4	R3
42 (1066)	100					
30 (762)		100				
24 (610)	15-50		100			
18 (460)		15-50		100		
15 (380)	0-15					
12 (300)		0-15	15-50		100	
9 (225)				15-50		
6 (150)		0-15	0-15		15-50	100
Square Opening inches (mm)	Percent Passing NCSA Size No.					
	R8	R7	R6	R5	R4	R3
4 (100)				0-15		
3 (75)					0-15	15-50
2 (50)						0-15

C. Geotextile Fabric: Furnish in accordance with Arkansas Department of Transportation standards.

2.2 PIPE MATERIALS

A. Pipe: Corrugated plastic, as specified in Section 334213.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 013100 – Project Management and Coordination: Verification of existing conditions before starting work.

B. Verify gradients and elevations of base or foundation for other work are correct.

3.2 DIVERSION CHANNELS

A. Windrow excavated material on low side of channel.

B. Compact to 95 percent maximum density.

C. On entire channel area, apply soil supplements and sow seed as specified in Section 329219.

D. Mulch seeded areas with hay as specified in Section 329219.

3.3 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.

NCSA Class	Nominal Placement Thickness (inches)
R8	48
R7	36
R6	30
R5	24
R4	18
R3	12

B. Install Work in accordance with applicable federal, state, and municipal standards.

3.4 SEDIMENTATION POND

A. Clear and grub storage area and embankment foundation area site.

B. Excavate key trench for full length of dam. Excavate emergency spillway in natural ground.

C. Install pipe spillway, with anti-seep collar attached, at location indicated.

D. Do not use coarse aggregate as backfill material around pipe. Backfill pipe with suitable embankment material to prevent dam leakage along pipe.

E. On entire sedimentation pond area, apply soil supplements and sow seed as specified in Section 329219.

F. Mulch seeded areas with hay as specified in Section 329219.

3.5 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 20 days.
   1. During non-germinating periods, apply mulch at recommended rates.
   2. Stabilize disturbed areas which are not at finished grade and which will be disturbed within one year in accordance with Section 329219 at 20 percent of permanent application rate with no topsoil.
   3. Stabilize disturbed areas which are either at finished grade or will not be disturbed within one year in accordance with Section 329219 permanent seeding specifications.

E. Stabilize diversion channels, sediment traps, and stockpiles immediately.

3.6 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.

3.7 CLEANING

A. Sections 017300 - Execution and 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.

3.8 PROTECTION

A. Sections 017300 - Execution and 017700 - Closeout Procedures: Requirements for protecting finished Work.

END OF SECTION

SECTION 313700
RIPRAP

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Riprap placed loose.

B. Related Sections:
   1. Section 310516 - Aggregates for Earthwork
   2. Section 312213 - Rough Grading
   3. Section 312316 - Excavation: Excavating for riprap
   4. Section 312317 - Trenching
   5. Section 312323 - Fill

1.2 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data for riprap bags, binder and geotextile fabric.

1.3 QUALITY ASSURANCE

A. Furnish each aggregate material from single source throughout the Work.

B. Perform Work in accordance with applicable federal, state, and municipal standards.

PART 2 PRODUCTS

2.1 MATERIALS

A. Furnish materials in accordance with Arkansas Department of Transportation standards.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 013100 – Project Management and Coordination: Verification of existing conditions before starting work.

B. Do not place riprap bags over frozen or spongy subgrade surfaces.

3.2 PLACEMENT

A. Place geotextile fabric over substrate, lap edges and ends.

B. Place riprap at culvert pipe ends and as indicated on Drawings.

C. Installed Thickness: As indicated on Drawings.

D. Place rock evenly and carefully over bagged riprap to minimize voids, do not tear bag fabric, place bags and rock in one consistent operation to preclude disturbance or displacement of substrate.

E. After placement, spray with water to moisten bagged mix. Keep bagged mix moist for 24 hours.

END OF SECTION

SECTION 320516
AGGREGATES FOR EXTERIOR IMPROVEMENTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Coarse aggregate materials.

B. Related Sections:

1. Section 310516 - Aggregates for Earthwork.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:

1. AASHTO M147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses.
2. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:

1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
3. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft3 (2,700 kN-m/m3)).
4. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).
5. ASTM D4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Materials Source: Submit name of imported materials suppliers.

C. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

A. Furnish each aggregate material from single source throughout the Work.

B. Perform Work in accordance with applicable, federal, state, and municipal standards.

PART 2 PRODUCTS

2.1 COARSE AGGREGATE MATERIALS

A. Coarse Aggregate: Furnish material as specified by the Arkansas Department of Transportation for gravel access roads.

2.2 SOURCE QUALITY CONTROL

A. Section 014000 - Quality Requirements: Testing and inspection services.

B. Coarse Aggregate Material - Testing and Analysis: Perform in accordance with ASTM D698, ASTM D1557, AASHTO T180, ASTM D4318, and ASTM C136.

C. When tests indicate materials do not meet specified requirements, change material and retest.

PART 3 EXECUTION

3.1 STOCKPILING

A. Stockpile materials on site at locations designated by Design Professional.

B. Stockpile in sufficient quantities to meet Project schedule and requirements.

C. Separate different aggregate materials with dividers or stockpile individually to prevent mixing.

D. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

3.2 STOCKPILE CLEANUP

A. Leave unused materials in neat, compact stockpile.

B. When borrow area is indicated, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION

SECTION 323113
CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fence framework, fabric, and accessories.
2. Excavation for post bases.
3. Concrete foundation for posts.
4. Manual gates and related hardware.

B. Related Sections:

1. Section 033000 – Cast-in-Place Concrete

1.2 REFERENCES

A. ASTM International:

1. ASTM A121 - Standard Specification for Zinc-Coated (Galvanized) Steel Barbed Wire.
2. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
3. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
4. ASTM A392 - Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric.
5. ASTM A491 - Standard Specification for Aluminum-Coated Steel Chain-Link Fence Fabric.
6. ASTM A585 - Standard Specification for Aluminum-Coated Steel Barbed Wire.
7. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
8. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
9. ASTM B429 - Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
10. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.

11. ASTM F567 - Standard Practice for Installation of Chain-Link Fence.
12. ASTM F668 - Standard Specification for Poly (Vinyl Chloride) (PVC)-Coated Steel Chain Link Fence Fabric.
13. ASTM F900 - Standard Specification for Industrial and Commercial Swing Gates.
14. ASTM F934 - Standard Specification for Standard Colors for Polymer-Coated Chain Link Fence Materials.
15. ASTM F1043 - Standard Specification for Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework.
16. ASTM F1083 - Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.
17. ASTM F1184 - Standard Specification for Industrial and Commercial Horizontal Slide Gates.

B. Chain Link Fence Manufacturers Institute:

1. CLFMI - Product Manual.

1.3 SYSTEM DESCRIPTION

A. Fence Height: 10 feet as indicated on Drawings.

B. Line Post Spacing: At intervals not exceeding 10 feet.

C. Fence Post and Rail Strength: Conform to ASTM F1043 Light Industrial Fence quality.

1.4 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, gates, and schedule of components.

C. Product Data: Submit data on fabric, posts, accessories, fittings and hardware.

1.5 CLOSEOUT SUBMITTALS

A. Sections 017300 - Execution and 017700 - Closeout Procedures: Closeout procedures.

B. Project Record Documents: Accurately record actual locations of property perimeter posts relative to property lines and easements.

C. Operation and Maintenance Data: Procedures for submittals.

1.6 QUALITY ASSURANCE

A. Supply material in accordance with CLFMI - Product Manual.

B. Perform installation in accordance with ASTM F567.

C. Perform Work in accordance with applicable federal, state, and municipal standards.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing work of this section with minimum three years documented experience.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver fence fabric and accessories in packed cartons or firmly tied rolls.

B. Identify each package with manufacturer’s name.

C. Store fence fabric and accessories in secure and dry place.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers:

1. Anchor Fence Inc.
2. Cyclone Inc.
3. Page Aluminized Steel Corp.

2.2 MATERIALS AND COMPONENTS

A. Materials and Components: Conform to CLFMI Product Manual.

B. Intermediate Posts: Type I round.

C. Terminal, Corner, Rail, Brace, and Gate Posts: Type I round.

D. Concrete: ASTM C94/C94M, Option A; Normal Portland Cement, 2,500 psi strength at 28 days.

2.3 ACCESSORIES

A. Caps: Cast steel galvanized; sized to post diameter, set screw retainer.

B. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings.

C. Extension Arms: Cast steel galvanized to accommodate 6 strands of barbed wire, single arm, vertical sloped to 45 degrees.

D. Gate Hardware: Fork latch with gravity drop; two 180 degree gate hinges for each leaf.

2.4 GATES

A. General:

1. Gate Types, Opening Widths and Directions of Operation: As indicated on Drawings.
2. Factory assemble gates.
3. Design gates for operation by one person.

B. Swing Gates:

1. Fabricate gates to permit 180 degree swing.
2. Gates Construction: ASTM F900 with welded corners. Use of corner fittings is not permitted.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install framework, fabric, accessories and gates in accordance with ASTM F567.

B. Set intermediate, terminal, and gate posts plumb, in concrete footings with top of footing 2 inches above finish grade. Slope top of concrete for water runoff.

C. Concrete a specified in Section 033000, Cast-In-Place Concrete.

D. Line Post Footing Depth Below Finish Grade: ASTM F567.

E. Corner, Gate and Terminal Post Footing Depth Below Finish Grade: ASTM F567.

F. Brace each gate and corner post to adjacent line post with horizontal center brace rail and diagonal truss rods. Install brace rail one bay from end and gate posts.

G. Install top rail through line post tops and splice with 6 inch long rail sleeves.

H. Install center and bottom brace rail on corner gate leaves.

I. Install bottom tension wire stretched taut between terminal posts.

J. Install support arms sloped inward and attach barbed wire; tension and secure.

K. Support gates from gate posts. Do not attach hinged side of gate from building wall.

L. Install gate with fabric and barbed wire overhang to match fence. Install three hinges on each gate leaf, latch, catches, and drop bolt.

M. Install posts with 6 inches maximum clear opening from end posts to buildings, fences and other structures.

N. Excavate holes for posts to diameter and spacing indicated on Construction Drawings without disturbing underlying materials.

O. Center and align posts. Place concrete around posts, and vibrate or tamp for consolidation. Verify vertical and top alignment of posts and make necessary corrections.

P. Extend concrete footings 1 inch above grade, and trowel, forming crown to shed water.

Q. Allow footings to cure minimum 7 days before installing fabric and other materials attached to posts.

END OF SECTION

SECTION 329113
SOIL PREPARATION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Preparation of structural fill, low permeability soil, and protective cover soil.
2. Soil testing.

B. Related Sections:

1. Section 312213 - Rough Grading: Rough grading of site.
2. Section 312317 - Trenching: Rough grading over cut.
3. Section 329219 - Seeding

1.2 QUALITY ASSURANCE

A. Perform Work in accordance with applicable federal, state, and municipal standards.

1.3 COORDINATION

A. Section 013100 – Project Management and Coordination: Requirements for coordination.

PART 2 PRODUCTS

2.1 SOIL MATERIALS

A. Soil Types: As specified in Section 310513.

2.2 ACCESSORIES

A. Edging: Galvanized steel.

2.3 SOURCE QUALITY CONTROL

A. Section 014000 - Quality Requirements: Testing, inspection and analysis requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 013100 – Project Management and Coordination: Verification of existing conditions before starting work.

B. Verify prepared soil base is ready to receive the Work of this section.

3.2 PREPARATION OF SOIL

A. Screen soil to remove particles larger than 1 inch.

B. Mechanical methods for removing large particles may be used for the grading layer.

END OF SECTION

SECTION 329219
SEEDING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fertilizing.
2. Seeding.
3. Hydroseeding.
4. Mulching.
5. Maintenance.

B. Related Sections:

1. Section 312213 - Rough Grading: Rough grading of site.
2. Section 312317 - Trenching: Rough grading over cut.
3. Section 310513 - Soils for Earthwork

1.2 REFERENCES

A. ASTM International:

1. ASTM C602 - Standard Specification for Agricultural Liming Materials.

1.3 DEFINITIONS

A. Weeds: Vegetative species other than specified species to be established in given area.

1.4 SUBMITTALS

A. Section 013300 - Submittal Procedures Requirements for submittals.

B. Product Data: Submit data for seed mix, fertilizer, mulch, and other accessories.

C. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 CLOSEOUT SUBMITTALS

A. Sections 017300 - Execution and 017700 - Closeout Procedures: Requirements for submittals.

B. Operation and Maintenance Data: Include maintenance instructions, cutting method and maximum grass height.

1.6 QUALITY ASSURANCE

A. Provide seed mixture in containers showing percentage of seed mix, germination percentage, inert matter percentage, weed percentage, year of production, net weight, date of packaging, and location of packaging.

B. Perform Work in accordance with applicable federal, state, and municipal standards.

1.7 QUALIFICATIONS

A. Seed Supplier: Company specializing in manufacturing Products specified in this section.

B. Installer: Company specializing in performing work of this section.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.

B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer or approved equivalent.

1.9 MAINTENANCE SERVICE

A. Sections 017300 - Execution and 017700 - Closeout Procedures: Requirements for maintenance service.

B. Maintain seeded areas for three months from Date of Substantial Completion.

PART 2 PRODUCTS

2.1 SEED MIXTURE

A. Furnish materials in accordance with applicable federal, state, and municipal standards.

B. Seed mixture will be 50% Sericea Lespedeza and 50% Tall Fescue

2.2 ACCESSORIES

A. Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are acceptable.

B. Fertilizer: Commercial grade; recommended for grass; of proportion necessary to eliminate deficiencies of topsoil, as indicated by topsoil testing (Section 310513), to the following proportions: Nitrogen 30 percent, phosphoric acid 30 percent, soluble potash 30 percent.

2.3 SOURCE QUALITY CONTROL

A. Section 014000 - Quality Requirements: Testing, inspection and analysis requirements.

B. Provide recommendation for fertilizer and lime application rates for specified seed mix based topsoil testing (Section 310513).

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 013100 – Project Management and Coordination: Verification of existing conditions before starting work.

B. Verify prepared soil base is ready to receive the Work of this section.

3.2 FERTILIZING

A. Apply fertilizer at application rate recommended by soil analysis.

B. Adjust soil pH as recommended by soil analysis

C. Apply after smooth raking of topsoil and prior to roller compaction.

D. Do not apply fertilizer at same time or with same machine used to apply seed.

E. Mix fertilizer thoroughly into upper 2 inches of topsoil.

F. Lightly water soil to aid dissipation of fertilizer. Irrigate top level of soil uniformly.

3.3 SEEDING

A. Apply seed mixture at rate of 4 of live seed per 1000 sq ft evenly in two intersecting directions. Rake in lightly.

B. Do not seed areas in excess of that which can be mulched on same day.

C. Do not sow immediately following rain, when ground is too dry, or when winds are over 12 mph.

3.4 HYDROSEEDING

A. Apply fertilizer, mulch and seeded slurry with hydraulic seeder at rate of 5 lbs per 1000 sq ft evenly in one pass.

B. After application, apply water with fine spray immediately after each area has been hydroseeded. Saturate to 4 inches of soil and maintain moisture levels two to four inches.

3.5 SEED PROTECTION

A. Identify seeded areas with stakes and string around area periphery.

B. Cover seeded slopes where grade is greater than 3H:1V or greater with erosion fabric. Roll fabric onto slopes without stretching or pulling.

C. Lay fabric smoothly on surface, bury top end of each section in 6 inch deep excavated topsoil trench. Overlap edges and ends of adjacent rolls minimum 12 inches. Backfill trench and rake smooth, level with adjacent soil.

D. Secure outside edges and overlaps at 36 inch intervals with stakes.

E. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.

F. At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges minimum 6 inches.

3.6 MAINTENANCE

A. Water to prevent grass and soil from drying out.

B. Control growth of weeds. Apply herbicides. Remedy damage resulting from improper use of herbicides.

C. Immediately reseed areas showing bare spots.

D. Repair washouts or gullies.

E. Protect seeded areas with warning signs during maintenance period.

END OF SECTION

SECTION 330513
MANHOLES AND STRUCTURES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Monolithic concrete manholes and structures with masonry transition to cover frame, covers, anchorage, and accessories.
   2. Modular precast concrete manhole and structures with tongue-and-groove joints with masonry transition to cover frame, covers, anchorage, and accessories.
   3. Bedding and cover materials.
   4. Manhole Testing.

B. Related Sections:
   1. Section 033000 - Cast-In-Place Concrete
   2. Section 310513 - Soils for Earthwork
   3. Section 310516 - Aggregates for Earthwork
   4. Section 312316 - Excavation
   5. Section 312323 - Fill

1.2 REFERENCES

A. American Concrete Institute:
   1. ACI 318 - Building Code Requirements for Structural Concrete.
   2. ACI 530/530.1 - Building Code Requirements for Masonry Structures and Specifications for Masonry Structures.

B. ASTM International:
   1. ASTM C478-15 – Standard Specification for Circular Precast Reinforced Concrete Manhole Sections
   2. ASTM A48/A48M - Standard Specification for Gray Iron Castings.
   3. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   4. ASTM A536 - Standard Specification for Ductile Iron Castings.
   5. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
   6. ASTM C55 - Standard Specification for Concrete Brick.
   7. ASTM C62 - Standard Specification for Building Brick (Solid Masonry Units Made From Clay or Shale).
   8. ASTM C913 - Standard Specification for Precast Concrete Water and Wastewater Structures.

1.3 DESIGN REQUIREMENTS

A. Equivalent strength: Based on structural design of reinforced concrete as outlined in ACI 318.

B. Design of Lifting Devices for Precast Components: In accordance with ASTM C913.

C. Design of Joints for Precast Components: In accordance with ASTM C913; maximum leakage of 0.025 gallons per hour per foot of joint at 3 feet of head.

1.4 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Shop Drawings: Indicate manhole and structure locations, elevations, piping, and conduit sizes and elevations of penetrations.

C. Product Data: Submit cover and frame construction, features, configuration, and dimensions.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with applicable federal, state, and municipal standards.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years documented experience.

1.7 DELIVERY, STORAGE AND HANDLING

A. Comply with precast concrete manufacturer's instructions for unloading, storing and moving precast manholes and structures.

B. Store precast concrete manholes and structures to prevent damage to Owner's property or other public or private property. Repair property damaged from materials storage.

C. Mark each precast structure by indentation or waterproof paint showing date of manufacture, manufacturer, and identifying symbols and numbers shown on Drawings to indicate its intended use.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Maintain materials and surrounding air temperature to minimum 50 degrees F prior to, during, and 48 hours after completion of masonry work.

PART 2 PRODUCTS

2.1 MANHOLES [AND STRUCTURES]

A. Manhole and Structure Sections: Reinforced precast concrete in accordance with ASTM C478 with gaskets in accordance with ASTM C923.

2.2 FRAMES AND COVERS

A. Manufacturers:
   1. Barry Pattern and Foundry Co. Inc.
   2. Campbell Foundry Co.
   3. McKinley Iron Works
   4. Neenah Foundry Co.

B. Product Description: ASTM A48/A48M, Class 30B Cast iron construction, machined flat bearing surface, removable lockable lid, closed cover design; live load rating of 200 psf.

2.3 COMPONENTS

A. Manhole and Structure Steps: Formed galvanized steel rungs; 3/4 inch diameter.

B. Base Pad: Cast-in-place concrete of type specified in Section 033000, leveled top surface.

2.4 CONFIGURATION

A. Steps: As required by applicable code.

2.5 FINISHING - STEEL

A. Galvanizing: ASTM A123/A123M; minimum 2.0 oz/sq ft coating thickness]; galvanize after fabrication.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 013100 – Project Management and Coordination: Verification of existing conditions before starting work.

B. Verify items provided by other sections of Work are properly sized and located.

C. Verify 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. Coordinate placement of inlet and outlet pipe or duct sleeves required by other sections.

B. Do not install structures where site conditions induce loads exceeding structural capacity of structures.

C. 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 for manholes and structures in accordance with Section 312316 in location and to depth shown on Construction Drawings. Provide clearance around sidewalls of structure for construction operations.
   2. When groundwater is encountered, prevent accumulation of water in excavations. Place manholes and structures in dry trench.
   3. Where possibility exists of watertight structure becoming buoyant in flooded excavation, anchor structure to avoid flotation.

B. Place base pad, trowel top surface level.

C. Place manhole and structure sections plumb and level, trim to correct elevations, anchor to base pad.

D. Backfill excavations for manholes and structures in accordance with Section 312316.

E. Form and place manhole and structures cylinder plumb and level, to correct dimensions and elevations. As Work progresses, build fabricated metal items.

F. Cut and fit for pipe.

G. Grout base of shaft sections to achieve slope to exit piping. Trowel smooth. Contour to form continuous drainage channel as indicated on Construction Drawings.

H. Set cover frames and covers level without tipping, to correct elevations.

I. Coordinate with other sections of Work to provide correct size, shape, and location.

3.4 PRECAST CONCRETE MANHOLE AND STRUCTURE INSTALLATION

A. Lift precast components at lifting points designated by manufacturer.

B. When lowering manholes and structures into excavations and joining pipe to units, take precautions to ensure interior of pipeline and structure remains clean.

C. Set precast structures bearing firmly and fully on compacted crushed stone bedding or on other support system shown on Construction Drawings.

D. Assemble multi-section structures by lowering each section into excavation. Lower, set level, and firmly position base section before placing additional sections.

E. Remove foreign materials from joint surfaces and verify sealing materials are placed properly. Maintain alignment between sections by using guide devices affixed to lower section.

F. Joint sealing materials may be installed on site or at manufacturer’s plant.

G. Verify manholes and structures installed satisfy required alignment and grade.

H. Remove knockouts or cut structure to receive piping without creating openings larger than required to receive pipe. Fill annular space with mortar.

I. Cut pipe to finish flush with interior of structure.

J. Shape inverts through manhole and structures as shown on Construction Drawings.

3.5 FRAME AND COVER INSTALLATION

A. Set frames using mortar and masonry. Install radially laid concrete brick with 1/4 inch thick vertical joints at inside perimeter. Lay concrete brick in full bed of mortar and completely fill joints. Where more than one course of concrete brick is required, stagger vertical joints.

B. 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.

3.6 MANHOLE TESTING

A. Vacuum testing of manholes is required and shall be performed as directed in the presence of the District Inspector.

B. Vacuum testing equipment shall be as manufactured by P.A. Glazier, Inc. or equal.

C. Manholes shall be tested after assembly and prior to mortaring the joints or backfilling.

D. In the case of manholes incorporating a PVC liner and polyurethane coating, the testing is to take place prior to mortaring the joints, welding the liner seams between sections, applying the coating, or backfilling.

E. All lift holes shall be plugged with an approved grout prior to testing.

F. All pipes entering the manhole shall be plugged, and bracing installed, to prevent the plug from being drawn into the manhole.

G. The test head shall be placed inside the top of the cone section and the seal inflated in accordance with the manufacturer's recommendations.

H. A vacuum of 10-inches of mercury shall be drawn. The time shall be measured for the vacuum to drop to 9-inches of mercury. The manhole shall pass the test if the time taken for the drop is greater than 60 seconds.

If the manhole fails the test, necessary repairs shall be made and the test repeated until acceptable results are obtained. The leak(s) shall be located and repaired according to their nature with material-in-kind.

END OF SECTION

SECTION 332300
EXTRACTION WELLS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes;

1. Drilling for well installation.
2. Installing Vertical Landfill Gas (LFG) Extraction Wells
3. Backfilling
4. Wellhead Installation
5. It is expected that combustible methane gas will be venting from boreholes drilled into waste for the installation of LFG extraction wells. The Contractor's bid price shall include provisions for all equipment and procedures necessary to safely install wells under this condition.

B. Related Sections:

1. Section 310513 - Soils for Earthwork
2. Section 310516 – Aggregates for Earthwork
3. Section 400533 – High-Density Polyethylene Process Pipe
4. Section 400533.16 – HDPE Valves and Appurtenances

1.2 REFERENCES

A. ASTM D 448 - Standard Classification Sizes of Aggregates for Road and Bridge Construction

B. ASTM D 422 - Standard Method for Particle-Size Analysis

C. JLT-S-105-89 - Degradation of Landfill Drainage Materials Due to Carbonate Content

1.3 QUALITY ASSURANCE/QUALITY CONTROL

A. Piping materials shall be handled and stored in accordance with manufacturer's recommendations and Section 400533.

B. The Contractor shall stockpile material so as to provide even and complete support for the material to prevent crimping or other damage. Contractor supplied material which is damaged shall be replaced at no additional cost to the Owner.

C. Pipe, fittings, and appurtenances shall be carefully inspected in the field before installation. All pieces found to be defective, as determined by the Design Professional, shall not be installed. Such rejected materials shall be clearly tagged in such a manner as not to deface or damage them.

D. Quality Assurance (QA) and Quality Control (QC) shall be performed in conformance with the Construction Quality Assurance Plan.

1.4 SUBMITTALS

A. General

1. All Shop Drawings and other submittals shall be made prior to commencing work.

B. Drill Rig

1. The Contractor shall certify that the drill rig and associated drilling equipment is decontaminated and clean before mobilizing to the Site.

C. Well Pipe, Fittings, Hardware, and Backfill

1. Prior to construction, the Contractor shall submit manufacturers' certificates that state that the pipe, fittings, bentonite, and joint materials for this work meet this Section. The Contractor shall also submit certified laboratory analyses for each borrow or stockpile material in accordance with Section 310513.
2. Shop drawings shall indicate the type and manufacturer of well pipe, well backfill materials, seal materials, and typical well cross-section.
3. Boring logs shall be prepared by the Contractor and one copy submitted to the Design Professional after the well installation is completed. The boring logs shall include:
   a. A complete description of all formations encountered.
   b. Depths of strata.
   c. Water levels.
   d. Number of feet drilled.
   e. Depth and length of perforated pipe.
   f. Depth and thickness of fill and seal materials.
   g. Other pertinent data.
4. For LFG Wells:
   a. Furnish survey x and y coordinates of well location.
   b. Furnish top-of-casing and ground surface elevation.

PART 2 PRODUCTS

2.1 MATERIALS

A. Well Pipe, Fittings, Hardware, and Backfill

1. Well Pipe and Fittings
   a. All pipe and fittings shall be fully integrated into components of the finished system. To the maximum practicable extent, the Contractor shall utilize products of a single manufacturer to ensure uniformity.
   b. Well pipe and fittings shall be 6" HDPE SDR-11, in accordance with Construction Drawings.
   c. All joints shall be made using butt-fusion methods.
2. Miscellaneous Hardware for Well
   a. Hose clamps and other appurtenant hardware shall be 304 stainless steel.
3. Well Backfill Materials
   a. Aggregate backfill shall be clean, river run or unbroken round non-calcareous gravel with size ranging from 1 to 3 inch or equal material approved by Design Professional. Aggregate shall conform to ASTM D448, Size No. 4. Percent of calcium carbonate by weight shall not exceed 15 percent, as determined by JLT-S-105-89.
   b. A barrier soil fill layer, in accordance with Section 310513, or approved equal between the crushed stone backfill and bentonite seal.
   c. Bentonite shall be Volclay bentonite in powder or pellet form, as required, as produced by the American Colloid Company or approved equal.
   d. General fill used for backfilling around solid-wall well pipe above the lower bentonite plug shall be clean soil, free of sticks, roots, organic matter, angular rock, and stones larger than 1 inch in any dimension.
4. Landfill Gas Wellheads
   a. Wellhead assemblies shall be pre-fabricated units consisting of the following components or equal:
      1) 2” LFG Specialties Wellhead Assmbly.
   b. Contractor shall label well heads with identification number using yellow paint and stencils or adhesive labels..
   c. Flexible PVC hose shall be 2-inch Type 101PS as manufactured by Kanaflex, Vernon Hills, IL (for CES-Landtec

wellhead) or 2-inch Solarguard Flex Hose as manufactured by QED Environmental (Model 40946/40947) (for QED wellhead).

d. Flexible hose clamps shall be Powerlock Clamp PS, as manufactured by Kanaflex, Vernon Hills, IL (for use with Kanaflex hose only) or 2-inch banding kits as manufactured by QED Environmental (Model No. 40979) (for use with Solarguard flex hose only). Hose shall be ultraviolet light resistant.

e. Wellheads and flexible PVC hoses shall be connected to LFG well casings and LFG laterals using Fernco Flexseal couplings or equal, with reducing dimensions to suit dimensions of wellheads, flexible PVC hose and LFG laterals.

PART 3 EXECUTION

3.1 GENERAL

A. The Contractor shall coordinate the start of drilling with the Design Professional.

B. The Contractor shall provide a thoroughly experienced, competent driller during all drilling operations.

C. The Contractor's Surveyor shall survey and stake the well locations prior to drilling. Well locations will be approved and may be adjusted by the Design Professional prior to beginning drilling.

D. Work shall not commence on this item until written approval of shop drawings, manufacturers' certificates, etc., has been issued by the Design Professional.

E. The location of new gas extraction wells shall be as indicated in the schedule of wells shown on the drawings and/or as directed by the Design Professional.

F. The Contractor shall protect the open excavation from stormwater runoff and keep the area of the new well installation dry (i.e., place plastic cover over excavation during rain events or overnight).

G. Wells are to be drilled to the depth and diameter as shown on the Construction Drawings. The boring depths shown on the Construction Drawings are estimated and may be adjusted in the field by the Design Professional. Under no circumstances are the drilling depths from the well

schedule on the Construction Drawings to be exceeded unless approved by the Design Professional in advance.

3.2 WELL BORING

A. The borehole shall be advanced to the depths shown on the Construction Drawings or as otherwise approved by the Design Professional, or as directed by the Design Professional. Drilling will be performed using an auger drill rig, a caisson or a bucket drill rig with a kelly bar extension system capable of boring to the required depth. The LFG extraction wells must be drilled using dry drilling equipment. Wet rotary drilling equipment shall not be used. The borehole diameter for LFG extraction wells shall be 36 inches minimum.

B. Boreholes shall be straight and vertical. The bottom of any borehole shall not be advanced below the indicated elevation. If a borehole is inadvertently advanced to below the indicated elevation, the Contractor shall, at his own expense, backfill the hole to the required elevation with a hydrated bentonite slurry, as specified below.

C. Wet Borings:

1. If water is encountered in a boring, the Contractor may be directed to drill beyond the point at which it was encountered. If wet conditions remain, the boring may be terminated and the length of perforated pipe adjusted by the Design Professional. If wet conditions cease (e.g., due to a perched water layer), then drilling will continue to the design depth.

2. If water is encountered in a boring at a shallow depth, the Design Professional may decrease the well depth and length of perforated pipe, or relocate the well.

D. If during the drilling of a borehole, an obstruction is encountered, the driller must use all reasonable means to advance the drilling. If the drilling rate falls to less than 2 feet per hour and the well cannot be completed as required, the Design Professional shall determine as to whether the borehole has advanced to a sufficient depth.

E. If, in the opinion of the Design Professional, the borehole has not reached a sufficient depth to function as an effective extraction well, and the Design Professional has determined that boring advancement should stop, the Contractor shall abandon this borehole by backfilling it with cuttings removed during drilling. If cuttings are unsuitable as backfill (for example, box springs, tires, etc.), the Contractor shall use general backfill material. A 2-foot thick bentonite plug will be placed in the borehole when the depth is 4 feet below the existing grade. The remaining 2 feet of the

borehole will then be filled with general fill and compacted to approximately match the elevation of the existing grade.

F. The Contractor shall perform no boring unless the Design Professional or his designated representative is present to approve location and to witness operation.

G. The Contractor shall minimize the number of open boreholes. No well boring shall remain open at the end of the workday. Boreholes shall not be left uncovered and/or unattended at any time.

H. The Contractor shall be responsible for any grading, leveling and/or towing which may be necessary for movement of the drill rig on, to or from the Site.

I. The Contractor shall dispose of all drill cuttings at the active face of Area 1-3.

3.3 WELL CONSTRUCTION

A. LFG extraction well casings shall be temporarily capped during installation to prevent backfill material from entering the pipe.

B. Well casings shall be installed immediately after completion of the boreholes by vertically lifting and lowering the casing into the hole by the drill rig cable. Initial crushed stone backfill shall be done while the well casing is still suspended by the drill rig approximately 6 to 12 inches above the bottom of the hole. When the pipe is supported by crushed stone backfill in the hole, the cable may be released and the drill rig may be moved.

C. The well pipe shall be installed plumb in the center of the borehole. Derricks, ropes, or other suitable equipment, or manual labor, shall be used for lowering the pipe into the well borings, subject to the approval of the Design Professional.

D. The well shall then be immediately backfilled with the specified materials to the levels and dimensions consistent with the Construction Drawings. The Contractor shall take all necessary precautions to maintain the well pipe vertically plumbed during the backfill operation. Care shall be taken during installation of backfill materials to prevent damage to the pipe.

E. If the borehole collapses partially or completely during backfill operations, the Contractor may be required to redrill the borehole, at no additional cost, upon the direction of the Design Professional.

F. Barrier fill soil shall be placed above the crushed stone backfill to preclude the downward migration of bentonite into the crushed stone.

G. Bentonite seals (pellet or slurry) shall be installed within the borehole at the locations shown on the Construction Drawings.

H. Bentonite slurry seals shall be made from bentonite powder hydrated to form a slurry in a ratio of 5 gallons of water for each 50 pounds of bentonite prior to placement in the well. Placement shall be by tremie pipe, or other method authorized by the Design Professional.

I. General fill will be placed above the hydrated bentonite to the ground surface.

3.4 JOINING OF PIPES

A. Pipes shall be joined as specified in Section 400533.

3.5 TEMPORARY CAP

A. Following well completion, the Contractor shall temporarily cap the riser pipe of the vertical extraction well to prevent direct venting of LFG through the riser pipe. The temporary cap shall be removed during the installation of the wellheads.

3.6 LFG WELLHEAD INSTALLATION

A. Wellhead assembly shall be installed on the riser pipes in accordance with the manufacturer's recommendations and as shown on the Construction Drawings.

B. Flexible hose shall be clamped, not glued, to the wellhead and lateral by the Contractor as recommended by the wellhead manufacturer. The hose shall be configured to cause condensate to flow into the lateral, without any sags, kinks, or low points.

END OF SECTION

SECTION 333613.16
FIBERGLASS ABOVE-GROUND LEACHATE STORAGE TANK

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Above-ground Tank for Leachate Storage: The work to be performed under this Section shall include installing leachate storage tanks associated with construction of the leachate collection and disposal system, as shown on the Construction Drawings or as directed by the Design Professional.

1.2 RELATED SECTIONS

A. Section 033000 – Cast in Place Concrete
B. Section 400533 – High-Density Polyethylene Process Pipe
C. Section 400533.16 – HDPE Valves and Appurtenances

1.3 REFERENCES

A. ANSI/AWWA D120 - Thermosetting Fiberglass-Reinforced Plastic Tanks.

B. ANSI/ASME/ B16.5 – Pipe Flanges and Flanged Fittings.

C. Tank manufacturer shall be recognized by Underwriters Laboratories as a manufacturer of tanks listed to the UL-1316 standard.

1.4 SUBMITTALS

A. Submit to the Design Professional Tank Manufacturer's data sheets on each product to be used, including, but not limited to, the following:

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation manual and operating guidelines.
4. Submit to the Design Professional prior to tank fabrication: Tank Manufacturer fabrication of the tanks:
5. Tank Manufacturer shop drawings of each tank complete with all accessories supplied by the manufacturer.
6. Tank Manufacturer shipping, handling and installation instructions.

1.5 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with tank manufacturer's Installation and Operating Guidelines recommendations for delivery, storage, and tank handling.

1.6 WARRANTY

A. Warranty: Provide manufacturer's standard limited warranty.

PART 2 PRODUCTS

2.1 MATERIALS:

A. Xerxes Corporation Fiberglass Tank for Industrial Wastewater and Chemical Storage or equivalent as approved by Design Professional.

B. Tank Design - Fiberglass reinforced plastic (FRP) tanks:

1. Tank Design: Single-wall vessel as specified and shown on the Contract Plans.
2. Tank Configuration: Aboveground Storage Tank Vertical (AST-V) configurations shall be as specified and shown on the Contract Plans.
3. The tank size, fittings and accessories shall be as shown on the Contract Plans.
4. Tank shall be manufactured with structural ribs which are fabricated as in integral part of the tank wall.
5. Tank shall be manufactured with a laminate consisting of resin and glass fiber reinforcement only. No sand/silica fillers or resin extenders shall be used.
6. Tank shall be vented to atmospheric pressure.
7. Tank shall be capable of handling liquids with specific gravity up to 1.1
8. Tank shall be compatible with landfill leachate.

C. Loading Conditions - Tank shall meet the following design criteria:

1. Internal Load - AST-V tanks shall be designed to withstand a full hydrostatic load with a 2:1 safety factor.

D. Accessories - Aboveground Tank Applications:

1. Piping and Fittings

a. AST-V tanks shall be equipped with factory-installed threaded fittings, or fiberglass nozzles.

b. All flanged nozzles shall be flanged and flat-faced, and conform to Class 150 bolting patterns as specified in ANSI/ASME/ B16.5.

c. Carbon steel and stainless steel NPT fittings shall withstand a minimum of 150 foot-pounds (203 NM) of torque and 1,000 foot-pounds (1356 NM) of bending, both with a 2:1 safety factor.

2. Manway Openings:

a. The standard manway shall be flanged, 22 inches (559 mm) I.D. and complete with gaskets, bolts and cover.

3. Ladders:

a. Ladders shall be the standard FRP, aluminum or NSF-61 approved ladder as supplied by tank manufacturer.

4. Tank Anchoring:

a. Number and location of tie-down lugs to be standard.

E. Industrial Wastewater and Chemical Applications:

1. Governing Standards, as applicable:

a. ANSI/AWWA D120 - Thermosetting Fiberglass-Reinforced Plastic Tanks.

b. Tank manufacturer shall be recognized by Underwriters Laboratories (UL) as a manufacturer of tanks listed to the UL-1316 standard.

PART 3 EXECUTION

3.1 TESTING

A. Tank shall be tested according to the tank manufacturer's Installation Manual and Operating Guidelines in effect at time of installation.

3.2 INSTALLATION

A. Tank shall be installed according to the tank manufacturer's Installation Manual and Operating Guidelines in effect at time of installation.

END OF SECTION

SECTION 334213
PIPE CULVERTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Corrugated steel pipe culvert.
2. Concrete pipe culvert.
3. Joints and accessories.
4. Bedding.
5. Slope protection at pipe end.

B. Related Sections:

1. Section 310516 - Aggregates for Earthwork
2. Section 310519.13 – Geotextiles for Earthwork
3. Section 313700 - Riprap
4. Section 033000 – Cast-in-Place Concrete

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:

1. AASHTO M294 - Specification for Corrugated Polyethylene Pipe, 305- to 915-mm (12- to 36-In.) Diameter.
2. AASHTO T99 - Standard Specification for the Moisture-Density Relations of Soils Using a 2.5 kg (5.5 lb) Rammer and a 305 mm (12 in.) Drop.
3. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:

1. ASTM A929/A929M - Standard Specification for Steel Sheet, Metallic-Coated by the Hot-Dip Process for Corrugated Steel Pipe.
2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
3. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft3 (2,700 kN-m/m3)).

4. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
5. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data on pipe, fittings and accessories.

C. Manufacturer's Installation Instructions: Submit special procedures required to install Products specified.

1.4 CLOSEOUT SUBMITTALS

A. Sections 017300 - Execution and 017700 - Closeout Procedures: Requirements for submittals.

B. Project Record Documents:

1. Accurately record actual locations of pipe runs, connections, and invert elevations.
2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

C. Operation and Maintenance Data: Procedures for submittals.

PART 2 PRODUCTS

2.1 STEEL CULVERT PIPE

A. Manufacturers:

1. Hall Pacific Corrugated Pipe.

B. Corrugated Steel Pipe: ASTM A929/A929M, galvanized.

C. Tapered Ends: Same material as pipe, machine cut, for joining to pipe end.

D. Coupling Bands: Galvanized steel, 0.052 inches thick x 10 inches wide; connected with two neoprene "O" ring gaskets and two galvanized steel bolts.

2.2 ACCESSORIES

A. Geotextile Fabric: Non-biodegradable, non-woven in accordance with Section 310519.13.

B. Fill at Pipe Ends: Riprap as specified in Section 313700.

C. Pipe bedding as specified for fine aggregate in Section 310516.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 013100 – Project Management and Coordination: Verification of existing conditions before starting work.

B. Verify trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.

3.2 PREPARATION

A. Remove large stones or other hard matter which could damage piping or impede consistent backfilling or compaction.

3.3 EXCAVATION AND BEDDING

A. Excavate culvert trench to 12 inches below pipe invert. Hand trim excavation for accurate placement of pipe to elevations indicated.

B. Place bedding material at trench bottom, level fill materials in one continuous layer not exceeding 6 inches compacted depth, compact to 95 percent.

C. Maintain optimum moisture content of bedding material to attain required compaction density.

D. Place filter fabric over compacted bedding.

3.4 INSTALLATION - PIPE

A. Lift or roll pipe into position. Do not drop or drag pipe over prepared bedding.

B. Shore pipe to required position; retain in place until after compaction of adjacent fills. Ensure pipe remains in correct position and to required slope.

C. Repair surface damage to pipe protective coating with two coats of compatible bituminous paint coating.

D. Install cover at sides and over top of pipe. Install top cover to minimum compacted thickness of 12 inches.

E. Maintain optimum moisture content of bedding material to attain required compaction density.

F. Place filter fabric over compacted cover.

G. Install culvert end gratings.

H. Refer to Section 312323 for backfilling and compacting requirements. Do not displace or damage pipe when compacting.

3.5 PIPE ENDS

A. Place fill at pipe ends as indicated on Construction Drawings.

3.6 ERECTION TOLERANCES

A. Section 014000 - Quality Requirements: Tolerances.

B. Lay pipe to alignment and slope gradients noted on Construction Drawings; with maximum variation from indicated slope of 1/8 inch in 10 feet.

C. Maximum Variation From Intended Elevation of Culvert Invert: 1/2 inch.

D. Maximum Offset of Pipe From Indicated Alignment: 1 inch.

E. Maximum Variation in Profile of Structure From Intended Position: 1 percent.

3.7 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Request inspection prior to and immediately after placing aggregate cover over pipe.

C. Compaction Testing: In accordance with ASTM D1557.

D. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

3.8 PROTECTION OF INSTALLED CONSTRUCTION

A. Sections 017300 - Execution and 017700 Closeout Procedures: Protecting installed construction.

B. Protect pipe and bedding from damage or displacement until backfilling operation is in progress.

END OF SECTION

SECTION 400533
HIGH-DENSITY POLYETHYLENE PROCESS PIPE

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. High-Density Polyethylene (HDPE) pipe
2. HDPE dual-containment pipe
3. HDPE joints and couplings

B. Related Sections:

1. Section 310513 - Soils for Earthwork
2. Section 310516 – Aggregates for Earthwork
3. Section 312316 - Excavation
4. Section 332300 - Extraction Wells
5. Section 333613.16 - Fiberglass Above-ground Leachate Storage Tank
6. Section 400533.16 - HDPE Valves and Appurtenances
7. Section 400533.23 - HDPE Pipe Testing
8. Section 432236.13 - Gas Blower Skid/Liquid Evaporator

1.2 SUBMITTALS

A. Submit to the Design Professional completely detailed working drawings and schedules of all HDPE pipe and fittings required.

B. Prior to each shipment of pipe, the Contractor shall submit to the Design Professional, for review and approval, manufacturer's Certifications that demonstrate that the HDPE pipe and fittings valves have been manufactured and tested consistent with the applicable standards specified herein.

C. For each HDPE pipe fusion technician, the Contractor shall submit a HDPE pipe fusion sample. The Contractor shall not allow any fusion technician to perform any pipe fusion until a fusion sample for that fusion technician has been submitted to and approved by the CQA Manager. The Contractor shall be responsible to remove and replace any piping installed prior to approval of a HDPE pipe fusion sample for each fusion technician performing this work.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. ASTM D1248 - Standard Specification for Polyethylene Plastics Molding and Extrusion Materials.
2. ASTM D3350 - Specification for Polyethylene Plastic Pipe and Fitting Materials.
3. ASTM F714 - Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.
4. ASTM F2620-13 - Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings
5. ASTM D2321-Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Appliances.

B. Plastic Pipe Institute (PPI)

1. TR-33 - Generic Butt Fusion Joining Procedure for Field Joining of Polyethylene Pipe
2. TR-31/9-79-Alternate for Expansion Test Pressure

C. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.4 QUALITY ASSURANCE/QUALITY CONTROL

A. All HDPE pipe and fittings shall be from a single manufacturer who is fully experienced, reputable, and qualified in the manufacture of the polyethylene pipe to be furnished. The pipe shall be designed, constructed, and installed in accordance with the best practices and methods and shall comply with this Section.

B. All pipe fusion must be performed by a technician that is certified by the piping manufacturer.

C. Where use of electrofusion couplings are required or proposed, the Contractor shall provide at least one employee for installation of electrofusion couplings who has completed an HDPE electrofusion coupling manufacturer's training course specific to installation of large diameter HDPE electrofusion couplings, and has received the corresponding certification from the manufacturer. Such certification shall be current, requiring annual recertification.

D. Quality Assurance (QA) and Quality Control (QC) shall be performed in conformance with the Construction Quality Assurance.

PART 2 PRODUCTS

2.1 HDPE PIPING

A. HDPE pipe resins shall be Type III, Class C, Category 5, Grade PE36 compound as required by ASTM D1248.

B. Pipe shall be manufactured using PE 4710 type resin classified with a cell number of PE 445474C in accordance with ASTM D3350.

C. HDPE eccentric reducers shall be used for all connections of odd diameter piping.

D. HDPE concentric reducers shall be used within all temporary and permanent active gas collection vaults.

E. All HDPE pipe and fittings shall be made from the same resin.

F. Compliance with the above requirements must be certified by the pipe supplier.

G. The pipes shall have the nominal dimensions and pipes and fittings shall have the Standard Dimension Ratios (SDR) shown on the Construction Drawings

H. All polyethylene pipe shall meet the requirements of ASTM F714.

I. HDPE pipe shall be joined with butt, heat fusion joints, unless otherwise indicated on the Construction Drawings, or specified herein. All joints shall be made in strict compliance with the manufacturer's recommendations.

J. Pipe shall be furnished in standard laying lengths not exceeding 50 feet.

K. The polyethylene pipe and appurtenances shall be manufactured by Isco Industries, Performance Pipe, Central Plastics, Polypipe, Inc. or equal as approved by Design Professional.

2.2 DUAL-CONTAINMENT HDPE PIPING

A. Dual Containment Pipe for condensate drains shall be a HDPE x HDPE dual containment piping system of uniform materials and pressure ratings. The pipe shall be supplied from a single source having responsibility and accountability to answer and resolve problems regarding proper installation, compatibility, performance, and acceptance. Dual containment pipe shall meet the following supplemental conditions:

1. Pipe and pipe fittings shall meet the same material requirements as Part 2.1 of this Section.

2. Carrier pipe support shall be with full round centralizers welded to the carrier pipe. Centralizer support spacing per Plastic Piping Institute standards. Supports, guides, etc. for product pipe shall be provided of same resin as product pipe. Supports shall be placed in a manner that a maximum of 1 inch deflection is allowed between supports. Supports shall allow axial movement of product pipe within containment pipe and maintain a concentric relationship between produce pipe and containment pipe. Supports shall supply a minimum of 1.5-inch wide surface area to prevent point loading of product pipe.

3. Centralizers will be either molded or machined from HDPE pipe grade resins or sheet. Manual or hand cut centralizers are not permitted as they have a low degree of dimensional accuracy. Centralizers should have at least two openings that will permit the flow of liquid between the carrier pipe and the containment pipe. The centralizer shall be thermally bonded to the primary carrier pipe, and maintain position and alignment of the primary carrier in relation to the secondary containment piping. Each end of pipe will have a centralizer that is thermally bonded to both the outside diameter of the primary carrier and the inside diameter of the secondary containment piping and designed such that movement will be restrained between the two piping systems during the butt fusion process.

4. The outer diameter (OD) of the centralizer shall match the inner diameter (ID) of the containment piping as closely as possible.

5. Anchors shall be provided of same resin as product pipe and containment pipe. Anchors shall be of same wall thickness as product and containment pipe.

6. Simultaneous weld discs shall be provided of the same resin as product pipe and containment pipe. Simultaneous weld discs shall supply 4 openings on 90 degree spacings to allow for drainage and venting of the annular space. Simultaneous weld discs shall be sized to maintain alignment of product pipe within + 10 percent of wall thickness.

7. End termination fittings shall be used to seal the system at both ends. The fitting shall be simultaneously butt fused to the carrier and containment pipe to seal the annular space. Terminations that are not butt fused in the system will not be allowed. This fitting will also provide the transition to single wall piping.

8. Connections to other piping systems and/or equipment where butt-fusion is not applicable shall be with HDPE flange adapters and metal back-up rings, unless otherwise approved by the Design

Professional. Mechanical compression or clamp style fittings are not be allowed.

9. Dual containment shall be as manufactured by Fluid Controls, ASAH/America, Plexco, Isco Industries or equal as approved by Design Professional.

2.3 PIPE IDENTIFICATION

A. The following shall be continuously indent printed on the pipe or spaced at intervals not exceeding 5 feet:

1. Name and/or trademark of the pipe manufacturer.
2. Nominal pipe size.
3. Dimension ratio.
4. The letters PE followed by the polyethylene grade in accordance with ASTM D1248, followed by the hydrostatic design basis in 100's of psi, e.g., PE 4710.
5. Manufacturing standard reference, e.g., ASTM F714.

2.4 PIPING JOINTS

A. Flanged connections for HDPE pipe shall be made with 1”- thick HDPE flange adapters with convoluted ductile iron backup rings for bolting. Back-up rings shall be finished with red oxide primer. Bolts, studs, nuts, and washers for the flanges shall be hot dipped galvanized steel. Below-grade flanges shall be wrapped in 5-mil polyethylene sheeting, just after installation and prior to backfilling, to help prevent corrosion. Valves shall be installed between two flanges; care shall be taken to avoid stripping bolts when tightening. Flange gaskets shall be full-face Neoprene.

2.5 PIPELINE LOCATOR/WARNING TAPE

A. Pipeline locator/warning tape shall be a metallic locator/warning tape imprinted with the words “Caution - Gas Line Buried Below”, 3 inches wide, yellow in color, as supplied by Terra Tape (800-231-2417) or approved equal.

2.6 HDPE ELECTROFUSION COUPLINGS

A. All HDPE electrofusion couplings shall be for HDPE pipe sizes and SDR as indicated in this Section and the Construction Drawings.

B. Manufacturer for electrofusion couplings shall be IPEX/Friatec or approved equal.

PART 3 EXECUTION

3.1 HANDLING

A. Care shall be taken during transportation of the pipe such that it will not be cut, kinked, or otherwise damaged.

B. Pipes shall be lifted by hoists and lowered on skidways in such a manner as to avoid shock. Ropes, derricks, fabric, rubber protected slings and straps shall be used when handling pipes. Chains, cables, or hooks inserted into the pipe ends shall not be used. Two slings spread apart shall be used for lifting each length of pipe. Pipe or fittings shall not be dropped or dumped.

C. Pipes shall be stored on level ground, preferably turf or sand, free of sharp objects which could damage the pipe. Stacking of the polyethylene pipe shall be limited to a height as recommended by the manufacturer, but no more than 6 feet, so as to prevent damage by marring, crushing, or piercing. Where necessary due to ground conditions, the pipe shall be stored on wooden sleepers, spaced suitably and of such width as not to allow deformation of the pipe at the point of contact with the sleeper or between supports.

D. The handling of the joined pipeline shall be in such a manner that the pipe is not damaged by dragging it over sharp and cutting objects. Pipe ends shall be covered with temporary end caps prior to dragging. Slings for handling the pipeline shall not be positioned at butt-fused joints. Sections of the pipes with deep cuts and gouges shall be removed and the ends of the pipeline rejoined.

E. HDPE pipe shall not be bent more than the minimum radius recommended by the manufacturer for type, grade, and SDR. Care shall be taken to avoid imposing strains that will overstress or buckle the HDPE piping or impose excessive stress on the joints.

F. Clean mud, pipe shavings and debris from pipes prior to installation.

3.2 PIPE JOINING

A. Only two methods shall be utilized to joining HDPE pipe: heat fusion and mechanical joining.

1. Mechanical Joining shall be accomplished with HDPE flange adapters, neoprene gaskets, and ductile iron back-up flanges, and shall be used only where shown on the Construction Drawings.

2. Heat fusion joints shall be made in accordance with ASTM F2620-13, PPI TR-33 and the piping manufacturer's step-by-step

procedures and recommendations (note that piping manufacturer's procedures and recommendations shall take precedence). Fusion equipment and a trained operator shall be provided by the Contractor. Pipe fusion equipment shall be of the size and nature to adequately weld all pipe sizes and fittings necessary to complete the Project. Branch saddle fusions shall be made in accordance with manufacturer's recommendations and step by step procedures. Branch saddle fusion equipment will be of the size to facilitate saddle fusion within the pipe trench. Heat fusion shall be performed outside of the trench whenever practical. Before heat fusing pipe, each length shall be inspected for the presence of dirt, sand, mud, shavings, and other debris. Any foreign material shall be completely removed. At the end of each day, all open ends of fused pipe shall be capped or otherwise covered to prevent entry by animals or debris.

3. Pursuant to manufacturer's instructions, no heat fusion shall be performed in precipitation unless a shelter is provided.

3.3 HDPE ELECTROFUSION COUPLING INSTALLATION

A. Measure the pipe OD using a Pi tape to verify true diameter. The pipe OD must be within the ID minimum/maximum tolerance of the coupling. Make sure to check and measure pipe ends for toe-in. If pipe toe-in OD is smaller than true pipe OD, that pipe section must be cut out prior to installation. If unsure, contact the manufacturer for additional information.

B. Measure and mark the pipe insertion depth or the pipe surface covered by the coupling with the FRIALEN Silver Pipe Marker, or approved equal.

C. Scrape off the oxidized layer on the pipe using either a hand scraper or IPEX scraper tool model number FWSG 710L or approved equal. It may be necessary to scrape two or three times. Localized scraping after checking the ovality with the coupling is also sometimes needed. Do not remove more than 10% of the pipe wall thickness.

D. Scrape off edge, inside and outside. Bevel the outer edge more than the inner edge and remove shavings and debris from the pipe.

E. If needed, re-round oval pipe with re-rounding clamp. A hydraulic re-rounding clamp is required.

F. Clean pipe surface and inside of coupling liberally with 96% or greater Isopropyl alcohol or acetone. Make sure surfaces are completely dry before assembly. The use of denatured alcohol is not permitted.

G. Install coupling to marked insertion depth on pipe. The use of a hammer and board placed across the open end face of the coupling is permissible to properly position coupling. If excessive resistance is met, repeat step F of this Section. Leave the plastic bag over the open end of the coupling during assembly to keep contamination out of the fusion zone area and also to retain the heat from prewarming and fusion time if only one pipe has been inserted. If both pipes have been inserted, place tape over area covering the ID of the coupling and the OD of the pipe to retain heat.

H. Assembly of pipe and coupling must be in a clean, supported, and as stress free condition as possible. Support coupling during fusion and cooling cycles.

I. Connect coupling to universal fusion processor and start fusion. Each side of the coupling is fused independently from the opposite side of the coupling. Prewarming and Fusion is required for both sides of the fitting.

J. Fusion technician must maintain a 3-foot minimum distance from the coupling during fusion.

K. After completing the fusion process, document the end of fusion time, total fusion time (in seconds), installers initials, cooling time (in minutes), and date on the pipe using a FRIALEN Silver Pipe Marker, or approved equal. Also record all information on a field log and submit to Design Professional.

3.4 LAYING PIPE

A. Care shall be exercised when lowering pipe into the trench to prevent damage or twisting of the pipe.

B. All pipe 4 inches and larger shall be installed with pipe locator/warning tape situated 3 inches above the crown of the pipe.

C. Pipe installation shall comply with the requirements of ASTM D 2321, PPI TR-31/9-79, and the manufacturer's recommendations.

D. Lengths of fused pipe to be handled as one segment shall not exceed 400 feet.

E. Pipe shall be inspected and cleaned of pipe cuttings, dirt, debris, or other deleterious materials prior to installation in the trench. All pipe shall be flushed using air or water (with exception that water may not be used to flush the air supply line) to adequately clean cuttings, dirt, and debris from the pipe prior to making final connections at low points. The air supply line shall only be flushed with air. The Contractor shall properly dispose of cuttings and debris as a result of flushing of pipes.

F. Below-grade HDPE pipe shall be installed within the minimum slope and cover requirements, as shown on the Construction Drawings.:

G. The Design Professional shall be notified prior to any pipe being installed in the trench in order for him/her to have an opportunity to inspect the following items:

1. All butt fusions;
2. Pipe integrity;
3. Trench excavation for rocks and foreign material;
4. Proper trench slope; and
5. Trench contour to ensure the pipe will have uniform and continuous support.

H. Any irregularities found by the Design Professional during this inspection must be corrected before lowering the pipe into the trench. Pipe shall be allowed sufficient time to adjust to trench temperature prior to any testing, segment tie-ins, and/or backfilling.

I. Tie-ins shall be made outside of the trench whenever possible. When tie-ins are to be made only in the trench, a bell hole shall be excavated large enough to ensure an adequate and safe work area.

J. Below-grade header piping shall be marked with metallic warning tape to be buried in the trench 6 inches above the pipe as specified in Part 2.5 and indicated on the Construction Drawings.

3.5 CLEANING

A. At the conclusion of the work, thoroughly clean all of the new pipelines to remove all dirt, stones, pieces of wood, or other material which may have entered during the construction period. Debris cleaned from the lines shall be removed from the Site. If, after this cleaning, any obstructions remain, they shall be removed by the Contractor at no additional cost to the Owner.

END OF SECTION

SECTION 400533.16
HDPE VALVES AND APPURTENANCES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes the valves and sample ports for High Density Polyethylene Pipe (HDPE):

1. Valves shall include all valve bodies, stems, seats, rotating or lifting elements, bearings, operators, actuators and appurtenances required for a completely functional valve installation.
2. Valve extensions shall be furnished and installed for smooth operation of the valves.
3. Valve boxes shall include all construction, materials, box bodies and covers required for operation of buried valves and incidentals.

B. Related Sections:

1. Section 310513 – Soils for Earthwork
2. Section 310516 – Aggregates for Earthwork
3. Section 312316 – Excavation
4. Section 400533 – High-Density Polyethylene Process Pipe
5. Section 40533.23 – HDPE Pipe Testing

1.2 REFERENCES

A. Occupational Health and Safety Act Regulations (Standards – 29 Code of Federal Regulations).

B. ASME B16.40 Manually Operated Thermoplastic Gas Shutoffs and Valves in Gas Distribution Systems.

C. ASTM D-2513 Standard Specification for Polyethylene Gas Pressure Pipe, Tubing, and Fittings.

1.3 QUALITY ASSURANCE

A. Parts Interchangeability

1. All valves of like size and type shall be the product of a single manufacturer.

1.4 SUBMITTALS

A. Shop Drawings and Submittals

1. Prior to obtaining any equipment in connection with this Section, the Contractor shall submit detailed shop drawings and descriptions of all valves and necessary accessories. Shop drawings shall indicate materials of construction, parts list, scale drawings and general location plan and schedule of valves and appurtenances.
2. Shop drawings shall be submitted for butterfly valve assemblies requiring spacers in accordance with this Section.

B. Contractor shall submit all operation and maintenance manuals for equipment supplied under this Section.

PART 2 PRODUCTS

2.1 GENERAL

A. Valves installed in pipelines shall be supported independently from the pipeline on a crushed stone bed in valve vaults or below grade in barrier protection material, as shown on the Construction Drawings, or as recommended by the manufacturer.

B. Valves located in flanged piping shall be wafer-style with appropriate spacers to mate with HDPE flange adapters on HDPE piping, as shown, specified or required.

C. Unless otherwise specified, valves shall be designed for 150-psi working pressure.

D. All manually operated valves shall open by turning to the left (counterclockwise).

E. Each valve shall have the name of the manufacturer and the size of the valve cast on the body or bonnet in raised letters.

F. All valves of like type furnished shall be the product of one manufacturer for the purpose of parts interchangeability.

1. All valves shall be complete with all necessary operators, actuators, handwheels, extension stems, worm and gear operators, operating nuts, chains, wrenches, and other accessories or appurtenances which are required for the proper completion of the work. Operators, actuators, and other accessories shall be sized and furnished by the valve supplier and factory mounted.

2. Valves shall be suitable for the intended service. Renewable parts including discs, packing, and seats shall be of types recommended by valve manufacturer for intended service, but not of a lower quality than specified herein.

3. Valves and operators shall be suitable for buried or exposed conditions, as applicable. Valves shall have all safety features required by OSHA.

G. Unless otherwise shown on the Construction Drawings, valves shall be the same size as the adjoining pipe.

2.2 BUTTERFLY VALVES AND APPURTENANCES

A. Header isolation valves shall be butterfly, bubble tight, wafer design, with a PVC body, Buna-N or nitrile seat, and compatible with a flat face flange, as manufactured by ASAHI/America or approved equal. Provide visual valve position indicator mounted on top and equipped with a removable manual operating wheel.

2.3 BALL VALVES

A. HDPE ball valves shall be PE 4710 SDR 17 HDPE full-port ball valves, rated up to 100 psig for water application between -20ºF and 140ºF. Valve size shall be as indicated on the Construction Drawings. Valve ends shall be extra-long for butt, socket or electrofusion joining, and the valve shall close with only ¼ turn. Contractor shall provide valve handle on the operating nut for valve actuation. Valve shall be compliant with ASME B16.40 and ASTM D-2513, and shall be manufactured by Kerotest, Integrity Fusion Products or approved equal. HDPE ball valve materials shall be as follows:

1. Body: PE 4710 HDPE
2. Ends: PE 4710 SDR 17 HDPE
3. Ball: Polypropylene
4. Retainer: Polypropylene
5. Ball Seat: Buna-N (HNBR)
6. Stem: Acetal
7. Stem Seals: Buna-N (HNBR)
8. Weather Seal: Buna-N (HNBR)
9. Operating Nut: Propylene

2.4 SAMPLE PORTS

A. Monitoring parts and hoses shall be provided at each valve. Ports threaded into header shall be Swagelock 1/4" SS-420-1-4 x1/4" MPT, or approved equal. Monitoring hose shall be stainless steel teflon-lined hose with Swagelock tube ends, model SS-4BHT-36, or approved equal, of adequate length (above-specified length is for 3-foot long tubing section). Sampling end shall have a 1/4" female connector SS-420-7-4 with a quick-connect polypropylene monitoring port by Ryan Herco, Part No. 0812-002.

PART 3 EXECUTION

3.1 HANDLING

A. The Contractor shall use particular care in handling and transporting the valves so as not to damage them.

B. The Contractor shall be responsible for all valves found damaged or broken. Contractor shall repair or replace all damaged parts to the satisfaction of the Design Professional.

3.2 INITIATION OF INSTALLATION

A. Inspection

1. Prior to all work of this Section, the Contractor shall inspect the installation area to see that the installed work has progressed to the point where this installation may properly commence.
2. The Contractor shall verify that the installation can be made in accordance with all pertinent codes and regulations, the original design and the referenced standards.

B. Discrepancies: In the event that the inspection reveals discrepancies, the Contractor shall immediately notify the Design Professional.

3.3 INSTALLATION

A. General

1. The installation of valves shall be in accordance with the configuration shown on the Construction Drawings and accepted shop drawings.
2. Valves shall be installed in accordance with the manufacturer's recommendations and the following:

a. Butterfly valves shall be installed between two flanges as shown on the Drawings; care shall be taken to avoid stripping bolts when tightening.
b. Flanges shall be joined with hot dipped galvanized steel studs and nuts. All below grade studs and nuts shall be coated with anti-seize compound, or approved equivalent, after installation and prior to backfilling. Stud and nut diameters shall be sized as recommended by the manufacturer for each size valve. Stud lengths shall accommodate the required distance between flanges including spacers, if necessary.

3. The valves and sample ports shall be installed in the same manner and care as the pipe.

4. Sample ports shall be installed air-tight and gasketed in accordance with manufacturer's recommendations.

5. Valves shall be installed in accordance with the manufacturer's recommendations. The Contractor shall wrap and tape the valves installed grade, flanges, and bolts in 5-mil polyethylene sheeting for all valves installed below grade prior to backfilling to help protect the valve assembly from corrosion.

6. Flanged butterfly valves may require spacers between the flange adapters and the valve body in order to allow full travel of the internal disk. If spacers are necessary for any butterfly valve, the Contractor will install valve spacers subject to the approval by the Design Professional.

B. Testing

1. Upon completion of the installation, the Contractor shall operate all valves to show that they operate without binding or strain.

2. Valves shall be tested in accordance with Section 400533.23.

3.4 VALVE TAGS AND DIRECTORY

A. A valve directory shall be provided listing all valve numbers, the valve function, and location. The directory shall be typewritten and presented to the Design Professional. Valve numbers are to be designated by the Design Professional.

END OF SECTION

SECTION 400533.23
HIGH DENSITY POLYETHYLENE PIPE TESTING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes testing of all pressure and non-pressure High Density Polyethylene (HDPE) piping for leakage as specified.

B. Related Sections:

1. Section 400533 - HDPE Process Pipe
2. Section 400533.16 –HDPE Valves and Appurtenances

1.2 SUBMITTALS

A. Contractor shall submit schedule of testing dates and times to the Design Professional before conducting any testing.

B. Contractor shall submit test procedure, including schematic and equipment details of proposed testing apparatus to the Design Professional for approval before conducting testing.

C. Test results and records shall be submitted within 24 hours following testing.

1.3 QUALITY ASSURANCE

A. All testing shall be witnessed by the Design Professional unless approved otherwise prior to testing.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 TESTING

A. Pipelines designed to transport fluid (i.e., liquids or gases) under pressure or vacuum shall be pneumatically tested for leakage in accordance with this section.

B. HDPE landfill gas system and leachate forcemain piping shall be subjected to a pneumatic pressure test per ASTM F-1417 and as

described herein to detect any leaks in the piping. Contractor shall furnish all necessary equipment and materials, and make all taps in the pipe, as required, for testing.

C. A 24- to 48-hour resting period between pipe installation and pressure test performance may be required to obtain a constant test pressure due to expansions within the piping

D. The test should be performed during a period when the pipe will be out of direct sunlight when possible; i.e., early morning, late evening, or cloudy days. This will minimize the pressure changes which will occur during temperature fluctuations.

E. Testing shall be performed on all new pipe installations and connections with existing piping. Connections with existing piping shall be tested by blocking the pipes downstream from the connection points in order to pressurize the system.

F. Ends of sections being tested shall be tightly closed by plugs, blind flanges, gates, or otherwise for the duration of the tests.

G. Equipment in or attached to the pipes being tested shall be protected. Any damage to such equipment during the test shall be repaired at no additional cost to the Owner.

H. When piping is to be insulated or concealed in a structure, tests shall be made before the pipe is covered.

I. All fittings and appurtenances shall be properly braced and harnessed before the pressure is applied. Thrust restraining devices which will become a part of the system shall also be tested at the test pressure.

J. All installed gas header and lateral pipe shall be subject to an air test pressure of 10 psig and all air supply line and leachate forcemain piping shall be subject to an air test pressure of 100 psig. All air pressure tests shall be performed for a period of one hour.

K. Valves shall be tested at the same time that the adjacent pipe is tested. Valves or joints shall show no detectable leakage under the test. Valves or joints that show signs of leakage shall be repaired prior to final acceptance.

L. The maximum allowable pressure loss shall be 10 percent of the starting pressure over a period of one hour.

M. Any section of pipe which fails to meet the stipulated pressure test shall be checked by the Contractor and corrective measures taken. The test shall then be repeated, at no additional cost to the Owner. Pipe installation will not be accepted until it meets the pressure test requirements.

N. The following steps shall be performed for failing pressure test described in this Part.

1. The pipe and all fusions shall be inspected for cracks, pinholes, or perforations.

2. All blocked risers and capped ends shall be inspected for leaks.

3. Leaks shall be located and/or verified by applying a soapy water solution and observing soap bubble formation.

O. All pipe and fused joint leaks shall be repaired by cutting out the leaking area and re-fusing the pipe.

END OF SECTION

SECTION 431343
WASTE GAS BURNER SYSTEM

PART 1 GENERAL

1.1 DESCRIPTION

A. The Contractor shall provide all labor, materials, and equipment to shop test the entire blower/flare system with control panels connected, before delivery to the site.

B. Related work described elsewhere:

1. Section 310513: Soils for Earthwork
2. Section 400533: High-Density Polyethylene Process Pipe
3. Section 400533.16: HDPE Valves and Appurtenances

1.2 SUBMITTALS

A. All equipment and accessories shall have manufacturer's Shop Drawings (e.g., descriptive literature, manufacturer's brochures, bulletins, equipment catalogs, certificates of compliance) approved by the Construction Manager prior to shipment and shall be tested for conformance with these Specifications prior to acceptance and final payment by the Owner. The following materials and shop drawing information shall be submitted:

1. Shop drawings showing all important details of construction and dimensions, including all piping schedules and detailed drawings in plan and profile. Show full details of piping, specials, and connections to existing pipes or equipment. Clearly mark the piping material on each assembly.
2. Drawings for butterfly valve assemblies requiring spacers.
3. A complete bill of materials for all equipment.
4. The total weight of the skid with all equipment installed.
5. Complete electrical interconnect diagram showing all wires and terminals between the control panel and external devices.
6. Exceptions to the applicable requirements, Construction Drawings, Specifications, and applicable codes and standards.
7. Heat tracing and insulation installation layout sketch.
8. Detailed control panel layout and electrical diagrams showing control panel enclosure, panel face and wiring diagrams for

approval prior to fabrication. Detailed wiring diagrams shall include point-to-point wiring information, including a wire and terminal numbering system. Field connections shall be clearly denoted.

9. Supplier's product data for all controls and electrical components including, but not limited to:

    a. Recorders

    b. Panel enclosures

    c. P&ID

10. Complete performance data that will indicate full compliance with the specifications; performance curves for flow and pressure/vacuum capacity; calculations showing the equipment gas flow and motor corrections required for operation at the elevation of the project site.

B. Three hard copies of an operation and maintenance (O&M) manual shall be furnished. Additionally, a digital version of the O&M manual (in PDF format) shall be submitted on acceptable electronic media (i.e., USB drive or compact disc). The O&M manual shall be prepared specifically for this installation and shall include all required catalog cuts, drawings, equipment list, descriptions, definitions, procedures, and information necessary to instruct operating and maintenance personnel unfamiliar with such equipment. The O&M manual shall include a list of suppliers, with phone numbers and contact, for equipment parts that may need servicing or replacement. The O&M manual hard copies shall be suitably bound with an index, and shall also include the following:

1. Installation and O&M manuals for each control and electrical component, including dimensional drawings and complete and easy-to-read sequential operating instructions for all normal and alarm modes.

2. Provide an alarm listing of all system alarms including setpoint description and a description of the alarm cause in spreadsheet format.

3. Provide a setpoint listing of all system setpoints including a description of the setpoint in spreadsheet format.

4. Provide a Programmable Logic Controller (PLC) database listing for all used memory in the PLC with a description of the memory address in spreadsheet format. This should be generated from the PLC programming software.

5. Two CDs containing:

    a. Copy of PLC program.

b. O&M Manual in searchable PDF format.

c. Complete copy of all Operator Interface Panel (OIP) application files (if used), including all screens and database.

d. All electronic drawing CAD files and related job documents.

C. Testing Plan:

1. Contractor shall submit a detailed skid-mounted blower/flare system testing plan 14 calendar days prior to system start up for approval by the Construction Manager. The testing plan shall include a step by step description of the proposed tests, a list of all test equipment including calibration dates, and signoff sheets.

2. Testing Plan shall be submitted with description of all tests for PLC control, OIP functionality (if used), and instrumentation for a complete control system test.

3. Testing Plan shall have an attached checklist containing all system functionality. Checklist shall be oriented in an easy to read format containing tag numbers, and place to check off each item.

4. Testing Plan shall contain a Test Certificate. This certificate shall state that the control system has been fully tested via the testing procedure under witness of the Construction Manager. Contractor and the Construction Manager are required to sign off on this during system testing. Final acceptance of system will require correct system operation for a period of one week without any system faults or irregularities.

D. Spare Parts: In addition to the spare parts recommended by this specification, a list of manufacturer's recommended spare parts shall be submitted.

1.3 QUALIFICATION

A. The Skid-Mounted Landfill Gas Blower/Flare System, including all ancillary equipment, shall be furnished by a manufacturer(s) who is fully experienced, reputable, and qualified in the manufacture of the equipment to be furnished. The equipment shall be designed and fabricated in accordance with the best practices and methods. The manufacturer shall have experience in supplying equipment for landfill gas handling systems.

B. The Skid-Mounted Landfill Gas Blower/Flare System shall be manufactured by one of the following manufacturers, or approved equal:

1. John Zink Company LLC
11920 East Apache

Tulsa, Oklahoma 74116
800-421-9242

2. Perennial Energy LLC
1375 CR 8690
West Plains, Missouri 65775
(417) 256-2002

3. LFG Specialties LLC
16406 U.S. Route 224 East
Findlay, Ohio 45840-9761
419-424-4999

4. Parnel Biogas, Inc.
5868 129th East Avenue
Tulsa, Oklahoma 74134
918-294-3868

5. AXD Service Industries Corp.
PO Box 39
Trenton, New Jersey 07763
732-946-9462)

1.4 DESIGN CRITERIA

A. Landfill Gas

1. Equipment specified herein is intended to be standard equipment for use in a landfill gas handling system.

Site elevation	1,390 feet above MSL
Gas composition:	
Methane	30 percent
Carbon Dioxide	30 percent
Oxygen	10 percent
Nitrogen	30 percent
Trace gases (e.g., VOCs, H2S)	0 - 1 percent
LFG inlet temperature:	
Maximum, degrees F	80
Minimum, degrees F	40
LFG moisture content	100% saturated

2. The flare shall be capable of achieving a minimum weighted average destruction efficiency of greater than 98 percent of total non-methane organic compounds and meet the requirements of 40 CFR 60.18.

1.5 APPLICABLE CODES AND STANDARDS

A. All equipment shall be manufactured in accordance with codes and guidelines as specifically detailed herein and in accordance with applicable portions of the following (latest edition):

1. Local laws and ordinances.
2. State and Federal laws.
3. National Electrical Code (NEC).
4. National Electrical Manufacturers Association (NEMA)
5. Underwriters Laboratories (UL).
6. State Building Code.
7. American National Standards Institute (ANSI).
8. American Society of Engineers (ASME).
9. Institute of Electrical and Electronic Engineers (IEEE).
10. Instrument Society of America (ISA).
11. Industrial Risk Insurance (IRI).
12. Factory Mutual (FM).
13. Environmental Protection Agency (EPA).
14. Arkansas Departmnet of Environmental Quality (ADEQ).
15. ASTM A 320, Alloy Steel Bolting Material For Low Temperature Service.
16. ASTM A 774, As-Welded Wrought Austenitic Stainless Steel Fittings for General Corrosive Service at Low and Moderate Temperatures.
17. ASTM A 778, Welded, Unannealed Austenitic Stainless Steel Tubular Products.
18. ASTM A-240, Stainless Steel Sheet or Plate

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. All parts shall be properly protected so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is completed and the units and equipment are ready for operation.

B. The equipment shall be delivered on site fully assembled. Factory-assembled parts and components shall not be dismantled for

shipment unless permission is received in writing from the Construction Manager.

C. Finished surfaces of all exposed openings shall be protected by wooden blanks, strongly built, and securely bolted thereto.

D. Each box or package shall be properly marked to show its net weight in addition to its contents.

1.7 WARRANTY AND GUARANTEES

A. The Contractor shall warrant the units being supplied to the Owner against defects in workmanship and material for a period of one (1) year from the date of successful startup test. In the event that the equipment fails to perform as specified, the equipment manufacturer shall promptly repair or replace the defective equipment without any cost to the Owner (including handling and shipment costs).

PART 2 PRODUCTS

2.1 GENERAL

A. Equipment shall not have been in service, except for shop tests, at any time prior to delivery.

B. Equipment shall be designed and proportioned to have liberal strength, stability, and stiffness and shall be especially adapted for the intended service. Ample room and facilities shall be provided for inspection, repairs, and adjustments.

C. Parts of equipment shall be amply proportioned for all stresses which may occur during operation and for any additional stresses which may occur during fabrication, transportation, handling, and erection.

D. These Specifications are intended to give a general description of what is required, but do not cover all requirements of the equipment as offered. They are, however, intended to cover the furnishing, delivery, and field testing of all materials, equipment, and apparatus as required. Auxiliary equipment necessary for proper operation of the proposed Skid-Mounted Landfill Gas Blower/Flare System not mentioned in these Specifications or shown on the Construction Drawings shall be furnished and installed.

E. A brass or stainless steel nameplate shall be attached to each piece of equipment in a conspicuous place. The following information shall be plainly marked on the nameplate: name and-address of the manufacturer,

serial number, model number, and any other information necessary for complete identification.

F. If necessary, modifications shall be made in the manufacturer's standard product to make it conform to the specific requirements of the Specifications and to requirements contained in regulations issued by public agencies. Such modifications shall be noted in Shop Drawing submittals.

G. Equipment shall include all production line improvements made prior to the delivery or Contract date. All equipment and components shall comply with applicable requirements of the standards of ASME, AGA, NSDLAE, NSFSR, and Underwriters' Laboratories.

H. The Skid-Mounted Blower/Flare System shall be fully assembled and tested prior to shipment to the site. All electrical components on the skid will be connected prior to shipment, requiring only connection to the electrical utility and piping for LFG inlet and condensate discharge upon delivery to the site to allow full operation of the Skid-Mounted Blower/Flare System.

I. At all levels of performance, the sound pressure shall not exceed 85dbA over a frequency range of 37.8 to 9,600 cycles per second. Measurement shall be made a distance of 3 feet from the outer face of the equipment. Contractor shall certify the equipment furnished does not exceed the specified sound pressure. This written certification shall be submitted with the Shop Drawings.

2.2 GAS HANDLING SYSTEM

A. Blower and Motor:

1. Blower. The blower units shall be gas inlet-driven, direct drive, multistage centrifugal type. Impellers shall be mounted on one shaft supported on each end by bearings mounted in the outboard bearing housings. The blower shall be built from parts cast in patterns from which previous units have been built and tested. Blower shall comply with the Design Criteria of Part 1.04 above.

2. Blower Housings. The housings shall consist of cast iron sections held securely between cast iron inlet and outlet heads with steel tie rods.

   a. No contact shall be made between the shaft rotor and the housing, other than through the bearings. Dual carbon rings shall be used as seals to ensure no leakage of gas to the atmosphere or air into the landfill gas.

b. The inlet and outlet connections shall be drilled and tapped flange pattern per ANSI 1316.1, 125-pound, and shall be an integral part of the heads.

3. Impellers:

   a. Impellers shall be one piece cast aluminum alloy, keyed to the shaft and held by a locknut. Hubs of the impellers shall butt against each other directly or through one piece metal spacers. There shall be ample clearance and tip speed shall not exceed 375 feet per second.

   b. Impellers shall be precisely machine balanced. Vibration shall not exceed 2 mils in the vertical plane measured at the blower bearing housings.

4. Diffusers. Diffuser sections which receive the gas from the impeller and guide the gas to the next impeller shall be provided. The diffusing vanes shall be an integral part of the sections.

5. Shaft. Each shaft shall be made of high grade carbon steel of sufficient diameter to operate below first critical speed.

6. Bearing Housings. Each blower shall be provided with two antifriction bearings. It shall be possible to replace bearings without disconnecting piping or disassembling the compressor casing. Both inlet and outlet bearings shall be designed for a minimum expected life of 10 years of continuous operation.

7. Casing Drains. Each blower stage shall be provided with 3/8-inch diameter casing drains manifolded to a single manual shut-off valve.

8. Internal Lining. The blower internals shall be furnished with a factory applied Bisonite, Kynar or Heresite phenolic coating or approved equal, minimum 10 mils thick to provide resistance to corrosion by landfill gas. The coating shall be applied to all parts of the blower (excluding aluminum impellers) which come in contact with the landfill gas stream.

9. Motor. Each blower shall be direct-coupled to a horizontal 575V, 3-phase, 60-hertz motor. The blower manufacturer shall be responsible for selecting the proper motor size to suit this equipment, the performance requirements noted herein, and the site conditions. The motor shall be rated for inverter duty. The motor shall be totally-enclosed fan-cooled (TEFC), and explosion-proof (i.e., suitable for Class 1, Division 2, Group D classified location) and ULC-approved. Motor shall be rated at 104 degrees F ambient with not more than 131 degrees F rise. Bearings shall

be of the antifriction type with an AFBMA L-10 life rating of not less than 25,000 hours. Provide a manufacturers' certificate confirming all motor ratings.

10. Flexible Couplings and Drives. The blowers shall be connected to the drivers with a suitable flexible coupling. The Contractor shall check and adjust the alignment of the couplings and drives in accordance with the instructions of the blowers' manufacturer to a tolerance of plus or minus 2 mils. Couplings shall be covered with base-mounted aluminum or non-sparking metallic guard.

11. Bases. Hot dip galvanized or epoxy-coated steel bedplates of suitable size for mounting blowers and motors shall be furnished by the blower manufacturer. The blower and motor shall be carefully aligned and then bolted in place. Suitable vibration isolation pads shall be provided under the steel bedplates of the units.

12. The blower-motor assemblies shall be located, installed, and plumbed on a skid, and delivered to the site as a complete unit. Neoprene base pads, bolts and mounting clips shall be provided.

13. Auxiliary Equipment: The following auxiliary items shall be provided by the blower manufacturer:

    a. The manufacturer of the blowers shall provide flanged expansion joints and concentric tapered reducers.

    b. Provide a pressure gauge on the outlet and a vacuum gauge on the inlet side of each blower, and temperature gauges on both sides.

    c. Provide a vibration sensor on each blower.

    d. The blower controls shall include a thermocouple-based (non-RTD) thermal protection package to monitor the blower inlet and outlet bearing temperatures. Sufficient wiring shall be provided by the manufacturer to span the distance between the control panel and the blower bearings.

14. Blower Controls:

    a. Blower-motor starters and controls are specified in Section 40 95 13. Starters and controls shall be commonly available parts. The manufacturer shall provide the Owner with a list of known suppliers for parts not commonly available that are expected to need servicing or replacement.

15. Experience:

a. Blowers shall be manufactured in Canada or the United States. Blower manufacturers shall have a minimum of 25 operating installations on landfills in Canada or the U.S.

b. Acceptable Manufacturers:

1) Houston Service Industries
Houston, Texas 77061
(800) 725-2291
2) Gardner Denver, Inc (Lamson Corporation
Peachtree City, Georgia
(800) 982-3009
3) Owner-approved equal.

2.3 MOISTURE SEPARATOR ASSEMBLY

A. The moisture separator shall be completely fabricated from 14-inch SDR 17 high density polyethylene or approved equal. It shall be of a vertical, cylindrical design with element removal from the top. A minimum 8-inch flanged, covered, inspection port shall be provided in the side near the bottom for manual clean out of accumulated debris. Nozzle flanges shall meet ANSI 125-pound specifications. A support ring shall be extrusion-welded along the inside diameter of the moisture separator for support of the demister pad.

B. The demister pad shall be made from non-corrosive mesh and shall be supported on and held down by high open area, stainless steel grid, or equivalent. The moisture separator shall be able to remove >99.99 percent of droplets greater than 15µm at flow capacity (i.e., 250 scfm) and shall also remove particulates having a density equal to or greater than water which are greater than 15µm in size. The pad shall be carefully constructed to ensure a tight fit in the separator vessel, thus eliminating any gas pass-by. The demister pad shall be secured to the support ring along the inside of the moisture separator using a minimum of three (3) latch-keys. The demister pad shall include a flow distributor plate installed along the top side of the demister pad. The flow distributor plate shall cover ½ diameter of the demister pad on the moisture separator discharge side of the demister pad, and shall be constructed of sheet HDPE or stainless steel, and be attached to the demister pad to prevent separation during service. The demister pad shall be manufactured by AMACS Process Tower Internals of Houston, TX (713) 434-0934), or Owner-approved equal.

C. The moisture separator shall have a flow capacity of at least 700 scfm. At the design flow rates, temperatures and pressures, the moisture separator (including demister pad) shall not have a pressure drop greater than

3 in-w.c. and shall be capable of withstanding no less than 40 in-w.c. gauge vacuum.

D. Condensate Removal. There shall be a 2-inch IPS pipe coupling near the bottom of the assembly for condensate removal.

E. Pressure Drop Monitoring. There shall be two (2) ½-inch pipe couplings in the side of the unit, one upstream and one downstream of the demister element material, for the purpose of connecting a differential pressure gauge. Isolation valves shall be provided for calibration and service. Pressure differential gauge shall be furnished and mounted on the face of the moisture separator.

F. Transparent Liquid Level Gauge. The moisture separator shall include a transparent liquid level gauge installed along the side of the unit, from the bottom to the invert elevation of the inlet landfill gas pipe, to allow visual determination of liquid level within the unit. The transparent material in the gauge shall be glass, and shall be easily removed for cleaning. The liquid level gauge shall be connected to the moisture separator at the top and bottom of the gauge, to allow the gauge to properly respond to changes in liquid level.

G. The moisture separator shall have a port for a level switch. The switch shall define the high condensate level, located at the elevation of the LFG header pipe invert, for system shutdown. The liquid level switch shall have a stainless steel stem and float, and shall be explosion-proof. Connection of the liquid level switch to the moisture separator shall allow free and sufficient movement of the float. The switch shall be manufactured by Linc or Owner-approved equal.

H. The moisture separator assembly shall be manufactured in the United States. Manufacturers shall have a minimum of 5 years of experience in the design and manufacture of this type of equipment, and have a minimum of 10 units operating successfully on similar landfill gas installations in the U.S.

I. The moisture separator assembly shall be located, installed, and pre-plumbed on the Skid-Mounted Landfill Gas Blower/Flare System.

2.4 STRUCTURAL SKID

A. The structural skid shall be manufactured from ASTM A-36 structural members. The arrangement, sizes, weights and shapes of the structural members shall be engineered to support all assemblies and sub-assemblies in loading, transport and operation.

B. 1-1/4 inch heavy galvanized non-skid steel grating or plating shall be cut to fit properly around each separate component mounted on the skid as well as complete coverage on the skid. Removable grating or plating shall be provided with edge bands and hold down clips. Provisions for drainage of the skid interior will be made. The non-galvanized portions of the skid shall be sand-blasted and coated with appropriate primer and epoxy-based paint for outdoor exposure.

C. All welding shall be accomplished per AWS Section 1.1.

2.5 UTILITY FLARE SYSTEM

A. The landfill gas flare system shall be a unitized, modular system including all components for a complete and operational system. The flare shall comply with the Design Criteria of Part 1.04 above.

B. The landfill gas flare system shall be completely pre-piped and pre-wired, requiring no field assembly.

C. The landfill gas flare system shall include, but not be limited to, the following components:

1. Automatic Shut-Off Valve. The valve shall open when prompted by the flare control panel and close by loss of electrical power, flame failure, or blower failure. It shall be a pneumatically-operated butterfly valve (as detailed in Section 33 51 30). The compressed air/nitrogen necessary to operate the valve shall be supplied by the Owner.

2. Flame Arrester

   a. Flame arrester shall have 125-pound ANSI flanged connections.

   b. The housing construction shall be cast aluminum. The bank assembly shall be all stainless steel and shall be arranged for easy removal from the housing to facilitate inspection and cleaning. The net free area through the bank assembly shall not be less than four times that of the corresponding size pipe.

   c. Maximum head loss through the flame arrester shall not exceed 2 inches of water column at 720 scfm. All grids of the bank shall be arranged for individual removal. The flame arrester shall be ULC-approved and manufactured by Varec Biogas, Model 5010-8-2, Enardo Model 7 14 08/D-A 6 F-13, or Owner- approved equal.

3. Thermal Valve

   a. Thermal valve shall be installed in series with and directly downstream of the flame arrester.

   b. Thermal valve shall have 125-pound ANSI flanged connections.

   c. The thermal valve shall be a fusible element-released, spring-operated pallet-type shut-off valve. The fusible element shall melt within 45 seconds upon reaching 260°F. Upon fusible element melt, the compression spring shall immediately force the pallet down against the valve seat, closing the valve.

   d. A sight glass shall be included on the valve for ease of valve inspection.

   e. A gas-tight fuse plug shall be included to allow the fusible element to be replaced without removing the valve cover or disassembling the valve.

   f. Pressure loss across the valve shall not exceed 3 in-w.c.

   g. Materials of construction:

      1) Housing construction: cast aluminum
      2) Pallet: low copper aluminum
      3) Compression spring: 304 stainless steel
      4) Sight glass indicator: acrylic isolated by Buna-N gaskets

   h. Thermal valve shall be Varec Biogas, Model 430-8-1 or Owner-approved equal.

4. Flare Stack. The flare stack shall be constructed of 316 stainless steel, and shall be of sufficient length to provide an overall flare system height of more than 20 feet. Flare construction shall consist of welds conforming to AWS D1.1 standards. The top 5 feet of the stack/burner tip shall be constructed of 316 stainless steel. Flare inlet shall be 90 degrees entrance into flare stack. Flare inlet shall project a minimum of 250mm (10 inches) from the stack and terminate with a 150# ANSI RFSO Flange. Inlet nozzle shall contain one (1) 12mm (½-inch) FNPT connection on the top of nozzle for mounting a temperature switch. Flare stack shall be flanged and hinged to allow flare to be laid in a horizontal position for skid mobility. An appropriate support and locking mechanism shall be provided on the skid to secure the flare stack while in the horizontal position without causing damage to the flare stack while the skid is transported.

5. Burner. The burner unit shall be constructed of 304 stainless steel. It shall consist of the burner nozzle, vanes, and impingement assembly. It shall be designed such that the full range of flow rates, as specified herein, shall combust without causing either flame yellowing, flame lift-off, or flashback, and shall perform according to the destruction and reduction efficiency requirements listed in Part 1.04.

6. Windshield. The flare windshield shall be constructed of 304 stainless steel. The windshield shall extend at least 2 feet above landfill gas exit. One (1) 2-inch lifting eye shall be welded to tip at bottom of windshield, for ease of raising stack during installation. An air damper assembly shall be installed along the bottom of the windshield to the flare stack, and be equipped with an extension rod to allow adjustment of the position of the air damper assembly from grade.

7. Propane Pilot System. Removable pilot assembly shall include pressure regulator, pressure indicator, solenoid valves, check valve, manual shutoff valve and pilot gas pressure manometer port. Two 100 pound L.P. containers equipped with fuel gauges and regulators that are arranged to allow one container to be removed from the system for re-filling without affecting system operation shall be provided. Pilot tip shall be made of stainless steel and shall be positioned such that main flare tip is ignited easily.

8. Electronic Spark Ignition. 6,000 V and 20 mA electronic igniter assembly removable from outside the flare without disconnecting conduit or wiring. Igniter assembly shall be commonly available parts (i.e., spark plug). The manufacturer shall provide a list of parts not commonly available and known suppliers.

9. Temperature Switch. A temperature sensor shall be mounted on the downstream side of the thermal valve to indicate gas temperature for flash back detection. The flare controls shall include a mechanism to shut down the flare at the pre-selected high temperature setting at this temperature sensor.

10. Thermocouple. 1 each (pilot flame and main flame), type K or Type E flame monitoring thermocouples. The thermocouple assembly shall be housed in a bendable protection sheathing of either stainless steel or inconel material.

11. Flare Mounting System. This system shall be manufactured of ASTM A36 carbon steel members, which shall be welded to the structure using AWS D1.1 methods. Sufficient steel gusset material shall be incorporated in the structure to prevent erratic vertical alignment of the flare pipe. Flare mounting shall provide

anchorage to the foundation to prevent overturning and provide resistance against seismic or wind forces. Structural design shall comply with UBC 100 MPH criteria.

12. Finish. 316 stainless steel base of the flare stack shall be sand-blast prepared and primed. Sand blasting shall be to SP-6 guidelines. An inorganic zinc primer, solvent or water based, with a minimum of 14 lbs metallic zinc content per gallon shall be applied. Minimum application will involve 1 coat, 4 MDFT cover. Acceptable coating suppliers include Ameron Protective Coatings (Brea, CA), DuPont Chemical Company (Wilmington, DE), Glidden Company (Cleveland, OH), and Koppers Company (Pittsburgh, PA), or Owner-approved equal.

13. Electrical Boxes. Ignition transformer enclosures and junction box enclosures shall meet NEMA 4 criteria.

14. Condensate Drains. Drain ports in the flame arrester and flare stack shall be equipped with manual ball valves and drip traps as manufactured by Varec or Owner-approved equal.

2.6 INTERCONNECTING PIPING SYSTEM

A. All landfill gas and condensate piping on the Skid-Mounted Blower/Flare System shall be SDR 17 HDPE pipe, as specified in Section 400533, or Owner-approved equal.

B. Compressed nitrogen piping for the automatic shutoff valve shall be stainless steel tubing or approved equal.

C. Final Cleaning and Shipment: All piping, fittings and flanges shall be free of loose particles or other foreign material.

D. Pipe Supports:

1. Pipe supports shall be installed as necessary to properly support the pipe during normal service and upon disconnection of any pipe or equipment at flanged connections.

2. Pipe supports shall be galvanized, adjustable with a Teflon seat, as manufactured by Grinnell or Owner-approved equal.

2.7 SKID-MOUNTED BLOWER/FLARE SYSTEM VALVES

A. All valves shall be complete with all necessary operators, actuators, handwheels, chain wheels, extension stems, floor stands, worm and gear operators, operating nuts, chains, wrenches, and other accessories or appurtenances which are required for the proper completion of the work.

Manual operators and other accessories shall be sized and furnished by the valve supplier and factory mounted.

B. Valves shall be suitable for the intended service. Renewable parts including discs, packing, and seats shall be of types recommended by valve manufacturer for intended service, but not of a lower quality than specified herein.

C. Valves and operators shall be suitable for the exposure they are subject to: interior or exterior, as applicable. Valves shall have all safety features required by OSHA.

D. Unless otherwise shown, valves shall be the same size as the adjoining pipe.

E. Butterfly Valves:

1. Butterfly valves on the skid-mounted blower/flare system shall be bubble-tight, cast iron body, wafer style with 304 or 316 stainless steel disc and stem, Acetal or Teflon stem bushing, and Teflon replaceable resilient seat or Buna-N replaceable liner which covers all non-stainless steel components in contact with gas. Interior of valve body and valve disc except for valve seat and stainless steel valve seat ring shall be coated with a fusion bonded, thermosetting epoxy or enamel coating in accordance with AWWA C550, latest revision, unless a Buna-N liner is used. Coating shall be holiday free with a minimum thickness of 12 mils. Surfaces shall be clean, dry, and free from rust and grease before coating.

2. Manual operators shall be worm gear or lever type. Manual actuators shall be provided with a handwheel and corrosion resistant bearings. Manual actuators shall be totally enclosed and sealed to protect moving parts from damage or corrosion. Manual actuators shall be provided with adjustable open and closed position stops, and external indication of disc position. Should an adjustment of the disc be required to maintain a bubble-tight seal, this adjustment shall be made externally without removing the operator housing cover. Butterfly valves may require spacers between the flange adapters and the valve body in order to allow full travel of the internal disk. If spacers are necessary for any butterfly valve, the Contractor will install valve spacers.

3. Butterfly valves shall be manufactured by Centerline, Grinnell, Flowseal, Xomox, Keystone, American-Darling Valves, Clow Valve Co. or as approved by Construction Manager equal.

4. Automatic actuator for the automatic shutoff valve shall be pneumatic, explosion-proof, fail-closed as manufactured by Bettis or equal, and shall be equipped with open/closed limit switches, solenoid valve, tubing and other appurtenances as necessary to connect to Owner's compressed nitrogen supply for a fully operational automatic shutoff valve system.

F. Ball Valves:

1. Ball valves on the Skid-Mounted Landfill Gas Blower/Flare System shall be HDPE ball valves, as specified in Section 400533.

G. Quick Disconnect Couplings:

1. Quick disconnect couplings shall be provided on the Skid-Mounted Landfill Gas Blower/Flare System at each sample port shown on the Construction Drawings.

2.8 HEAT TRACING AND INSULATION

A. General:

1. Heat tracing, insulation and jacketing shall be provided on all piping and equipment indicated as insulated and heat traced on the Construction Drawings.

2. For the 2 inch SDR 17 HDPE moisture separator condensate drain, the manufacturer of the Skid-Mounted Landfill Gas Blower/Flare System shall ship loose the necessary components for heat tracing, insulating and jacketing the moisture separator drain from the sidewall of the moisture separator to a point at least 4 feet below grade. An electrical junction box near to this drain shall be installed and connected on the skid at the factory to the power supply to enable simple connection of thermostat and heat tracing wire for the moisture separator condensate drain in the field.

3. Additional electrical capacity and connections shall be provided for future connection of heat tracing on the 2" condensate drain for the future second flare.

B. Insulation:

1. The insulation shall be minimum 6 lb/ft^3 density, with a maximum thermal conductivity ("K" value) of 0.042 0.29 Btu-in/(hr-ft^2-°F) at 75°F mean temperature.

2. For all piping/equipment up to and including 6 inch diameter, the minimum nominal thickness shall be 25mm 1 inch.

3. For all piping/equipment over 6 inch diameter, the minimum nominal thickness shall be 1.5 inch.

4. The insulation shall be 705 FRK Fiberglas as manufactured by Owens-Corning, FoamGlas as manufactured by Pittsburgh Corning, or Owner-approved equal.

C. Aluminum Jacket:

1. All piping/equipment insulation shall be covered with an aluminum jacket. The aluminum jackets shall have corrugations or stucco pattern 3/16 inch deep with poly-weld lining with a metal thickness of 0.016 inches.

2. Jacket shall be as manufactured by Pabco, or Owner-approved equal.

D. Heat Tracing System:

1. The heat tracing system shall be self-regulating SRL as manufactured by Chromalox Corp., Redwood City, CA or Owner-approved equal.

2. Heating Cable – Self Limiting Type:

a. Provide electric heat tracing of pipe, fittings, valves and line specialties where shown on the Construction Drawings or where specified.

b. The heat tracing strips shall be flat, flexible, low heat density type of parallel circuit construction consisting of a continuous inner core of semi-conductive material between two or more copper electric power conductors. Heaters shall operate from 120V, 60 hertz, 1 phase power unless noted otherwise on the Construction Drawings.

c. The heat tracing strips shall have a thermal self-limiting characteristic to prevent overheating without the need for thermostats to sense the heated surface temperatures.

1) For plastic pipe heat tracing, cable shall have a tinned-copper braid for a positive ground path.
2) In hazardous areas, heat tracing cable shall have tinned-copper braid.

d. The heat tracing system shall be designed for freeze protection using a pipe temperature of 4°C (40°F) and an ambient temperature of –30°C (-22°F).

1) The installed heating density shall not be less than listed below:

Minimum Pipe Size (in)	Heat Trace Power (W/ft)
½	1.6
¾	1.9
1	2.2
1 ¼	2.5
1 ½	2.8
2	3.2
2 ½	3.8
3	4.4
3 ½	4.9
4	5.4
5	6.5
6	7.5
8	6.7
10	8.1

2) Values are based on 1 inch fiberglass insulation for up to and including a 6 inch pipe; 1.5 inch fiberglass insulation for pipe larger than 6 inch.

e. Cable length shall be selected for proper number of turns around piping, valves and accessories.

f. Cable shall be secured to pipes on a maximum 24 inch center. DO NOT use metal attachments for the heat cable.

g. The plastic cable ties or glass tape shall have a temperature rating that matches the system's exposure temperature.

h. Use aluminum tape for plastic pipe installed in accordance with the manufacturer's recommendations.

3. Thermostats and Indicating Lights:

a. Tracing thermostats shall be provided by the tracing cable manufacturer. Thermostats shall be line-sensing type with fixed NEMA 3/7 waterproof, explosive-proof, and corrosion resistant enclosure, Chromalox DL, or approved equal.

b. Each tracing circuit shall be limited in load to ensure that thermostat ampere ratings are not exceeded, including effects of startup currents. Each independent run of pipe shall have its own heat tracing circuit and thermostat.

c. Provide indicting light at end of each heat trace circuit for continuity indication, NEMA 3/7 weatherproof, explosion-

proof and corrosion resistant enclosure, neon bulb, Chromalox PMK-SL, or equal.

d. Provide no more than one (1) thermostat and indicating light per 120V, 20 amp circuit.

2.9 GAUGES

A. Pressure/Vacuum/Differential Pressure Gauges:

1. The Skid-Mounted Landfill Gas Blower/Flare system shall be equipped with pressure, vacuum, and differential pressure gauges: Gauges shall be Capsuhelic gauges as manufactured by Dwyer Instruments, Inc., Marietta, Georgia, or Owner-approved equal. Isolation valves shall be provided for calibration and service. Graduations shall be at intervals of 1 inch of water column (in-w.c.). Gauges shall include the following:

   a. Moisture separator pressure drop indicator. Gauge shall be capable of measuring 0 to 15 in-w.c., differential pressure.

   b. Blower vacuum indicators. Vacuum gauges shall be capable of measuring 0 to 50 in-w.c.

   c. Blower pressure indicators. Pressure gauges shall be capable of measuring 0 to 10 in-w.c.

B. Temperature Gauges:

1. The Skid-Mounted Blower/Flare System shall be equipped with temperature gauges. Temperature gauges shall be manufactured by Ashcroft or Owner-approved equal, and include a stainless steel stem, NPT stem connection and 3-inch minimum dial. Temperature gauges shall include blower inlet and discharge temperature indicators. Gauges shall be provided at the inlet and outlet of each blower. The gauges shall range from 0 to 200 degrees F.

2.10 Control System

A. Control system panels shall be designed and the layout organized in a logical manner. Switches, pushbuttons, controllers, and other components shall be easily accessible and positioned to facilitate operator interaction. Electrical components mounted behind the door shall be arranged to be easily accessible, provide ease of maintenance, repair and replacement.

B. Control panels shall be listed in accordance with Underwriters Laboratories 508A and housed in NEMA 4 or 3R enclosure(s) on the skid, suitable for outdoor operation. NEMA 4 gasketing shall be used, and a

single lockable handle that operates a three-point latching mechanism. All components shall be clearly identified by engraved laminated plastic nameplates. The control panels shall be completely pre-wired in the factory. The panel shall include at a minimum, but not be limited to, the following components:

1. Electrical connections and controls for all the motors, outlets, fixtures, controls, and devices, etc., included with the system. The panels shall be pre-wired to receive incoming power from the electrical service equipment, and with suitable junction boxes for all outgoing conduit and cable to equipment.
2. A control center to receive all the signals from the various safeties, controls and monitoring equipment, and to automatically control the blowers.

C. The manufacturer shall provide the controls for blower system mounted on the skid with the control panel, and will interface with operation of the VFD. The blower controls shall include hand-off-automatic switch and green push-to-test or touch screen lamp indication run lights housed in the control panel enclosure. A time delay shall prevent blower restart until sufficient time has elapsed for the shaft to stop spinning (approximately 5 minutes).

D. Safeties. The control system shall be equipped with the following safeties that shall cause shutdown of the system or of the applicable component, as a minimum:

1. Automatic shutoff valve fail open/closed.
2. Blower-motor over-current.
3. Blower-motor undercurrent (surge).
4. High blower vibration.
5. High liquid level in the knockout pot.
6. Low flare flame temperature.

E. Control Panel Face-Mounted Devices. The system shall be equipped with the following control panel face-mounted devices as a minimum:

1. Operator Interface Panel (if used).
2. Chart recorder (if not included on the optional OIP).
3. Alarm and Shutdown Indicating Lights.
4. Hand/Off/Auto Switches for the Blowers.
5. Safety Shutoff Switch (E-Stop button).

F. Panel Appearance:

1. The panel shall have lighting with manually operated switches.
2. The control panel door shall be lockable using a standard combination lock approved by the Construction Manager. The contractor shall supply 2 combination locks for each control panel.

G. Pushbutton/Selector Switches, Control Units and Panel Lights:

1. Manufacturers:
   a. Square D
   b. Cutler-Hammer
   c. Allen Bradley
   d. Or equal

2. Construction:
   a. Heavy duty
   b. Oil-tight
   c. Base mounted or
   d. Flush panel mounted

3. Pushbuttons:
   a. Flush head unless otherwise specified elsewhere
   b. Control blocks:
      1) Double break silver contacts
      2) AC ratings: 7200 va make, 720 va break
      3) Single-pole-double-throw or double-pole-double-throw
      4) Up to six (6) tandem blocks
   c. Maintained contact unless otherwise specified elsewhere
   d. Non-illuminated
   e. Legend plates as required for type of operation or as specified elsewhere

4. Selector Switches
   a. Maintained position unless otherwise specified elsewhere.
   b. Contact blocks:
      1) Double break silver contacts
      2) AC ratings: 7200 va make, 720 ma break
      3) Single-pole-double-throw or double-pole, single-throw
      4) Up to six (6) tandem blocks

5. Operators:
   a. Number of positions as required or specified elsewhere
   b. Standard knob type of operation unless otherwise specified elsewhere

6. Panel lights
   a. LED type
   b. Colored lenses or bulbs as specified elsewhere
   c. Interchangeable lenses
   d. Legend plates as required or as specified elsewhere
   e. Press-to-test feature.

7. Nameplates
   a. Engraved laminated plastic
   b. Letters 0.2” High
   c. White letters on black background
   d. Identity per equipment controlled

H. Wiring

1. If more than two 120VAC circuits are provided, then a breaker distribution panel is required.
2. The panel must have a main breaker sized to support the existing loads and a minimum of 20% spare slots for future use;
3. These future loads can be assumed to be a 20 amp load/each.
4. Unused I/O shall be labeled as spare.
5. Panel wiring shall be color coded per national electric code requirements.
6. Minimum wire size for control wire is 18 AWG for all conductors.
7. No components shall be installed on the back panel closer than 1” from any wall.
8. All conduit runs shall enter the panel through the bottom of the panel. All penetrations into enclosure shall be tightly sealed using standard methods to prevent exposure to the outside environment.
9. Wire all PLC I/O modules to din rail mounted terminal blocks in enclosure for all field wiring and all spare points. Terminal blocks shall be arranged in a logical order grouped by I/O card.

I. Wireway

1. The minimum wire way height will be 4 inch.
2. A minimum clearance of 1 inch shall be kept between the wire way and wire terminals and or devices.
3. The wire way shall be dark grey color only.
4. The back panel will be framed by wire way.

5. The wire way will be installed inset a minimum of ½ inch from the edge of the back panel.

J. Receptacles

1. Quantity of two (2) GREY 120VAC receptacles with a breaker shall be provided and wired through a 20 AMP breaker each.

K. EMI Isolation

1. If 480VAC is provided in the panel, it will be isolated from the control voltages (120 VAC/+24 VDC).
2. The panel will be supplied with EMI protection for control voltages.

L. Labeling

1. All panel devices (breakers, relays, etc.) shall be labeled per the electrical schematic.
2. Labels shall be provided for all hardware, switches, lights, power supplies, PLC racks, etc.

M. Fluorescent Lighting Package

1. Provide and install a fluorescent lighting package in control panel on incoming panel power circuit. Circuit feeding light shall be breaker protected and sized accordingly.
2. Light shall have an aluminum body with integrally mounted switch. Lens shall be non-yellowing PVC covering standard-mount fluorescent bulbs.
3. Light shall have three separate screw terminal blocks for power and ground.

N. Panel Weather Shield:

1. Provide a weather shield (waterproof metal) over control panel with a minimum 3 feet overhang. The roof shall have 7 feet clearance above bottom of skid, over front of panel(s) and integral with panel support structure, designed for suitable site wind load. Factory-apply 2-coat paint system over weather shield.

O. Power:

1. Provide separate transformers for 120VAC control circuit power and auxiliary loads such as lighting, heat tracing.
2. All 120 VAC circuits shall have breakers. Fuses are not permitted.

3. The control transformer shall be sized to support the blower skid control power loads.
4. A 1000 VA UPS battery backup shall be provided. Acceptable manufacturers are:
    a. Tripplite
    b. Belkin
    c. APC

P. Circuit Breaker and Surge Protection

1. Provide and install a single pole circuit breaker sized appropriately in control panel on incoming panel power circuit. Circuit breaker shall be enclosed terminal block style with din rail mount.
2. Provide surge protection on incoming panel power circuit designed to protect all electronics inside control panel. Surge protector shall be rated for 120 VAC and a nominal current of 16 A.
3. Surge protector shall be model no. MT-2PE/S-120AC as manufactured by Phoenix Contact or approved equal.

Q. Variable Frequency Drive

1. Variable frequency drive (VFD) shall be installed in control panel to provide and control power to blower system, installed on Skid-Mounted Landfill Gas Blower System by skid manufacturer. The blower motor shall require 3-5 HP, 480V/three phase/60Hz power. Clarification on blower motor size shall be provided by Owner to Contractor upon approval of blower system shop drawing.
2. VFD shall include input for 4-20 mA vacuum transmitter signal, and include integrated PID controller to adjust blower operation to maintain constant inlet vacuum on Skid-Mounted Blower/Flare System. VFD shall also allow output of vacuum signal to Programmable Logic Control (PLC), and allow PLC to modify VFD PID controller setpoint.
3. Variable frequency drive shall be Yaskawa model Z1E1B or Owner-approved equal, specific for blower system inlet power.

R. Programmable Logic Controllers

1. PLC shall include all necessary parts including specified processor, rack, I/O cards, and power supply to meet described system functionality.
    a. 20% spare slot space.

b. 20% spare IO on installed PLC cards.

2. PLC processor shall include a minimum of one communication port. One of the ports shall be a 10+ MB Ethernet port. The Ethernet port will have processor programming capabilities.

3. The PLC must be provided with an Ethernet port or Ethernet card. If an Automation Direct PLC is used, the ethernet port must be a DL-260 CPU.

   a. All IO Cards shall have a minimum of 4 points for analog loops and 8 points for discrete points.

4. Acceptable manufacturers:

   a. General Electric

   b. Allen Bradley

   c. Modicon

   d. Automation Direct

   e. Or approved equal.

S. Control Relays

1. Provide and install relays where required to meet specified functionality.

2. Relay coils shall be rated for the required voltage source. Contact count shall be at least DPDT at a minimum and rated for 2A at 120 VAC. Contacts shall be gold-flashed fine silver, gold diffused, Form C. Relay should be rated for 10,000,000 operations minimum. Maximum pickup and dropout times shall be 13ms and 10ms, respectively. Operating temperature shall be -45°C to +70°C. Each relay shall have LED indication for energized status.

3. Manufacturers:

   a. Potter and Brumfield

   b. IDEC

   c. Omron model LY

   d. Or approved equal.

T. Chart Recorder

1. The chart recorder for the blower/flare system control panel shall be a digital, 6 channel or greater, and shall be Yokogawa DX100 or DX1000, or as approved by the Construction Manager as equal. The recorder shall accept input from the flowmeters and

thermocouples for each of two flares (one flare in Contract, and provide space for future additional flare) and inlet vacuum transmitter.

2. If Automation Direct C-More OIP is used, a chart recorder is not necessary. The C-More panels must be supplied with two (2) 512 megabyte flash drives and be configured to log data and alarms to the flash drives. A trend screen for each logged point will be required.

3. Information will be stored at 1 minute intervals.

4. The following information shall be shown on the chart or C-More touch screen:

   a. LFG flow to flare.

   b. Flare flame temperature based on maximum thermocouple reading at flare.

   c. Skid-Mounted Blower/Flare System Inlet Vacuum (from vacuum transmitter as relayed by VFD).

U. Beacon: Control system shall include a beacon which shall be mounted in a position on the skid visible from locations remote from the skid. Beacon may be mounted on a standard, control panel weather shield, above panels, or other location appropriate for remote visibility. Beacon shall be red in color (or approved equal), sufficiently bright to be visibly lit at minimum 100 feet in full daylight, and shall oscillate on/off when activated (i.e., when control system alarm is triggered).

2.11 Flow Meters

A. Landfill gas flow meter shall be a thermal mass flow metering system, Model TA2-A1B0-930 (Thermatel mass flow transmitter) / TER-A03A-080 (Thermatel mass flow probe) by Magnetrol of Aurora, Illinois, or Owner-approved equal. The flow output from this device shall be corrected for temperature and pressure, and converted to a 4-20 mA signal, scaled from 0 to 1000 scfm, at a molar weight of 29.5 lb/lbmol. Flowmeter shall include the following design features:

1. Housing: NEMA 4X

2. Power: 100-264 VAC, 15-30 VDC

3. Probe type: Mass Flow – Insertion

4. Probe material: 316/316L SS

5. Connection type: ¾" MNPT compression fitting with Teflon ferrule

6. Line size: 4-inch SDR 17 HDPE
7. Insertion length: 8.00 inch”

2.12 Vacuum Transmitter

A. Vacuum transmitter shall transmit inlet LFG header vacuum readings to VFD as a 4-20 mA signal, calibrated to a range of +5 in-w.c. to -30 in-w.c.

B. Vacuum transmitter shall be suitable for Class 1, Division 2 area classification.

C. Vacuum transmitter shall be manufactured by Foxboro, Rosemount or Owner-approved equal.

D. Mounting: Installed on pipe tap; Contractor shall coordinate pipe tap size with port size on transmitter.

E. Sensor Materials: 316L ss.

F. Electronic Classification: Explosion-proof.

2.13 SPARE PARTS

A. The Vendor shall provide the following spare parts:

1. One each blower vacuum, pressure and temperature gauge, and moisture separator differential pressure gauge.
2. One circuit breaker of each type/size provided.
3. Two replacement surge protection devices.
4. One replacement lamp for each type of installed control panel light.
5. One flare spark pilot.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The manufacturer/supplier shall install the following items on the main skid:

1. Blower system.
2. Moisture Separator Assembly.
3. Flare System.
4. Piping and fittings.

5. Valves.
6. Electrical power panel and control panel(s).

B. All pipe shall be supported by the skid and pipe supports.

C. All equipment shall be installed in strict accordance with the manufacturer's recommendations and codes and standards.

D. All skid-mounted equipment shall be installed plumb and perpendicular to piping.

E. Marred or abraded surfaces of equipment shall be cleaned and refinished to match original finish.

F. The Contractor shall coordinate the electrical work with the equipment manufacturer and panel fabricator to provide a complete, integrated, and automatic system.

3.2 PIPING

A. Inspection: The Contractor shall visually inspect all piping to ensure that piping is free of defects in material and workmanship.

B. Installation:

1. Perform HDPE piping installation in accordance with Section 400533.
2. Installation of couplings shall be in accordance with manufacturer’s recommendation.
3. Install all pipe in accordance with manufacturer/fabricators drawings and instructions.
4. Place valve operators and instruments in readily accessible positions for convenient operation as approved by the Construction Manager.
5. Testing: New pipe assemblies shall be pressure tested, in accordance with Section 014000, prior to shipment and after installation and connection to equipment at the site. Contractor shall provide all labor and equipment required.

3.3 VALVES

A. Valves shall be installed in accordance with the manufacturer's recommendations and the Drawings. Care shall be taken to avoid stripping bolts when tightening.

B. Butterfly valves may require spacers between the angle rings and the valve body in order to allow full travel of the internal disk. If spacers are necessary for any butterfly valve, the Contractor will install valve spacers subject to the approval by the Construction Manager.

C. Quick disconnects couplings shall be taped with teflon tape and threaded (not glued) into the plastic piping or sample ports as shown on the Drawings.

3.4 INSULATION AND HEAT TRACING

A. Install insulation and heat tracing with appurtenances where required or as shown on the Construction Drawings.

B. Heat Tracing:

1. Insulation shall be applied with staggered joints firmly butted and joined. The insulation shall be held in place by stainless steel or aluminum bands spaced on 12-inch centers. All joints and voids shall be filled with Owens-Corning No. 110 cement well troweled into openings. For 705 FRK insulation all joints and voids shall be FGRK taped and vapor sealed.
2. Coordinate location of thermostats and junction boxes.
3. Each thermostat body shall be secured with a stainless steel strap, directly to the pipe surface. Seal insulation around each thermostat and all cables and follow manufacturer's installation procedures. Use glass tape for bulb capillary and position not less than 90 degrees from heat tape.
4. Mount indicating light at the end of each heating tape circuit and position for visibility of operating personnel. Secure to the pipe with a stainless steel strap.
5. Connect the ground strap of tinned-copper braided cable to the electrical junction box.

C. Aluminum Jacket Cover:

1. Cover shall be lapped 3 inches at all joints with the lap in the 4 o'clock position to shed water. All laps shall be sealed with Foster 60-25 or equal.
2. The cover shall be held in place by stainless steel bands on 12 inch centers or loops of stainless steel wire spaced on 8 inch centers. Nothing shall be allowed to pierce the jacket at any point. Outdoor fittings, valves and flanges shall be weatherproofed. Over the base finish apply two (2) coats of Foster's Hyplastic Vapor Resistant

mastic reinforced with glass fabric. Where aluminum jackets are used, apply bumped ells of fabricated 16 mil aluminum, banded in place and weatherproofed.

D. Insulation on valves and other piping accessories that normally require access shall be installed with removable covers.

E. Wiring and conduits for electrical power shall be provided by the Contractor. Wiring shall be suitable for Class 1, Division 2, Group D hazardous area.

F. Inspection and Testing:

1. A visual inspection of all heater cable and equipment shall be made and reported satisfactory and unsatisfactory before installation starts.
2. Continuity and insulation resistance tests shall be done to check for damage of cable during shipment.
3. Install heat tracing wire, thermostats, etc. in accordance with manufacturer's recommendations.
4. After the heater cable is installed and wired, but before insulation is applied to the system, the following tests shall be made:
   a. Continuity and insulation resistance tests.
   b. Measure the actual voltage and current load. Make up a chart showing the voltage and load for each circuit.
5. Install insulation. Repeat above tests when insulation installation is completed. There shall be no change in readings when first taken.
6. All records of tests shall be given to the Construction Manager by the Contractor.

3.5 CONTROL SYSTEM

A. Control Panel

1. Label each individual wire or cable in control panel using thermal printed self-laminating identifying labels, sized for the specific application. Each wire shall have its own unique number.
2. Wire shall be type MTW stranded with a minimum size of 18 AWG. Wire shall be sized as per CEC for maximum current through wire as designated by the upstream protection device.
3. All wiring shall be neatly routed in PVC slotted wire duct sized correctly for the application with snap on cover.

a. Wire duct shall be Type E as manufactured by Panduit or equal.

b. The minimum wire way height is 4 inches.

c. Control Panel and all internal devices shall be grounded in accordance with the National Electric Code.

4. All discrete inputs from field to PLC shall be wired to field terminal blocks. Each terminal block shall have a unique numbered label easily identifying the block. Wire and block shall be grouped and labeled by the discrete input point (e.g., DI-01).

5. All discrete outputs from field to PLC shall be wired to field terminal blocks. Each output shall be protected by a single fused terminal block with fuse sized to protect the PLC output module. Each terminal block shall have a unique numbered label easily identifying the block. Wire and block shall be grouped and labeled by the discrete output point (e.g., DO-01).

6. All analog inputs and outputs from field to PLC shall be wired to field terminal blocks having three levels. The first two levels are for analog signal and the lowest level is for grounding the signal shield.

7. Label all relays and bases with a thermal printed label containing relay number.

8. Provide black laminated nameplate with white lettering, or a stainless steel name plate with black lettering, mounted to enclosure face. Lettering shall be 20mm high font minimum. Nameplate shall state control panel description on one line and tag name on following line.

9. All wires shall be run continuous between terminals. No splices in wires will be acceptable.

10. Mount all equipment firmly to enclosure back panel using either self-tapping machine screws or 1.5inch din rail. All equipment shall be mounted neatly and square.

3.6 START-UP AND TESTING

A. Prior to shipment, the entire station equipment and all circuits, control systems and devices, including all alarm signals, shall be tested. A full shop test report shall be provided, with the system tested running on natural gas or propane in place of landfill gas. All apparatus shall be cleaned, adjusted and made ready for shipment after testing.

B. A factory representative with complete knowledge of proper operation and maintenance shall be provided for a minimum of one (1) 8-hour day to

instruct representatives of the Owner and/or the Construction Manager on proper operation and maintenance of the Skid-Mounted Landfill Gas Blower/Flare System. If there are difficulties in operation of the equipment due to Contractor's or manufacturer's design or fabrication, additional service shall be provided at no cost to the Owner.

C. After installation, the Contractor shall test the entire station equipment and all control systems in the presence of the Owner or his representative. If any unsatisfactory conditions are encountered in the system, related to system design or supply, the Contractor shall make such changes in wiring or connections and such adjustments, repairs or replacements as are necessary to make the circuits, device or control system to function as specified and otherwise comply with the specifications or data on the Construction Drawings.

1. Contractor shall provide qualified personnel during control system startup on site. Personnel shall be equipped with any equipment and special tools to perform required tests and system commissioning.
2. Contractor shall be responsible to coordinate system testing pursuant to Testing Plan.
3. All analog loops shall be calibrated and tested for valid data. Data readings shall be consistent at local indication on instrument, in PLC, on OIP screens, and on chart recorders (where applicable).
4. All system alarm indications and interlocks shall be tested from the triggering device. Values forced on in the PLC or jumpered in the field shall not be acceptable, except when no other way exists (if authorized by Construction manager).
5. Accessibility to all system setpoints shall be tested from OIP screens.

3.7 CLEANING

A. The Contractor shall clean exposed surface of all greases, dirt, and other foreign materials.

B. The Contractor shall touch up all marred or abraded surfaces as specified herein.

PART 4 SYSTEM FUNCTIONAL DESCRIPTION

4.1 GENERAL-PLC PROGRAMMING

A. All PLC programming shall be annotated. Each rung shall have a description entered in the programming software providing functionality of the rung. Each address used in the PLC shall have a descriptive comment (and tagname where applicable).

B. Where applicable the tag name will refer to the P&ID instrument name (e.g. Flow meter FM-140).

C. All PLC memory shall be allocated in an organized fashion. All similar functionality should be grouped in contiguous memory addresses with room for future additions. This shall include, but not be limited to, separate areas for alarms, timers, setpoints, inputs, outputs, etc. A separate contiguous area of memory shall be used for communication with the OIP. All status bits and values shall be copied to and from other memory locations.

D. Store runtimes for motor driven equipment in PLC (hours). Values shall be accessible and resettable from OIP with password-protected reset.

E. Store flow totals for all flow meters in PLC. Values shall be accessible and resettable from OIP.

F. Store instantaneous flows, flare temperatures and inlet vacuum in the OIP historical files for access on trend screens in OIP.

4.2 GENERAL CONTROL LOGIC

A. When started in automatic mode, the control system shall perform the following:

1. Confirm that the automatic shutoff valve is closed. If automatic shutoff valve cannot be confirmed closed, control system shall trigger and latch alarm until manually reset.
2. Open the automatic shtutoff valve and confirm open. If automatic shutoff valve cannot be confirmed open, control system shall trigger and latch alarm until manually reset.
3. Enable the flare spark pilot, and startup the blower.

B. Following blower operation, the following alarms shall be included to halt system operation:

1. A high level switch monitors the liquid level in the moisture separator. Trigger a high level alarm and shut down blower after an adjustable time delay. Latch high liquid level alarm until manually reset.

2. The blower system will be equipped with a vibration switch. The vibration switch will open upon vibration exceeding ¾ in/sec, and will shut down the blower. Such shutdown will trigger a high blower vibration alarm. Latch vibration alarm until manually reset.

3. Upon indication of high or low operating current from the VFD, the control system or VFD shall shut down the blower motor, and control system shall trigger alarm indicating high or low current. Latch alarm until manually reset.

4. Closure confirmation, or stoppage of open position confirmation, of the automatic shutoff valve during blower operation shall trigger an alarm. Latch alarm until manually reset.

5. After a user-adjustable startup time delay, the control logic shall include a minimum flare temperature setpoint, and shall monitor the maximum temperature for the flare from the three (3) flare thermocouple inputs for the flare. The control system shall shut down the blower and close the automatic shutoff valve if flare temperature is below minimum flare temperature setpoint past a user-adjustable time delay. Following a user-adjustable time delay, control system shall attempt to re-start the system (beginning at Part 4.02.A.1 of this Section). If control system shall attempt more than three such re-starts within a one hour period, control system shall trigger a low flare temperature alarm. Latch low flare temperature alarm until manually reset.

C. Upon any alarm, control system shall shut down the blower, close the automatic shutoff valve, stop the flare spark pilot and annunciate alarm and activate beacon.

END OF SECTION

SECTION 432236
GAS BLOWER SKID/LEACHATE EVAPORATOR

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Leachate Feed System
   2. Evaporator Vessel
   3. Blower Skid Assembly
   4. Automatic Control and Ignition Station
   5. Ancillary Equipment

B. Related Sections:
   1. 333613.16 – Fiberglass Above-Ground Leachate Storage Tank
   2. 400533 – High Density Polyethyelene Pipe (HDPE)

1.2 SUBMITTALS

A. Section 013300 – Submittal Procedures

B. All equipment and accessories shall have manufacturer's Shop Drawings (e.g., descriptive literature, manufacturer's brochures, bulletins, equipment catalogs, certificates of compliance) approved by the Construction Manager prior to shipment and shall be tested for conformance with these Specifications prior to acceptance and final payment by the OWNER. The following materials and shop drawing information shall be submitted:

   1. Shop drawings showing all important details of construction and dimensions, including all piping schedules and detailed drawings in plan and profile. Show full details of piping, specials, and connections to existing pipes or equipment. Clearly mark the piping material on each assembly.
   2. Drawings for butterfly valve assemblies requiring spacers.
   3. A complete bill of materials for all equipment.
   4. The total weight of the blower skid with all equipment installed.
   5. Complete electrical interconnect diagram showing all wires and terminals between the control panel and external devices.
   6. Exceptions to the applicable requirements, Construction Drawings, Specifications, and applicable codes and standards.
   7. Heat tracing and insulation installation layout sketch.
   8. Detailed control panel layout and electrical diagrams showing control panel enclosure, panel face and wiring diagrams for approval prior to fabrication. Detailed wiring diagrams shall include point-to-point wiring information, including a wire and terminal numbering system. Field connections shall be clearly denoted.

9. Supplier's product data for all controls and electrical components including, but not limited to:

    a. Recorders
    b. Panel enclosures
    c. P&ID

10. Complete performance data that will indicate full compliance with the specifications.

B. Three hard copies of an operation and maintenance (O&M) manual shall be furnished. Additionally, a digital version of the O&M manual (in PDF format) shall be submitted on acceptable electronic media (i.e., USB drive or compact disc). The O&M manual shall be prepared specifically for this installation and shall include all required catalog cuts, drawings, equipment list, descriptions, definitions, procedures, and information necessary to instruct operating and maintenance personnel unfamiliar with such equipment. The O&M manual shall include a list of suppliers, with phone numbers and contact, for equipment parts that may need servicing or replacement. The O&M manual hard copies shall be suitably bound with an index, and shall also include the following:

1. Installation and O&M manuals for each control and electrical component, including dimensional drawings and complete and easy-to-read sequential operating instructions for all normal and alarm modes.
2. Provide an alarm listing of all system alarms including setpoint description and a description of the alarm cause in spreadsheet format.
3. Provide a setpoint listing of all system setpoints including a description of the setpoint in spreadsheet format.
4. Provide a Programmable Logic Controller (PLC) database listing for all used memory in the PLC with a description of the memory address in spreadsheet format. This should be generated from the PLC programming software.
5. Two CDs containing:

    a. Copy of PLC program.
    b. O&M Manual in searchable PDF format.
    c. Complete copy of all Operator Interface Panel (OIP) application files (if used), including all screens and database.
    d. All electronic drawing CAD files and related job documents.

C. Testing Plan:

1. CONTRACTOR shall submit a detailed skid-mounted blower/ leachate evaporator system testing plan 14 calendar days prior to system start up for approval by the Construction Manager. The testing plan shall include a step by step description of the proposed tests, a list of all test equipment including calibration dates, and signoff sheets.
2. Testing Plan shall be submitted with description of all tests for PLC control, OIP functionality (if used), and instrumentation for a complete control system test.
3. Testing Plan shall have an attached checklist containing all system functionality. Checklist shall be oriented in an easy to read format containing tag numbers, and place to check off each item.
4. Testing Plan shall contain a Test Certificate. This certificate shall state that the control system has been fully tested via the testing procedure under witness of the Construction Manager. CONTRACTOR and the Construction Manager are required to sign off on this during system testing. Final acceptance of system will require correct system operation for a period of one week without any system faults or irregularities.

D. Spare Parts: In addition to the spare parts recommended by this specification, a list of manufacturer's recommended spare parts shall be submitted.

1.2 QUALIFICATION

A. The Skid-Mounted Landfill Gas Blower and Leachate Evaporator System, including all ancillary equipment, shall be furnished by a manufacturer(s) who is fully experienced, reputable, and qualified in the manufacture of the equipment to be furnished.

B. The manufacturer(s) shall have a minimum of 50 blower skids in successful operation.

C. The Leachate Evaporator System shall be manufactured by the following manufacturer, or approved equal:

1. John Zink Company LLC
   11920 East Apache
   Tulsa, Oklahoma 74116
   800-421-9242

1.3 DESIGN CRITERIA

A. The evaporator shall be designed to operate continuously with landfill gas as the primary fuel source.

B. The landfill gas stream is characterized by the following parameters.

Type:	landfill
Composition:	50% CH4
	50% CO2, air, inerts
Gas Temperature:	100^0 F
System Flow Rate:	270-700 (estimated)
Heat Release:	7.5 MM BTU/hr

C. The leachate stream is characterized by the following parameters.

Composition:	varies
Flow Rate:	15,000 gallons per day

D. The evaporator system shall satisfy the following site conditions.

Site Elevation:	1060 ft above sea level
Ambient Temperature:	32 ºF to 120 ºF
Electrical Area Classification:	non-hazardous (unclassified)

E. The following utilities are required to support operation of the evaporator system.

Pilot Gas (intermittent):	22 SCFH of propane at 7-10 psig
	50 SCFH of natural gas at 10-15 psig
Electricity:	480 V, 3 phase, 60 Hz

1.4 REFERENCES

A. All equipment shall be manufactured in accordance with codes and guidelines as specifically detailed herein and in accordance with applicable portions of the following (latest edition):

1. Local laws and ordinances.
2. State and Federal laws.
3. National Electrical Code (NEC).
4. National Electrical Manufacturers Association (NEMA)
5. Underwriters Laboratories (UL).
6. State Building Code.
7. American National Standards Institute (ANSI).
8. American Society of Engineers (ASME).
9. Institute of Electrical and Electronic Engineers (IEEE).
10. Instrument Society of America (ISA).
11. Industrial Risk Insurance (IRI).
12. Factory Mutual (FM).
13. Environmental Protection Agency (EPA).

14. Arkansas Departmnet of Environmental Quality (ADEQ).
15. ASTM A 320, Alloy Steel Bolting Material For Low Temperature Service.
16. ASTM A 774, As-Welded Wrought Austenitic Stainless Steel Fittings for General Corrosive Service at Low and Moderate Temperatures.
17. ASTM A 778, Welded, Unannealed Austenitic Stainless Steel Tubular Products.
18. ASTM A-240, Stainless Steel Sheet or Plate

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. All parts shall be properly protected so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is completed and the units and equipment are ready for operation.

B. The blower skid shall be delivered on site fully assembled. Factory-assembled parts and components shall not be dismantled for shipment unless permission is received in writing from the Construction Manager.

C. Finished surfaces of all exposed openings shall be protected by wooden blanks, strongly built, and securely bolted thereto.

D. Each box or package shall be properly marked to show its net weight in addition to its contents.

1.6 WARRANTY

A. The CONTRACTOR shall warrant the units being supplied to the OWNER against defects in workmanship and material for a period of one (1) year from the date of successful startup test. In the event that the equipment fails to perform as specified, the equipment manufacturer shall promptly repair or replace the defective equipment without any cost to the OWNER (including handling and shipment costs).

PART 2 PRODUCTS

2.1 GENERAL

A. Equipment shall not have been in service, except for shop tests, at any time prior to delivery.

B. Equipment shall be designed and proportioned to have liberal strength, stability, and stiffness and shall be especially adapted for the intended

service. Ample room and facilities shall be provided for inspection, repairs, and adjustments.

C. Parts of equipment shall be amply proportioned for all stresses which may occur during operation and for any additional stresses which may occur during fabrication, transportation, handling, and erection.

D. These Specifications are intended to give a general description of what is required, but do not cover all requirements of the equipment as offered. They are, however, intended to cover the furnishing, delivery, and field testing of all materials, equipment, and apparatus as required. Auxiliary equipment necessary for proper operation of the proposed Skid-Mounted Landfill Gas Blower/Leachate Evaporator System not mentioned in these Specifications or shown on the Construction Drawings shall be furnished and installed.

E. A brass or stainless steel nameplate shall be attached to each piece of equipment in a conspicuous place. The following information shall be plainly marked on the nameplate: name and-address of the manufacturer, serial number, model number, and any other information necessary for complete identification.

F. If necessary, modifications shall be made in the manufacturer's standard product to make it conform to the specific requirements of the Specifications and to requirements contained in regulations issued by public agencies. Such modifications shall be noted in Shop Drawing submittals.

G. Equipment shall include all production line improvements made prior to the delivery or Contract date. All equipment and components shall comply with applicable requirements of the standards of ASME, AGA, NSDLAE, NSFSR, and Underwriters' Laboratories.

H. The blower skid and control system shall be completely assembled and tested prior to shipment to the site. .

I. At all levels of performance, the sound pressure shall not exceed 85dbA over a frequency range of 37.8 to 9,600 cycles per second. Measurement shall be made a distance of 3 feet from the outer face of the equipment. CONTRACTOR shall certify the equipment furnished does not exceed the specified sound pressure. This written certification shall be submitted with the Shop Drawings.

2.2 LEACHATE FEED SYSTEM (ALL ITEMS SHIPPED LOOSE)

A. 5 HP feed pump for leachate. Pump is sized for a maximum of 300 feet between the evaporator and leachate source.
B. Two (2) 2" manual butterfly valves, one at the inlet and outlet of the pump, for isolation.
C. One (1) 2" electric fill valve.
D. One (1) flow switch

2.3 EVAPORATOR VESSEL

A. One (1) 316 SS vessel for 15,000 gpd of leachate.
B. 316 SS diverter plates and level control box
C. 276 Alloy wetted combustion chamber.
D. Submersible burner package rated for 7.5 MM BTU/hr including flame scanner, refractory lined combustion chamber.
E. Eight foot stack to discharge vapor plume with sample ports and 10 micron mist pad.
F. Ladder and platform for access to FGR blower and port for maintenance/cleaning of the mesh pad and vessel internals.
G. One (1) 5 HP washdown pump to prevent solid build up at the bottom of the evaporator.
H. One (1) 5 HP sludge pump to send residual to a container (supplied by others) maximum of 30 feet.
I. Level and pressure switches for safe operation. These include a high gas pressure shutdown, low gas pressure shutdown, high temperature shutdown, low level shutdown, and high level shutdown.

2.4 BLOWER SKID ASSEMBLY

A. Structural steel skid.

1. Heavy duty AISC designed structural steel skid.
2. Skid to be completely galvanized or painted after fabrication.

B. Blower and motor

1. Landfill gas blower(s) shall be supplied in accordance with the design flow and pressure requirements, taking into account a 100% saturated gas, site elevation, and appropriate gas composition. All internal surfaces (other than aluminum or stainless steel) must be coated with a phenolic or equal coating.
2. A combustion air blower with totally enclosed, fan cooled (TEFC) motor shall supply the required combustion air for proper dilution.

C. Piping

3. All landfill gas piping to be HDPE or 304 SS Schedule 10S.
4. Gaskets shall be a synthetic fiber type with an NBR binder, Donex 660 or equal for stainless steel piping or neoprene for HDPE piping.
5. All stainless steel flanges to be 150# RFSO.
6. All piping to be fully assembled, mounted, and supported from the outlet of the moisture separator to the skid edge.

D. Manual valves, check valves, and expansion joints

1. Cast iron wafer body valves shall be supplied at the inlet and outlet of each blower on a multiple blower system, complete with ductile iron nickel plated disc, buna-n seat, and complete isolation of cast iron from the landfill gas. For valves 8" and above, a gear operator to be provided. For valves 6" and less, lever handles to be provided.
2. Flanged, aluminum check valves to be provided at the outlet of each blower or multiple blower systems.
3. Flanged, reinforced, hypalon material flexible expansion joints to be provided at the inlet and outlet of each blower.

E. One (1) moisture separator sized to separate 99% of all liquid droplets 10 microns and larger complete with the following:

1. Flanged inlet and outlet
2. Drain connection
3. Level gauge
4. Stainless steel mesh pad for moisture collection
5. Flanged top for accessibility and maintenance
6. HDPE construction
7. A differential pressure gauge to be mounted on the vessel and connected to taps on the upstream and downstream side of the mesh pad
8. Two (2) 1" FNPT connections with plugs for optional addition of level switches.

F. Control Panel, VFD, and fail-closed valve

1. The control panel and VFDs as specified in the Landfill Leachate System specification are to be mounted to the blower skid and completely wired in rigid conduit from the panels to each appropriate instrument and or control item on the blower skid.

2. One (1) high performance butterfly valve with carbon steel body, 316 stainless steel disk, PTFE seat with pneumatic fail-closed actuator, three-way solenoid valve, speed control valve, and auxiliary switches is to be mounted between the moisture separator and the blowers.

2.5 IGNITION AND CONTROL STATION

A. Provide a complete and functional control system designed for 480 V, 3 phase, 60 Hz incoming power, including transformer conversion as required for operating the evaporator system. The following items shall be completely mounted, assembled, and wired on a structural steel rack.

1. One (1) weatherproof single phase power transformer to convert electrical service from 480 V to 120 V.
2. One (1) weatherproof Evaporator Control Panel including the following instrumentation for safe, overall system operation and control.
   a. Allen Bradley programmable logic controller, or equal
   b. High temperature shutdown switch
   c. Self-checking flame scanner amplifier and relay
   d. Yokogawa six (6) channel chart recorder, or equal
   e. Automation Direct 8” touch screen display or equal.
3. The following switch and lights are required are required on the front of the control panel, as a minimum.
   a. Panel power (On/Off) switch
   b. Power ON light (white)
   c. Evaporator operating light (green)
   d. Evaporator shutdown light (red)
4. The following evaporator system status is required on the touch screen display, as a minimum.
   a. Evaporator start up status
   b. Pilot re-light count
   c. Pilot gas ON/OFF status
   d. Ignitor ON/OFF status
   e. Pilot proved status
   f. Auto valve status
   g. Blower status
   h. Flame proved status
   i. Evaporator operating temperature

j. Temperature controller output status
k. Landfill gas flow rate

5. The following switches/settings are required on the touch screen display, as a minimum.
   a. System control (Local – Off – Remote)
   b. Blower control (Hand – Off – Auto)
   c. Temperature controller PID settings
   d. Temperature controller setpoint
   e. Temperature controller Auto/Manual switch
   f. Thermocouple selection switches - Manual
   g. Thermocouple selection switch – Automatic
   h. Reset switch
   i. Alarm acknowledgement switch
6. The following alarms are required on the touch screen display, as a minimum.
   a. Manual stop
   b. Pilot flame failure
   c. Auto valve failure
   d. Blower failure
   e. Main flame failure
   f. Early flame failure
   g. Evaporator low temperature
   h. Evaporator high temperature

B. Weatherproof variable frequency drive (VFD) for each gas blower.

C. One (1) Pilot Gas Control System including pressure regulator, fail-closed shutdown valve, manual block valve, and pressure gauge.

D. One (1) motor starter panel for the washdown pump, FGR blower, feed pump, and sludge pump.

E. The following components shall be installed on or mounted to the evaporator.
   1. One (1) weatherproof Ignition Panel with 6000 V transformer mounted to the stack for intermittent pilot ignition.
   2. One (1) self-checking, ultraviolet flame scanner to monitor both pilot and main flame.
   3. Three (3) temperature control thermocouples.
   4. One (1) high temperature thermocouple.
   5. One (1) 3/4 HP purge air blower.

F. The control station and instrumentation shall be assembled and wired completely in a facility approved by Underwriters Laboratories and shall be functionally tested prior to shipment simulating actual operation.

2.6 ANCILLARY EQUIPMENT

A. One (1) 4” diameter, eccentric *Enardo* Flame Arrester with aluminum housing, housing drain, and removable aluminum internals.
B. One (1) automatic block valve assembly consisting of a 4" diameter, high performance butterfly valve and fail-closed pneumatic actuator. The valve has a carbon steel wafer body, 316 stainless steel disk and shaft, and PTFE seal. The pneumatic actuator includes a three-way solenoid valve, speed control valve, position indicator, and auxiliary switches. Pneumatic actuation is achieved using either nitrogen cylinders (not included) or 100 psig compressed air (if available).
C. One (1) thermal mass flow meter assembly *(Thermal Instruments)* with 316 stainless steel probe for 1" NPT mounting.
D. One (1) fabricated steel hood designed to limit control panel exposure to the elements. It provides approximately 4’ of overhang to the front and 2’ to the rear. The hood is painted to match the rest of the control panel rack and comes with a fluorescent light assembly for enhanced visibility of the panel components at night.

PART 3 EXECUTION

Not Used

END OF SECTION