

PROJECT MANUAL

LAKE POINSETT STATE PARK DAY USE IMPROVEMENTS



JUNE, 2024



MCE PROJECT NO. 19-5825
DBA PROJECT NO. 9002317

MCE McCLELLAND
CONSULTING
DESIGNED TO SERVE ENGINEERS, INC.

PROJECT MANUAL

LAKE POINSETT STATE PARK DAY USE IMPROVEMENTS

JUNE, 2024

**MCE PROJECT NO. 19-5825
DBA PROJECT NO. 9002317**

Prepared By:
McClelland Consulting Engineers, Inc.
7302 Kanis Road
Little Rock, Arkansas 72204
Phone 501/371-0272
Fax 501/371-9932

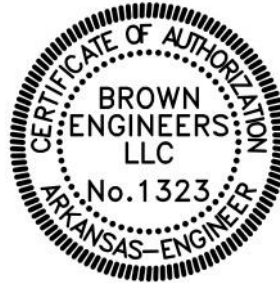
CERTIFICATION

The professional license seals listed on this page represent the design responsibility for the plans and technical specifications represented in this project.

I certify that the Lake Poinsett State Park Day Use Improvements Contract Documents including the specifications were prepared under my direct supervision. Further I certify that I am a duly licensed Profession Engineer under the laws of the State of Arkansas.



Bruce Brown, PE
Brown Engineers, LLC
Arkansas License No. 10206



Certificate of Authorization
Brown Engineers, LLC
COA Number 1323

Sections Included:

- 26 05 00 Common Work Results for Electrical
- 26 06 00 Grounding and Bonding
- 26 12 30 600-Volt or Less Wires and Cables
- 26 13 00 Conduits
- 26 13 30 Duct Banks
- 26 13 40 Boxes
- 26 13 60 Wireway
- 26 15 00 Low voltage Wire Connections
- 26 21 00 Utility Coordination
- 26 28 50 Surge Protection Devices
- 26 41 20 Low Voltage Molded Case Circuit Breakers
- 26 44 50 Panelboards

**LAKE POINSETT STATE PARK
DAY USE IMPROVEMENTS
19-5825
TABLE OF CONTENTS**

<u>SECTION NO.</u>	<u>SECTION TITLE</u>	<u>NUMBER OF PAGES</u>
DIVISION 00 BIDDING DOCUMENTS		
	Certification – Brown Engineers, Inc.	1
Section 00 11 16	Invitation to Bid	2
	Common Bidding Mistakes	1
Section 00 21 13	Instructions to Bidders	11
Section 00 41 13	Bid Form	4
Section 00 43 13	Bid Security Form.....	2
Section 00 43 22	Bid Form Attachment A Unit Prices.....	1
Section 00 45 00	Anti-Boycott of Israel Certification	1
Section 00 52 13	Agreement Form	3
Section 00 61 13	Performance and Payment Bond Form	2
Section 00 63 63	Change Order Form (by reference only)	
Section 00 65 16	Certificate of Substantial Completion Form	2
Section 00 65 19	Certificate of Final Completion Form.....	1
Section 00 65 19.16	Release of Claims Form.....	1
Section 00 65 19.19	Consent of Surety Form	1
Section 00 72 13	General Conditions	40
Section 00 73 16	Insurance Requirements.....	1
Section 00 73 19	Trench Safety 29 CFR 1926 Subpart P.....	37
Section 00 73 43	Wage Rate Requirements.....	10
Section 00 73 73	Contract and Grant Disclosure Certification Form.....	2
Section 00 91 13	Bidding Addenda	1
DIVISION 01 GENERAL REQUIREMENTS		
01 20 00	Price and Payment Procedures.....	2
01 21 00	Allowances.....	2
01 30 00	Administrative Requirements	11
DIVISION 02 EXISTING CONDITIONS		
02 41 13	Selective Site Demolition	2
DIVISION 13 SPECIAL CONSTRUCTION		
13 00 00	Prefabricated Restroom Building.....	10
DIVISION 26 ELECTRICAL		
26 05 00	Common Work Results for Electrical.....	15
26 06 00	Grounding and Bonding.....	5
26 12 30	600-Volt or Less Wires and Cables	7
26 13 00	Conduits	12
26 13 30	Duct Banks.....	5

26 13 40	Boxes.....	6
26 13 60	Wireway	5
26 15 00	Low Voltage Wire Connections.....	5
26 21 00	Utility Coordination.....	4
26 28 50	Surge Protective Devices	7
26 41 20	Low Voltage Molded Case Circuit Breakers	4
26 44 50	Panelboards	6
31 00 00	EARTHWORK	
31 00 00	Site Earthwork	8
31 10 00	Site Clearing.....	3
31 11 00	Clearing and Grubbing.....	4
31 23 16.16	Structural Excavation and Backfill	5
31 23 33	Trenching and Backfilling	8
32 11 23	BASES, BALLASTS, AND PAVING	
32 11 23	Aggregate Base Courses	6
32 16 23	Concrete Curbs and Sidewalks	5
32 17 23	Pavement Markings	2
32 39 00	Manufactured Site Specialties.....	5
32 92 23	Sodding	4
33 01 10	UTILITIES	
33 01 10	Disinfection of Water Utility Piping.....	5
33 05 05	Hydrostatic Testing.....	3
33 05 31	Polyvinyl Chloride Pressure Pipe and Fittings	4
33 05 31.11	Polyvinyl Chloride Gravity Sewer Pipe.....	2
33 14 16	Water Utility Distribution Valves.....	5
33 37 24	Backflow Prevention.....	3
GEOTECHNICAL REPORT		26
SEPTIC TANK PERMIT		14
APPENDIX		1

INVITATION TO BID
Section 00 11 16 / Rev: August 2021

McClelland Consulting Engineers, Inc.	Day Use Improvements at Lake Poinsett State Park
7302 Kanis Road	DBA Project #: 9002317
Little Rock, Arkansas 72204	Owner/Agency: Arkansas Department of Parks, Heritage and Tourism
501-371-0272	

- 1) You are invited to bid on a General Contract for the:
- Construction of: Day Use Improvements at Lake Poinsett State Park
Located At: Lake Poinsett State Park, 5752 State Park Ln, Harrisburg, AR 72432
Project Owner: Arkansas Department of Parks, Heritage and Tourism
Bid Type: Lump Sum Basis: Lowest Responsive and Responsible Bidder

- 2) There will not be a Pre-Bid Conference
- Date:
Time:
Location:

The State reserves the right to schedule future meetings.

- 3) The Owner will receive bids until:
- Date: Wednesday, June 26, 2024
Time: 2:00 p.m.
Location: Division of Building Authority, 501 Woodlane St., Suite 101N, Little Rock,
Arkansas 72201

Sealed 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:

Arkansas Blueprint Company, 10110 West Markham, Little Rock, Arkansas 72205, 501-312-0050

- 5) Bid document deposit and refund information:

Bidders must deposit a check in the amount of \$175.00 per set, payable to McClelland Consulting Engineers, Inc. Deposits will be refunded to all prime bidders who return bidding documents in good condition within then (10) days after the opening of bids. A bidder receiving a contract award may retain the bidding documents and the Bidders deposit will be refunded. Prime Bidders requiring additional sets and Sub-bidders may purchase bidding documents through Arkansas Blueprint Company.

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

N/A

- 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 prevailing wage rates will not 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>
- 13) Bidders are responsible to adhere to the guidelines established for state operated buildings. Face coverings should be worn upon entering the facility and whenever moving through common areas (lobbies, elevators, stairs, restrooms, meetings and hallway/corridors). Bidders without a face covering may be denied access at the point of entry. Due to social distancing requirements and health/safety concerns, prompt entrance to the building may not occur therefore, Bidders should be prepared for any delays into the building for a timely bid submittal.

To: All Bidders
From: Division of Building Authority, Construction Section
Re: Common Bidding Mistakes
Date: 4/1/2017

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 is unlicensed to do the listed 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 2021

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. Bidders shall not make additions, notations, clarifications, reservations, or exceptions to the bid form proposal or include additional documents regarding additions, notations, clarifications, reservations, or exceptions. See also # 6.1. Segregated bids, alternate bids or assignments ("additions") shall not be considered. The reading of a bid is not inclusive of the Bidder's additions, notations, clarifications, reservations, or exceptions and shall not change the Bidder's responsibilities and duties to provide all labor, materials, services and equipment necessary for, or incidental to, the construction of the project pursuant to the contract documents, including the time set forth and the lump sum base bid stated in the bid proposal.

- 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 101N, Little Rock, AR 72201 (501-682-1833).

- 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.

- 6.3 Bidder shall not enter into an agreement for any portion of the Work (services, materials, supplies, equipment, etc.) throughout the term of the Contract with any design professional (or firm) who is under contract to the Owner to provide administration of the Contract.

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 \$50,000.00. 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 security, 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 \$50,000.00 or under, except for roofing projects. For work exceeding \$50,000.00, 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 the listed work performed 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 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 the Contractors Licensing Board.

9.2 License Requirement

a. No person shall perform Work on the contract without possessing the applicable 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 scrivener's 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 within the division zero documents.

- 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/welcome>

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.

- 13.8 Pursuant to Ark. Code Ann. §25-1-501 (Act 710 of 2017), state agencies shall not enter into contracts with companies for construction work unless the contract includes a written certification from the company or person that the company or person is not currently engaged in a boycott of Israel and agrees for the duration of the contract not to engage in a boycott of Israel.

Before executing a public contract, each prospective contractor shall certify by signing the "Anti-Boycott of Israel" certification. This certification shall be submitted as one of the contract documents. The Contract shall not be approved until the certification is completed and provided with the other bid documents necessary for contract approval. If a Contractor violates this section, the Owner shall require the Contractor to remedy the violation within thirty (30) days. Failure to remedy the violation, shall constitute a breach of the contract and the Contractor shall be liable to the Owner for actual damages.

Note: A copy of the "Anti-Boycott of Israel Certification" is included in section 00 45 00.

- 13.9 Pursuant to Ark. Code Ann. §22-9-105 (Act 422 of 2019) , contractors who have been determined by a State Agency to be on the "Prohibited Bidders List" may not bid on state projects. Bidders should review Section 3-324 of the Building Authority Minimum Standards and Criteria for more information. Contractors who are determined to be prohibited from bidding due to material issues on state contracts may not be awarded state capital improvement contracts until the state agency has determined the material issue is no longer of concern or the contract has been terminated or closed out, whichever is sooner. However, the contractor's ineligible bidding status shall not exceed more than three (3) years.

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 2021

Bid Date: Wednesday, June 26, 2024
Bid Time: 2:00 p.m.
Bid Opening Location: Division of Building Authority,
501 Woodlane St., Suite 101N,
Little Rock, Arkansas 72201

Bid To: Arkansas Department of Parks, Heritage and Tourism

Bid From: _____

DBA Project Number: 9002317

Project Name: Day Use Improvements at Lake Poinsett State Park

- 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: Allowances described in Section 01 21 00 are included in the Base Bid Price Required
- 3) Unit Prices: 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. Required
- 4) Trench or Excavation Safety: Ark. Code Ann. §22-9-212 requires the contractor to indicate on this bid form the total cost of trench or excavation safety systems. FAILURE TO SHOW THE TOTAL COST WILL INVALIDATE THE BID. (see Section 00 73 19) Required
- The total cost shall be included in the above base bid price.

\$ _____

Dollar Amount Is To Be Shown Numerically

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

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: 90
On or Before Date: N/A

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: \$250 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.

e. The undersigned understands that the Owner's intent is to construct all facilities proposed within the limits established by the funds appropriated for the project.

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:
Bidders are hereby notified that prevailing wage rates will not apply.

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

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(s):

#: _____	Dated: _____
#: _____	Dated: _____
#: _____	Dated: _____
#: _____	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 question. 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:
Not Required

Plumbing:
Required

- Is the amount of Plumbing 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:

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:
Not Required

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.

Bid Form Signature Page

Project Name: Day Use Improvements at Lake Poinsett State Park

Project #: 9002317

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 Email 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 Email 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 Email 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 Email Phone Number

Street Address City State Zip Code

Bid Bond
Section 00 43 13 / Rev: August 2021

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 Parks, Heritage and Tourism _____, 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: 9002317
Day Use Improvements at Lake Poinsett State Park

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 No.	Item Description	Quantity	Units	Cost/Unit	Total for Item
1	Select Fill Material	1	CY	\$	\$
				Total	\$

ISRAEL BOYCOTT RESTRICTION CERTIFICATION

Section 00 45 00 / Rev: August 2021

DBA Project Number: 9002317

Project Name: Day Use Improvements at Lake Poinsett State Park

Pursuant to Arkansas Code Annotated § 25-1-503, a public entity **shall not** enter into a contract valued at \$1,000 or greater with a company unless the contract includes a written certification that the person or company is not currently engaged in and agrees for the duration of the contract not to engage in, a boycott of Israel.

By signing below, the Contractor agrees and certifies that they do not currently boycott Israel and will not boycott Israel during any time in which they are entering into, or while in contract, with any public entity as defined in § 25-1-503*. If at any time after signing this certification the contractor decides to engage in a boycott of Israel, the contractor must notify the contracting public entity in writing.

If a company does boycott Israel, see Arkansas Code Annotated § 25-1-503.

Arkansas Department of Parks, Heritage and Tourism

Name of Public Entity

Print Name of Company

AASIS Vendor Number

Contractor Signature and Date

Print Name and Title

"Public entity" means the State of Arkansas, or a political subdivision of the state, including all boards, commissions, agencies, institutions, authorities, and bodies politic and corporate of the state, created by or in accordance with state law or rules, and does include colleges, universities, a statewide public employee retirement system, and institutions in Arkansas as well as units of local and municipal government.

AGREEMENT FORM
Section 00 52 13 / Rev: August 2021

THIS AGREEMENT entered into this _____ by and between _____ hereinafter referred to as the Contractor, and Arkansas Department of Parks, Heritage and Tourism hereinafter referred to as the Owner, and the Department of Transformation and Shared Services, 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 Poinsett County, designated as

Project # : 9002317

Project Name: Day Use Improvements at Lake Poinsett State Park

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, Arkansas, on:

Wednesday, June 26, 2024

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: 90 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 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 required. 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.

Project # : 9002317

Project Name: Day Use Improvements at Lake Poinsett State Park

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 Parks, Heritage and Tourism

Owner: _____ Agency Name

Signature of Authorized Officer of the Agency _____ Date _____

Print Name _____ Title _____ Email Address _____

1 Capitol Mall, 4B 215 Little Rock, Arkansas 72201

Street Address _____ City _____ State _____ Zip Code _____

Approved: Transformation & Shared Services, Division of Building Authority

By: _____ Date: _____

Title _____

PERFORMANCE AND PAYMENT BOND
Section 00 61 13 / Rev: August 2021

1) We _____, (Principal), and

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

and severally, unto Arkansas Department of Parks, Heritage and Tourism, 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:

Day Use Improvements at Lake Poinsett State Park

Project # 9002317. 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 Email Address

CERTIFICATE OF SUBSTANTIAL COMPLETION

Section 00 65 16 / Rev: August 2021

Project Name: Day Use Improvements at Lake Poinsett State Park

DBA Project Number: 9002317 Owner/Agency: Arkansas Department of Parks, Heritage and

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: McClelland Consulting Engineers, Inc.

Address: 7302 Kanis Road
Little Rock, Arkansas 72204

Signature Title Date

Approval of Contractor:

Company Name: _____

Address: _____

Signature Title Date

Approval of Owner-Agency:

Agency Name: Arkansas Department of Parks, Heritage and Tourism

Address: 1 Capitol Mall, 4B 215
Little Rock, Arkansas 72201

Signature Title Date

Approval of Dept. of Transformation and Shared Services, Division of Building Authority:

Signature Title Date

Cc: Surety Company

Certificate of Final Completion – Capital Improvement Project

Section 00 65 19 / Rev: August 2021

DBA Project Number: 9002317 Project Name: Day Use Improvements at Lake

We, the undersigned parties, state: Poinsett State Park

- 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

State Agency, Board & Commission:
Arkansas Department of Parks, Heritage
and Tourism

Owner/Agency Name

By: Agency Authorized Representative

Print Name Date

Design Professional:

McClelland Consulting Engineers, Inc.

Design Professional Firm Name

By: Design Professional 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 2021

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 # : 9002317

which was executed on: _____, on the following project:
Day Use Improvements at Lake Poinsett State Park

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 2021

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 Day Use Improvements at Lake Poinsett State Park

DBA Project # 9002317 ; Contract Date _____

_____ Contractor, and the Project Owner

Arkansas Department of Parks, Heritage and Tourism ; 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 2021

Table of Contents

Article 1: General Provisions

- 1.1 Definitions
- 1.2 Intent
- 1.3 Capitalization
- 1.4 Interpretation

Article 2: Owner

- 2.1 Land
- 2.2 Right of Entry by Owner
- 2.3 Owner's Right to Carry Out the Work

Article 3: Contractor

- 3.1 General
- 3.2 Review of Field Conditions
- 3.3 Review of Contract Documents
- 3.4 Request for Supplementary Information
- 3.5 Shop Drawings, Product Data, and Samples
- 3.6 Labor and Materials
- 3.7 Unauthorized Work
- 3.8 Superintendence
- 3.9 Permits, Fees, and Notices
- 3.10 Sample and Tests
- 3.11 Location, Gradient, and Alignment
- 3.12 Land
- 3.13 Limits of Work
- 3.14 Warranty
- 3.15 Patents and Royalties
- 3.16 Cleaning Up

Article 4: Administration of Contract

- 4.1 Design Professional Authority
- 4.2 Claims

Article 5: Subcontractors

- 5.1 Assignment of Contract
- 5.2 Subcontracts

Article 6: Construction by Owner or Separate Contractors

- 6.1 Other Contracts

6.2 Dependence on Others

Article 7: Changes in the Work

- 7.1 General
- 7.2 Change Orders
- 7.3 Payment for Changes in Work

Article 8: Time

- 8.1 Definitions
- 8.2 Progress
- 8.3 Holidays
- 8.4 Delays

Article 9: Payment and Completion

- 9.1 Contract Sum
- 9.2 Schedule of Values
- 9.3 Measurement of Quantities
- 9.4 Requests for Payment
- 9.5 Periodic Estimates for Payment
- 9.6 Payment for Increase or Decreased Quantities
- 9.7 Design Professional's Action on a Request for Payment
- 9.8 Action on a Request for Payment and a Final Payment
- 9.9 Payment for Uncorrected Work
- 9.10 Payment for Rejected Materials and Work
- 9.11 Date of Substantial Completion
- 9.12 Final Completion and Payment by Owner
- 9.13 Partial Occupancy or Use
- 9.14 Final Inspection
- 9.15 Assignment of Warranties
- 9.16 Acceptance and Final Payment

Article 10: Protection of Persons and Property

- 10.1 General

Article 11: Insurance and Bonds

- 11.1 Contractor's Liability Insurance
- 11.2 Bonds

Article 12: Uncovering and Correction of Work

- 12.1 Examination of Completed Work
- 12.2 Defective Work
- 12.3 Rejected Materials
- 12.4 Correction of Faulty Work After Final Payment

Article 13: Miscellaneous Provisions

- 13.1 Governing Law

- 13.2 Written Notice
- 13.3 Tests and Inspections
- 13.4 Verbal Agreements

Article 14: Termination or Suspension of the Contract

- 14.1 Suspension of Work
- 14.2 Termination by Owner for Cause
- 14.3 Termination by Owner for Convenience

Article 15: Dispute Resolution

- 15.1 Contractual Disputes
- 15.2 Mediation
- 15.3 Arbitration

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 (if required); 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 <u>including Owner approved General Conditions</u>	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 Contract 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 Contract. 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 2021

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	<u>Statutory</u>
b. Applicable Federal	<u>Statutory</u>
c. Employers' Liability	Per Accident: <u>\$100,000</u>
	Disease, Policy Limit: <u>\$500,000</u>
	Disease, Each Employee: <u>\$1,000,000</u>

3) Subparagraph 11.1.3, add the following clause:

11.1.3.1 Commercial General Liability

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

4) Subparagraph 11.1.4, add the following clause:

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

5) Subparagraph 11.1.5, add the following clause:

11.1.5.1 Umbrella Liability:	Each Occurrence: <u>\$1,000,000</u>
------------------------------	-------------------------------------

6) Subparagraph 11.1.6, add the following clause:

11.1.6.1 Pollution Liability:	Per Loss: <u>N/A</u>
	Aggregate: <u>\$0</u>

7) Subparagraph 11.1.7, add the following clause:

11.1.7.1 Builder's Risk or Installation Floater Policy:	<u>\$ = Contract Amount</u>
---	-----------------------------

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

Trench Safety 29 CFR 1926 Subpart P

Section 00 73 19

(c) *Coaming*—The raised frame, as around a hatchway in the deck, to keep out water.

(d) *Jacob's ladder*—A marine ladder of rope or chain with wooden or metal rungs.

(e) *Rail*, for the purpose of § 1926.605, means a light structure serving as a guard at the outer edge of a ship's deck.

Subpart P—Excavations

AUTHORITY: 40 U.S.C. 333; 29 U.S.C. 653, 655, and 657; Secretary of Labor's Order No. 12-71 (36 FR 8754), 8-76 (41 FR 25059), 9-83 (48 FR 35736), or 1-2012 (77 FR 3912), as applicable; and 29 CFR part 1911.

SOURCE: 54 FR 45959, Oct. 31, 1989, unless otherwise noted.

§ 1926.650 Scope, application, and definitions applicable to this subpart.

(a) *Scope and application.* This subpart applies to all open excavations made in the earth's surface. Excavations are defined to include trenches.

(b) *Definitions applicable to this subpart.*

Accepted engineering practices means those requirements which are compatible with standards of practice required by a registered professional engineer.

Aluminum Hydraulic Shoring means a pre-engineered shoring system comprised of aluminum hydraulic cylinders (crossbraces) used in conjunction with vertical rails (uprights) or horizontal rails (walers). Such system is designed, specifically to support the sidewalls of an excavation and prevent cave-ins.

Bell-bottom pier hole means a type of shaft or footing excavation, the bottom of which is made larger than the cross section above to form a belled shape.

Benching (Benching system) means a method of protecting employees from cave-ins by excavating the sides of an excavation to form one or a series of horizontal levels or steps, usually with vertical or near-vertical surfaces between levels.

Cave-in means the separation of a mass of soil or rock material from the side of an excavation, or the loss of soil from under a trench shield or support system, and its sudden movement into the excavation, either by falling or sliding, in sufficient quantity so that it

could entrap, bury, or otherwise injure and immobilize a person.

Competent person means one who is capable of identifying existing and predictable hazards in the surroundings, or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

Cross braces mean the horizontal members of a shoring system installed perpendicular to the sides of the excavation, the ends of which bear against either uprights or wales.

Excavation means any man-made cut, cavity, trench, or depression in an earth surface, formed by earth removal.

Faces or sides means the vertical or inclined earth surfaces formed as a result of excavation work.

Failure means the breakage, displacement, or permanent deformation of a structural member or connection so as to reduce its structural integrity and its supportive capabilities.

Hazardous atmosphere means an atmosphere which by reason of being explosive, flammable, poisonous, corrosive, oxidizing, irritating, oxygen deficient, toxic, or otherwise harmful, may cause death, illness, or injury.

Kickout means the accidental release or failure of a cross brace.

Protective system means a method of protecting employees from cave-ins, from material that could fall or roll from an excavation face or into an excavation, or from the collapse of adjacent structures. Protective systems include support systems, sloping and benching systems, shield systems, and other systems that provide the necessary protection.

Ramp means an inclined walking or working surface that is used to gain access to one point from another, and is constructed from earth or from structural materials such as steel or wood.

Registered Professional Engineer means a person who is registered as a professional engineer in the state where the work is to be performed. However, a professional engineer, registered in any state is deemed to be a "registered professional engineer" within the meaning of this standard when approving designs for "manufactured protective

systems" or "tabulated data" to be used in interstate commerce.

Sheeting means the members of a shoring system that retain the earth in position and in turn are supported by other members of the shoring system.

Shield (Shield system) means a structure that is able to withstand the forces imposed on it by a cave-in and thereby protect employees within the structure. Shields can be permanent structures or can be designed to be portable and moved along as work progresses. Additionally, shields can be either premanufactured or job-built in accordance with §1926.652 (c)(3) or (c)(4). Shields used in trenches are usually referred to as "trench boxes" or "trench shields."

Shoring (Shoring system) means a structure such as a metal hydraulic, mechanical or timber shoring system that supports the sides of an excavation and which is designed to prevent cave-ins.

Sides. See "Faces."

Sloping (Sloping system) means a method of protecting employees from cave-ins by excavating to form sides of an excavation that are inclined away from the excavation so as to prevent cave-ins. The angle of incline required to prevent a cave-in varies with differences in such factors as the soil type, environmental conditions of exposure, and application of surcharge loads.

Stable rock means natural solid mineral material that can be excavated with vertical sides and will remain intact while exposed. Unstable rock is considered to be stable when the rock material on the side or sides of the excavation is secured against caving-in or movement by rock bolts or by another protective system that has been designed by a registered professional engineer.

Structural ramp means a ramp built of steel or wood, usually used for vehicle access. Ramps made of soil or rock are not considered structural ramps.

Support system means a structure such as underpinning, bracing, or shoring, which provides support to an adjacent structure, underground installation, or the sides of an excavation.

Tabulated data means tables and charts approved by a registered profes-

sional engineer and used to design and construct a protective system.

Trench (Trench excavation) means a narrow excavation (in relation to its length) made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench (measured at the bottom) is not greater than 15 feet (4.6 m). If forms or other structures are installed or constructed in an excavation so as to reduce the dimension measured from the forms or structure to the side of the excavation to 15 feet (4.6 m) or less (measured at the bottom of the excavation), the excavation is also considered to be a trench.

Trench box. See "Shield."

Trench shield. See "Shield."

Uprights means the vertical members of a trench shoring system placed in contact with the earth and usually positioned so that individual members do not contact each other. Uprights placed so that individual members are closely spaced, in contact with or interconnected to each other, are often called "sheeting."

Wales means horizontal members of a shoring system placed parallel to the excavation face whose sides bear against the vertical members of the shoring system or earth.

§ 1926.651 Specific excavation requirements.

(a) *Surface encumbrances.* All surface encumbrances that are located so as to create a hazard to employees shall be removed or supported, as necessary, to safeguard employees.

(b) *Underground installations.* (1) The estimated location of utility installations, such as sewer, telephone, fuel, electric, water lines, or any other underground installations that reasonably may be expected to be encountered during excavation work, shall be determined prior to opening an excavation.

(2) Utility companies or owners shall be contacted within established or customary local response times, advised of the proposed work, and asked to establish the location of the utility underground installations prior to the start of actual excavation. When utility companies or owners cannot respond to a request to locate underground utility

installations within 24 hours (unless a longer period is required by state or local law), or cannot establish the exact location of these installations, the employer may proceed, provided the employer does so with caution, and provided detection equipment or other acceptable means to locate utility installations are used.

(3) When excavation operations approach the estimated location of underground installations, the exact location of the installations shall be determined by safe and acceptable means.

(4) While the excavation is open, underground installations shall be protected, supported or removed as necessary to safeguard employees.

(c) *Access and egress*—(1) *Structural ramps*. (i) Structural ramps that are used solely by employees as a means of access or egress from excavations shall be designed by a competent person. Structural ramps used for access or egress of equipment shall be designed by a competent person qualified in structural design, and shall be constructed in accordance with the design.

(ii) Ramps and runways constructed of two or more structural members shall have the structural members connected together to prevent displacement.

(iii) Structural members used for ramps and runways shall be of uniform thickness.

(iv) Cleats or other appropriate means used to connect runway structural members shall be attached to the bottom of the runway or shall be attached in a manner to prevent tripping.

(v) Structural ramps used in lieu of steps shall be provided with cleats or other surface treatments on the top surface to prevent slipping.

(2) *Means of egress from trench excavations*. A stairway, ladder, ramp or other safe means of egress shall be located in trench excavations that are 4 feet (1.22 m) or more in depth so as to require no more than 25 feet (7.62 m) of lateral travel for employees.

(d) *Exposure to vehicular traffic*. Employees exposed to public vehicular traffic shall be provided with, and shall wear, warning vests or other suitable garments marked with or made of reflectorized or high-visibility material.

(e) *Exposure to falling loads*. No employee shall be permitted underneath loads handled by lifting or digging equipment. Employees shall be required to stand away from any vehicle being loaded or unloaded to avoid being struck by any spillage or falling materials. Operators may remain in the cabs of vehicles being loaded or unloaded when the vehicles are equipped, in accordance with § 1926.601(b)(6), to provide adequate protection for the operator during loading and unloading operations.

(f) *Warning system for mobile equipment*. When mobile equipment is operated adjacent to an excavation, or when such equipment is required to approach the edge of an excavation, and the operator does not have a clear and direct view of the edge of the excavation, a warning system shall be utilized such as barricades, hand or mechanical signals, or stop logs. If possible, the grade should be away from the excavation.

(g) *Hazardous atmospheres*—(1) *Testing and controls*. In addition to the requirements set forth in subparts D and E of this part (29 CFR 1926.50–1926.107) to prevent exposure to harmful levels of atmospheric contaminants and to assure acceptable atmospheric conditions, the following requirements shall apply:

(i) Where oxygen deficiency (atmospheres containing less than 19.5 percent oxygen) or a hazardous atmosphere exists or could reasonably be expected to exist, such as in excavations in landfill areas or excavations in areas where hazardous substances are stored nearby, the atmospheres in the excavation shall be tested before employees enter excavations greater than 4 feet (1.22 m) in depth.

(ii) Adequate precautions shall be taken to prevent employee exposure to atmospheres containing less than 19.5 percent oxygen and other hazardous atmospheres. These precautions include providing proper respiratory protection or ventilation in accordance with subparts D and E of this part respectively.

(iii) Adequate precaution shall be taken such as providing ventilation, to prevent employee exposure to an atmosphere containing a concentration

§ 1926.651

29 CFR Ch. XVII (7-1-22 Edition)

of a flammable gas in excess of 20 percent of the lower flammable limit of the gas.

(iv) When controls are used that are intended to reduce the level of atmospheric contaminants to acceptable levels, testing shall be conducted as often as necessary to ensure that the atmosphere remains safe.

(2) *Emergency rescue equipment.* (1) Emergency rescue equipment, such as breathing apparatus, a safety harness and line, or a basket stretcher, shall be readily available where hazardous atmospheric conditions exist or may reasonably be expected to develop during work in an excavation. This equipment shall be attended when in use.

(ii) Employees entering bell-bottom pier holes, or other similar deep and confined footing excavations, shall wear a harness with a life-line securely attached to it. The lifeline shall be separate from any line used to handle materials, and shall be individually attended at all times while the employee wearing the lifeline is in the excavation.

(h) *Protection from hazards associated with water accumulation.* (1) Employees shall not work in excavations in which there is accumulated water, or in excavations in which water is accumulating, unless adequate precautions have been taken to protect employees against the hazards posed by water accumulation. The precautions necessary to protect employees adequately vary with each situation, but could include special support or shield systems to protect from cave-ins, water removal to control the level of accumulating water, or use of a safety harness and lifeline.

(2) If water is controlled or prevented from accumulating by the use of water removal equipment, the water removal equipment and operations shall be monitored by a competent person to ensure proper operation.

(3) If excavation work interrupts the natural drainage of surface water (such as streams), diversion ditches, dikes, or other suitable means shall be used to prevent surface water from entering the excavation and to provide adequate drainage of the area adjacent to the excavation. Excavations subject to runoff from heavy rains will require an in-

spection by a competent person and compliance with paragraphs (h)(1) and (h)(2) of this section.

(i) *Stability of adjacent structures.* (1) Where the stability of adjoining buildings, walls, or other structures is endangered by excavation operations, support systems such as shoring, bracing, or underpinning shall be provided to ensure the stability of such structures for the protection of employees.

(2) Excavation below the level of the base or footing of any foundation or retaining wall that could be reasonably expected to pose a hazard to employees shall not be permitted except when:

(i) A support system, such as underpinning, is provided to ensure the safety of employees and the stability of the structure; or

(ii) The excavation is in stable rock; or

(iii) A registered professional engineer has approved the determination that the structure is sufficiently removed from the excavation so as to be unaffected by the excavation activity; or

(iv) A registered professional engineer has approved the determination that such excavation work will not pose a hazard to employees.

(3) Sidewalks, pavements, and appurtenant structure shall not be undermined unless a support system or another method of protection is provided to protect employees from the possible collapse of such structures.

(j) *Protection of employees from loose rock or soil.* (1) Adequate protection shall be provided to protect employees from loose rock or soil that could pose a hazard by falling or rolling from an excavation face. Such protection shall consist of scaling to remove loose material; installation of protective barricades at intervals as necessary on the face to stop and contain falling material; or other means that provide equivalent protection.

(2) Employees shall be protected from excavated or other materials or equipment that could pose a hazard by falling or rolling into excavations. Protection shall be provided by placing and keeping such materials or equipment at least 2 feet (.61 m) from the edge of excavations, or by the use of retaining devices that are sufficient to prevent

materials or equipment from falling or rolling into excavations, or by a combination of both if necessary.

(k) *Inspections.* (1) Daily inspections of excavations, the adjacent areas, and protective systems shall be made by a competent person for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. An inspection shall be conducted by the competent person prior to the start of work and as needed throughout the shift. Inspections shall also be made after every rainstorm or other hazard increasing occurrence. These inspections are only required when employee exposure can be reasonably anticipated.

(2) Where the competent person finds evidence of a situation that could result in a possible cave-in, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions, exposed employees shall be removed from the hazardous area until the necessary precautions have been taken to ensure their safety.

(1) Walkways shall be provided where employees or equipment are required or permitted to cross over excavations. Guardrails which comply with § 1926.502(b) shall be provided where walkways are 6 feet (1.8 m) or more above lower levels.

[54 FR 45959, Oct. 31, 1989, as amended at 59 FR 40730, Aug. 9, 1994]

§ 1926.652 Requirements for protective systems.

(a) *Protection of employees in excavations.* (1) Each employee in an excavation shall be protected from cave-ins by an adequate protective system designed in accordance with paragraph (b) or (c) of this section except when:

(i) Excavations are made entirely in stable rock; or

(ii) Excavations are less than 5 feet (1.52m) in depth and examination of the ground by a competent person provides no indication of a potential cave-in.

(2) Protective systems shall have the capacity to resist without failure all loads that are intended or could reasonably be expected to be applied or transmitted to the system.

(b) *Design of sloping and benching systems.* The slopes and configurations of sloping and benching systems shall be selected and constructed by the employer or his designee and shall be in accordance with the requirements of paragraph (b)(1); or, in the alternative, paragraph (b)(2); or, in the alternative, paragraph (b)(3), or, in the alternative, paragraph (b)(4), as follows:

(1) *Option (1)—Allowable configurations and slopes.* (i) Excavations shall be sloped at an angle not steeper than one and one-half horizontal to one vertical (34 degrees measured from the horizontal), unless the employer uses one of the other options listed below.

(ii) Slopes specified in paragraph (b)(1)(i) of this section, shall be excavated to form configurations that are in accordance with the slopes shown for Type C soil in appendix B to this subpart.

(2) *Option (2)—Determination of slopes and configurations using Appendices A and B.* Maximum allowable slopes, and allowable configurations for sloping and benching systems, shall be determined in accordance with the conditions and requirements set forth in appendices A and B to this subpart.

(3) *Option (3)—Designs using other tabulated data.* (i) Designs of sloping or benching systems shall be selected from and be in accordance with tabulated data, such as tables and charts.

(ii) The tabulated data shall be in written form and shall include all of the following:

(A) Identification of the parameters that affect the selection of a sloping or benching system drawn from such data;

(B) Identification of the limits of use of the data, to include the magnitude and configuration of slopes determined to be safe;

(C) Explanatory information as may be necessary to aid the user in making a correct selection of a protective system from the data.

(iii) At least one copy of the tabulated data which identifies the registered professional engineer who approved the data, shall be maintained at the jobsite during construction of the protective system. After that time the data may be stored off the jobsite, but a copy of the data shall be made available to the Secretary upon request.

(4) *Option (4)—Design by a registered professional engineer.* (i) Sloping and benching systems not utilizing Option (1) or Option (2) or Option (3) under paragraph (b) of this section shall be approved by a registered professional engineer.

(ii) Designs shall be in written form and shall include at least the following:

(A) The magnitude of the slopes that were determined to be safe for the particular project;

(B) The configurations that were determined to be safe for the particular project; and

(C) The identity of the registered professional engineer approving the design.

(iii) At least one copy of the design shall be maintained at the jobsite while the slope is being constructed. After that time the design need not be at the jobsite, but a copy shall be made available to the Secretary upon request.

(c) *Design of support systems, shield systems, and other protective systems.* Designs of support systems shield systems, and other protective systems shall be selected and constructed by the employer or his designee and shall be in accordance with the requirements of paragraph (c)(1); or, in the alternative, paragraph (c)(2); or, in the alternative, paragraph (c)(3); or, in the alternative, paragraph (c)(4) as follows:

(1) *Option (1)—Designs using appendices A, C and D.* Designs for timber shoring in trenches shall be determined in accordance with the conditions and requirements set forth in appendices A and C to this subpart. Designs for aluminum hydraulic shoring shall be in accordance with paragraph (c)(2) of this section, but if manufacturer's tabulated data cannot be utilized, designs shall be in accordance with appendix D.

(2) *Option (2)—Designs Using Manufacturer's Tabulated Data.* (i) Design of support systems, shield systems, or other protective systems that are drawn from manufacturer's tabulated data shall be in accordance with all specifications, recommendations, and limitations issued or made by the manufacturer.

(ii) Deviation from the specifications, recommendations, and limitations issued or made by the manufacturer

shall only be allowed after the manufacturer issues specific written approval.

(iii) Manufacturer's specifications, recommendations, and limitations, and manufacturer's approval to deviate from the specifications, recommendations, and limitations shall be in written form at the jobsite during construction of the protective system. After that time this data may be stored off the jobsite, but a copy shall be made available to the Secretary upon request.

(3) *Option (3)—Designs using other tabulated data.* (i) Designs of support systems, shield systems, or other protective systems shall be selected from and be in accordance with tabulated data, such as tables and charts.

(ii) The tabulated data shall be in written form and include all of the following:

(A) Identification of the parameters that affect the selection of a protective system drawn from such data;

(B) Identification of the limits of use of the data;

(C) Explanatory information as may be necessary to aid the user in making a correct selection of a protective system from the data.

(iii) At least one copy of the tabulated data, which identifies the registered professional engineer who approved the data, shall be maintained at the jobsite during construction of the protective system. After that time the data may be stored off the jobsite, but a copy of the data shall be made available to the Secretary upon request.

(4) *Option (4)—Design by a registered professional engineer.* (i) Support systems, shield systems, and other protective systems not utilizing Option 1, Option 2 or Option 3, above, shall be approved by a registered professional engineer.

(ii) Designs shall be in written form and shall include the following:

(A) A plan indicating the sizes, types, and configurations of the materials to be used in the protective system; and

(B) The identity of the registered professional engineer approving the design.

(iii) At least one copy of the design shall be maintained at the jobsite during construction of the protective system. After that time, the design may be stored off the jobsite, but a copy of the design shall be made available to the Secretary upon request.

(d) *Materials and equipment.* (1) Materials and equipment used for protective systems shall be free from damage or defects that might impair their proper function.

(2) Manufactured materials and equipment used for protective systems shall be used and maintained in a manner that is consistent with the recommendations of the manufacturer, and in a manner that will prevent employee exposure to hazards.

(3) When material or equipment that is used for protective systems is damaged, a competent person shall examine the material or equipment and evaluate its suitability for continued use. If the competent person cannot assure the material or equipment is able to support the intended loads or is otherwise suitable for safe use, then such material or equipment shall be removed from service, and shall be evaluated and approved by a registered professional engineer before being returned to service.

(e) *Installation and removal of support*—(1) *General.* (i) Members of support systems shall be securely connected together to prevent sliding, falling, kickouts, or other predictable failure.

(ii) Support systems shall be installed and removed in a manner that protects employees from cave-ins, structural collapses, or from being struck by members of the support system.

(iii) Individual members of support systems shall not be subjected to loads exceeding those which those members were designed to withstand.

(iv) Before temporary removal of individual members begins, additional precautions shall be taken to ensure the safety of employees, such as installing other structural members to carry the loads imposed on the support system.

(v) Removal shall begin at, and progress from, the bottom of the excavation. Members shall be released slowly

so as to note any indication of possible failure of the remaining members of the structure or possible cave-in of the sides of the excavation.

(vi) Backfilling shall progress together with the removal of support systems from excavations.

(2) *Additional requirements for support systems for trench excavations.* (i) Excavation of material to a level no greater than 2 feet (.61 m) below the bottom of the members of a support system shall be permitted, but only if the system is designed to resist the forces calculated for the full depth of the trench, and there are no indications while the trench is open of a possible loss of soil from behind or below the bottom of the support system.

(ii) Installation of a support system shall be closely coordinated with the excavation of trenches.

(f) *Sloping and benching systems.* Employees shall not be permitted to work on the faces of sloped or benched excavations at levels above other employees except when employees at the lower levels are adequately protected from the hazard of falling, rolling, or sliding material or equipment.

(g) *Shield systems*—(1) *General.* (i) Shield systems shall not be subjected to loads exceeding those which the system was designed to withstand.

(ii) Shields shall be installed in a manner to restrict lateral or other hazardous movement of the shield in the event of the application of sudden lateral loads.

(iii) Employees shall be protected from the hazard of cave-ins when entering or exiting the areas protected by shields.

(iv) Employees shall not be allowed in shields when shields are being installed, removed, or moved vertically.

(2) *Additional requirement for shield systems used in trench excavations.* Excavations of earth material to a level not greater than 2 feet (.61 m) below the bottom of a shield shall be permitted, but only if the shield is designed to resist the forces calculated for the full depth of the trench, and there are no indications while the trench is open of a possible loss of soil from behind or below the bottom of the shield.

APPENDIX A TO SUBPART P OF PART
1926—SOIL CLASSIFICATION

(a) *Scope and application*—(1) *Scope*. This appendix describes a method of classifying soil and rock deposits based on site and environmental conditions, and on the structure and composition of the earth deposits. The appendix contains definitions, sets forth requirements, and describes acceptable visual and manual tests for use in classifying soils.

(2) *Application*. This appendix applies when a sloping or benching system is designed in accordance with the requirements set forth in §1926.652(b)(2) as a method of protection for employees from cave-ins. This appendix also applies when timber shoring for excavations is designed as a method of protection from cave-ins in accordance with appendix C to subpart P of part 1926, and when aluminum hydraulic shoring is designed in accordance with appendix D. This appendix also applies if other protective systems are designed and selected for use from data prepared in accordance with the requirements set forth in §1926.652(c), and the use of the data is predicated on the use of the soil classification system set forth in this appendix.

(b) *Definitions*. The definitions and examples given below are based on, in whole or in part, the following: American Society for Testing Materials (ASTM) Standards D653-85 and D2488; The Unified Soils Classification System, the U.S. Department of Agriculture (USDA) Textural Classification Scheme; and The National Bureau of Standards Report BSS-121.

Cemented soil means a soil in which the particles are held together by a chemical agent, such as calcium carbonate, such that a hand-size sample cannot be crushed into powder or individual soil particles by finger pressure.

Cohesive soil means clay (fine grained soil), or soil with a high clay content, which has cohesive strength. Cohesive soil does not crumble, can be excavated with vertical sideslopes, and is plastic when moist. Cohesive soil is hard to break up when dry, and exhibits significant cohesion when submerged. Cohesive soils include clayey silt, sandy clay, silty clay, clay and organic clay.

Dry soil means soil that does not exhibit visible signs of moisture content.

Fissured means a soil material that has a tendency to break along definite planes of fracture with little resistance, or a material that exhibits open cracks, such as tension cracks, in an exposed surface.

Granular soil means gravel, sand, or silt, (coarse grained soil) with little or no clay content. Granular soil has no cohesive strength. Some moist granular soils exhibit apparent cohesion. Granular soil cannot be molded when moist and crumbles easily when dry.

Layered system means two or more distinctly different soil or rock types arranged

in layers. Micaceous seams or weakened planes in rock or shale are considered layered.

Moist soil means a condition in which a soil looks and feels damp. Moist cohesive soil can easily be shaped into a ball and rolled into small diameter threads before crumbling. Moist granular soil that contains some cohesive material will exhibit signs of cohesion between particles.

Plastic means a property of a soil which allows the soil to be deformed or molded without cracking, or appreciable volume change.

Saturated soil means a soil in which the voids are filled with water. Saturation does not require flow. Saturation, or near saturation, is necessary for the proper use of instruments such as a pocket penetrometer or shear vane.

Soil classification system means, for the purpose of this subpart, a method of categorizing soil and rock deposits in a hierarchy of Stable Rock, Type A, Type B, and Type C, in decreasing order of stability. The categories are determined based on an analysis of the properties and performance characteristics of the deposits and the environmental conditions of exposure.

Stable rock means natural solid mineral matter that can be excavated with vertical sides and remain intact while exposed.

Submerged soil means soil which is underwater or is free seeping.

Type A means cohesive soils with an unconfined compressive strength of 1.5 ton per square foot (tsf) (144 kPa) or greater. Examples of cohesive soils are: clay, silty clay, sandy clay, clay loam and, in some cases, silty clay loam and sandy clay loam. Cemented soils such as caliche and hardpan are also considered Type A. However, no soil is Type A if:

- (i) The soil is fissured; or
- (ii) The soil is subject to vibration from heavy traffic, pile driving, or similar effects; or
- (iii) The soil has been previously disturbed; or
- (iv) The soil is part of a sloped, layered system where the layers dip into the excavation on a slope of four horizontal to one vertical (4H:1V) or greater; or
- (v) The material is subject to other factors that would require it to be classified as a less stable material.

Type B means:

- (i) Cohesive soil with an unconfined compressive strength greater than 0.5 tsf (48 kPa) but less than 1.5 tsf (144 kPa); or
- (ii) Granular cohesionless soils including: angular gravel (similar to crushed rock), silt, silt loam, sandy loam and, in some cases, silty clay loam and sandy clay loam.
- (iii) Previously disturbed soils except those which would otherwise be classified as Type C soil.

(iv) Soil that meets the unconfined compressive strength or cementation requirements for Type A, but is fissured or subject to vibration; or

(v) Dry rock that is not stable; or

(vi) Material that is part of a sloped, layered system where the layers dip into the excavation on a slope less steep than four horizontal to one vertical (4H:1V), but only if the material would otherwise be classified as Type B.

Type C means:

(i) Cohesive soil with an unconfined compressive strength of 0.5 tsf (48 kPa) or less; or

(ii) Granular soils including gravel, sand, and loamy sand; or

(iii) Submerged soil or soil from which water is freely seeping; or

(iv) Submerged rock that is not stable; or

(v) Material in a sloped, layered system where the layers dip into the excavation on a slope of four horizontal to one vertical (4H:1V) or steeper.

Unconfined compressive strength means the load per unit area at which a soil will fail in compression. It can be determined by laboratory testing, or estimated in the field using a pocket penetrometer, by thumb penetration tests, and other methods.

Wet soil means soil that contains significantly more moisture than moist soil, but in such a range of values that cohesive material will slump or begin to flow when vibrated. Granular material that would exhibit cohesive properties when moist will lose those cohesive properties when wet.

(c) *Requirements*—(1) *Classification of soil and rock deposits.* Each soil and rock deposit shall be classified by a competent person as Stable Rock, Type A, Type B, or Type C in accordance with the definitions set forth in paragraph (b) of this appendix.

(2) *Basis of classification.* The classification of the deposits shall be made based on the results of at least one visual and at least one manual analysis. Such analyses shall be conducted by a competent person using tests described in paragraph (d) below, or in other recognized methods of soil classification and testing such as those adopted by the American Society for Testing Materials, or the U.S. Department of Agriculture textural classification system.

(3) *Visual and manual analyses.* The visual and manual analyses, such as those noted as being acceptable in paragraph (d) of this appendix, shall be designed and conducted to provide sufficient quantitative and qualitative information as may be necessary to identify properly the properties, factors, and conditions affecting the classification of the deposits.

(4) *Layered systems.* In a layered system, the system shall be classified in accordance with its weakest layer. However, each layer may be classified individually where a more stable layer lies under a less stable layer.

(5) *Reclassification.* If, after classifying a deposit, the properties, factors, or conditions affecting its classification change in any way, the changes shall be evaluated by a competent person. The deposit shall be reclassified as necessary to reflect the changed circumstances.

(d) *Acceptable visual and manual tests*—(1) *Visual tests.* Visual analysis is conducted to determine qualitative information regarding the excavation site in general, the soil adjacent to the excavation, the soil forming the sides of the open excavation, and the soil taken as samples from excavated material.

(i) Observe samples of soil that are excavated and soil in the sides of the excavation. Estimate the range of particle sizes and the relative amounts of the particle sizes. Soil that is primarily composed of fine-grained material is cohesive material. Soil composed primarily of coarse-grained sand or gravel is granular material.

(ii) Observe soil as it is excavated. Soil that remains in clumps when excavated is cohesive. Soil that breaks up easily and does not stay in clumps is granular.

(iii) Observe the side of the opened excavation and the surface area adjacent to the excavation. Crack-like openings such as tension cracks could indicate fissured material. If chunks of soil spall off a vertical side, the soil could be fissured. Small spalls are evidence of moving ground and are indications of potentially hazardous situations.

(iv) Observe the area adjacent to the excavation and the excavation itself for evidence of existing utility and other underground structures, and to identify previously disturbed soil.

(v) Observe the opened side of the excavation to identify layered systems. Examine layered systems to identify if the layers slope toward the excavation. Estimate the degree of slope of the layers.

(vi) Observe the area adjacent to the excavation and the sides of the opened excavation for evidence of surface water, water seeping from the sides of the excavation, or the location of the level of the water table.

(vii) Observe the area adjacent to the excavation and the area within the excavation for sources of vibration that may affect the stability of the excavation face.

(2) *Manual tests.* Manual analysis of soil samples is conducted to determine quantitative as well as qualitative properties of soil and to provide more information in order to classify soil properly.

(i) *Plasticity.* Mold a moist or wet sample of soil into a ball and attempt to roll it into threads as thin as 1/8-inch in diameter. Cohesive material can be successfully rolled into threads without crumbling. For example, if at least a two inch (50 mm) length of 1/8-inch thread can be held on one end without tearing, the soil is cohesive.

(ii) *Dry strength.* If the soil is dry and crumbles on its own or with moderate pressure into individual grains or fine powder, it is granular (any combination of gravel, sand, or silt). If the soil is dry and falls into clumps which break up into smaller clumps, but the smaller clumps can only be broken up with difficulty, it may be clay in any combination with gravel, sand or silt. If the dry soil breaks into clumps which do not break up into small clumps and which can only be broken with difficulty, and there is no visual indication the soil is fissured, the soil may be considered unfissured.

(iii) *Thumb penetration.* The thumb penetration test can be used to estimate the unconfined compressive strength of cohesive soils. (This test is based on the thumb penetration test described in American Society for Testing and Materials (ASTM) Standard designation D2488—"Standard Recommended Practice for Description of Soils (Visual—Manual Procedure).") Type A soils with an unconfined compressive strength of 1.5 tsf can be readily indented by the thumb; however, they can be penetrated by the thumb only with very great effort. Type C soils with an unconfined compressive strength of 0.5 tsf can be easily penetrated several inches by the thumb, and can be molded by light finger pressure. This test should be conducted on an undisturbed soil sample, such as a large clump of spoil, as soon as practicable after excavation to keep to a minimum the effects of exposure to drying influences. If the excavation is later exposed to wetting influences (rain, flooding), the classification of the soil must be changed accordingly.

(iv) *Other strength tests.* Estimates of unconfined compressive strength of soils can also be obtained by use of a pocket penetrometer or by using a hand-operated shearvane.

(v) *Drying test.* The basic purpose of the drying test is to differentiate between cohesive material with fissures, unfissured cohesive material, and granular material. The procedure for the drying test involves drying a sample of soil that is approximately one inch thick (2.54 cm) and six inches (15.24 cm) in diameter until it is thoroughly dry:

(A) If the sample develops cracks as it dries, significant fissures are indicated.

(B) Samples that dry without cracking are to be broken by hand. If considerable force is necessary to break a sample, the soil has significant cohesive material content. The soil can be classified as an unfissured cohesive material and the unconfined compressive strength should be determined.

(C) If a sample breaks easily by hand, it is either a fissured cohesive material or a granular material. To distinguish between the two, pulverize the dried clumps of the sample by hand or by stepping on them. If the clumps do not pulverize easily, the material is cohesive with fissures. If they pul-

verize easily into very small fragments, the material is granular.

[85 FR 8743, Feb. 18, 2020]

APPENDIX B TO SUBPART P OF PART 1926—SLOPING AND BENCHING

(a) *Scope and application.* This appendix contains specifications for sloping and benching when used as methods of protecting employees working in excavations from cave-ins. The requirements of this appendix apply when the design of sloping and benching protective systems is to be performed in accordance with the requirements set forth in § 1926.652(b)(2).

(b) *Definitions.*

Actual slope means the slope to which an excavation face is excavated.

Distress means that the soil is in a condition where a cave-in is imminent or is likely to occur. Distress is evidenced by such phenomena as the development of fissures in the face of or adjacent to an open excavation; the subsidence of the edge of an excavation; the slumping of material from the face or the bulging or heaving of material from the bottom of an excavation; the spalling of material from the face of an excavation; and raveling, i.e., small amounts of material such as pebbles or little clumps of material suddenly separating from the face of an excavation and trickling or rolling down into the excavation.

Maximum allowable slope means the steepest incline of an excavation face that is acceptable for the most favorable site conditions as protection against cave-ins, and is expressed as the ratio of horizontal distance to vertical rise (H:V).

Short term exposure means a period of time less than or equal to 24 hours that an excavation is open.

(c) *Requirements—(1) Soil classification.* Soil and rock deposits shall be classified in accordance with appendix A to subpart P of part 1926.

(2) *Maximum allowable slope.* The maximum allowable slope for a soil or rock deposit shall be determined from Table B-1 of this appendix.

(3) *Actual slope.* (i) The actual slope shall not be steeper than the maximum allowable slope.

(ii) The actual slope shall be less steep than the maximum allowable slope, when there are signs of distress. If that situation occurs, the slope shall be cut back to an actual slope which is at least $\frac{1}{2}$ horizontal to one vertical ($\frac{1}{2}$ H:1V) less steep than the maximum allowable slope.

(iii) When surcharge loads from stored material or equipment, operating equipment, or traffic are present, a competent person shall determine the degree to which the actual slope must be reduced below the maximum

allowable slope, and shall assure that such reduction is achieved. Surcharge loads from adjacent structures shall be evaluated in accordance with §1926.651(i).

(4) *Configurations.* Configurations of sloping and benching systems shall be in accordance with Figure B-1.

TABLE B-1
MAXIMUM ALLOWABLE SLOPES

SOIL OR ROCK TYPE	MAXIMUM ALLOWABLE SLOPES (H:V) [1] FOR EXCAVATIONS LESS THAN 20 FEET DEEP [3]
STABLE ROCK TYPE A [2] TYPE B TYPE C	VERTICAL (90°) 3/4 : 1 (53°) 1:1 (45°) 1½ : 1 (34°)

NOTES:

1. Numbers shown in parentheses next to maximum allowable slopes are angles expressed in degrees from the horizontal. Angles have been rounded off.
2. A short-term maximum allowable slope of 1/2H:1V (63°) is allowed in excavations in Type A soil that are 12 feet (3.67 m) or less in depth. Short-term maximum allowable slopes for excavations greater than 12 feet (3.67 m) in depth shall be 3/4H:1V (53°).
3. Sloping or benching for excavations greater than 20 feet deep shall be designed by a registered professional engineer.

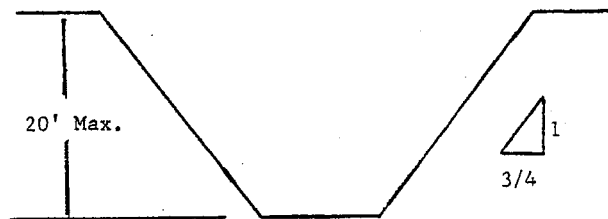
Figure B-1

Slope Configurations

(All slopes stated below are in the horizontal to vertical ratio)

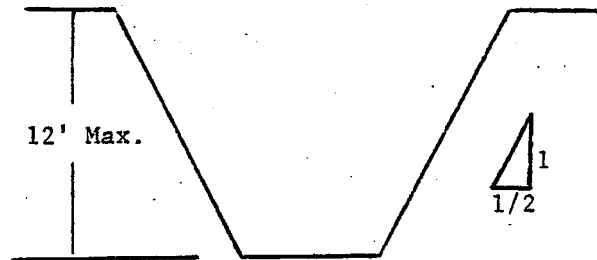
B-1.1 Excavations made in Type A soil.

1. All simple slope excavation 20 feet or less in depth shall have a maximum allowable slope of ¾:1.



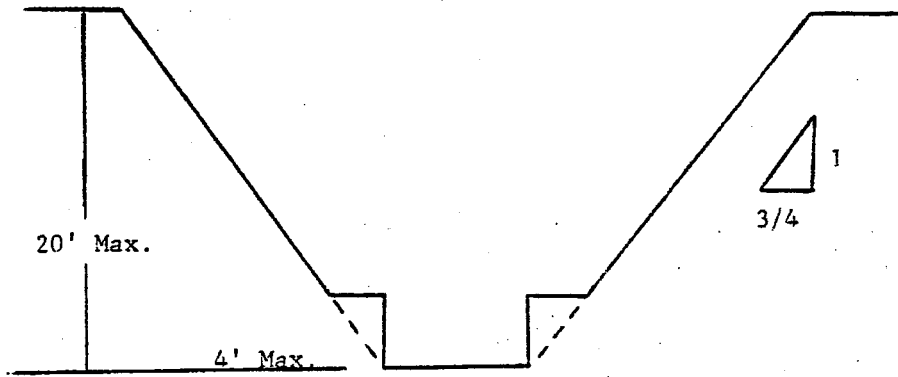
SIMPLE SLOPE—GENERAL

Exception: Simple slope excavations which are open 24 hours or less (short term) and which are 12 feet or less in depth shall have a maximum allowable slope of ½:1.

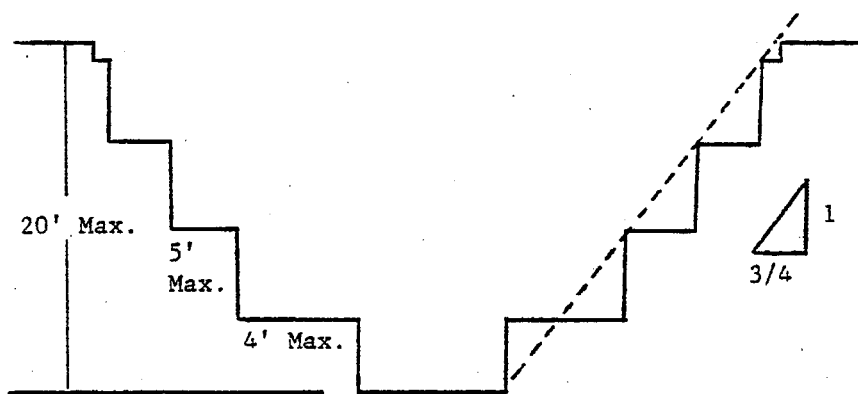


SIMPLE SLOPE—SHORT TERM

2. All benched excavations 20 feet or less in depth shall have a maximum allowable slope of $\frac{3}{4}$ to 1 and maximum bench dimensions as follows:

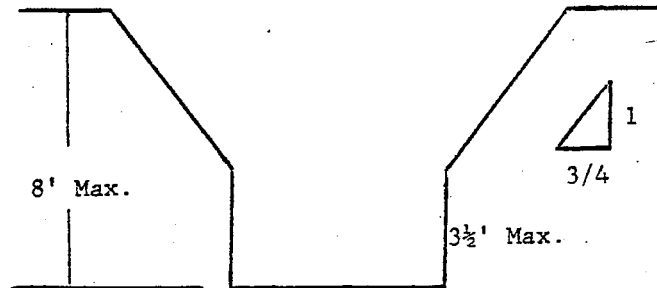


SIMPLE BENCH



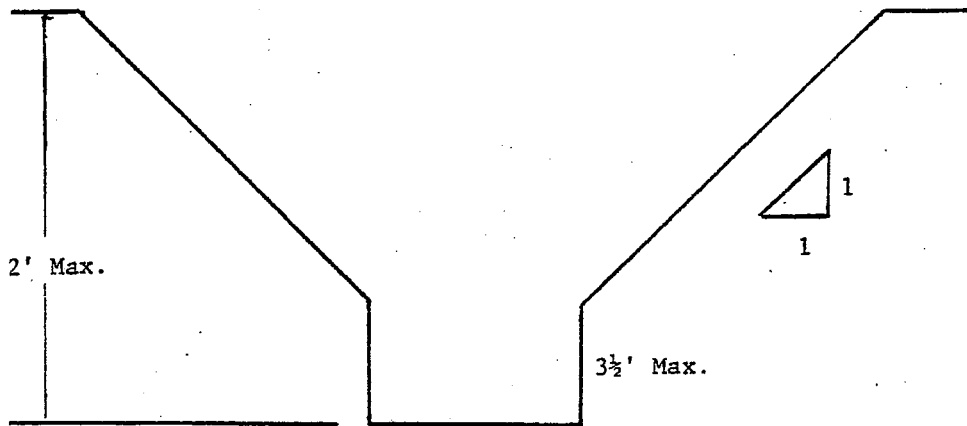
MULTIPLE BENCH

3. All excavations 8 feet or less in depth which have unsupported vertically sided lower portions shall have a maximum vertical side of $3\frac{1}{2}$ feet.



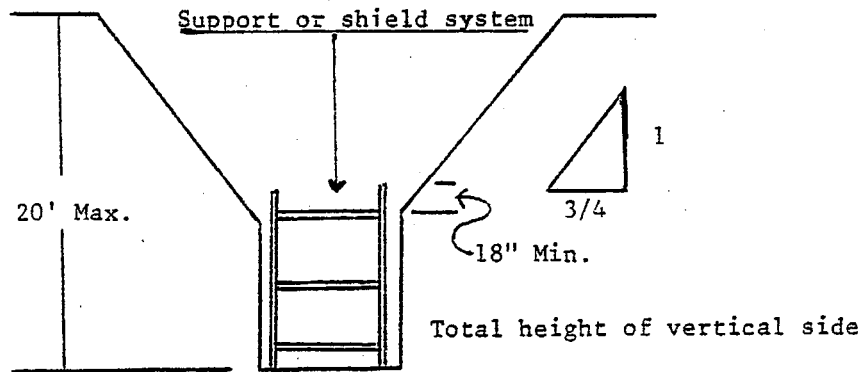
UNSUPPORTED VERTICALLY SIDED LOWER PORTION—MAXIMUM 8 FEET IN DEPTH

All excavations more than 8 feet but not more than 12 feet in depth which unsupported vertically sided lower portions shall have a maximum allowable slope of 1:1 and a maximum vertical side of 3½ feet.



UNSUPPORTED VERTICALLY SIDED LOWER PORTION—MAXIMUM 12 FEET IN DEPTH

All excavations 20 feet or less in depth which have vertically sided lower portions that are supported or shielded shall have a maximum allowable slope of ¾:1. The support or shield system must extend at least 18 inches above the top of the vertical side.

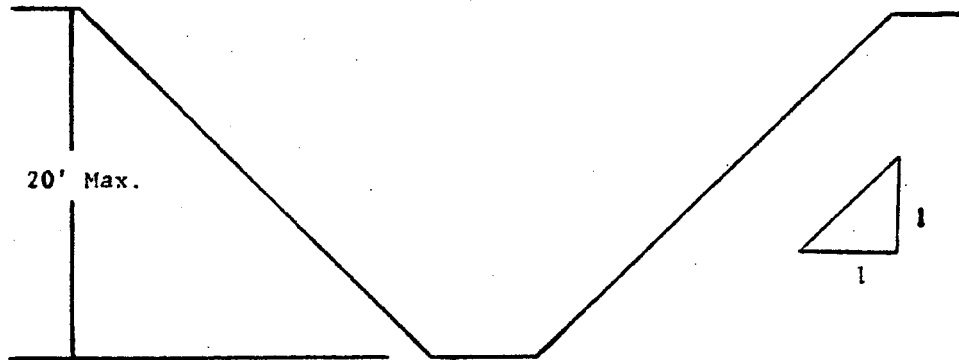


SUPPORTED OR SHIELDED VERTICALLY SIDED LOWER PORTION

4. All other simple slope, compound slope, and vertically sided lower portion excavations shall be in accordance with the other options permitted under § 1926.652(b).

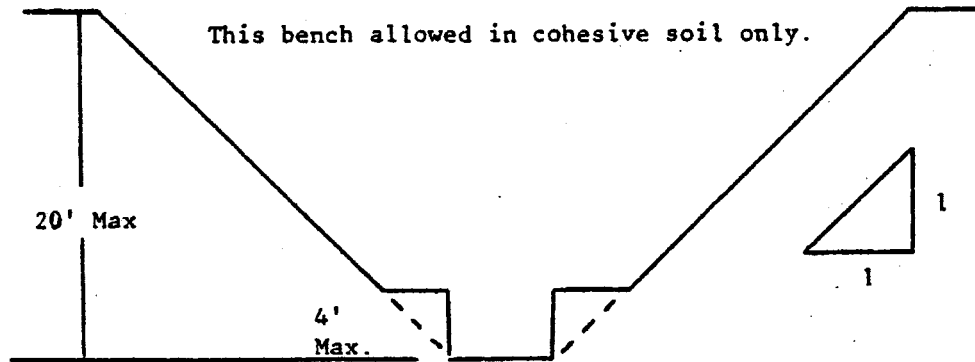
B-1.2 Excavations Made in Type B Soil

1. All simple slope excavations 20 feet or less in depth shall have a maximum allowable slope of 1:1.

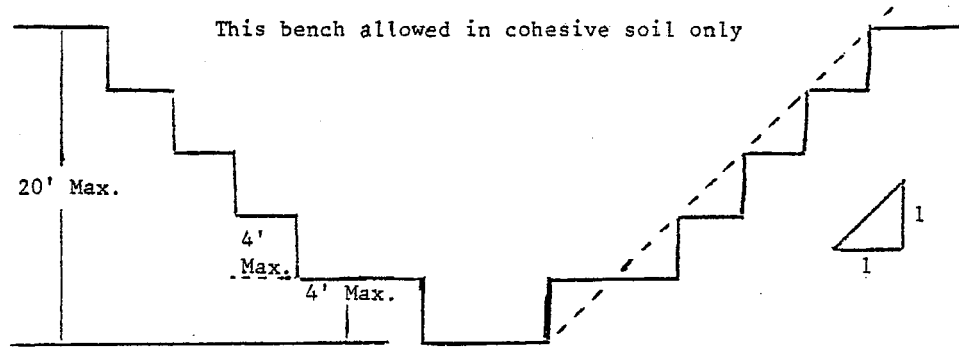


SIMPLE SLOPE

2. All benched excavations 20 feet or less in depth shall have a maximum allowable slope of 1:1 and maximum bench dimensions as follows:

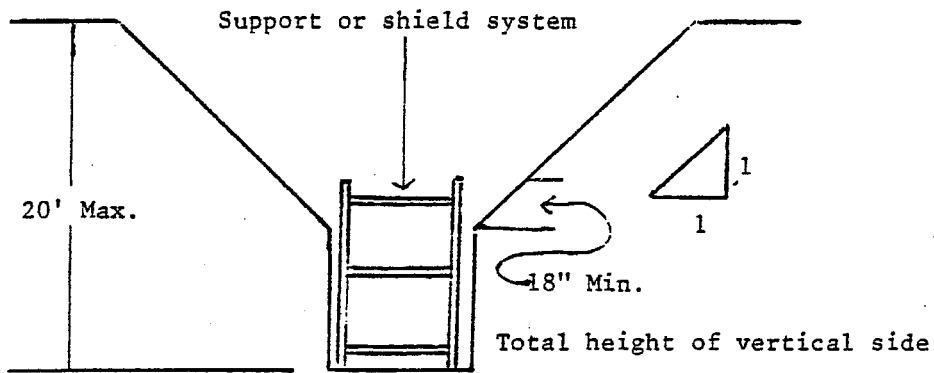


SINGLE BENCH



MULTIPLE BENCH

3. All excavations 20 feet or less in depth which have vertically sided lower portions shall be shielded or supported to a height at least 18 inches above the top of the vertical side. All such excavations shall have a maximum allowable slope of 1:1.

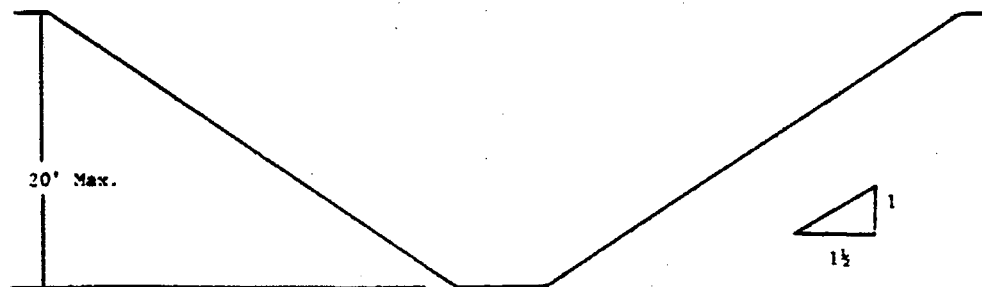


VERTICALLY SIDED LOWER PORTION

4. All other sloped excavations shall be in accordance with the other options permitted in §1926.652(b).

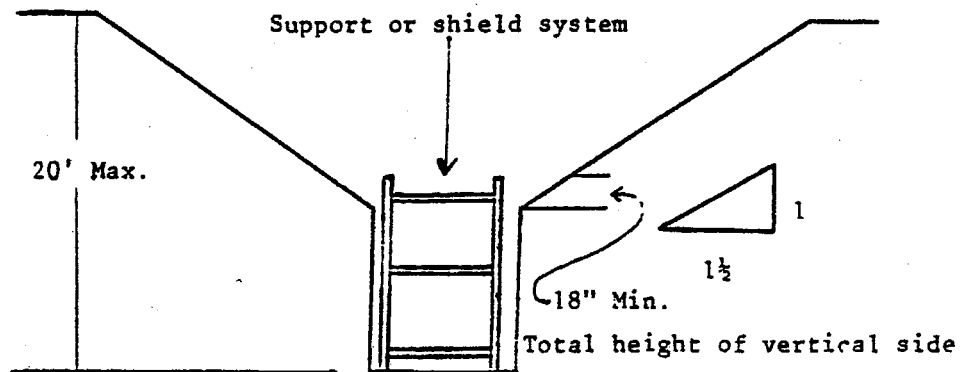
B-1.3 Excavations Made in Type C Soil

1. All simple slope excavations 20 feet or less in depth shall have a maximum allowable slope of $1\frac{1}{2}:1$.



SIMPLE SLOPE

2. All excavations 20 feet or less in depth which have vertically sided lower portions shall be shielded or supported to a height at least 18 inches above the top of the vertical side. All such excavations shall have a maximum allowable slope of $1\frac{1}{2}:1$.

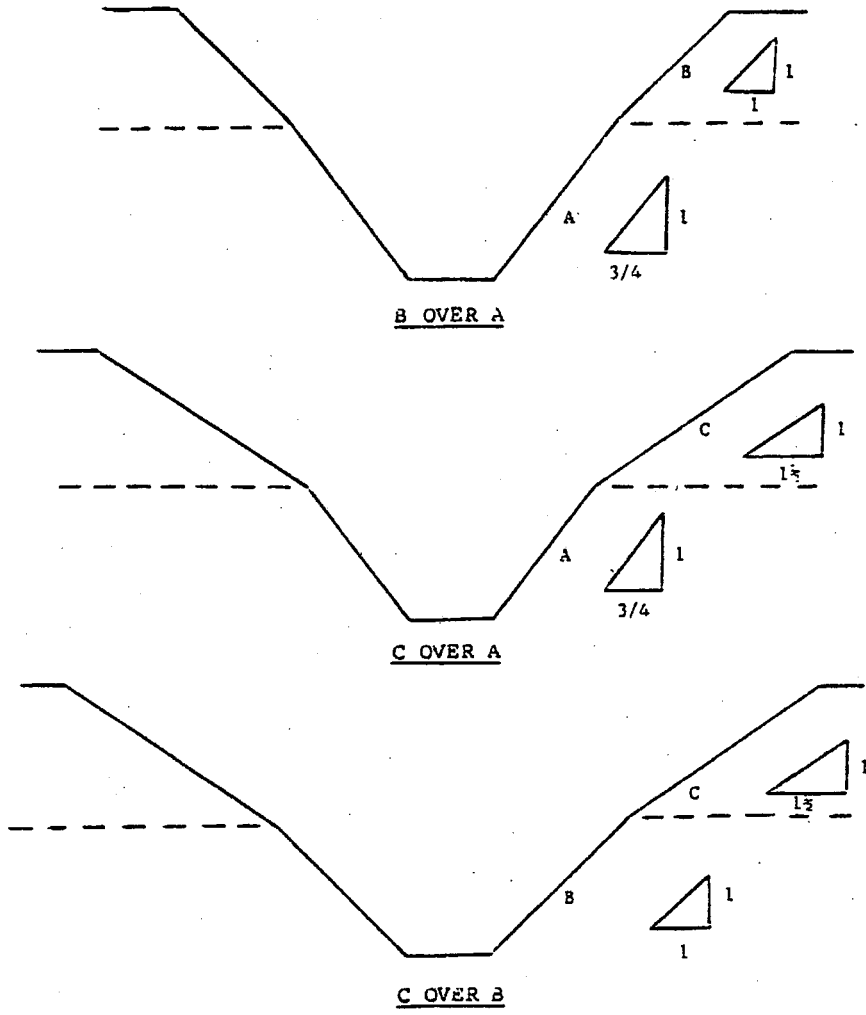


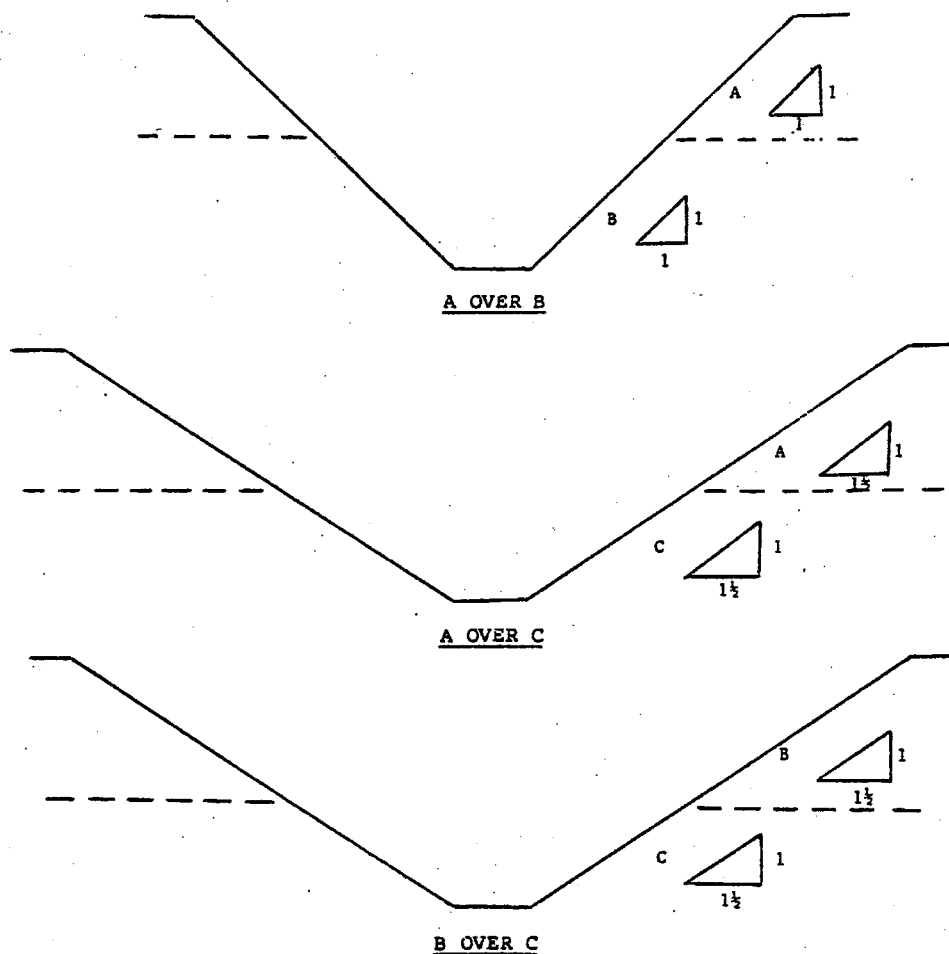
VERTICAL SIDED LOWER PORTION

3. All other sloped excavations shall be in accordance with the other options permitted in §1926.652(b).

B-1.4 Excavations Made in Layered Soils

1. All excavations 20 feet or less in depth made in layered soils shall have a maximum allowable slope for each layer as set forth below.





2. All other sloped excavations shall be in accordance with the other options permitted in §1926.652(b).

APPENDIX C TO SUBPART P OF PART 1926—TIMBER SHORING FOR TRENCHES

(a) *Scope.* This appendix contains information that can be used timber shoring is provided as a method of protection from cave-ins in trenches that do not exceed 20 feet (6.1 m) in depth. This appendix must be used when design of timber shoring protective systems is to be performed in accordance with §1926.652(c)(1). Other timber shoring configurations; other systems of support such as hydraulic and pneumatic systems; and other protective systems such as sloping, benching, shielding, and freezing systems must be designed in accordance with the requirements set forth in §1926.652(b) and §1926.652(c).

(b) *Soil Classification.* In order to use the data presented in this appendix, the soil type or types in which the excavation is made must first be determined using the soil classification method set forth in appendix A of subpart P of this part.

(c) *Presentation of Information.* Information is presented in several forms as follows:

(1) Information is presented in tabular form in Tables C-1.1, C-1.2, and C-1.3, and Tables C-2.1, C-2.2 and C-2.3 following paragraph (g) of the appendix. Each table presents the minimum sizes of timber members to use in a shoring system, and each table contains data only for the particular soil type in which the excavation or portion of

the excavation is made. The data are arranged to allow the user the flexibility to select from among several acceptable configurations of members based on varying the horizontal spacing of the crossbraces. Stable rock is exempt from shoring requirements and therefore, no data are presented for this condition.

(2) Information concerning the basis of the tabular data and the limitations of the data is presented in paragraph (d) of this appendix, and on the tables themselves.

(3) Information explaining the use of the tabular data is presented in paragraph (e) of this appendix.

(4) Information illustrating the use of the tabular data is presented in paragraph (f) of this appendix.

(5) Miscellaneous notations regarding Tables C-1.1 through C-1.3 and Tables C-2.1 through C-2.3 are presented in paragraph (g) of this Appendix.

(d) *Basis and limitations of the data*—(1) *Dimensions of timber members.* (i) The sizes of the timber members listed in Tables C-1.1 through C-1.3 are taken from the National Bureau of Standards (NBS) report, "Recommended Technical Provisions for Construction Practice in Shoring and Sloping of Trenches and Excavations." In addition, where NBS did not recommend specific sizes of members, member sizes are based on an analysis of the sizes required for use by existing codes and on empirical practice.

(ii) The required dimensions of the members listed in Tables C-1.1 through C-1.3 refer to actual dimensions and not nominal dimensions of the timber. Employers wanting to use nominal size shoring are directed to Tables C-2.1 through C-2.3, or have this choice under §1926.652(c)(3), and are referred to The Corps of Engineers, The Bureau of Reclamation or data from other acceptable sources.

(2) *Limitation of application.* (i) It is not intended that the timber shoring specification apply to every situation that may be experienced in the field. These data were developed to apply to the situations that are most commonly experienced in current trenching practice. Shoring systems for use in situations that are not covered by the data in this appendix must be designed as specified in §1926.652(c).

(ii) When any of the following conditions are present, the members specified in the tables are not considered adequate. Either an alternate timber shoring system must be designed or another type of protective system designed in accordance with §1926.652.

(A) When loads imposed by structures or by stored material adjacent to the trench weigh in excess of the load imposed by a two-foot soil surcharge. The term "adjacent" as used here means the area within a horizontal distance from the edge of the trench equal to the depth of the trench.

(B) When vertical loads imposed on crossbraces exceed a 240-pound gravity load distributed on a one-foot section of the center of the crossbrace.

(C) When surcharge loads are present from equipment weighing in excess of 20,000 pounds.

(D) When only the lower portion of a trench is shored and the remaining portion of the trench is sloped or benched unless: The sloped portion is sloped at an angle less steep than three horizontal to one vertical; or the members are selected from the tables for use at a depth which is determined from the top of the overall trench, and not from the toe of the sloped portion.

(e) *Use of Tables.* The members of the shoring system that are to be selected using this information are the cross braces, the uprights, and the wales, where wales are required. Minimum sizes of members are specified for use in different types of soil. There are six tables of information, two for each soil type. The soil type must first be determined in accordance with the soil classification system described in appendix A to subpart P of part 1926. Using the appropriate table, the selection of the size and spacing of the members is then made. The selection is based on the depth and width of the trench where the members are to be installed and, in most instances, the selection is also based on the horizontal spacing of the crossbraces. Instances where a choice of horizontal spacing of crossbracing is available, the horizontal spacing of the crossbraces must be chosen by the user before the size of any member can be determined. When the soil type, the width and depth of the trench, and the horizontal spacing of the crossbraces are known, the size and vertical spacing of the crossbraces, the size and vertical spacing of the wales, and the size and horizontal spacing of the uprights can be read from the appropriate table.

(f) *Examples to Illustrate the Use of Tables C-1.1 through C-1.3.*

(1) *Example 1.*

A trench dug in Type A soil is 13 feet deep and five feet wide.

From Table C-1.1, for acceptable arrangements of timber can be used.

Arrangement #B1

Space 4 × 4 crossbraces at six feet horizontally and four feet vertically.

Wales are not required.

Space 3 × 8 uprights at six feet horizontally. This arrangement is commonly called "skip shoring."

Arrangement #B2

Space 4 × 6 crossbraces at eight feet horizontally and four feet vertically.

Space 8 × 8 wales at four feet vertically.

Space 2 × 6 uprights at four feet horizontally.

Arrangement #B3

Space 6 × 6 crossbraces at 10 feet horizontally and four feet vertically.

Space 8 × 10 wales at four feet vertically.

Space 2 × 6 uprights at five feet horizontally.

Arrangement #B4

Space 6 × 6 crossbraces at 12 feet horizontally and four feet vertically.

Space 10 × 10 wales at four feet vertically.

Spaces 3 × 8 uprights at six feet horizontally.

(2) Example 2.

A trench dug in Type B soil in 13 feet deep and five feet wide. From Table C-1.2 three acceptable arrangements of members are listed.

Arrangement #B1

Space 6 × 6 crossbraces at six feet horizontally and five feet vertically.

Space 8 × 8 wales at five feet vertically.

Space 2 × 6 uprights at two feet horizontally.

Arrangement #B2

Space 6 × 8 crossbraces at eight feet horizontally and five feet vertically.

Space 10 × 10 wales at five feet vertically.

Space 2 × 6 uprights at two feet horizontally.

Arrangement #B3

Space 8 × 8 crossbraces at 10 feet horizontally and five feet vertically.

Space 10 × 12 wales at five feet vertically.

Space 2 × 6 uprights at two feet vertically.

(3) Example 3.

A trench dug in Type C soil is 13 feet deep and five feet wide.

From Table C-1.3 two acceptable arrangements of members can be used.

Arrangement #B1

Space 8 × 8 crossbraces at six feet horizontally and five feet vertically.

Space 10 × 12 wales at five feet vertically.

Position 2 × 6 uprights as closely together as possible.

If water must be retained use special tongue and groove uprights to form tight sheeting.

Arrangement #B2

Space 8 × 10 crossbraces at eight feet horizontally and five feet vertically.

Space 12 × 12 wales at five feet vertically.

Position 2 × 6 uprights in a close sheeting configuration unless water pressure must be resisted. Tight sheeting must be used where water must be retained.

(4) Example 4.

A trench dug in Type C soil is 20 feet deep and 11 feet wide. The size and spacing of members for the section of trench that is over 15 feet in depth is determined using Table C-1.3. Only one arrangement of members is provided.

Space 8 × 10 crossbraces at six feet horizontally and five feet vertically.

Space 12 × 12 wales at five feet vertically.

Use 3 × 6 tight sheeting.

Use of Tables C-2.1 through C-2.3 would follow the same procedures.

(g) Notes for all Tables.

1. Member sizes at spacings other than indicated are to be determined as specified in §1926.652(c), "Design of Protective Systems."

2. When conditions are saturated or submerged use Tight Sheeting. Tight Sheeting refers to the use of specially-edged timber planks (e.g., tongue and groove) at least three inches thick, steel sheet piling, or similar construction that when driven or placed in position provide a tight wall to resist the lateral pressure of water and to prevent the loss of backfill material. Close Sheeting refers to the placement of planks side-by-side allowing as little space as possible between them.

3. All spacing indicated is measured center to center.

4. Wales to be installed with greater dimension horizontal.

5. If the vertical distance from the center of the lowest crossbrace to the bottom of the trench exceeds two and one-half feet, uprights shall be firmly embedded or a mudsill shall be used. Where uprights are embedded, the vertical distance from the center of the lowest crossbrace to the bottom of the trench shall not exceed 36 inches. When mudsills are used, the vertical distance shall not exceed 42 inches. Mudsills are wales that are installed at the toe of the trench side.

6. Trench jacks may be used in lieu of or in combination with timber crossbraces.

7. Placement of crossbraces. When the vertical spacing of crossbraces is four feet, place the top crossbrace no more than two feet below the top of the trench. When the vertical spacing of crossbraces is five feet, place the top crossbrace no more than 2.5 feet below the top of the trench.

TABLE C-1.1
 TIMBER TRENCH SHORING -- MINIMUM TIMBER REQUIREMENTS *
 SOIL TYPE A $P_a = 25 \times H + 72$ psf (2 ft Surcharge)

DEPTH OF TRENCH (FEET)	CROSS BRACES										VERT. SPACING (FEET)			SIZE (ACTUAL) AND SPACING OF MEMBERS **			UPRIGHTS			
	HORIZ. SPACING (FEET)		WIDTH OF TRENCH (FEET)		UP TO		UP TO		UP TO		UP TO		VERT. SPACING (FEET)		SIZE (IN)		MAXIMUM ALLOWABLE HORIZONTAL SPACING (FEET)		UPRIGHTS	
	UP TO	DOWN TO	UP TO	DOWN TO	UP TO	DOWN TO	UP TO	DOWN TO	UP TO	DOWN TO	UP TO	DOWN TO	UP TO	DOWN TO	UP TO	DOWN TO	UP TO	DOWN TO	UP TO	DOWN TO
5 TO 10	UP TO 6	4X4	4X4	4X4	6X6	6X6	6X6	6X6	6X6	6X6	4	Not Req'd	---	---	---	---	---	---	---	---
	UP TO 8	4X4	4X4	4X4	6X6	6X6	6X6	6X6	6X6	4	Not Req'd	---	---	---	---	---	---	---	---	---
	UP TO 10	4X6	4X6	4X6	6X6	6X6	6X6	6X6	6X6	4	8X8	4	2X6	2X6	2X6	2X6	2X6	2X6	2X6	2X6
10 TO 15	UP TO 6	4X4	4X4	4X4	6X6	6X6	6X6	6X6	6X6	4	Not Req'd	---	---	---	---	---	---	---	---	---
	UP TO 8	4X6	4X6	4X6	6X6	6X6	6X6	6X6	6X6	4	8X8	4	2X6	2X6	2X6	2X6	2X6	2X6	2X6	2X6
	UP TO 10	6X6	6X6	6X6	6X6	6X6	6X6	6X6	6X6	4	8X10	4	2X6	2X6	2X6	2X6	2X6	2X6	2X6	2X6
15 TO 20	UP TO 6	6X6	6X6	6X6	6X6	6X6	6X6	6X6	6X6	4	10X10	4	3X6	3X6	3X6	3X6	3X6	3X6	3X6	3X6
	UP TO 8	6X6	6X6	6X6	6X6	6X6	6X6	6X6	6X6	4	8X8	4	3X6	3X6	3X6	3X6	3X6	3X6	3X6	3X6
	UP TO 10	8X8	8X8	8X8	8X8	8X8	8X8	8X8	8X8	4	8X10	4	3X6	3X6	3X6	3X6	3X6	3X6	3X6	3X6
OVER 20	UP TO 12	8X8	8X8	8X8	8X8	8X8	8X8	8X10	8X10	4	10X10	4	3X6	3X6	3X6	3X6	3X6	3X6	3X6	3X6

SEE NOTE 1

* Mixed oak or equivalent with a bending strength not less than 850 psi.
 ** Manufactured members of equivalent strength may be substituted for wood.

TABLE C-1.2

TIMBER TRENCH SHORING -- MINIMUM TIMBER REQUIREMENTS *

SOIL TYPE B P_a = 45 X H + 72 psf (2 ft. Surcharge)

DEPTH OF TRENCH (FEET)	SIZE (ACTUAL) AND SPACING OF MEMBERS**												UPRIGHTS			
	CROSS BRACES						WALES						MAXIMUM ALLOWABLE HORIZONTAL SPACING			
	HORIZ. SPACING (FEET)		WIDTH OF TRENCH (FEET)				VERT. SPACING (FEET)		SIZE (IN)		VERT. SPACING (FEET)		CLOSE	2	3	
5 TO 10	UP TO 6	4X6	4X6	6X6	6X6	6X6	6X6	5	6X8	5	5			2X6		
	UP TO 8	6X6	6X6	6X6	6X8	6X8	6X8	5	8X10	5	5			2X6		
	UP TO 10	6X6	6X6	6X6	6X8	6X8	6X8	5	10X10	5	5			2X6		
	See Note 1															
10 TO 15	UP TO 6	6X6	6X6	6X6	6X8	6X8	6X8	5	8X8	5	5		2X6			
	UP TO 8	6X8	6X8	6X8	8X8	8X8	8X8	5	10X10	5	5		2X6			
	UP TO 10	8X8	8X8	8X8	8X8	8X10	8X10	5	10X12	5	5		2X6			
	See Note 1															
15 TO 20	UP TO 6	6X8	6X8	6X8	8X8	8X8	8X8	5	8X10	5	5	3X6				
	UP TO 8	8X8	8X8	8X8	8X8	8X10	8X10	5	10X12	5	5	3X6				
	UP TO 10	8X10	8X10	8X10	8X10	10X10	10X10	5	12X12	5	5	3X6				
	See Note 1															
OVER 20	SEE NOTE 1															

* Mixed oak or equivalent with a bending strength not less than 850 psi.
 ** Manufactured members of equivalent strength may be substituted for wood.

TABLE C-1.3

TIMBER TRENCH SHORING -- MINIMUM TIMBER REQUIREMENTS *
 SOIL TYPE C P = 80 X H + 72 psf (2 ft. Surcharge)
 a

DEPTH OF TRENCH (FEET)	CROSS BRACES										VERT. SPACING (FEET)	SIZE (IN)	VERT. SPACING (FEET)	UPRIGHTS		
	WIDTH OF TRENCH (FEET)													CLOSE	MAXIMUM ALLOWABLE HORIZONTAL SPACING (FEET) (See Note 2)	
	4	6	9	12	15	UP TO	UP TO	UP TO	UP TO	UP TO						
5	UP TO 6	6X8	6X8	6X8	8X8	8X8	8X8	8X8	8X8	8X8	5	8X10	5	2X6		
TO	UP TO 8	8X8	8X8	8X8	8X8	8X8	8X8	8X8	8X10	8X10	5	10X12	5	2X6		
10	UP TO 10	8X10	8X10	8X10	8X10	8X10	8X10	8X10	10X10	10X10	5	12X12	5	2X6		
	See Note 1															
10	UP TO 6	8X8	8X8	8X8	8X8	8X8	8X8	8X8	8X10	8X10	5	10X12	5	2X6		
TO	UP TO 8	8X10	8X10	8X10	8X10	8X10	8X10	8X10	10X10	10X10	5	12X12	5	2X6		
15	See Note 1															
	See Note 1															
	See Note 1															
15	UP TO 6	8X10	8X10	8X10	8X10	8X10	8X10	8X10	10X10	10X10	5	12X12	5	3X6		
TO	See Note 1															
20	See Note 1															
	See Note 1															
OVER 20	SEE NOTE 1															

* Mixed Oak or equivalent with a bending strength not less than 850 psi.
 ** Manufactured members of equivalent strength may be substituted for wood.

TABLE C-2.1

TIMBER TRENCH SHORING -- MINIMUM TIMBER REQUIREMENTS *
 SOIL TYPE A $P_a = 25 \times H \pm 72$ psf (2 ft. Surcharge)

DEPTH OF TRENCH (FEET)	SIZE (S4S) AND SPACING OF MEMBERS **																					
	CROSS BRACES					WALLES			UPRIGHTS													
	HORIZ. SPACING (FEET)	WIDTH OF TRENCH (FEET)					VERT. SPACING (FEET)	SIZE (IN.)	VERT. SPACING (FEET)	MAXIMUM ALLOWABLE HORIZONTAL SPACING												
UP TO 4		UP TO 6	UP TO 9	UP TO 12	UP TO 15	CLOSE				4	5	6	8									
5 TO 10	UP TO 6	4X4	4X4	4X4	4X4	4X6	4	Not Req'd	4	Not Req'd												
	UP TO 8	4X4	4X4	4X4	4X4	4X6	4	Not Req'd	4	Not Req'd											4X8	
	UP TO 10	4X6	4X6	4X6	4X6	6X6	4	8X8	4			4X6										
10 TO 15	UP TO 6	4X4	4X4	4X4	4X4	6X6	4	Not Req'd	4	Not Req'd											4X6	
	UP TO 8	4X6	4X6	4X6	4X6	6X6	4	6X8	4			4X6										
	UP TO 10	6X6	6X6	6X6	6X6	6X6	4	8X8	4					4X8								
15 TO 20	UP TO 6	6X6	6X6	6X6	6X6	6X6	4	8X10	4												4X10	
	UP TO 8	6X6	6X6	6X6	6X6	6X6	4	6X8	4													
	UP TO 10	6X6	6X6	6X6	6X6	6X6	4	8X8	4												4X12	
OVER 20	UP TO 12	6X6	6X6	6X6	6X8	6X8	4	8X12	4												3X6	4X12
	SEE NOTE 1																					

* Douglas fir or equivalent with a bending strength not less than 1500 psi.
 ** Manufactured members of equivalent strength may be substituted for wood.

TABLE C-2.2

TIMBER TRENCH SHORING -- MINIMUM TIMBER REQUIREMENTS *
 SOIL TYPE B P = 45 X H + 72 psf (2 ft. Surcharge)

DEPTH OF TRENCH (FEET)	SIZE (3x5) AND SPACING OF MEMBERS **																	
	CROSS BRACES						WALES						UPRIGHTS					
	HORIZ. SPACING (FEET)	WIDTH OF TRENCH (FEET)			VERT. SPACING (FEET)	SIZE (IN)	VERT. SPACING (FEET)	CLOSE	MAXIMUM ALLOWABLE HORIZONTAL SPACING (FEET)			3x12 4x8	2	3	4	6		
		UP TO 4	UP TO 6	UP TO 9					UP TO 12	UP TO 15								
5	UP TO 6	4X6	4X6	4X6	6X6	6X6	6X6	5	6X8	5								
	UP TO 8	4X6	4X6	6X6	6X6	6X6	6X6	5	8X8	5		3X8		4X8				
10	UP TO 10	4X6	4X6	6X6	6X6	6X8	6X8	5	8X10	5			4X8					
	See Note 1																	
10	UP TO 6	6X6	6X6	6X6	6X8	6X8	6X8	5	8X8	5	3X6	4X10						
	UP TO 8	6X8	6X8	6X8	8X8	8X8	8X8	5	10X10	5	3X6	4X10						
15	UP TO 10	6X8	6X8	8X8	8X8	8X8	8X8	5	10X12	5	3X6	4X10						
	See Note 1																	
15	UP TO 6	6X8	6X8	6X8	8X8	8X8	8X8	5	8X10	5	4X6							
	UP TO 8	6X8	6X8	6X8	8X8	8X8	8X8	5	10X12	5	4X6							
20	UP TO 10	8X8	8X8	8X8	8X8	8X8	8X8	5	12X12	5	4X6							
	See Note 1																	
OVER 20	SEE NOTE 1																	

* Douglas fir or equivalent with a bending strength not less than 1500 psi.
 ** Manufactured members of equivalent strength may be substituted for wood.

TABLE C-2.3
 TIMBER TRENCH SHORING -- MINIMUM TIMBER REQUIREMENTS *
 SOIL TYPE C P_a = 80 X H + 72 psf (2 ft. Surcharge)

DEPTH OF TRENCH (FEET)	SIZE (S4S) AND SPACING OF MEMBERS **												
	CROSS BRACES					MALES					UPRIGHTS		
	HORIZ. SPACING (FEET)		WIDTH OF TRENCH (FEET)			VERT. SPACING (FEET)		SIZE (IN)		VERT. SPACING (FEET)	MAXIMUM ALLOWABLE HORIZONTAL SPACING (FEET)		
UP TO	TO	4	6	9	12	15	UP TO	UP TO	UP TO	UP TO	CLOSE		
5	UP TO 6	6X6	6X6	6X6	6X6	8X8	5	8X8	5	8X8	5	3X6	
TO 10	UP TO 8	6X6	6X6	6X6	8X8	8X8	5	10X10	5	10X10	5	3X6	
	UP TO 10	6X6	6X6	8X8	8X8	8X8	5	10X12	5	10X12	5	3X6	
	See Note 1												
10	UP TO 6	6X8	6X8	6X8	8X8	8X8	5	10X10	5	10X10	5	4X6	
TO 15	UP TO 8	8X8	8X8	8X8	8X8	8X8	5	12X12	5	12X12	5	4X6	
	See Note 1												
	See Note 1												
15	UP TO 6	8X8	8X8	8X8	8X10	8X10	5	10X12	5	10X12	5	4X6	
TO 20	See Note 1												
	See Note 1												
	See Note 1												
OVER 20	SEE NOTE 1												

* Douglas fir or equivalent with a bending strength not less than 1500 psi.
 ** Manufactured members of equivalent strength may be substituted for wood.

APPENDIX D TO SUBPART P OF PART 1926—ALUMINUM HYDRAULIC SHORING FOR TRENCHES

(a) *Scope.* This appendix contains information that can be used when aluminum hydraulic shoring is provided as a method of protection against cave-ins in trenches that

do not exceed 20 feet (6.1m) in depth. This appendix must be used when design of the aluminum hydraulic protective system cannot be performed in accordance with §1926.652(c)(2).

(b) *Soil Classification.* In order to use data presented in this appendix, the soil type or types in which the excavation is made must

first be determined using the soil classification method set forth in appendix A of subpart P of part 1926.

(c) *Presentation of Information.* Information is presented in several forms as follows:

(1) Information is presented in tabular form in Tables D-1.1, D-1.2, D-1.3 and E-1.4. Each table presents the maximum vertical and horizontal spacings that may be used with various aluminum member sizes and various hydraulic cylinder sizes. Each table contains data only for the particular soil type in which the excavation or portion of the excavation is made. Tables D-1.1 and D-1.2 are for vertical shores in Types A and B soil. Tables D-1.3 and D-1.4 are for horizontal waler systems in Types B and C soil.

(2) Information concerning the basis of the tabular data and the limitations of the data is presented in paragraph (d) of this appendix.

(3) Information explaining the use of the tabular data is presented in paragraph (e) of this appendix.

(4) Information illustrating the use of the tabular data is presented in paragraph (f) of this appendix.

(5) Miscellaneous notations (footnotes) regarding Table D-1.1 through D-1.4 are presented in paragraph (g) of this appendix.

(6) Figures, illustrating typical installations of hydraulic shoring, are included just prior to the Tables. The illustrations page is entitled "Aluminum Hydraulic Shoring; Typical Installations."

(d) *Basis and limitations of the data.* (1) Vertical shore rails and horizontal wales are those that meet the Section Modulus requirements in the D-1 Tables. Aluminum material is 6061-T6 or material of equivalent strength and properties.

(2) Hydraulic cylinders specifications. (i) 2-inch cylinders shall be a minimum 2-inch inside diameter with a minimum safe working capacity of no less than 18,000 pounds axial compressive load at maximum extension. Maximum extension is to include full range of cylinder extensions as recommended by product manufacturer.

(ii) 3-inch cylinders shall be a minimum 3-inch inside diameter with a safe working capacity of not less than 30,000 pounds axial compressive load at extensions as recommended by product manufacturer.

(3) Limitation of application.

(1) It is not intended that the aluminum hydraulic specification apply to every situation that may be experienced in the field. These data were developed to apply to the situations that are most commonly experienced in current trenching practice. Shoring systems for use in situations that are not covered by the data in this appendix must be otherwise designed as specified in §1926.652(c).

(ii) When any of the following conditions are present, the members specified in the Ta-

bles are not considered adequate. In this case, an alternative aluminum hydraulic shoring system or other type of protective system must be designed in accordance with §1926.652.

(A) When vertical loads imposed on cross braces exceed a 100 Pound gravity load distributed on a one foot section of the center of the hydraulic cylinder.

(B) When surcharge loads are present from equipment weighing in excess of 20,000 pounds.

(C) When only the lower portion or a trench is shored and the remaining portion of the trench is sloped or benched unless: The sloped portion is sloped at an angle less steep than three horizontal to one vertical; or the members are selected from the tables for use at a depth which is determined from the top of the overall trench, and not from the toe of the sloped portion.

(e) *Use of Tables D-1.1, D-1.2, D-1.3 and D-1.4.* The members of the shoring system that are to be selected using this information are the hydraulic cylinders, and either the vertical shores or the horizontal wales. When a waler system is used the vertical timber sheeting to be used is also selected from these tables. The Tables D-1.1 and D-1.2 for vertical shores are used in Type A and B soils that do not require sheeting. Type B soils that may require sheeting, and Type C soils that always require sheeting are found in the horizontal wale Tables D-1.3 and D-1.4. The soil type must first be determined in accordance with the soil classification system described in appendix A to subpart P of part 1926. Using the appropriate table, the selection of the size and spacing of the members is made. The selection is based on the depth and width of the trench where the members are to be installed. In these tables the vertical spacing is held constant at four feet on center. The tables show the maximum horizontal spacing of cylinders allowed for each size of wale in the waler system tables, and in the vertical shore tables, the hydraulic cylinder horizontal spacing is the same as the vertical shore spacing.

(f) *Example to Illustrate the Use of the Tables:*

(1) Example 1:

A trench dug in Type A soil is 6 feet deep and 3 feet wide. From Table D-1.1: Find vertical shores and 2 inch diameter cylinders spaced 8 feet on center (o.c.) horizontally and 4 feet on center (o.c.) vertically. (See Figures 1 & 3 for typical installations.)

(2) Example 2:

A trench is dug in Type B soil that does not require sheeting, 13 feet deep and 5 feet wide. From Table D-1.2: Find vertical shores and 2 inch diameter cylinders spaced 6.5 feet o.c. horizontally and 4 feet o.c. vertically. (See Figures 1 & 3 for typical installations.)

(3) A trench is dug in Type B soil that does not require sheeting, but does experience some minor raveling of the trench face. The

trench is 16 feet deep and 9 feet wide. From Table D-1.2: Find vertical shores and 2 inch diameter cylinder (with special oversleeves as designated by footnote #B2) spaced 5.5 feet o.c. horizontally and 4 feet o.c. vertically, plywood (per footnote (g)(7) to the D-1 Table) should be used behind the shores. (See Figures 2 & 3 for typical installations.)

(4) Example 4: A trench is dug in previously disturbed Type B soil, with characteristics of a Type C soil, and will require sheeting. The trench is 18 feet deep and 12 feet wide. 8 foot horizontal spacing between cylinders is desired for working space. From Table D-1.3: Find horizontal wale with a section modulus of 14.0 spaced at 4 feet o.c. vertically and 3 inch diameter cylinder spaced at 9 feet maximum o.c. horizontally. 3 x 12 timber sheeting is required at close spacing vertically. (See Figure 4 for typical installation.)

(5) Example 5: A trench is dug in Type C soil, 9 feet deep and 4 feet wide. Horizontal cylinder spacing in excess of 6 feet is desired for working space. From Table D-1.4: Find horizontal wale with a section modulus of 7.0 and 2 inch diameter cylinders spaced at 6.5 feet o.c. horizontally. Or, find horizontal wale with a 14.0 section modulus and 3 inch diameter cylinder spaced at 10 feet o.c. horizontally. Both wales are spaced 4 feet o.c. vertically. 3 x 12 timber sheeting is required at close spacing vertically. (See Figure 4 for typical installation.)

(g) *Footnotes, and general notes, for Tables D-1.1, D-1.2, D-1.3, and D-1.4.*

(1) For applications other than those listed in the tables, refer to §1926.652(c)(2) for use of manufacturer's tabulated data. For trench depths in excess of 20 feet, refer to §1926.652(c)(2) and §1926.652(c)(3).

(2) 2 inch diameter cylinders, at this width, shall have structural steel tube (3.5 x 3.5 x 0.1875) oversleeves, or structural oversleeves of manufacturer's specification, extending the full, collapsed length.

(3) Hydraulic cylinders capacities. (i) 2 inch cylinders shall be a minimum 2-inch inside diameter with a safe working capacity of not less than 18,000 pounds axial compressive load at maximum extension. Maximum extension is to include full range of cylinder extensions as recommended by product manufacturer.

(ii) 3-inch cylinders shall be a minimum 3-inch inside diameter with a safe work capacity of not less than 30,000 pounds axial compressive load at maximum extension. Maximum extension is to include full range of cylinder extensions as recommended by product manufacturer.

(4) All spacing indicated is measured center to center.

(5) Vertical shoring rails shall have a minimum section modulus of 0.40 inch.

(6) When vertical shores are used, there must be a minimum of three shores spaced equally, horizontally, in a group.

(7) Plywood shall be 1.125 in. thick softwood or 0.75 inch. thick, 14 ply, arctic white birch (Finland form). Please note that plywood is not intended as a structural member, but only for prevention of local raveling (sloughing of the trench face) between shores.

(8) See appendix C for timber specifications.

(9) Wales are calculated for simple span conditions.

(10) See appendix D, item (d), for basis and limitations of the data.

ALUMINUM HYDRAULIC SHORING TYPICAL INSTALLATIONS

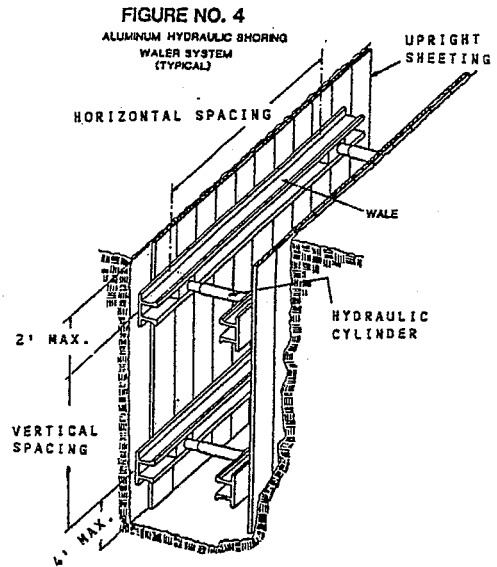
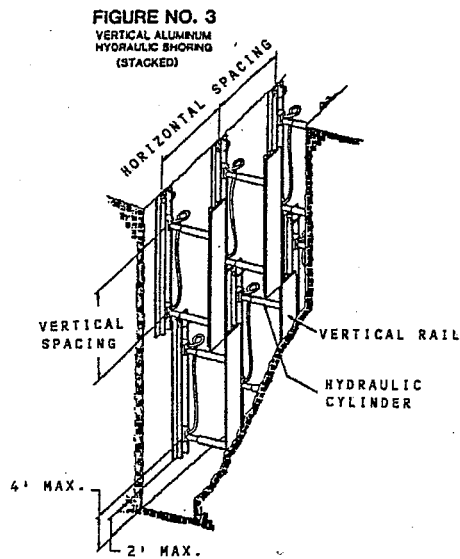
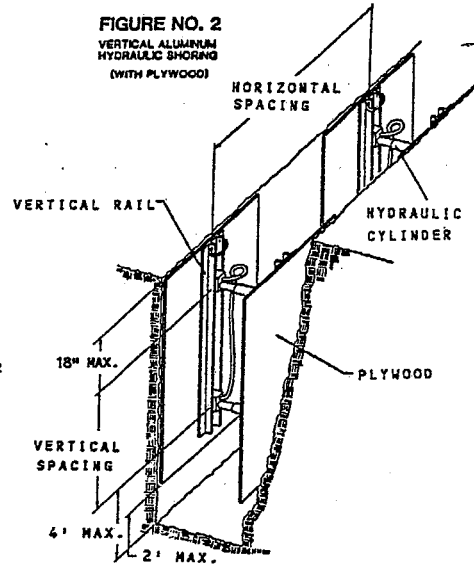
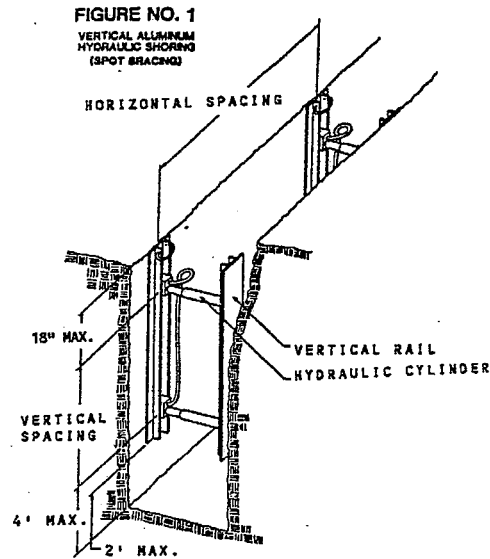


TABLE D - 1.1
ALUMINUM HYDRAULIC SHORING
VERTICAL SHORES
FOR SOIL TYPE A

DEPTH OF TRENCH (FEET)	HYDRAULIC CYLINDERS		
	MAXIMUM HORIZONTAL SPACING (FEET)	MAXIMUM VERTICAL SPACING (FEET)	WIDTH OF TRENCH (FEET)
OVER 5 UP TO 10	8	4	UP TO 8
			OVER 8 UP TO 12
OVER 10 UP TO 15	8	4	2 INCH DIAMETER
			2 INCH DIAMETER NOTE (2)
OVER 15 UP TO 20	7		3 INCH DIAMETER
OVER 20			NOTE (1)

Footnotes to tables, and general notes on hydraulic shoring, are found in Appendix D, Item (g)
 Note (1): See Appendix D, Item (g) (1)
 Note (2): See Appendix D, Item (g) (2)

TABLE D - 1.2
ALUMINUM HYDRAULIC SHORING
VERTICAL SHORES
FOR SOIL TYPE B

DEPTH OF TRENCH (FEET)	HYDRAULIC CYLINDERS			WIDTH OF TRENCH (FEET)	
	MAXIMUM HORIZONTAL SPACING (FEET)	MAXIMUM VERTICAL SPACING (FEET)	UP TO 8	OVER 8 UP TO 12	OVER 12 UP TO 15
OVER 5 UP TO 10	8	4	2 INCH DIAMETER	2 INCH DIAMETER NOTE (2)	3 INCH DIAMETER
OVER 10 UP TO 15	6.5				
OVER 15 UP TO 20	5.5				
OVER 20	NOTE (1)				

Footnotes to tables, and general notes on hydraulic shoring, are found in Appendix D, Item (g)

Note (1): See Appendix D, Item (g) (1)

Note (2): See Appendix D, Item (g) (2)

TABLE D - 1.3
ALUMINUM HYDRAULIC SHORING
WALER SYSTEMS
FOR SOIL TYPE B

DEPTH OF TRENCH (FEET)	WALES		HYDRAULIC CYLINDERS						TIMBER UPRIGHTS	
	VERTICAL SPACING (FEET)	SECTION MODULUS (IN ³)	WIDTH OF TRENCH (FEET)						MAX. HORIZ. SPACING (ON CENTER)	
			UP TO 8	OVER 8 UP TO 12		OVER 12 UP TO 15		SOLID SHEET	3 FT.	
			HORIZ. SPACING	CYLINDER DIAMETER	HORIZ. SPACING	CYLINDER DIAMETER	HORIZ. SPACING	CYLINDER DIAMETER		
OVER 5 UP TO 10	4	3.5	8.0	2 IN	8.0	2 IN	8.0	3 IN	3x12	3 FT.
			9.0	2 IN	9.0	2 IN	9.0	3 IN		
			12.0	3 IN	12.0	3 IN	12.0	3 IN		
OVER 10 UP TO 15	4	3.5	6.0	2 IN	6.0	2 IN	6.0	3 IN	3x12	3 FT.
			8.0	3 IN	8.0	3 IN	8.0	3 IN		
			10.0	3 IN	10.0	3 IN	10.0	3 IN		
OVER 15 UP TO 20	4	3.5	5.5	2 IN	5.5	2 IN	5.5	3 IN	3x12	3 FT.
			6.0	3 IN	6.0	3 IN	6.0	3 IN		
			9.0	3 IN	9.0	3 IN	9.0	3 IN		
OVER 20			NOTE (1)							

Footnotes to tables, and general notes on hydraulic shoring, are found in Appendix D, Item (g)
 Notes (1): See Appendix D, item (g) (1)
 Notes (2): See Appendix D, Item (g) (2)
 * Consult product manufacturer and/or qualified engineer for Section Modulus of available wales.

TABLE D - 1.4
ALUMINUM HYDRAULIC SHORING
WALER SYSTEMS
FOR SOIL TYPE C

DEPTH OF TRENCH (FEET)	WALES		HYDRAULIC CYLINDERS						TIMBER UPRIGHTS	
	VERTICAL SPACING (FEET)	SECTION MODULUS (IN ³)	WIDTH OF TRENCH (FEET)						MAX. HORIZ SPACING (ON CENTER)	SOLID SHEET
			UP TO 8	OVER 8 UP TO 12	OVER 12 UP TO 15	UP TO 8	OVER 8 UP TO 12	OVER 12 UP TO 15		
			HORIZ. SPACING	HORIZ. SPACING	HORIZ. SPACING	CYLINDER DIAMETER	CYLINDER DIAMETER	CYLINDER DIAMETER		
OVER 5 UP TO 10	4	3.5	6.0	6.0	6.0	2 IN	NOTE(2)	6.0	3 IN	3 FT.
			7.0	6.5	6.5	2 IN	NOTE(2)	6.5	3 IN	
			14.0	10.0	10.0	3 IN	3 IN	10.0	3 IN	
OVER 10 UP TO 15	4	3.5	4.0	4.0	4.0	2 IN	NOTE(2)	4.0	3 IN	3 FT.
			7.0	5.5	5.5	3 IN	3 IN	5.5	3 IN	
			14.0	8.0	8.0	3 IN	3 IN	8.0	3 IN	
OVER 15 UP TO 20	4	3.5	3.5	3.5	3.5	2 IN	NOTE(2)	3.5	3 IN	3 FT.
			7.0	5.0	5.0	3 IN	3 IN	5.0	3 IN	
			14.0	6.0	6.0	3 IN	3 IN	6.0	3 IN	
OVER 20			NOTE (1)							

Footnotes to tables, and general notes on hydraulic shoring, are found in Appendix D, Item (g)
Notes (1): See Appendix D, item (g) (1)
Notes (2): See Appendix D, Item (g) (2)
* Consult product manufacturer and/or qualified engineer for Section Modulus of available wales.

APPENDIX E TO SUBPART P OF PART 1926—ALTERNATIVES TO TIMBER SHORING

Figure 1. Aluminum Hydraulic Shoring

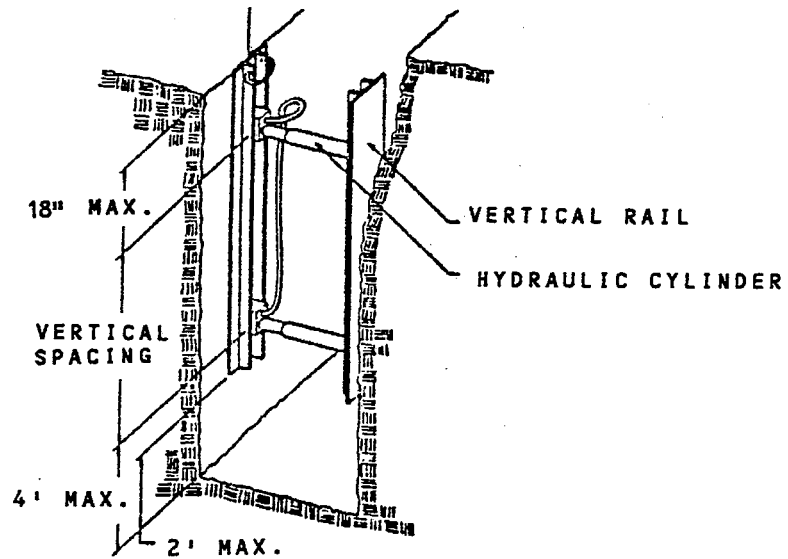


Figure 2. Pneumatic/hydraulic Shoring

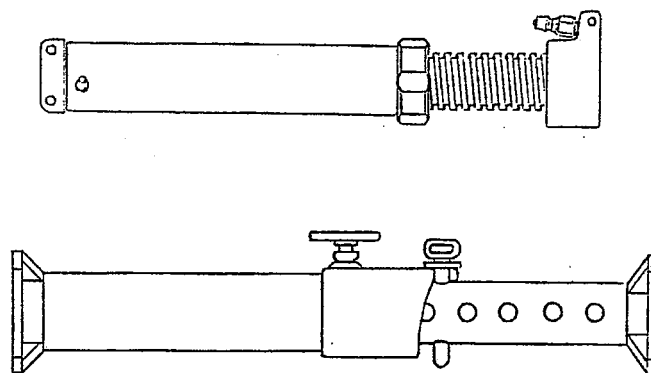


Figure 3. Trench Jacks (Screw Jacks)

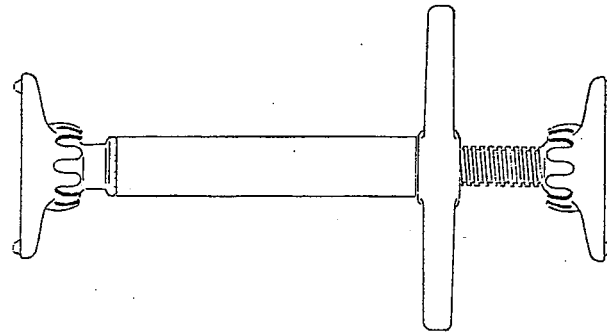
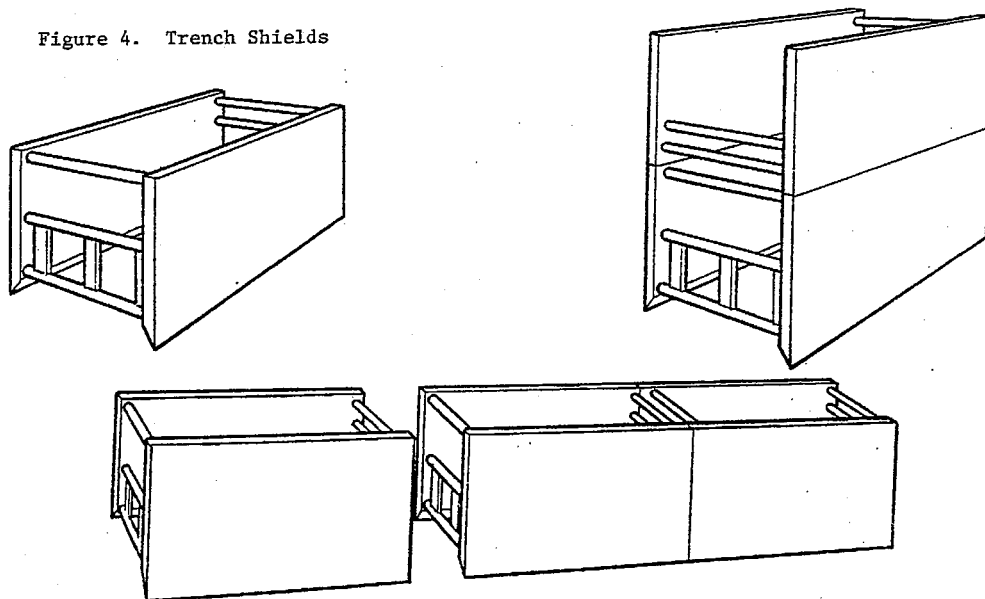


Figure 4. Trench Shields



APPENDIX F TO SUBPART P OF PART 1926—SELECTION OF PROTECTIVE SYSTEMS

The following figures are a graphic summary of the requirements contained in subpart P for excavations 20 feet or less in depth. Protective systems for use in excavations more than 20 feet in depth must be designed by a registered professional engineer in accordance with §1926.652 (b) and (c).

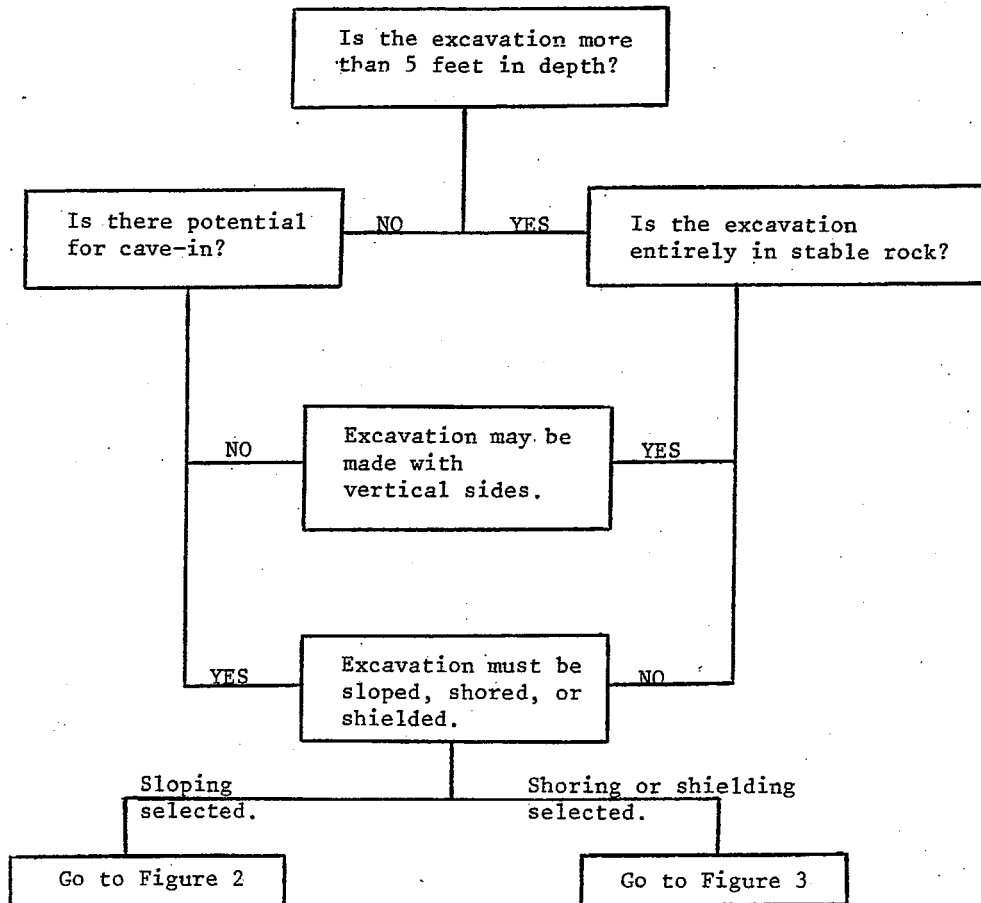


FIGURE 1 - PRELIMINARY DECISIONS

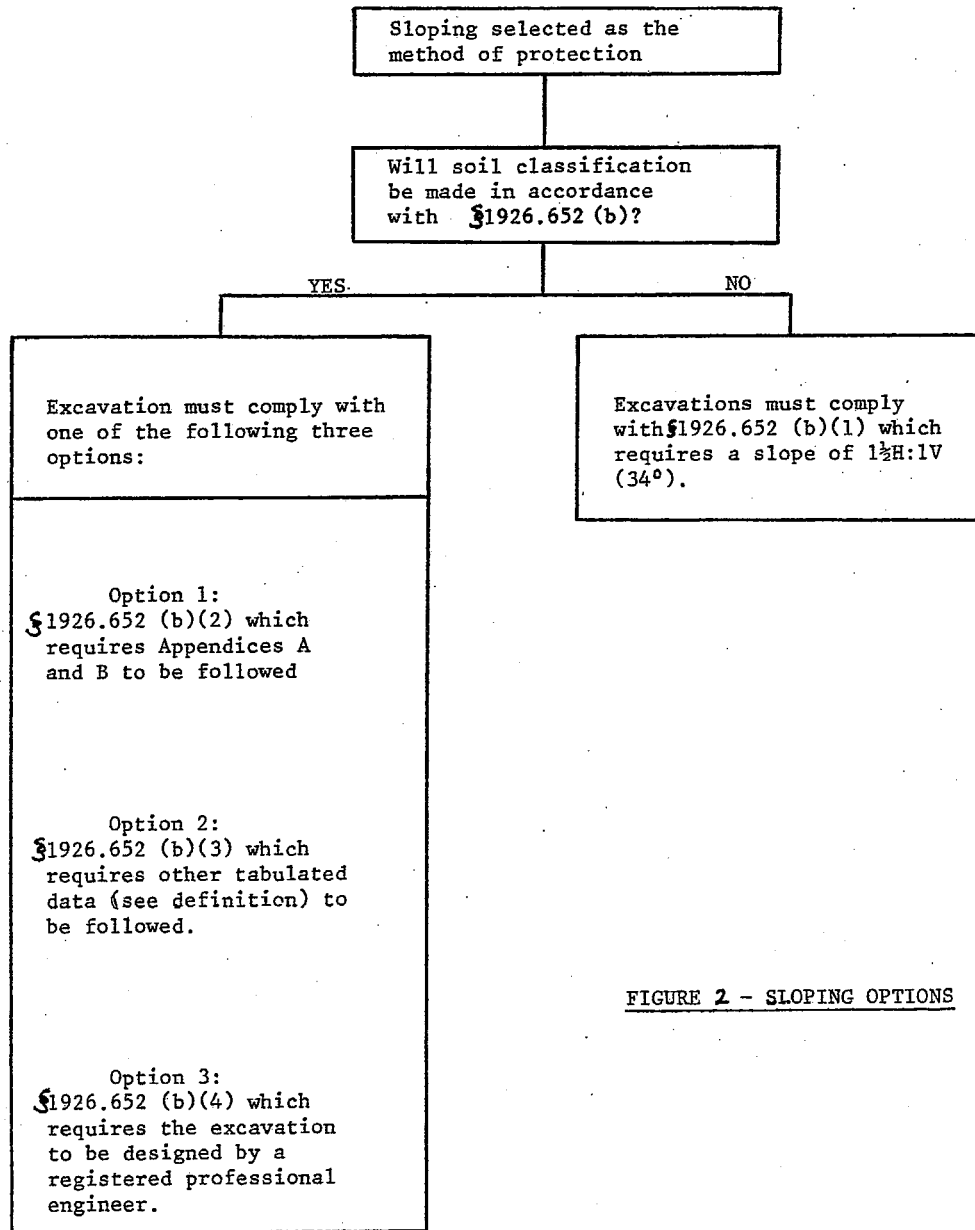


FIGURE 2 - SLOPING OPTIONS

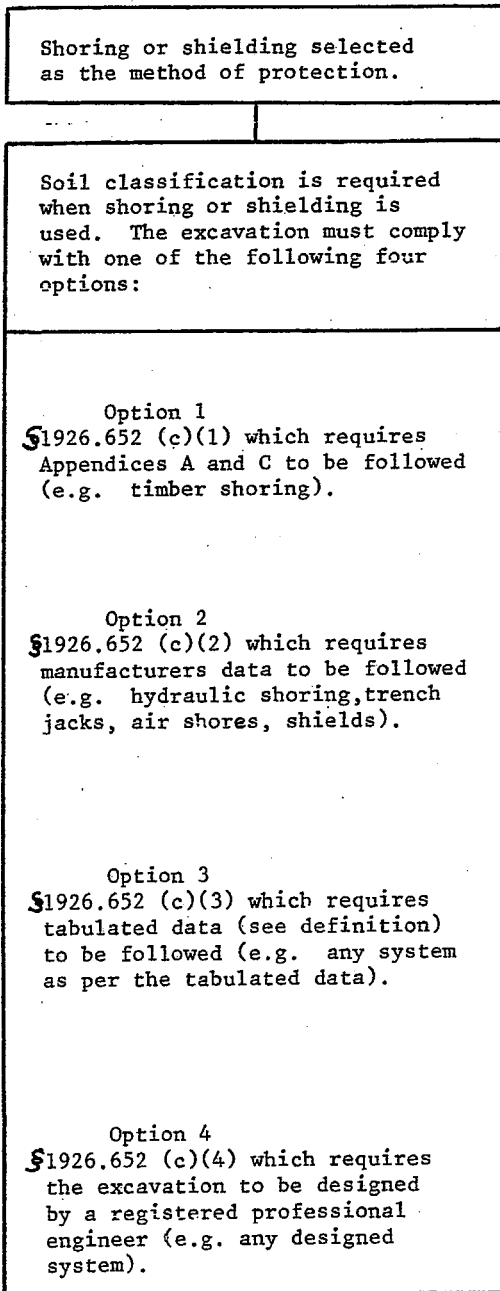


FIGURE 3 - SHORING AND SHIELDING OPTIONS

Wage Rate Requirements
Section 00 73 43 / Rev: August 2021

Bidders are hereby notified that prevailing wage rates do not apply.

N/A

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 Name: _____

Yes No

Is This For:

Goods? Services? Both?

Taxpayer ID Name: _____

Your Last 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 (senator, representative, name of board/ commission, data entry, etc.)	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.)	Relation
	Current	Former		From MM/YY	To MM/YY		
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 (senator, representative, name of board/ commission, data entry, etc.)	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		From MM/YY	To MM/YY	Person's Name(s)	Ownership Interest (%)
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
900 - 2317	Arkansas Department of Parks, Heritage and Tourism	David McFadden
	Contact Phone #	501.682.6941
	Contract or Grant Number	9002317

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

BIDDING ADDENDA
Section 00 91 13 / Rev: August 2021

Date:

Addendum Number:

Project Number: 9002317

Agency Name: Arkansas Department of Parks, Heritage and Tourism

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

1 INVITATION TO BID

2 SPECIFICATIONS

3 DRAWINGS

SECTION 01 20 00

PRICE AND PAYMENT PROCEDURES

PART 1. GENERAL

1.1 RELATED SECTIONS

- A. Document 00 41 13 – Bid Form.
- B. Section 01 30 00 - Administrative Requirements.

1.2 MEASUREMENT OF QUANTITIES

- A. All work completed under the contract will be measured by the Engineer, or his/her authorized representatives, using United States Customary Units of Measure or the International System of Units.
- B. The method of measurement and computations to be used in determination of quantities of material furnished and of work performed under the contract will be those methods generally recognized as conforming to good engineering practice.

1.3 SCOPE OF PAYMENT

- A. The Amount for Work listed in the Bid, whether lump sum or unit price, shall include all costs specified on the Bid Form, including all miscellaneous amounts (mobilization, demobilization, bonds, insurance, as built record drawings, traffic control, erosion control, plans and any items not covered elsewhere) to complete the project in accordance with the Contract Documents.
- B. The quantities listed in these documents are approximate, for information only, and should be verified by each bidder prior to bidding
- C. Payments for lump sum items shall be made in proportion to the amount of Work accomplished, as determined by the Engineer, as of the period ending date of each Application for Payment.
- D. It is understood and agreed that the Contractor shall not be entitled to partial payment based on quantities of work in excess of those provided in the proposal or covered by approved change orders or supplemental agreements, except when such excess quantities have been determined by the Engineer to be a part of the final quantity for the item of work in question.
- E. No partial payments shall bind the Owner to the acceptance of any materials or work in place as to quality or quantity. All partial payments are subject to correction at the time of final payment.

- F. The Contractor has sole responsibility for providing materials, equipment and work which meet the specifications. In the event inspection or testing reveals that materials/equipment furnished or work performed by the Contractor does not meet the specifications, payment for said materials/equipment/work will be withheld until compliance with the specifications is demonstrated by the Contractor.

1.4 TOTAL LUMP SUM BASE BID

- A. The total lump sum base bid shall include costs for all material and labor required for day use improvements at Lake Poinsett State Park per the Drawings and Specifications.

1.5 UNIT PRICE ITEMS

- A. Item No. 1 – Select Fill Material
 - 1. Unit of Measure: Cubic Yard
 - 2. This item shall compensate the Contractor for materials, labor, tools, and equipment for select fill material per the Drawings and Specifications.

PART 2. PRODUCTS

Not Used.

PART 3. EXECUTION

Not Used.

END OF SECTION

DOCUMENT 01 21 00

ALLOWANCES

PART 1. GENERAL

1.1 SUMMARY

- A. Provide adequate budget and bonding to cover items not precisely determined by the Owner prior to bidding, allow within the proposed Contract Sum the amounts described in this Section.

1.2 SCHEDULE OF ALLOWANCES

- A. Undercut/Select Fill:
 - 1. Allowance: 2000 cubic yard
 - 2. The above allowance shall be included in the list of Unit Prices on Base Bid.

PART 2. ALLOWANCE SPECIFICATION FOR UNDERCUT AND SELECT FILL

2.1 OBJECTIVE

- A. The objective of this section is to outline the procedure for tracking the utilization of the allowance for undercut and select fill on the construction project. This includes the submission of quantity tickets from import and export transactions to accurately measure the quantity of materials used in cubic yards.

2.2 MEASUREMENT METHOD

- A. The measurement of undercut and select fill shall be in cubic yards (CY).
- B. All quantities shall be determined by the contractor and confirmed by engineer or his designated authority based on the actual volumes of material imported or exported from the site.

2.3 SUBMISSION OF QUANTITY TICKETS

- A. The contractor shall maintain detailed records of all import and export activities related to undercut and select fill.
- B. For each import or export transaction, the contractor shall collect quantity tickets from the respective suppliers or haulers.
- C. Quantity tickets must clearly indicate the date, time, location, and volume of material transported (in cubic yards).

- D. The contractor shall submit these quantity tickets to the project engineer or designated authority on a daily/weekly basis.

2.4 VERIFICATION AND APPROVAL

- A. Upon receipt of quantity tickets, the project engineer or designated authority shall review and verify the information provided.
- B. Any discrepancies or inconsistencies shall be promptly addressed and resolved between the contractor and the project engineer.
- C. Approved quantity tickets shall be retained for record-keeping purposes and may be subject to audit at any time during the project duration.

2.5 DOCUMENTATION AND REPORTING

- A. The contractor shall maintain accurate documentation of all quantity tickets, including copies of original tickets and any related correspondence.
- B. Monthly reports detailing the total volume of undercut and select fill utilized, broken down by source (import) and destination (export), shall be submitted to the project engineer.
- C. These reports shall serve as a basis for monitoring the progress of work and assessing compliance with the allowance specified for undercut and select fill.

2.6 ADJUSTMENTS AND RECONCILIATION

- A. In the event that the actual quantity of undercut and select fill used exceeds or falls short of the allowance specified in the contract, adjustments may be necessary.
- B. Any adjustments to the allowance must be agreed upon by all parties, contractor, engineer, and client, through formal change orders or amendments to the contract prior to continuation of undercut and select fill work.
- C. All adjustments and reconciliations shall be documented and approved in writing by the client, project engineer, and contractor representatives.

END OF SECTION

SECTION 01 30 00

ADMINISTRATIVE REQUIREMENTS

PART 1. GENERAL

1.1 SUMMARY OF WORK

- A. Section Includes:
 - 1.2 Description of Project
 - 1.3 Site Investigation
 - 1.4 Existing Utilities
 - 1.5 Payment Schedule
 - 1.6 Application for Payment
 - 1.7 Change Order Procedures
 - 1.8 Cutting and Patching
 - 1.9 Conferences
 - 1.10 Progress Meetings
 - 1.11 Submittal Procedures
 - 1.12 Construction Progress Schedule
 - 1.13 Prosecution of the Work
 - 1.14 Shop Drawings
 - 1.15 Product Data
 - 1.16 Manufacturers' Instructions and Certifications
 - 1.17 Quality Assurance
 - 1.18 References
 - 1.19 Manufacturer's Field Services
 - 1.20 Testing Laboratory Services
 - 1.21 Temporary Electric Power and Lighting
 - 1.22 Temporary Water
 - 1.23 Sanitary Facilities
 - 1.24 Water for Testing
 - 1.25 Temporary Telephone Service
 - 1.26 Temporary Water Control
 - 1.27 Temporary Access Roads and Parking
 - 1.28 Temporary Heating and Ventilating
 - 1.29 Protection of Finished Work
 - 1.30 Progress Cleaning
 - 1.31 Field Offices
 - 1.32 Removal of Utilities, Facilities, and Controls
 - 1.33 Products
 - 1.34 Transportation, Handling, Storage, and Protection
 - 1.35 Substitutions
 - 1.36 System Demonstration
 - 1.37 Contract Closeout Procedures
 - 1.38 Final Cleaning and Inspection
 - 1.39 Final Submittals
 - 1.40 Project Record Documents ("As-Builts")
 - 1.41 Operation and Maintenance Data
 - 1.42 Guarantees, Bonds, Affidavits, and Warranties
 - 1.43 Spare Parts and Maintenance Materials

1.2 DESCRIPTION OF PROJECT

- A. Wherever in these Documents the word "Engineer" appears, it shall be understood to mean McClelland Consulting Engineers, Inc., acting either directly or indirectly as authorized agents of the Owner. In these Documents where the word "Owner" appears, it shall be understood to mean the Arkansas Department of Parks and Tourism.
- B. A Contract for the restroom renovation at Lake Poinsett State Park.

1.3 SITE INVESTIGATION

- A. Information obtained by the Owner regarding site conditions; topography; existing construction of site facilities; and subsurface investigations, including test boring logs are available for examination at the office of the Engineer.

1.4 EXISTING UTILITIES

- A. Approximate locations of major utilities and structures are shown on the Drawings, there may be some discrepancies and omissions in the locations and size of utilities and structures shown.
- B. Notify all utilities affected by the construction operation at least 48 hours in advance of beginning work, and contact Arkansas One-Call at 1-800-482-8998.

1.5 PAYMENT SCHEDULE

- A. Payment shall be made based on the payment schedule submitted by the Contractor in accordance with the Bid Form and the Engineers observation of work completed to date.
- B. Payment for pipe shall be made at 85 percent of the unit bid price upon pipe installation, backfilling and rough grading. Payment shall be increased 5 percent upon completion of testing and disinfection. Payment will be increased 10 percent of the unit price bid upon completion and acceptance of final clean-up by the Owner and Engineer and in accordance with the General Conditions.

1.6 APPLICATION FOR PAYMENT

- A. Submit three copies of each application on EJCDC Form 1910-8E or other format approved by Engineer.
- B. For payment of stored materials, the Contractor shall submit a copy of supplier/vendor's invoice for the materials with job name, delivery date, invoice number, and invoice amount on invoice attached with the Application for Payment. Stored materials shall be on site and stored in accordance with Contract Documents prior to making Application for Payment.
- C. Contractor shall submit copies of paid invoices and proof of payment in the form of a lien release from the supplier/vendor for stored materials that the Owner has paid for previously with Application for Payment. Contractor's subsequent Applications for Payment will not be approved without copies of paid invoices and lien releases.

- D. Contractor shall submit lien release for all previous progress payments for materials, labor, and equipment that has been billed to the Owner in the present pay request. Lien release shall be submitted to the Engineer with next Application for Payment. Application for Payment submitted without lien release from previous Application for Payment will not be approved for payment until Engineer has received lien release. Submit lien release on the form found at the end of this Section.
- E. Utilize Payment Schedule or Unit Prices for listing items in Application for Payment.
- F. Pay Periods: Calendar Month.

1.7 CHANGE ORDER PROCEDURES

- A. Submit on EJCDC Form 1910-8B.

1.8 CUTTING AND PATCHING

- A. Employ a skilled and experienced installer to perform cutting and patching new Work; restore Work with new products.
- B. Submit written request in advance of cutting or altering existing structures or utilities.
- C. Fit work tight to adjacent elements and maintain integrity of existing work.

1.9 CONFERENCES

- A. Engineer will schedule a preconstruction conference after Notice of Award for all affected parties.
- B. Where required in individual specification Section, convene a pre-installation conference at project site prior to commencing Work of the Section.

1.10 PROGRESS MEETINGS

- A. Schedule and administer meetings at the site throughout progress of the Work at minimum monthly intervals.
- B. Preside at meetings, record minutes, and distribute typed copies within two days to those affected by decisions made.

1.11 SUBMITTAL PROCEDURES

- A. The Contractor shall submit a sufficient number of copies to allow the Engineer to retain four copies (2 for himself; 2 for the Owner) for review. Submittals shall include shop drawings, electrical diagrams, and catalog cuts for fabricated items and manufactured items (including mechanical and electrical equipment) required for construction.
- B. Submittal form to identify Project, Contractor, subcontractor or supplier, and pertinent Contract Document reference.

- C. Apply Contractor's stamp, signed or initialed, certifying that review, verification of products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.
- D. Identify variations from Contract Documents and product or system limitations which may be detrimental to successful performance of completed Work.
- E. Revise and resubmit as required; identify all changes made since previous submittal.

1.12 CONSTRUCTION PROGRESS SCHEDULE

- A. Submit initial Construction Progress Schedule in duplicate within 10 days after date of Contract. Engineer shall review Construction Progress Schedule and approve. Once approved by Engineer this Construction Progress Schedule shall become the "Approved Construction Progress Schedule" by which the Contractor shall plan, organize, direct, coordinate, and execute the Work, and the basis of evaluating progress of the Work.
- B. "Approved Construction Progress Schedule" shall be a horizontal bar chart with separate lines for each major section of Work or operation, identifying first work day of each week.
- C. Submit updated Construction Progress Schedule with each Application for Payment, identifying changes since previous updated Construction Progress Schedule. Indicate estimate percentage of completion for each item of Work at each submission.
- D. Should updated Construction Progress Schedule show the Contractor to be 10 percent or more behind schedule, Contractor shall immediately devise a plan for recovery of lost time and submit to the Engineer for approval within 1 week. Once approved by the Engineer, the Contractor shall immediately put "Recovery Construction Progress Schedule" into action.
- E. During period covered by "Recovery Construction Progress Schedule" plan, Contractor's progress will be monitored against the "Approved Construction Progress Schedule." If Contractor does not recover from delay as detailed in his "Recovery Construction Progress Schedule," the Engineer shall advise the Owner to exercise its options as described in the General Conditions.
- F. Contractor shall bear all cost and expenses related to recovery from the Contractor's delays, including costs, expenses, and lost revenue by the Owner.

1.13 PROSECUTION OF THE WORK

- A. It is expressly understood and agreed that the time of beginning, rate of progress, and time of completion of the Work are the essence of this Contract. The Work shall be prosecuted at such time, and in or on such part or parts of the Project as may be required, to complete the Project as contemplated in the Contract Documents and the approved construction schedule.
- B. Regular Work hours shall be from 7:00 a.m. to 6:00 p.m. Monday through Friday. No Work requiring the presence of the Engineer's representative will be performed outside of regular Work hours. If, however, the Contractor works additional hours (other than specified herein), the Contractor shall pay the Owner for additional engineering services as outlined below.

- C. The cost of additional engineering services shall be borne by the Contractor and will be based upon actual hours worked (labor cost x 3 x 1.5) plus out-of-pocket expenses such as lodging, mileage, materials, etc. Otherwise, the Contractor may perform clean-up work only outside of regular hours (including Saturdays and Sundays). No Work will be accomplished on holidays.

1.14 SHOP DRAWINGS

- A. Submit number of copies which the Contractor requires, plus four copies which will be retained by the Engineer.
- B. Include as a minimum dimensions, size, location of connections to other work, weight of equipment, and supporting calculations.

1.15 PRODUCT DATA

- A. Submit number of copies which the Contractor requires, plus four copies which will be retained by the Engineer.
- B. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturer's standard data to provide information unique to this Project.

1.16 MANUFACTURERS' INSTRUCTIONS AND CERTIFICATIONS

- A. Submit as noted in individual specification Sections.

1.17 QUALITY ASSURANCE

- A. Maintain quality control over suppliers, manufacturers, products, services, site conditions, and workmanship to produce work of specified quality.
- B. Comply fully with manufacturer's instructions.
- C. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

1.18 REFERENCES

- A. Conform to reference standard by date of issue current as of date of Contract.
- B. Should specified reference standard conflict with Contract Documents, request clarification from Engineer before proceeding.

1.19 MANUFACTURERS' FIELD SERVICES

- A. Representative shall submit written report to Engineer listing observations and recommendations.

1.20 TESTING LABORATORY SERVICES

- A. Owner will approve the Contractor's selection of a testing laboratory to perform inspections, tests, and other services required by individual Specification Sections.
- B. All costs for laboratory testing of earthwork and concrete shall be paid for by the Contractor.
- C. Services will be performed in accordance with requirements of governing authorities and with specified standards.
- D. Contractor shall cooperate with Testing Laboratory personnel; furnish tools, samples of materials, design mix, equipment, storage and assistance as requested.
 - 1. Notify Engineer/Testing Laboratory 48 hours prior to expected time for operations requiring testing services.
 - 2. Furnish and deliver samples/cylinders to lab for testing.
 - 3. Pay for testing.

1.21 TEMPORARY ELECTRIC POWER AND LIGHTING

- A. Provide and pay for power services required from source.
- B. Provide power outlets for construction operations, branch wiring, distribution boxes, and flexible power cords as required.

1.22 TEMPORARY WATER

- A. Provide water, as needed, for own use.
- B. Provide an adequate supply of potable drinking water for use by employees and Engineer's employees.

1.23 SANITARY FACILITIES

- A. Provide and maintain required sanitary facilities and enclosures.
- B. Maintain clean and sanitary condition.

1.24 WATER FOR TESTING

- A. The Owner shall provide the water for first time testing up to a maximum amount of two and half times the water capacity volume in the total length of the waterlines in the distribution system in this Project. Owner shall determine the location(s) on where the Contractor can obtain the water. If test fails, the Contractor shall be responsible to paying Owner the cost of additional water for testing until the system being tested passes.

1.25 TEMPORARY TELEPHONE SERVICE

- A. Provide on-site telephone service for Contractor's and Engineer's use during the period of construction of the Contract.

1.26 TEMPORARY WATER CONTROL

- A. Maintain excavations and trenches free of water. Provide and operate pumping equipment of a capacity to control water flow.
- B. Provide dewatering system and pumping to maintain excavations dry and free of water inflow on a 24 hours basis.
- C. Provide piping to handle pumping outflow to discharge in a manner to avoid erosion or deposit of silt.

1.27 TEMPORARY ACCESS ROADS AND PARKING

- A. Construct and maintain temporary construction access roads, parking areas, and detours as are required to execute the Work.

1.28 TEMPORARY HEATING AND VENTILATING

- A. Provide adequate heat and ventilation to all parts of the Work.
- B. See requirements of Specifications for minimum temperature to be maintained for various trades.
- C. Ventilate enclosed areas.
- D. Do not use permanent systems to provide temporary heating or ventilation.

1.29 PROTECTION OF FINISHED WORK

- A. Protect installed work and provide special protection where specified in individual specification Sections.

1.30 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

1.31 FIELD OFFICES

- A. Contractor shall provide a field office for himself and the Owner's use, as follows:
Office shall be weather tight, secure, with lighting, electrical outlets, heating, cooling and ventilating equipment, and equipped with sturdy furniture, drawing display table, telephone, and space for project meetings with table and chairs.

1.32 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary erosion control construction, above grade or buried utilities, equipment, facilities, and materials, prior to Substantial Completion inspection.
- B. Remove and repair damage caused by installation or use of temporary work.

1.33 PRODUCTS

- A. Products: New material, machinery, components, equipment, and systems forming Work, but does not include machinery or equipment used for preparation, fabrication, or erection of Work.
- B. Use interchangeable components of the same manufacture for similar components.

1.34 TRANSPORTATION, HANDLING, STORAGE, AND PROTECTION

- A. Transport, handle, store and protect Products in accordance with manufacturer's instructions.

1.35 SUBSTITUTIONS

- A. Possible substitutions (“or approved equal”/ “or equal”) shall be submitted no later than 10 days prior to bid date for Engineer to review and consider requests from Contractor or Bidder for substitutions as equal . The Bidder may include substitutions not specified only if written approval is received from the Engineer prior to bidding. Otherwise, substitutions will be not be allowed.
- B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.

1.36 SYSTEMS DEMONSTRATION

- A. Prior to final inspection, demonstrate operation of each system to Engineer and Owner.
- B. Instruct Owner's personnel in operation, adjustment, and maintenance of equipment and systems, using the operation and maintenance data as the basis of instruction.

1.37 CONTRACT CLOSEOUT PROCEDURES

- A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and Work is complete in accordance with Contract Documents and ready for Engineers inspection.
- B. Submit final Application for Payment identifying total adjusted Contract Price, previous payments, and amount remaining due after Engineer has given written approval of Project Record Documents.

1.38 FINAL CLEANING AND INSPECTION

- A. Execute final cleaning prior to final inspection.
- B. Clean interior and exterior surfaces exposed to view.
- C. Clean debris, waste and surplus supplies, rubbish, and construction facilities from site.
- D. After final cleaning and upon written notice from the Contractor that the Work is completed, the Engineer will make a preliminary inspection with the Owner and Contractor present. Upon completion of this preliminary inspection, the Engineer will notify the

Contractor, in writing, of any particulars in which this inspection reveals that the Work is defective or incomplete.

- E. Upon receiving written notice from the Engineer, the Contractor shall immediately undertake the work required to remedy defects and complete the Work to the satisfaction of the Owner.
- F. When the Contractor has corrected or completed the items as listed in the Engineer's written notice, he shall inform the Engineer, in writing, that the required Work has been completed. Upon receipt of this notice, the Engineer, in the presence of the Owner and Contractor, shall make his final inspection of the Project.
- G. Should the Engineer find all Work satisfactory at the time of his inspection, the Contractor will be allowed to make application for final payment in accordance with the provisions of the General Conditions. Should the Engineer still find deficiencies in the Work, the Engineer will inform the Contractor of the deficiencies and will deny the Contractor's request for final payment until the Contractor has satisfactorily completed the required Work.
- H. Water courses, gutters, and ditches shall be opened and left in a condition satisfactory to the Engineer.

1.39 FINAL SUBMITTALS

- A. No contract will be finalized until all of the following have been submitted:
 - 1. Final Shop Drawings.
 - 2. Record Drawings.
 - 3. Operations and Maintenance Manuals.
 - 4. Manufacturers' Certificates of Proper Installation.

1.40 PROJECT RECORD DOCUMENTS (“AS-BUILTS”)

- A. Maintain on Project site, one set of Contract Documents, Shop Drawings, and Product Submittals to be utilized for Record Documents.
- B. Keep Record Documents and samples available for inspection by Engineer.
- C. Maintain Record Documents in a clean, dry, and legible condition. **Do not use Record Documents for construction purposes.** If Contractor submits Record Documents that are in poor condition and is unacceptable by the Engineer, Contractor shall re-purchase a new set of Project Drawings and Project Manual and re-recording information on new purchased set and resubmit to Engineer.
- D. Specification, Record Documents, and Shop Drawings: Legibly mark each item to record actual construction or product installed.
- E. Record information in red ink on a set of blue line opaque Drawings, and in a copy of a Project Manual.
- F. Record information concurrently with construction progress.

- G. Contract Drawings and Shop Drawings: Legibly mark each item to record actual construction, including:
 - 1. Measured depths of elements of structures in relation to datum.
 - 2. Measured horizontal and vertical locations of underground utilities, valves, fittings, and other appurtenances incorporated in the Project, referenced to permanent surface improvements (3 each).
 - 3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of construction.
 - 4. Field changes of dimension and detail.
 - 5. Changes made by Modifications by either Field Orders or Change Orders.
 - 6. Details not on original Contract Drawings or referenced in Project Manual, but are part of the Project.

- H. Specifications: Legibly mark each item to record actual construction, including:
 - 1. Manufacturer, trade name, and catalog number of each product actually installed, particularly optional items and substitute items.
 - 2. Changes made by Addenda, Field Orders, Change Orders, or other Modifications.

- I. Other Documents: Maintain manufacturer's certifications, inspection certifications, field test records, and other required documentation required by individual Specifications Sections.

- J. Transmit with cover letter in duplicate, listing:
 - 1. Date.
 - 2. Project title and number.
 - 3. Contractor's name, address, and telephone number.
 - 4. Number and title of each Record Document.
 - 5. Signature of Contractor or authorized representative.

- K. Final Application for Payment shall not be approved until Project Record Documents ("As-Builts") are reviewed and approved by Engineer.

1.41 OPERATION AND MAINTENANCE DATA

- A. Submit 2 sets prior to final inspection, bound in 8-1/2 x 11 inch text pages with durable plastic covers.

- B. Prepare binder cover with printed title "OPERATION AND MAINTENANCE MANUAL" and title of project.

- C. Internally subdivide the binder contents with permanent page dividers, logically organized, with tabs clearly printed under reinforced laminated plastic tabs.

- D. Contents:
 - 1. Directory listing names, addresses, and telephone numbers of Engineer, Contractor, Subcontractors, and major equipment suppliers.
 - 2. Operation and maintenance instructions, arranged by system.
 - 3. Certificates.
 - 4. Shop drawings.
 - 5. Product data.
 - 6. Warranties.

1.42 GUARANTEES, BONDS, AFFIDAVITS, AND WARRANTIES

- A. Provide duplicate notarized copies.
- B. Execute and assemble documents from Subcontractors, suppliers, and manufacturers.
- C. No contract will be finalized until all guarantees, performance tests, bonds, certificates, licenses, affidavits, and warranties required for Work or equipment as specified are satisfactorily filed with the Engineer.
- D. Submit prior to final Application for Payment.

1.43 SPARE PARTS AND MAINTENANCE MATERIALS

- A. Provide products, spare parts, maintenance and extra materials in quantities specified in individual specification Sections.
- B. Deliver to project site and place in locations as directed; obtain receipt prior to final payment.

PART 2. PRODUCTS

Not Used.

PART 3. EXECUTION

Not Used.

END OF SECTION

SECTION 13 00 00
PREFABRICATED RESTROOM BUILDING

A. General, Specifications and Clarification of Prefabricated Building and Site Installation

1. This portion of the bid specifications does not follow the CSI standard format as the prefabricated structure in this bid is an **off-site constructed "product"** and not "typical" general construction.
2. The **installation of the product on-site is general construction** which must be coordinated between the owner or their general contractor and the supplier. Specifications for the building foundation/pad shall be provided herein by the specified design/build supplier. Due to the responsibility of the specified building supplier for architecture, engineering and a five-year warranty, the site pad/foundation must meet the suppliers design so the pad and building can be considered from a single source for warranty purposes. The supplier must accept the pad and compactions tests before they take responsibility for the entire system under their warranty.

B. Architectural Design/Engineering and Insurance Responsibility

1. While Arkansas State Parks or their representative has provided bid specifications and a design for the building, the building design/build supplier remains legally responsible for architecture, engineering, and all applicable building, safety, health, fire, and accessibility code compliance. Since they hold professional design responsibility to the owner, the building supplier must furnish certification that they provide product liability insurance in the amounts required by the general specifications **to cover property damage and personal injury**. Final drawings shall be stamped by an Arkansas engineer.

C. Errors and Omissions Insurance

1. The building design/build supplier must also provide an additional Professional Architectural and Engineering Errors and Omissions insurance, in the minimum amount of \$2,000,000, **to cover claims against the owner or their general contractor for State and Federal ADA handicapped accessibility and other design/engineering code issues**. This Errors and Omission Policy must remain in effect for 5 years from the completion and owner acceptance of the project. Products liability insurance (since it does not cover professional design responsibility only) will be insufficient for this bid and will be cause for rejection of the bidder.

D. Insurance for the Building offsite, while in transit, and/or on site until turn over and final owner acceptance

1. The supplier may request invoicing for a percentage of building completion in-plant, monthly. Under UCC law, this means that the supplier is turning over

responsibility for the portion invoiced to the owner yet the building will not be on the owner's property and may not be covered by the owners insurance. Therefore, the building supplier must provide a separate insurance policy insuring the owner and their general contractor as additionally insured for liability, damage and/or vandalism to the building while in the manufacturing facility, while in transit, and/or while in storage at a certified bonded storage facility or at the final project site for up to \$200,000 for each prefabricated building module, until the building is final accepted by owner.

E. Owner or General Contractor Coordination with Design/Build Supplier

1. The specified prefabricated public restroom building requires coordination between the owner or their general contractor (who prepares the site pad and delivery access for the prefabricated storage building) and the prefabricated restroom building supplier (who completes the architectural design, engineering, off-site building construction, delivery and installation on site.) The specified prefabricated restroom building specifications include unique components/systems which are custom to the restroom building supplier. Since the restroom supplier is responsible for design, additional insurance requirements for errors and omissions are required.

F. Owner or General Contractor, General Scope of Work

1. The owner or their general contractor for this project is responsible for the site survey and staking the building location, finished slab survey elevations and marking on site, construction and compaction of the required building pad; access to the site for a large crane and tractor trailers delivering the prefabricated building; providing water, sewer, and power at a point of connection (POC) within 6 feet of the building and at the depth required by the building subcontractor and local code; and the installation of any sidewalks outside the building footprint.
2. The owner or their general contractor is responsible for verification to the building subcontractor design/build firm that there are no unanticipated site delivery issues such as overhead wires, trees, tree roots, or existing grade changes and that prevent a clear path of travel between a roadway and the final site exists for a tractor trailer and crane to expedite delivery. The design/build supplier requires that the owner or their general contractor certify that the required delivery crane must be able to set the building module/modules within 35' distance from the center of the building to the center of the crane hoist.

G. Supplier/Prefabricated Restroom Building, General Scope of Work

1. The prefabricated restroom building specialist will provide to the owner or their general contractor final building design architectural drawings and engineering calculations under the responsibility of a licensed structural engineer, in compliance with all local, state and federal codes. The design/build supplier shall construct the building offsite as a permanently relocatable building, transport it to the final required destination, and install the building turnkey, (to 6' from the

building footprint) on an owner or general contractor prepared pad per the drawings included in this bid.

H. Licensing:

The supplier must comply with all federal requirements.

I. Bid Standard for the Prefabricated Restroom Building

1. Arkansas State Parks or their representative understands that there are several firms who design and build various types of prefabricated public restroom buildings in varying quality and architectural styles, using similar or different construction methods and materials. For the purpose of this project, the owner has selected:

Public Restroom Company, 2587 Business Parkway, Minden, Nevada, 89423 and specifies herein that this firm is the standard for architectural design, safety, green design, code compliance, and site-specific compatibility. Public Restroom Company is the standard of building performance and quality for the 50-year building design-life with low maintenance based upon the longevity of the materials selected.

Contact: **Mike Earle**, Regional Sales Manager
Phone: **888-888-2060 extension 126**
Fax: **888-888-1448**
Email: **Mike@PublicRestroomCompany.com**
Web: **www.publicrestroomcompany.com**

J. "Or Equal Restroom Design/Build Suppliers"

1. Arkansas State Parks or their representative may also allow other firms to become qualified to bid but any firms so authorized to bid must comply with the bid specifications and plans or be subject to post bid rejection.
2. In order to provide full and open competition, other firms may request approval as "or equal." **The following items must be provided to ASP in accordance with substitution requirements outlined in the project specifications.** Failure to supply these items will result in bid rejection.
 - a) Or Equal applicant shall provide with their bid submission, scaled floor plans and elevations, to show general architectural design criteria is met.
 - b) Or Equal applicant shall provide with their bid submission, a written list of each and every deviation from the published bid specifications/plans. Lack of specificity to each deviation from the bid specifications will be cause for rejection.
 - c) Or Equal applicant shall provide with their bid submission, manufacturer's certification of test compliance from a national independent testing laboratory to support the claim for absorption resistance of the slab type that will be used in their proposed restroom. Or Equal applicant must provide a list of every building they designed and built over the last 3 years utilizing the same building

-
- materials/systems design criteria as published in this bid. Provide date of building bid, date of completion, and most knowledgeable owner contact.
- d) Or equal applicant shall provide certification of the special insurance required in this bid.
 - e) Or Equal applicant shall be responsible for and bear all cost for architecture, plan checks, design and structural engineering and all fees in obtaining approvals and permits from applicable agencies.
3. Precast Concrete Structures will not be accepted.
 4. Arkansas State Parks or their representative will be solely responsible for the decision to accept or reject the “or equal” submission.

K. Certificate of Off-site Inspection and Construction Compliance, Provision for Maintenance Manuals, and Warranty

1. The off-site restroom construction requires that a licensed third-party inspection firm provide the owner and the local building official with certification and compliance for the building with the approved plans and specifications. A certificate of compliance shall be issued by this inspector to the local building official to provide certification that the building meets and or exceeds the approve plans and applicable codes.
2. At the project conclusion, the building supplier shall furnish one complete maintenance manual including a trouble shooting guide, and a **five (5) year warranty** to the owner or general contractor.

L. Site Scope of Work by Owner or Their General Contractor

The owner or general contractor shall prepare the restroom building sub grade pad to receive the prefabricated building in accordance with the bid drawings.

1. The building pad shall be excavated to 14” deep from the final building concrete slab elevation in accordance with the drawing titled “foundation pad design.”
2. The building pad shall meet a 90% compaction in lifts using class II base for the first four inches and coarse sand for the last two inches of the pad, leaving the finished sub grade pad elevation at finished floor, minus 8”.
3. The owner or general contractor shall provide water point of service at 30” below finished building slab; sewer at 24” below the finished building slab; and electrical at 36” below the finished building slab or other per bid plans.
4. Owner or their general contractor shall coordinate with restroom supplier to provide full site delivery access for a 70’ tractor-trailer and hydro crane to the final building site.
5. If the final site access is over existing sidewalks, utilities, or landscaping, the owner or their general contractor shall be responsible for plating and or tree trimming, utility line removal, or other to protect any existing conditions.
6. The hydro crane must be able to locate no greater than 35’ from the center point of the building to the center point of the crane.
7. The utilities shall be furnished per bid site plans at specified points of connection (POC) nominally 6’ from the building line.

-
8. Owner or their general contractor shall furnish and install final grading, landscaping and sidewalks.

M. Connection to Utilities

1. The restroom subcontractor will furnish Electrical, Water, and Sewer at the proper POINT OF CONNECTION AND AT THE PROPER ELEVATION BELOW GRADE, for this project. Restroom subcontractor shall provide final hook up of the water from building to POC; sewer hookup to POC; and electrical sleeve from building panel to POC only. Final utility connections shall be by owner, their general contractor, or others. Owner or their general contractor shall flush the water lines thoroughly before making final water connection to the building.

N. Concrete Slab, Required Independent Testing Laboratory Certification

1. The prefabricated building slab special concrete technology claims to be water and urine resistant for life due to special additive technology. The building subcontractor must furnish a test certification of compliance from a national independent testing laboratory to support the claim for absorption resistance. The written report must state the concrete compressive and absorption per ASTM standard #C642 and #C39 respectively. Since this non-absorbency capability is so significant, the design/build subcontractor must provide a general certification of compliance with the above standards.

O. Prefabricated Restroom Building

1. Arkansas State Parks or their representative have evaluated several prefabricated restroom building suppliers. This bid requires such a building be used in lieu of site built traditional construction because of the unique built-in advantages guaranteed by the design/build firm. This technology includes many new innovations such as non-absorbent concrete; anti-microbial components to reduce health risks; built in vandal resistance design; lowered maintenance and long-term warranties that reduce owner risk for failure. The specifications below are written around this new technology.

P. Mat Engineered Concrete Building Slab/Foundation

1. The mat engineered 8" thick slab/foundation shall be engineered and constructed to withstand the transportation weight of the building without cracking and to resist absorption from any liquids deposited on the surface. The concrete slab shall be constructed inside a steel angle curb, reinforced with dual mats (tension and compression,) and poured with a custom concrete formula with special admixtures to create a finished slab that is waterproof for life.
2. Perimeter Steel Curb: 5/16" 50,000 kip steel 6" X 6" welded continuous angle.
3. Rebar Steel Mat: Two layers of 40,000 tensile steel rebar in varying sizes per engineers requirements, including a perimeter structural continuous grade beam design inside the exterior steel angle and at any other location deemed by the engineer of record as required for the use intended. In coastal locations or when required for corrosion resistance rebar shall be epoxy coated or fiberglass to resist

permanent corrosion. Rebar mats shall be wire tied to code with a minimum of three turns of the wire and overlaps shall be minimum of 15 diameters for any connection.

4. All slab openings shall be surrounded with two layers of steel collars as required by the engineer of record to stop corner cracking and to reinforce the openings for lifting.
5. 1" thick by 3" minimum length threaded nuts shall be welded to the steel perimeter frame with continuous ¼" fillet welds. Nuts shall be welded to common steel plates per the engineer of records design and attached to the interior steel rebar structural mats.
6. The engineer of record shall provide lifting locations with sufficient reinforcement to allow the safe lifting of the entire designed weight of the structure with dual 1" steel bolts and washers at each lifting location. The number of lifting locations with each location fitted with removable ¾" 8" X 8" 50,000 tensile strength steel angles shall be determined by the engineer of record.
7. The slab shall be poured over a 1" thick steel plate table. The concrete mix design shall not exceed a 3" slump and shall be stinger vibrated for maximum consolidation. All floors shall slope to any floor drains within each room and if no floor drain is present the floor should not slope. The surface shall be a very light broom that should meet a coefficient of friction on the surface of .06. Birdbaths shall be cause for rejection.
8. The steel perimeter angle will remain below the concrete surface by nominal two inches to prevent corrosion. After the site concrete sidewalks are poured, the joint shall be full flow sealed with self-leveling grey urethane caulk to prevent penetration of water into the joint.
9. The building shall be designed for future relocation and shall provide protection for the lifting openings in the mat slab so that the threaded openings will be available for future use if needed.
10. The building system shall be designed for placement on an owner or their general contractor site prepared class 2 building pad/and or footings as required by code, per the bid drawings, suitable for 1500 pounds soil bearing capacity minimum. Any soils survey (if necessary) shall be by owner or engineer of record.

Q. Exterior & Interior Masonry Block Walls

1. The exterior walls shall be 4" thickness per State of Arkansas codes or engineering for wind and seismic. The interior walls shall be 4" block to cap beam.
2. The 8" mat engineered concrete slab shall be cured a minimum of 7 days. Holes for vertical dowels shall be drilled into the mat engineered slab avoiding any grade beams or other structural reinforcement. Once the holes are drilled, blow out the remaining material and using two-part structural epoxy, wet set the #3 or #4 vertical rebar (as specified on the engineering calculations into holes drilled to the depth per the engineer of record requirements. Each rebar shall be held vertical to allow equal epoxy support to each dowel during the drying period. Engineering calculations require that rebar shall be installed in each concrete block center void or every block hole. The engineered uplift on each rebar shall be sufficient to

restrain any load imposed on the masonry block wall for vertical rebar pull out from the concrete mat engineered slab.

3. The block walls shall be nominal 8" x 16" CMU. The building corners shall have special corner return block that matches the exterior finish and creates a uniform appearance. All 4" CMU shall be custom fabricated with an enlarged interior hole for placement of the grout and vertical rebar.

R. Roof System

1. The roof structure shall be 2" x 6" wood rafters at 24" on center with 5/8" OSB sheathing and ice and water shield membrane with 24-gauge corrugated metal roof panels, color selected by owner. The rake and fascia shall be 16 gauge formed steel painted in a color selected by owner.
2. Roof shall be designed per plans to reduce vandals climbing on roof and to obtain proper ventilation size openings for the gables to provide fan-free ventilation.
3. The restroom ventilation screens (described in a following section) shall be attached to the truss frames with vandal resistant fasteners. Roof color shall be determined by owner.

S. Interior Wall Finish

1. Interior wall finish to cap beam shall be precision CMU block masonry walls smoothed to a pebble grain finish with 2-4 mil layers of 7-day curing block fillers and painted with two additional 4 mil layers of industrial high solids (color selected by client) industrial grade enamel. Above cap beam shall be painted FRC.

T. Exterior Wall Finish, Masonry and Gable

1. The building exterior shall have horizontal Allura Cedarmill Lap Siding to cap beam. Above cap beam shall be horizontal Allura Cedarmill Lap siding. The exterior shall be painted with two layers of industrial high solids, semigloss enamel to a 4-mil thickness. Color to be selected by Owner.

U. Passive Ventilation System (Restrooms)

1. Shall be woven 1/4" X 1" X 1", 316T, stainless steel wire mesh set in welded stainless-steel angles attached to the masonry wall with vandal resistant stainless-steel screws, per plans. There shall also be an 8" x 16" aluminum louvered vent in the utility chase at 9' AFF, nominal.

V. Doors and Gates

1. The restroom entry doors shall be 7'-0" high, custom fabricated, 14-gauge steel; reinforced with concealed 14-gauge steel ribs welded at 6" intervals on each face; reinforced with a welded plate for door closer mounting; hung on a single continuous, 1 million cycle, aluminum gear hinge with stainless steel vandal resistant screws at nominal 4" on center. The doors shall weigh nominally 176 lbs. each for a 36" X 84" door. Custom fabricated 14-gauge steel door jambs with 4" steel heads shall be welded to the steel cap beam and be solid filled with 3000 psi masonry grout mix.

-
2. All entry doors shall have a 1/8" thick plate stainless steel "Z-shaped" anti-microbial pull handles with integral latch guard (latch guard on concession entry door and utility chase door only) and Schlage B-600 series commercial series dead bolts with large format temporary core.
 3. The door closer (restroom entry doors only) shall be "LCN" heavy duty #4210 Series, fastened to a structural reinforced door plate per door manufacturer design.
 4. Stainless steel vandal resistant fasteners shall be used on all hardware.

W. Specialties

All specialty washroom equipment shall be commercial grade stainless steel fastened securely to walls with vandal resistant stainless-steel screws to avoid removal by vandals as follows:

1. Toilet paper holder shall be a covered three-roll, 18-gauge stainless steel. Toilet paper holders shall be attached to block walls with 4 epoxy bedded vandal resistant stainless-steel fasteners.
2. Stainless steel grab bars to code shall be 1 ¼" minimum exposed fastener vandal resistant design and installed at each accessible water closet.
3. Cast Aluminum ADA compliant signs shall be recessed into block surface flush with masonry exterior. Signs shall have raised pointed Braille tips and shall be blind secured with epoxy adhesive and stainless-steel fasteners.
4. Baby Changing Stations: Foundations Horizontal #5410339
5. Hand Dryer: Dyson Airblade V, nickel finish, mounted adjacent to lavatories
6. Soap Dispenser shall be a stainless steel thru wall nozzle with remote reservoir located in the mechanical chase.

X. Plumbing

1. Building shall be fully compliant with the following codes:
 - a) All applicable Building Codes. Latest edition applicable.
 - b) State of Arkansas Plumbing Code. Latest edition applicable.
2. GENERAL: All components and fabrications shall be designed to reduce life cycle maintenance, be compatible with current maintenance spare parts, and shall be listed in a spare parts/maintenance manual delivered in utility chase of building.
3. WATER PIPING: Shall be type L copper above grade and type K with silver solder below grade. All water piping shall be designed and constructed with high and low point drain fittings. All piping shall be mounted on Uni-strut wall brackets with neoprene isolators, to code.
4. WATER PRESSURE GAUGE/VALVE COMBO: install two commercial grade industrial water pressure gauges, isolation ball valves, 10-micron water filter with clear canister and check valve.
5. PLUMBING FAUCETS, ISOLATION VALVES AND ACTUATORS: All fixtures except those with flush valves shall be isolated with ball valves for each fixture, concealed lever flush valves, and metered push-button type lavatory faucets.
6. DWV PIPING: DWV piping shall be concealed behind the wall. DWV piping shall be PVC DWV, solvent welded, for all concealed piping. A cast iron no hub DWV vent pipe with a cast iron roof mounted vandal cap vent shall be required, through

the roof.

7. REMOVABLE PIPE TRAPS: All sink drain and waste traps shall be removable for maintenance. Floor drains shall be trapped in the building slab. Floor drains shall be increased two pipe sizes over standard to allow code use. All surface mounted utility chase piping shall be mounted on Uni-strut with plastic isolators to code. Sink drain traps shall be concealed behind the utility chase walls where maintenance staff can access all plumbing.
8. PLUMBING FIXTURES: Plumbing fixtures shall be stainless steel manufactured by Acorn. Toilets shall be wall hung, rear discharge, with lever flush valves. Toilet seats shall be black solid core plastic, non-flammable construction with continuous stainless steel concealed self-checking hinges. Lavatories shall have concealed remote traps behind the mechanical wall. Schedule of fixtures:
 - a. Water Closets: Acorn 1675 W-1-HET
 - b. Water Closet Flush Valve: Zurn Z6143AV-HET-7L-BG
 - c. Lavatories: Acorn 1652LRB
 - d. Lavatory Faucet: Chicago Model# 333-E2805-665PSHBCP
9. FLOOR GRATES: Removable 350 lbs. per square foot pultruded fiberglass non-skid floor grates shall be installed over every opening in the utility chase for OSHA protection/compliance.
10. HOSE BIB: There shall be one Acorn 8121 LF hose bib provided in the utility chase.
11. HOSE REEL: One commercial grade hose reel with capacity for 75' X 5/8" commercial heavy-duty hose and nozzle shall be hung in mechanical room for cleaning of restrooms. One 75' x 5/8" commercial hose shall be furnished.

Y. Electrical

1. GENERAL: Electrical system and components shall be commercial grade or better and piping conduits shall be installed on commercial Uni-strut wall hangers. Interior and exterior electrical lighting fixtures in public areas shall provide lifetime manufacturer's warranty.
2. PANEL/WIRING: One 100-amp, single-phase, 20 circuit, main industrial grade Panel Board, Square "D" QO series, shall be mounted in the utility chase in the restroom building. All breakers shall be plug-on type, minimum 10,000 A.I.C. RMS (Sym) at 120/240 vac. Wiring shall be stranded copper wire #12 min in EMT piping with screw fittings.
3. PIPING: All piping shall be surface mounted to the masonry block walls with minimum of 2" fastener penetration. EMT conduit shall be compression type. Main panel shall maintain a 30" X 36" safety code required clear space, floor to 6' above finished floor.
4. EXTERIOR LIGHTING: Luminaire AEL12-10W-120-4000K-DP-BZH, 10watt LED, dark sky complaint, vandal resistant fixtures shall be installed per plans.
5. INTERIOR LIGHTING: Luminaire SWP1212-OP-BRZ-OCC, 15 watt, LED, vandal resistant high-impact polycarbonate lens fixtures shall be installed in the restrooms per plans (one in each restroom) and shall have integral occupancy sensors. The utility chase shall have one (1), 4' single-tube LED fixture, suitable for wet

locations, with a single switch occupancy sensor at door entry.

6. LIGHTING CONTROL: All exterior restroom lighting shall be controlled by a photo-cell mounted 8' high on the utility chase/restroom wall. Two (2) bypass switches shall be located in the utility chase (one for interior lighting and one for exterior lighting), so maintenance staff can check operation during daylight hours. Integral occupancy sensors shall control the interior lighting.
7. ELECTRICAL OUTLETS: (1) commercial spec grade dedicated GFCI in the utility chase, per plans.
8. WATER HEATER: Shall be Steibel DHC-E3-2, located in the utility chase, one for each lavatory (Qty. 2). The water to the lavatories shall be tempered.

Z. Shipping Protection

The building, while traveling over roads to the destination may encounter inclement weather or road grime that could require substantial cleaning when it arrives on site. The building shall be shrink-wrapped before transportation and sufficiently strong to arrive at the owner site intact for exterior finish protection. Materials removed on site shall be disposed of and recycled by restroom building install staff.

AA. Certifications

The local building authority shall provide site inspections for the underground mechanical piping and final connections, footings, and access issues outside the restroom footprint. Restroom building subcontractor shall also furnish 5-year warranty, certifications for the concrete slab specification compliance, and maintenance manuals for the building and components.

END OF SECTION

SECTION 26 05 00

COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
1. General requirements applicable to all Electrical Work.
 2. General requirements for electrical submittals.
 3. Interfaces to equipment, instruments, and other components:
 4. The Drawings, Specifications, and overall design are based on preliminary information furnished by various equipment manufacturers which identify a minimum scope of supply from the manufacturers. This information pertains to, but is not limited to, instruments, control devices, electrical equipment, packaged mechanical systems, and control equipment provided with mechanical systems.
 5. Provide all material and labor needed to install the actual equipment furnished, and include all costs to add any additional conduit, wiring, terminals, or other electrical hardware to the Work, which may be necessary to make a complete, functional installation based on the actual equipment furnished:
 - a. Make all changes necessary to meet the manufacturer's wiring requirements.
 - b. Submit all such changes and additions to the Engineer for acceptance.
 6. Review the complete set of Drawings and Specifications in order to ensure that all items related to the electrical power and control systems are completely accounted for. Include any such items that appear on the Drawings or in the Specifications from another discipline in the scope of Work:
 - a. If a conflict between Drawings and Specifications is discovered, refer conflict to the Engineer as soon as possible for resolution.
- B. All electrical equipment and systems for the entire Project must comply with the requirements of the Electrical Specifications, whether referenced in the individual Equipment Specifications or not:
1. The requirements of the Electrical Specifications apply to all Electrical Work specified in other sections.
 2. Inform all vendors supplying electrical equipment or systems of the requirements of the Electrical Specifications.
 3. Owner is not responsible for any additional costs due to the failure of Contractor to notify all subcontractors and suppliers of the Electrical Specifications requirements.
- C. Contract Documents:
1. General:
 - a. The Drawings and Specifications are complementary and are to be used together in order to fully describe the Work.

2. Specifications:
 - a. The General and Supplementary Conditions of the Contract Documents govern the Work.
 - b. These requirements are in addition to all General Requirements.
3. Contract Drawings:
 - a. The Electrical Drawings show desired locations, arrangements, and components of the Electrical Work in a diagrammatic manner.
 - b. Locations of equipment, control devices, instruments, boxes, panels, etc. are approximate only; exercise professional judgment in executing the Work to ensure the best possible installation:
 - c. The equipment locations and dimensions indicated on the Drawings are approximate. Use the shop drawings to determine the proper layout, foundation, and pad requirements, etc. for final installation. Coordinate with all subcontractors to ensure that all electrical equipment is compatible with other equipment and space requirements. Make changes required to accommodate differences in equipment dimensions.
 - d. The Contractor has the freedom to select any of the named manufacturers identified in the individual specification sections; however, the Engineer has designed the spatial equipment layout based upon a single manufacturer and has not confirmed that every named manufacturer's equipment fits in the allotted space. It is the Contractor's responsibility to ensure that the equipment being furnished fits within the defined space.
 - e. Installation details:
 - 1) The Contract Drawings include typical installation details the Contractor is to use to complete the Electrical Work. For cases where a typical detail does not apply, develop installation details that may be necessary for completing the Work, and submit these details for review by the Engineer.
 - 2) Not all typical installation details are referenced within the Drawing set. Apply and use typical details where appropriate.

1.2 REFERENCES

- A. Code compliance:
 1. As specified in the section for Regulatory Requirements.
The publications are referred to in the text by the basic designation only. The latest edition accepted by the Authority Having Jurisdiction of referenced publications in effect at the time of the bid governs.
 2. The standards listed are hereby incorporated into this Section.
 - a. American National Standards Institute (ANSI).
 - b. American Society of Civil Engineers (ASCE):
 - c. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.
 - d. ASTM International (ASTM).
 - e. Illuminating Engineering Society (IES).
 - f. Institute of Electrical and Electronics Engineers (IEEE).

- g. Insulated Cable Engineers Association (ICEA).
- h. International Code Council (ICC):
- i. International Code Council Evaluation Service (ICC-ES).
- j. AC 156 - Acceptance Criteria for Seismic Certification by Shake Table Testing of Non-Structural Components (ICC-ES AC 156).
- k. International Society of Automation (ISA).
- l. National Electrical Manufacturers Association (NEMA):
- m. 250 - Enclosures for Electrical Equipment (1000 V Maximum).
- n. National Fire Protection Association (NFPA):
- o. 70 - National Electrical Code (NEC).
- p. National Institute of Standards and Technology (NIST).
- q. Underwriters' Laboratories, Inc. (UL).
- r. Compliance with laws and regulations: As specified in Document 01 30 00 – Administrative Requirements.

1.3 DEFINITIONS

- A. Definitions of terms and other electrical and instrumentation considerations as set forth by:
 - 1. IEEE.
 - 2. NETA.
 - 3. IES.
 - 4. ISA.
 - 5. NEC.
 - 6. NEMA.
 - 7. NFPA.
 - 8. NIST.
 - 9. Specific definitions:
 - 10. FAT: Factory acceptance test.
 - 11. LCS: Local Control Station
 - 12. ICSC: Instrumentation and controls subcontractor.
 - 13. LCP: Local control panel: Operator interface panel that may contain an HMI, pilot type control devices, operator interface devices, control relays, etc. and does not contain a PLC or RIO.
 - 14. PCM: Process control module: An enclosure containing any of the following devices: PLC, RTU, or RIO.
 - 15. PCIS: Process control and instrumentation system.
 - 16. RTU: Remote telemetry unit: A controller typically consisting of a PLC, and a means for remote communications. The remote communications devices typically are radios, modems, etc.
 - 17. Space: That portion of the switchgear, motor control center, panelboard, switchboard or control panel that does not physically contain a device but is capable of accepting a

device with no modifications to the equipment, i.e., provide all standoffs, bus, and hardware, as part of the space.

18. Spare: That portion of the switchgear, motor control center, panelboard, switchboard or control panel that physically contains a device with no load connections to be made.
19. VCP: Vendor control panel: Control panels that are furnished with particular equipment by a vendor other than the ICSC. These panels may contain PLCs, RIO, OIT, HMI, etc.
20. Unequipped space: That portion of the switchgear, motor control center, panelboard, switchboard or control panel that does not physically contain a device, standoff, bus, hardware, or other equipment.

1.4 SYSTEM DESCRIPTION

A. General requirements:

1. The Work includes everything necessary for and incidental to executing and completing the Electrical Work indicated on the Drawings and specified in the Specifications and reasonably inferable there from:
 - a. The Electrical Drawings are schematic in nature; use the Structural, Architectural, Mechanical, and Civil Drawings for all dimensions and scaling purposes.
2. It is the intent of these Specifications that the entire electrical power, instrumentation, and control system be complete and operable. Provide all necessary material and labor for the complete system from source of power to final utilization equipment, including all connections, testing, calibration of equipment furnished by others as well as equipment furnished by the Contractor, whether or not specifically mentioned but which are necessary for successful operation.
3. Provide all Electrical Work, including conduit, field wiring, and connections by the electrical subcontractor under the provisions of the Electrical Specifications for all aspects of the Work.
4. Coordinate all aspects of the Work with the electrical subcontractor and other subcontractors before bidding in order to ensure that all costs associated with a complete installation are included. The Owner is not responsible for any change orders due to lack of coordination of the Work between the Contractor, the electrical subcontractor, the other subcontractors or suppliers.

1.5 SUBMITTALS

A. General:

1. Instruct all equipment suppliers of submittals and operation and maintenance manuals of the requirements in this Section.
2. Furnish the submittals required by each section in the Electrical Specifications.
3. Adhere to the wiring numbering scheme specified in the section for Identification for Electrical Systems throughout the Project:
4. Uniquely number each wire.
5. Wire numbers must appear on all Equipment Drawings.
6. Use equipment and instrument tags, as indicated on the Drawings, for all submittals.

- B. Seismic requirements:
1. Provide electrical equipment with construction and anchorage to supporting structures designed to resist site seismic loads based on the seismic design criteria in Specifications.
 2. For equipment installed in structures designated as seismic design category C, D, E or F, prepare and submit the following:
 - a. Statement of seismic qualification, and special seismic certification:
 - 1) "Statement of seismic qualification:" Provide manufacturer's statement that the equipment satisfies the seismic design requirements of the building code indicated in the section for Regulatory Requirements, including the requirements of ASCE 7, Chapter 13.
 - 2) "Special seismic certification:" Provide manufacturer's certification that the equipment, when subjected to shake table testing in accordance with ICC-ES AC 156, meets the "Post-Test Functional Compliance Verification" requirements of ICC-ES AC 156 for "Components with $I_p = 1.5$." Compliance shall include both operability and containment of hazardous materials as appropriate to the unit being tested.
 - b. Substantiating test data: With seismic qualification and special seismic certification statements, submit results of testing in accordance with ICC-ES AC 156.
 - c. Anchoring design calculations and details:
 - 1) Submit project-specific drawings and supporting calculations, prepared and sealed by a professional engineer licensed in the state where the Project is being constructed, and showing details for anchoring electrical equipment to its supports and for anchoring supports provided with the equipment to the structure. Prepare calculations in accordance with the requirements of the section for Seismic Design Criteria.
 - 2) Exemptions: A "statement of seismic qualification" and a "special seismic certification" are not required for the following equipment:
 - d. Temporary or moveable equipment.
 - 1) Equipment anchored to the structure and having a total weight of 20 pounds or less.
 - 2) Distribution equipment anchored to the structure and having a total unit weight of 3 pounds per linear foot, or less.
- C. Submittal organization:
1. First page:
 - a. Specification section reference.
 - b. Name and telephone number of individual who reviewed submittal before delivery to Engineer.
 - c. Name and telephone number of individual who is primarily responsible for the development of the submittal.
 - d. Place for Contractor's review stamp and comments.
 2. Next pages:
 - a. Provide confirmation of specification compliance:
 - 1) Specification section: Include with each submittal a copy of the relevant specification section.

- 2) Indicate in the left margin, next to each pertinent paragraph, either compliance with a check (√) or deviation with a consecutive number (1, 2, 3).
 - 3) Provide a list of all numbered deviations with a clear explanation and reason for the deviation.
 - b. Include a response in writing to each of the Engineer's comments or questions for submittal packages which are re-submitted:
 - 1) In the order that the comments or questions were presented throughout the submittal.
 - 2) Referenced by index section and page number on which the comment appeared.
 - c. Acceptable responses to Engineer's comments are either:
 - 1) Engineer's comment or change is accepted and appropriate changes are made.
 - 2) Explain why comment is not accepted or requested change is not made.
 - 3) Explain how requirement will be satisfied in lieu of comment or change requested by Engineer.
 - d. Any re-submittal, which does not contain responses to the Engineer's previous comments shall be returned for Revision and Re-submittal.
 - e. No further review by the Engineer will be performed until a response for previous comments has been received.
 3. Remaining pages:
 - a. Actual submittal data:
 - 1) Organize submittals in exactly the same order as the items are referenced, listed, and/or organized in the specification section.
 - 2) For submittals that cover multiple devices used in different areas under the same specification section, the submittal for the individual devices must list the area where the device is intended to be used.
- D. Submittal requirements:
1. Furnish submittals that are fully indexed with a tabbed divider for every component.
 2. Sequentially number pages within the tabbed sections. Submittals and operation and maintenance manuals that are not fully indexed and tabbed with sequentially numbered pages, or are otherwise unacceptable, will be returned without review.
 3. Edit all submittals and operation and maintenance manuals so that the submittal specifically applies to only the equipment furnished.
 4. Neatly cross out all extraneous text, options, models, etc. that do not apply to the equipment being furnished, so that the information remaining is only applicable to the equipment being furnished.
 5. Submit copies of shop drawings, and product data:
 - a. Show dimensions, construction details, wiring diagrams, controls, manufacturers, catalog numbers, and all other pertinent details.
 6. Where submittals are required, provide a separate submittal for each specification section. In order to expedite construction, the Contractor may make more than 1 submittal per specification section, but a single submittal may not cover more than 1 specification section:

- a. The only exception to this requirement is when 1 specification section covers the requirements for a component of equipment specified in another section. (For example, circuit breakers are a component of switchgear. The switchgear submittal must also contain data for the associated circuit breakers, even though they are covered in a different specification section.)
7. Exceptions to Specifications and Drawings:
- a. Include a list of proposed exceptions to the Specifications and Drawings along with a detailed explanation of each.
 - b. If there is insufficient explanation for the exception or deviation, the submittal will be returned requiring revision and re-submittal.
 - c. Acceptance of any exception is at the sole discretion of the Engineer.
 - d. Provide all items (materials, features, functions, performance, etc.) required by the Contract Documents that are not accepted as exceptions.
 - e. Replace all items that do not meet the requirements of the Contract Documents, which were not previously accepted as exceptions, even if the submittals contained information indicating the failure to meet the requirements.
8. Specific submittal requirements:
- a. Shop drawings:
 - 1) Required for materials and equipment listed in this and other sections.
 - 2) Furnish sufficient information to evaluate the suitability of the proposed material or equipment for the intended use, and for compliance with these Specifications.
 - 3) Shop drawings requirements:
 - a) Front, side, and, rear elevations, and top and bottom views, showing all dimensions.
 - b) Locations of conduit entrances and access plates.
 - c) Component layout and identification.
 - d) Schematic and wiring diagrams with wire numbers and terminal identification.
 - e) Connection diagrams, terminal diagrams, internal wiring diagrams, conductor size, etc.
 - f) Anchoring method and leveling criteria, including manufacturer's recommendations for the Project site seismic criteria.
 - g) Weight.
 - h) Finish.
 - b. Nameplates:
 - 1) As specified in the section for Identification for Electrical Systems.
 - 2) Temperature limitations, as applicable.
 - c. Product data:
 - 1) Submitted for non-custom manufactured material listed in this and other sections and shown on shop drawings.

- 2) Include:
 - a) Catalog cuts.
 - b) Bulletins.
 - c) Brochures.
 - d) Quality photocopies of applicable pages from these documents.
 - e) Identify on the data sheets the Project name, applicable specification section, and paragraph.
 - f) Identify model number and options for the actual equipment being furnished.
 - g) Neatly cross out options that do not apply or equipment not intended to be supplied.
 - h) Detailed sequence of operation for all equipment or systems.
- E. Operation and maintenance manuals:
 1. As specified in the section for Operation and Maintenance Data.
 2. Furnish the Engineer with a complete set of written operation and maintenance manuals 8 weeks before Functional Acceptance Testing.
- F. Material and equipment schedules:
 1. Furnish a complete schedule and/or matrix of all materials, equipment, apparatus, and luminaries that are proposed for use:
 2. Include sizes, names of manufacturers, catalog numbers, and such other information required to identify the items.
- G. Schedule of values:
 1. In addition to completing all items referred to in the schedule of values, submit per unit material and labor costs used in developing the final bid for the electrical system, for the express purpose of pricing and cost justification for any proposed change orders. In addition to the items shown on the schedule of values, provide per unit material and labor costs for conduit and wire installation for specific types, sizes, and locations as indicated on the Drawings. It is the responsibility of the electrical subcontractor to prove to the Engineer's satisfaction that said per unit costs were used in the development of the final Bid amount.
- H. Record Documents:
 1. Provide Record Documents of all Electrical Drawings.
 2. Record Drawing requirements:
 - a. Update Record Drawings weekly.
 - b. Record Drawings must be fully updated as a condition of the monthly progress payments.
 - c. Submit Record Drawings upon completion of the Work for final review.
 - d. Clearly and neatly show all changes including the following:
 - 1) All existing pipe, conduit, wire, instruments or other structures encountered or uncovered during construction.

3. Shop drawings:
 - a. Upon completion of the Work, update all shop drawings to indicate the final as-built configuration of the systems:
 - b. Provide as-built shop drawings for all electrical equipment on 11-inch by 17-inch paper.
 - c. Size all drawings to be readable and legible on 11-17-inch media.
 - d. Provide electronic copies of these documents on CD-ROM or DVD disks in PDF format.
 4. Review and corrections:
 - a. Correct any record documents or other documents found to be incomplete, not accurate, of poor quality, or containing errors.
 - b. Promptly correct and re-submit record documents returned for correction.
- I. Test reports:
1. Include the following:
 - a. A description of the test.
 - b. List of equipment used.
 - c. Name of the person conducting the test.
 - d. Date and time the test was conducted.
 - e. All raw data collected.
 - f. Calculated results.
 2. Each report signed by the person responsible for the test.
 3. Additional requirements for field acceptance test reports are specified in the section for Field Electrical Acceptance Tests.
- J. Calculations:
1. Where required by specific Electrical Specifications:
 - a. Because these calculations are being provided by a registered professional engineer, they will be reviewed for form, format, and content but will not be reviewed for accuracy and calculation means.

1.6 QUALITY ASSURANCE

- A. Furnish all equipment listed by and bearing the label of UL or of an independent testing laboratory acceptable to the Engineer and the Authority Having Jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. As specified in the section for Product Requirements.
- B. Shipping precautions:
1. After completion of shop assembly and successful factory testing, pack all equipment in protective crates, and enclose in heavy duty polyethylene envelopes or secured sheeting to provide complete protection from damage, dust, and moisture.
 2. Place dehumidifiers, when required, inside the polyethylene coverings.
 3. Skid-mount the equipment for final transport.

4. Provide lifting rings for moving without removing protective covering.
 5. Display boxed weight on shipping tags together with instructions for unloading, transporting, storing, and handling at the job site.
- C. Delivery and inspection:
1. Deliver products in undamaged condition, in manufacturer's original container or packaging with identifying labels intact and legible. Include date of manufacture on label.
- D. Special instructions:
1. Securely attach special instructions for proper field handling, storage, and installation to each piece of equipment before packaging and shipment.

1.8 PROJECT OR SITE CONDITIONS

- A. Site conditions:
1. Provide an electrical, instrumentation and control system, including all equipment, raceways, and any other components required for a complete installation that meets the environmental conditions for the Site as specified in the General Requirements and below.
 2. Seismic load resistance:
 - a. Provide electrical equipment with construction and anchorage to supporting structures designed to resist site seismic loads as specified in Specifications.
 3. Wind load resistance:
 - a. Provide electrical equipment with construction and anchorage to supporting structures designed to resist site wind loads as specified in Specifications.
 4. Altitude, temperature and humidity:
 - a. As specified in Specifications.
 - b. Provide all electrical components and equipment fully rated for continuous operation at this altitude, with no additional derating factors applied.
 - c. Provide additional temperature conditioning equipment to maintain all equipment in non-conditioned spaces subject to these ambient temperatures, with a band of 10 degrees Fahrenheit above the minimum operating temperature and 10 degrees Fahrenheit below maximum operating temperature, as determined by the equipment manufacturer's guidelines:
 - d. Provide all power conduits wiring for these devices (e.g. heaters, fans, etc.) whether indicated on the Drawings or not.
 5. Outdoor installations:
 - a. Provide electrical, instrumentation and control equipment suitable for operation in the ambient conditions where the equipment is located.
 - b. Provide heating, cooling, and dehumidifying devices incorporated into and included with electrical equipment, instrumentation and control panels to maintain the enclosures within the rated environmental operating ranges as specified in this Section for the equipment:
 - c. Provide all wiring necessary to power these devices.

1.9 SEQUENCING (NOT USED)

1.10 WARRANTY

- A. Warrant the Electrical Work as specified in General Conditions:
- B. Provide additional warranty as specified in the individual Electrical Specifications.

1.11 SYSTEM START-UP

- A. Replace or modify equipment, software, and materials that do not achieve design requirements after installation in order to attain compliance with the design requirements:
- B. Following replacement or modification, retest the system and perform additional testing to place the complete system in satisfactory operation and obtain compliance acceptance from the Engineer.

1.12 OWNER'S INSTRUCTIONS (NOT USED)

1.13 MAINTENANCE

- A. Before Substantial Completion, perform all maintenance activities required by any sections of the Specifications including any calibrations, final adjustments, component replacements or other routine service required before placing equipment or systems in service.
- B. Furnish all spare parts as required by other sections of the Specifications.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Provide similar items of same manufacturer throughout the electrical and instrumentation portion of the Project.
- B. Allowable manufacturers are specified in individual Electrical Specifications.

2.2 EXISTING PRODUCTS (NOT USED)

2.3 MATERIALS

- A. Furnish all materials under this Contract that are new, free from defects, and standard products produced by manufacturers regularly engaged in the production of these products and that bear all approvals and labels as required by the Specifications.
- B. Provide materials complying with the applicable industrial standard as specified in General Conditions.

2.4 MANUFACTURED UNITS (NOT USED)

2.5 EQUIPMENT (NOT USED)

2.6 COMPONENTS (NOT USED)

2.7 ACCESSORIES (NOT USED)

2.8 MIXES (NOT USED)

2.9 FABRICATION (NOT USED)

2.10 FINISHES (NOT USED)

2.11 SOURCE QUALITY CONTROL

- A. Provide all equipment that is new, free from defects, and standard products produced by manufacturers regularly engaged in the production of these products.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. The electrical subcontractor is encouraged to visit the site to examine the premises completely before bidding.
- B. **Review the site conditions and examine all shop drawings for the various items of equipment in order to determine exact routing and final terminations for all wiring and cables.**
- C. It is the electrical subcontractor's responsibility to be fully familiar with the existing conditions and local requirements and regulations.
- D. Comply with pre-bid conference requirements as specified in Instructions to Bidders.

3.2 PREPARATION (NOT USED)

3.3 INSTALLATION

- A. Equipment locations shown on Electrical Drawings may change due to variations in equipment size or minor changes made by others during construction:
- B. Verify all dimensions indicated on the Drawings:
 - 1. Actual field conditions govern all final installed locations, distances, and levels.
- C. Review all Contract Documents and approved equipment shop drawings and coordinate Work as necessary to adjust to all conditions that arise due to such changes.
- D. Make minor changes in location of equipment before rough in, as directed by the Owner or Engineer.
- E. Provide a complete electrical system:
 - 1. Install all extra conduits, cables, and interfaces as may be necessary to provide a complete and operating electrical system.
 - 2. Install the equipment in accordance with the accepted installation instructions and anchorage details to meet the seismic and wind load requirements at the Project site.
- F. Cutting and patching:
 - 1. Perform all cutting, patching, channeling, core drilling, and fitting required for the Electrical Work, except as otherwise directed:
 - 2. Secure the permission of the Engineer before performing any operation likely to affect the strength of a structural member such as drilling, cutting or piercing:
 - 3. Before cutting, channeling, or core drilling any surface, ensure that no penetration of any other systems will be made:
 - a. Verify that area is clear and free of conduits, cables, piping, ductwork, post-tensioning cables, etc.
 - b. Use tone-locate system or X-ray to ensure that area is clear of obstructions.
 - c. Review the complete Drawing set to ensure that there are no conflicts or coordination problems before cutting, channeling, or core drilling any surface.

4. Perform all patching to the same quality and appearance as the original work. Employ the proper tradesmen to secure the desired results. Seal around all conduits, wires, and cables penetrating walls, ceilings, and floors in all locations with a fire stop material, typically:
 - a. 3M: CP 25WB+: Caulk.
 - b. 3M: Fire Barrier: Putty.
 5. Install all conduits and equipment in such a manner as to avoid all obstructions and to preserve headroom and keep openings and passageways clear:
 - a. Install all conduits and equipment in accordance with working space requirements in accordance with the NEC.
 - b. This includes any panel, disconnect switch or other equipment that can be energized while open exposing live parts regardless of whether it is likely to require examination or has serviceable parts.
 - c. Where the Drawings do not show dimensions for locating equipment, install equipment in the approximate locations indicated on the Drawings.
 - d. Adjust equipment locations as necessary to avoid any obstruction or interferences.
 - e. Where an obstruction interferes with equipment operation or safe access, relocate the equipment.
 - f. Where the Drawings do not indicate the exact mounting and/or supporting method to be used, use materials and methods similar to the mounting details indicated on the Drawings.
- G. Earthwork and concrete:
1. Install all trenching, shoring, concrete, backfilling, grading and resurfacing associated with the Electrical Work:
 - a. Requirements as specified in the Contract Documents.
- H. Miscellaneous installation requirements:
1. In case of interference between electrical equipment indicated on the Drawings and the other equipment, notify the Engineer as specified in General Conditions.
 2. Location of manholes and pullboxes indicated on the Drawings are approximate. Coordinate exact location of manholes and pullboxes with Mechanical and Civil Work.
 3. Provide additional manholes or pullboxes to those shown where they are required to make a workable installation.
 4. Circuits of different service voltage:
 - a. Voltage and service levels:
 - b. Medium voltage: greater than 1.0 kV.
 - c. Low voltage: 120 V to 480 V.
 - d. Instrumentation: Less than 50 VDC.
 - e. Install different service voltage circuits in separate raceways, and junction boxes.
 5. In manholes, install all cables operating at less than 50 VDC in PVC coated flexible metallic conduit, with corrosion resistant fittings.

- 6. Labeling:
 - I. Equipment tie-downs:
 - 1. Anchor all instruments, control panels, and equipment by methods that comply with seismic and wind bracing criteria, which apply to the Site.
 - 2. **ALL CONTROL PANELS MUST BE PERMANENTLY MOUNTED AND TIED DOWN TO STRUCTURES IN ACCORDANCE WITH THE PROJECT SEISMIC CRITERIA.**
- 3.4 ERECTION, INSTALLATION, APPLICATION, CONSTRUCTION (NOT USED)
- 3.5 REPAIR/RESTORATION (NOT USED)
- 3.6 RE-INSTALLATION (NOT USED)
- 3.7 FIELD QUALITY CONTROL
 - A. Inspection:
 - 1. Provide any assistance necessary to support inspection activities.
 - 2. Engineer inspections may include, but are not limited to, the following:
 - 3. Inspect equipment and materials for physical damage.
 - 4. Inspect installation for compliance with the Drawings and Specifications.
 - 5. Inspect installation for obstructions and adequate clearances around equipment.
 - 6. Inspect equipment installation for proper leveling, alignment, anchorage, and assembly.
 - 7. Inspect equipment nameplate data to verify compliance with design requirements.
 - 8. Inspect raceway installation for quality workmanship and adequate support.
 - 9. Inspect cable terminations.
 - 10. Inspection activities conducted during construction do not satisfy inspection or testing requirements specified in the section for Field Electrical Acceptance Tests.
 - B. Workmanship:
 - 1. Leave wiring in panels, manholes, boxes, and other locations neat, clean, and organized:
 - 2. Neatly coil and label spare wiring lengths.
 - 3. Shorten, re-terminate, and re-label excessive used as well as spare wire and cable lengths, as determined by the Engineer.
- 3.8 ADJUSTING (NOT USED)
- 3.9 CLEANING
 - A. Remove all foreign material and restore all damaged finishes to the satisfaction of the Engineer and Owner.
 - B. Clean and vacuum all enclosures to remove all metal filings, surplus insulation and any visible dirt, dust or other matter before energization of the equipment or system start-up:
 - C. Use of compressors or air blowers for cleaning is not acceptable.
 - D. As specified in other sections of the Contract Documents.

3.10 PROTECTION

- A. Protect all Work from damage or degradation until Substantial Completion.
- B. Maintain all surfaces to be painted in a clean and smooth condition.

END OF SECTION

SECTION 26 06 00

GROUNDING AND BONDING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes: Grounding materials and requirements.

1.2 REFERENCES

- A. As specified in the Common Work Results for Electrical.
- B. ASTM International (ASTM):
 - 1. B3 - Standard Specification for Soft or Annealed Copper Wire.
 - 2. B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.
- C. Institute of Electrical and Electronics Engineers (IEEE):
 - 1. 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System.
- D. Underwriters Laboratories, Inc. (UL):
 - 1. 467 - Ground and Bonding Equipment.

1.3 DEFINITIONS

- A. As specified in the Common Work Results for Electrical section.

1.4 SUBMITTALS

- A. Furnish submittals as specified in the Submittal Procedures section and the Common Work Results for Electrical section.
- B. Product data:
 - 1. Catalog cut sheets.

1.5 QUALITY ASSURANCE

- A. As specified in the Common Work Results for Electrical section.
- B. All grounding components and materials shall be UL listed and labeled.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. As specified in the Common Work Results for Electrical section.

1.7 PROJECT/SITE CONDITIONS (NOT USED)

1.8 SEQUENCING (NOT USED)

1.9 SCHEDULING (NOT USED)

1.10 WARRANTY

A. As specified in the Common Work Results for Electrical.

1.11 SYSTEM START-UP

A. As specified in the Common Work Results for Electrical section.

1.12 OWNER'S INSTRUCTIONS (NOT USED)

1.13 MAINTENANCE (NOT USED)

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Exothermic connectors: One of the following or equal:

1. Erico.
2. Harger.
3. Burndy.
4. Thomas & Betts.

B. Ground rods: One of the following or equal:

1. Erico.
2. Harger.
3. Nehring.
4. Thomas & Betts.

C. Ground cable: One of the following or equal:

1. Erico.
2. Harger.
3. Nehring.
4. Southwire.

D. Precast ground well boxes: One of the following or equal:

1. Brooks Products, 3-RT Valve Box.
2. Christy Concrete Products, G12 Valve Box.

2.2 SYSTEM DESCRIPTION

A. Ground equipment and raceway systems so that the completed installation conforms to all applicable code requirements.

B. Provide a complete electrical grounding system as indicated on the Drawings and as specified including but not limited to:

1. Grounding electrodes.
2. Bonding jumpers.
3. Ground connections.

- C. Provide bonding jumpers and wire, grounding bushings, clamps and appurtenances required for complete grounding system to bond equipment and raceways to equipment grounding conductors.
- D. The ground system resistance (electrode to ground) of the completed installation, as determined by tests specified in Section 16950 - Field Electrical Acceptance Tests, shall be:
 - 1. 5 ohms or less for industrial systems.

2.3 EXISTING PRODUCTS (NOT USED)

2.4 MATERIALS

- A. Ground rod:
 - 1. Minimum: 3/4-inch diameter, 10 feet long.
 - 2. Uniform 10 mil covering of electrolytic copper metallically bonded to a rigid steel core:
 - a. The copper-to-steel bond shall be corrosion resistant.
 - 3. In accordance with UL 467.
 - 4. Sectional type joined by threaded copper alloy couplings.
 - 5. Fit the top of the rod with a threaded coupling and steel-driving stud.
- B. Ground cable:
 - 1. Requirements:
 - a. Soft drawn (annealed).
 - b. Concentric lay, coarse stranded in accordance with ASTM B8.
 - 2. Size is as indicated on the Drawings, but not less than required by the NEC.
- C. Exothermic welds:
 - 1. Current carrying capacity equal to that of the conductor.
 - 2. Permanent molecular bond that cannot loosen or corrode over time.
 - 3. Will not deteriorate with age.
 - 4. Use low emission welds for indoor installations.
- D. Equipment grounding conductors:
 - 1. Conductors shall be the same type and insulation as the load circuit conductors:
 - a. Use 600-volt insulation for the equipment grounding conductors for medium voltage systems.
 - 2. Minimum size in accordance with the NEC.
- E. Grounding electrode conductors:
 - 1. Minimum size in accordance with the NEC.
- F. Main bonding jumpers and bonding jumpers:
 - 1. Minimum size in accordance with the NEC.

2.5 MANUFACTURED UNITS (NOT USED)

2.6 EQUIPMENT (NOT USED)

2.7 COMPONENTS (NOT USED)

2.8 ACCESSORIES

2.9 MIXES (NOT USED)

2.10 FABRICATION (NOT USED)

2.11 FINISHES (NOT USED)

2.12 SOURCE QUALITY CONTROL (NOT USED)

PART 3 - EXECUTION

3.1 EXAMINATION (NOT USED)

3.2 PREPARATION (NOT USED)

3.3 INSTALLATION

- A. As specified in the Common Work Results for Electrical section.
- B. Provide a separate, green insulated, grounding conductor in each raceway independent of raceway material:
 - 1. Multi-conductor power and control cables shall include an integral green insulated grounding conductor.
 - 2. Provide a separate grounding conductor in each individual raceway for parallel feeders.
- C. Provide a separate grounding conductor for each motor and connect at motor terminal box. Do not use bolts securing motor box to frame or cover for grounding connectors:
 - 1. When grounding motors driven by variable frequency drives (VFD) comply with the requirements of the VFD manufacturer.
- D. Provide a grounding type bushing with lug for connection of grounding conductor for conduits that originate from each motor control center section, switchboard, or panelboard:
 - 1. Individually bond these raceways to the ground bus in the equipment.
- E. Provide grounding type bushings with lugs for connection of grounding conductor at both ends of metallic conduit runs. Bond ground bushings to the grounding system.
- F. Provide a green insulated wire-grounding jumper from the ground screw to a box grounding screw and, for grounding type devices, to equipment grounding conductor.
- G. Interconnect the secondary switchgear, switchboard, or panelboard neutral bus to the ground bus in the secondary switchgear, switchboard, or panelboard compartment, only at service entrance point or after a transformer.
- H. Duct bank ground system:
 - 1. Provide a bare copper grounding conductor the entire length of each duct bank.
 - 2. Bond duct bank ground conductors together where duct banks join, merge, intersect, or split.
- I. Grounding at service (600 V or Less):
 - 1. Connect the neutral to ground only at one point within the enclosure of the first disconnecting means on the load side of the service transformer.
- J. Ground connections:
 - 1. All connections to the ground grid system, the duct bank grounding system, equipment, ground rods, etc., shall be made using exothermic welds as indicated on the Drawings, UL listed, and labeled for the application.
 - 2. Make ground connections in accordance with the manufacturer's instructions.

- K. Grounding electrode system:
 - 1. Ground rods:
 - a. Locations as indicated on the Drawings.
 - b. Length of rods forming an individual ground array shall be equal in length.
 - c. Drive ground rods and install grounding conductors before construction of concrete slabs and duct banks.
 - 2. Metal frame of building or structure:
 - a. Bond metal frame of building or structure to grounding electrode system.
 - 3. Extend grounding conductors through concrete to accessible points for grounding equipment and electrical enclosures.
 - 4. Where grounding conductors are not concrete-encased or direct buried, install in Schedule 40 PVC conduit for protection.
 - 5. Install grounding system at each structure where switchgear, motor control centers, switchboards, panelboards, panels, or other electrical equipment are installed.
- 3.4 ERECTION, INSTALLATION, APPLICATION, CONSTRUCTION (NOT USED)
- 3.5 REPAIR/RESTORATION (NOT USED)
- 3.6 RE-INSTALLATION (NOT USED)
- 3.7 COMMISSIONING (NOT USED)
- 3.8 FIELD QUALITY CONTROL
 - A. As specified in the Common Work Results for Electrical section.
 - B. Measure grounding electrode system resistance to ground in accordance with IEEE 81.
- 3.9 ADJUSTING
 - A. Under the direction of the Engineer, add additional parallel connected ground rods and/or deeper driven rods until the ground resistance measurement meets the specified resistance requirements:
 - 1. Use of salts, water, or compounds to attain the specified ground resistance is not acceptable.
- 3.10 CLEANING (NOT USED)
- 3.11 PROTECTION
 - A. As specified in Section 26 05 00 - Common Work Results for Electrical.
- 3.12 SCHEDULES (NOT USED)

END OF SECTION

SECTION 26 12 30

600-VOLT OR LESS WIRES AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. 600 volt class or less wire and cable.

1.2 REFERENCES

- A. As specified in the Common Work Results for Electrical section.
- B. ASTM International (ASTM):
 - 1. B3 - Standard Specification for Soft or Annealed Copper Wire.
 - 2. B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.
- C. CSA International (CSA).
- D. Insulated Cable Engineers Association (ICEA):
 - 1. NEMA WC 70/ICEA S-95-658-1999 - Standard for Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy.
 - 2. NEMA WC 57/ICEA S-73-532 - Standard for Control, Thermocouple Extension, and Instrumentation Cables.
- E. National Fire Protection Association (NFPA):
 - 1. 72 - National Fire Alarm and Signaling Code.
 - 2. 101 - Life Safety Code.
- F. Telecommunications Industry Association/Electronics Industry Association (TIA/EIA):
 - 1. 568-C.2 - Balanced Twisted-Pair Telecommunication Cabling and Components Standard.
 - 2. 569-B – Commercial Building Standards for Telecommunications Pathways and Spaces.
 - 3. 1005 – Industrial Cabling Standard.
- G. Underwriter's Laboratories Inc., (UL):
 - 1. 44 - Thermoset-Insulated Wires and Cables.
 - 2. 1277 - Standard for Electrical Power and Control Tray Cables with Optional Optical-Fiber Members.
 - 3. 1424 - Standard for Cables for Power-Limited Fire-Alarm Circuits.
 - 4. 1569 - Standard for Metal-Clad Cables.
 - 5. 2196 - Standard for Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control, and Data Cables.
 - 6. 2225 - Standard for Cables and Cable-Fittings for Use in Hazardous (Classified) Locations.

1.3 DEFINITIONS

- A. As specified in the Common Work Results for Electrical section.

- B. Specific definitions and abbreviations:
 - 1. AWG: American wire gauge.
 - 2. BCCS: Bare copper-covered steel.
 - 3. CPE: Chlorinated polyethylene.
 - 4. FEP: Fluorinated ethylene propylene.
 - 5. FHDPE: Foam high-density polyethylene.
 - 6. FPE: Foam polyethylene.
 - 7. OD: Outside diameter.
 - 8. PVC: Polyvinyl chloride.
 - 9. XHHW: Cross-linked high heat water resistant insulated wire.

- C. Definitions of terms and other electrical considerations as set forth in the:
 - 1. ASTM.
 - 2. ICEA.

1.4 SYSTEM DESCRIPTION

- A. Furnish and install the complete wire and cable system.

1.5 SUBMITTALS

- A. Furnish submittals as specified in the Common Work Results for Electrical section.

- B. Product data:
 - 1. Manufacturer of wire and cable.
 - 2. Insulation:
 - a. Type.
 - b. Voltage class.
 - 3. AWG size.
 - 4. Conductor material.
 - 5. Pulling compounds.

- C. Shop drawings:
 - 1. Show splice locations.
 - a. For each proposed splice location provide written justification describing why the splice is necessary.

- D. Test reports:
 - 1. Submit test reports for meg-ohm tests.

- E. Calculations:
 - 1. Submit cable pulling calculations to the Engineer for review and comment for all cables that will be installed using mechanical pulling equipment. Show that the maximum cable tension and sidewall pressure will not exceed manufacturer recommended values:
 - a. Provide a table showing the manufacturer's recommended maximum cable tension and sidewall pressure for each cable type and size included in the calculations.
 - b. Submit the calculations to the Engineer a minimum of 2 weeks before conduit installation.

1.6 QUALITY ASSURANCE

- A. As specified in the Common Work Results for Electrical section.

- B. All wires and cables shall be UL listed and labeled.
- 1.7 DELIVERY, STORAGE, AND HANDLING
 - A. As specified in the Common Work Results for Electrical section.
- 1.8 PROJECT OR SITE CONDITIONS (NOT USED)
- 1.9 SEQUENCING (NOT USED)
- 1.10 SCHEDULING (NOT USED)
- 1.11 WARRANTY
 - A. As specified in the Common Work Results for Electrical section.
- 1.12 SYSTEM START-UP
 - A. As specified in the Common Work Results for Electrical section.
- 1.13 OWNER'S INSTRUCTIONS (NOT USED)
- 1.14 MAINTENANCE (NOT USED)

PART 2 - PRODUCTS

- 2.1 MANUFACTURERS
 - A. One of the following or equal:
 - 1. 600 volt class wire and cable:
 - a. General Cable.
 - b. Okonite Co.
 - c. Southwire Co.
 - d. Service Wire.
- 2.2 EXISTING PRODUCTS (NOT USED)
- 2.3 MATERIALS
 - A. Conductors:
 - 1. Copper in accordance with ASTM B3.
- 2.4 MANUFACTURED UNITS
 - A. General:
 - 1. Provide new wires and cables manufactured within 1 year of the date of delivery to the Site.
 - 2. Permanently mark each wire and cable with the following at 24-inch intervals:
 - a. AWG size.
 - b. Voltage rating.
 - c. Insulation type.
 - d. UL symbol.
 - e. Month and year of manufacture.

- f. Manufacturer's name.
 - 3. Identify and mark wire and cable as specified in the Identification for Electrical Systems section:
 - a. Use integral color insulation for #2 AWG and smaller wire.
 - b. Wrap colored tape around cable larger than #2 AWG.
 - B. 600 volt class wire and cable:
 - 1. Provide AWG or kcmil sizes as indicated on the Drawings:
 - a. When not indicated on the Drawings, size wire as follows:
 - 1) In accordance with the NEC:
 - a) Use 75 degree Celsius ampacity ratings.
 - b) Ampacity rating after all derating factors, equal to or greater than rating of the overcurrent device.
 - 2) Provide #12 AWG minimum for power conductors.
 - 3) Provide #14 AWG minimum for control conductors.
 - 2. Provide Class B stranding in accordance with ASTM B8:
 - a. Provide Class C stranding where extra flexibility is required.
 - 3. Insulation:
 - a. XHHW-2.
 - b. 90 degree Celsius rating.
- 2.5 EQUIPMENT (NOT USED)
- 2.6 COMPONENTS (NOT USED)
- 2.7 ACCESSORIES
- A. Wire ties:
 - 1. One of the following or equal:
 - a. T&B, "Ty-Rap" cable ties.
 - b. Panduit, cable ties.
 - B. Wire markers:
 - 1. As specified in the Identification for Electrical Systems section.
- 2.8 MIXES (NOT USED)
- 2.9 FABRICATION (NOT USED)
- 2.10 FINISHES (NOT USED)
- 2.11 SOURCE QUALITY CONTROL
- A. Assembly and testing of cable shall comply with the applicable requirements of ICEA S-95-658-1999.
 - B. Test Type XHHW-2 in accordance with the requirements of UL 44.

PART 3 EXECUTION

3.1 EXAMINATION (NOT USED)

3.2 PREPARATION (NOT USED)

3.3 INSTALLATION

- A. As specified in the Common Work Results for Electrical section.
- B. Color-coding:
 - 1. Color-coding shall be consistent throughout the facility.
 - 2. The following color code shall be followed for all 240/120 volt and 208/120 volt systems:
 - a. Phase A: Black.
 - b. Phase B: Red.
 - c. Phase C: Blue.
 - d. Single phase system: Black for 1 hot leg, red for the other.
 - e. Neutral: White.
 - f. High phase or wild leg: Orange.
 - g. Equipment ground: Green.
 - 3. The following color code shall be followed for all 480/277 volt systems:
 - a. Phase A: Brown.
 - b. Phase B: Orange.
 - c. Phase C: Yellow.
 - d. Neutral: Gray.
 - e. Equipment ground: Green.
 - 4. The following color code shall be followed for all 120 VAC control wiring:
 - a. Power: Red.
 - b. Neutral: White.
 - 5. The following color code shall be followed for all general purpose DC control circuits:
 - a. Grounded conductors: White with blue stripe.
 - b. Ungrounded conductors: Blue.
 - 6. Switch legs shall be violet. 3-way switch runners shall be pink.
 - 7. Wires in intrinsically safe circuits shall be light blue.
 - 8. Wire colors shall be implemented in the following methods:
 - a. Wires manufactured of the desired color.
 - b. Continuously spiral wrap the first 6 inches of the wire from the termination point with colored tape:
 - 1) Colored tape shall be wrapped to overlap 1/2 of the width of the tape.
- C. Install conductors only after the conduit installation is complete, and all enclosures have been vacuumed clean, and the affected conduits have been swabbed clean and dry:
 - 1. Install wires only in approved raceways.
 - 2. Do not install wire:
 - a. In incomplete conduit runs.
 - b. Until after the concrete work and plastering is completed.
- D. Properly coat wires and cables with pulling compound before pulling into conduits:
 - 1. For all #4 AWG and larger, use an approved wire-pulling lubricant while cable is being installed in conduit:
 - a. Ideal Products.
 - b. Polywater Products.

- c. 3M Products.
 - d. Greenlee Products.
 - e. Or equal as recommended by cable manufacturer.
 - f. Do not use oil, grease, or similar substances.
- E. Cable pulling:
- 1. Prevent mechanical damage to conductors during installation.
 - 2. For cables #1 AWG and smaller, install cables by hand.
 - 3. For cables larger than #1 AWG, power pulling winches may be used if they have cable tension monitoring equipment.
 - 4. Provide documentation that maximum cable pulling tension was no more than 75 percent of the maximum recommended level as published by the cable manufacturer. If exceeded, the Engineer may, at his discretion, require replacement of the cable.
 - 5. Ensure cable pulling crews have all calculations and cable pulling limitations while pulling cable.
 - 6. Make splices or add a junction box or pullbox where required to prevent cable pulling tension or sidewall pressure from exceeding 75 percent of manufacturer's recommendation for the specified cable size:
 - a. Make splices in manholes or pull boxes only.
 - b. Leave sufficient slack to make proper connections.
- F. Use smooth-rolling sheaves and rollers when pulling cable into cable tray to keep pulling tension and bending radius within manufacturer's recommendations.
- G. Install and terminate all wire in accordance with manufacturer's recommendations.
- H. Neatly arrange and lace conductors in all switchboards, panelboards, pull boxes, and terminal cabinets by means of wire ties:
- 1. Do not lace wires in gutter or panel channel.
 - 2. Install all wire ties with a flush cutting wire tie installation tool:
 - a. Use a tool with an adjustable tension setting.
 - 3. Do not leave sharp edges on wire ties.
- I. Terminate stranded conductors on equipment box lugs such that all conductor strands are confined within the lug:
- 1. Use ring type lugs if box lugs are not available on the equipment.
- J. Lighting circuits:
- 1. Each circuit shall have a dedicated neutral.
- K. Splices:
- 1. Provide continuous circuits from origin to termination whenever possible:
 - a. Obtain Engineer's approval prior to making any splices.
 - 2. Lighting and receptacle circuit conductors may be spliced without prior approval from the Engineer.
 - 3. Where splices are necessary because of extremely long wire or cable lengths that exceed standard manufactured lengths:
 - a. Splice box NEMA rating requirements as specified in the Common Work Results for Electrical section.
 - b. Make splices in labeled junction boxes for power conductors.
 - c. Make splices for control and instrument conductors in terminal boxes:
 - 1) Provide terminal boards with setscrew pressure connectors, with spade or ring lug connectors.

4. Power and control conductors routed in common raceways may be spliced in common junction boxes.
 5. Clearly label junction and terminal boxes containing splices with the word "SPlice LOCATED WITHIN".
 6. Leave sufficient slack at junction boxes and termination boxes to make proper splices and connections. Do not pull splices into conduits.
 7. Install splices with compression type butt splices and insulate using a heat-shrink sleeve:
 - a. In NEMA Type 4 or NEMA Type 4X areas, provide heat-shrink sleeves that are listed for submersible applications.
 8. Splices in below grade pull boxes, in any box subject to flooding, and in wet areas shall be made waterproof using:
 - a. A heat shrink insulating system listed for submersible applications.
 - b. Or an epoxy resin splicing kit.
- L. Apply wire markers to all wires at each end after being installed in the conduit and before meg-ohm testing and termination.
- M. Wiring allowances:
1. Equipment locations may vary slightly from the drawings. Include an allowance for necessary conductors and terminations for motorized equipment, electrical outlets, fixtures, communication outlets, instruments, and devices within 10 linear feet of locations indicated on the Drawings.
 2. Locations for pull boxes, manholes, and duct banks may vary slightly from the drawings. Include an allowance for necessary conductors and related materials to provide conductors to all pull boxes, manholes and duct banks within 20 linear feet of locations indicated on the Drawings.
- 3.4 ERECTION, INSTALLATION, APPLICATION, CONSTRUCTION (NOT USED)
- 3.5 REPAIR/RESTORATION (NOT USED)
- 3.6 RE-INSTALLATION (NOT USED)
- 3.7 COMMISSIONING
- 3.8 FIELD QUALITY CONTROL
- A. As specified in the Common Work Results for Electrical section.
- B. Grounding:
1. As specified in the Grounding and Bonding section.
- 3.9 ADJUSTING (NOT USED)
- 3.10 CLEANING (NOT USED)
- 3.11 PROTECTION
- A. As specified in the Common Work Results for Electrical section.
- 3.12 SCHEDULES (NOT USED)

END OF SECTION

SECTION 26 13 00

CONDUITS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Metallic conduits.
 - 2. Nonmetallic conduits.
 - 3. Conduit bodies.
 - 4. Conduit fittings and accessories.
 - 5. Conduit installation.

1.2 REFERENCES

- A. As specified in the Common Work Results for Electrical section.
- B. American National Standards Institute (ANSI):
 - 1. C80.1 - Electrical Rigid Steel Conduit.
 - 2. C80.3 - Steel Electrical Metallic Tubing.
 - 3. C80.5 - Electrical Rigid Aluminum Conduit.
 - 4. C80.6 - Electrical Intermediate Metal Conduit.
- C. National Electrical Manufacturer's Association (NEMA):
 - 1. RN-1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Steel Conduit.
 - 2. TC2 - Electrical Polyvinyl Chloride (PVC) Conduit.
 - 3. TC3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing.
 - 4. TC7 - Smooth-Wall Coilable Electrical Polyethylene Conduit.
 - 5. TC13 - Electrical Nonmetallic Tubing.
 - 6. TC14 - Reinforced Thermosetting Resin Conduit (RTRC) and Fittings.
- D. Underwriters Laboratories (UL):
 - 1. 1 - Standard for Flexible Metal Conduit.
 - 2. 6 - Standard for Electrical Rigid Metal Conduit - Steel.
 - 3. 6A - Standard for Electrical Rigid Metal Conduit - Aluminum, Red Brass, and Stainless Steel.
 - 4. 360 - Standard for Liquidtight Flexible Steel Conduit.
 - 5. 651 - Standard for Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings.
 - 6. 651B - Standard for Continuous Length HDPE Conduit.
 - 7. 797 - Standard for Electrical Metallic Tubing - Steel.
 - 8. 1242 - Standard for Electrical Intermediate Metal Conduit - Steel.
 - 9. 1653 - Standard for Electrical Nonmetallic Tubing.
 - 10. 1660 - Standard for Liquidtight Flexible Nonmetallic Conduit.
 - 11. 1684 - Standard for Reinforced Thermosetting Resin Conduit (RTRC) and Fittings.

1.3 DEFINITIONS

- A. As specified in the Common Work Results for Electrical section.

- B. Specific definitions and abbreviations:
 - 1. Conduit bodies: A separate portion of a conduit system that provides access through a removable cover to the interior of the system at a junction of 2 or more conduit sections. Includes, but not limited to, Shapes C, E, LB, T, X, etc.
 - 2. Conduit fitting: An accessory that primarily serves a mechanical purpose. Includes, but not limited to, bushings, locknuts, hubs, couplings, reducers, etc.
 - 3. GRC: Galvanized rigid steel conduit.
 - 4. PCS: Polyvinyl chloride (PVC) coated rigid steel conduit.
 - 5. EMT: Electrical metallic tubing.
 - 6. PVC: Polyvinyl chloride rigid nonmetallic conduit.
 - 7. SLT: Sealtight-liquidtight flexible conduit.
 - 8. EFLX: Explosion proof flexible conduit.
 - 9. RAC: Rigid aluminum conduit.
 - 10. NPT: National pipe thread.

1.4 SUBMITTALS

- A. Furnish submittals as specified in the Common Work Results for Electrical section.
- B. Product data:
 - 1. Furnish complete manufacturer's catalog sheets for every type and size of conduit, fitting, conduit body, and accessories to be used on the Project.
 - 2. Furnish complete manufacturer's recommended special tools to be used for installation if required.
- C. Certifications:
 - 1. Furnish PVC-coated conduit manufacturer's certification for each installer.
- D. Record Documents:
 - 1. Incorporate all changes in conduit routing on electrical plan drawings.
 - 2. Dimension underground and concealed conduits from building lines.
 - 3. Furnish hard copy drawings.

1.5 QUALITY ASSURANCE

- A. As specified in the Common Work Results for Electrical section.
- B. All conduits, conduit bodies, and fittings shall be UL listed and labeled.
- C. Every installer of PVC-coated metallic conduit shall be certified by the manufacturer for installation of the conduit.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. As specified in the Common Work Results for Electrical section.
- B. Do not expose non-metallic conduit to direct sunlight.
- C. Do not store conduit in direct contact with the ground.
- D. Do not store aluminum conduit in contact with concrete.

1.7 PROJECT OR SITE CONDITIONS

- A. As specified in the Common Work Results for Electrical section.

1.8 SEQUENCING

- A. Before installing any conduit or locating any device box:
 - 1. Examine the complete set of Drawings and Specifications, and all applicable shop drawings.
 - 2. Verify all dimensions and space requirements and make any minor adjustments to the conduit system as required to avoid conflicts with the building structure, other equipment, or the work of other trades.

1.9 SCHEDULING (NOT USED)

1.10 WARRANTY

- A. As specified in the Common Work Results for Electrical section.

1.11 SYSTEM START-UP

- A. As specified in the Common Work Results for Electrical section.

1.12 OWNER'S INSTRUCTIONS (NOT USED)

1.13 MAINTENANCE (NOT USED)

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Galvanized rigid steel conduit:
 - 1. One of the following or equal:
 - a. Western Tube and Conduit.
 - b. Allied Tube and Conduit.
 - c. Wheatland Tube Co.
- B. PVC-coated rigid steel conduit:
 - 1. One of the following or equal:
 - a. Robroy Ind.
 - b. Ocal, Inc.
 - c. Calbond.
 - d. Allied.
 - e. NEC, Inc. BlackGuard.
- C. Sealtight-liquidtight flexible conduit:
 - 1. One of the following or equal:
 - a. Southwire.
 - b. AFC Cable Systems.
 - c. Electri-Flex Co.
 - d. Anaconda.
- D. Conduit bodies:
 - 1. One of the following or equal:
 - a. Crouse-Hinds.
 - b. Appleton.
 - c. O-Z/Gedney.
 - d. Ocal, Inc.
 - e. Robroy Ind.

- f. Calbond.
- g. Carlon.

2.2 SYSTEM DESCRIPTION

- A. Provide conduits, conduit bodies, fittings, junction boxes, and all necessary components, whether or not indicated on the Drawings, as required, to install a complete electrical raceway system.

2.3 EXISTING PRODUCTS (NOT USED)

2.4 MATERIALS (NOT USED)

2.5 MANUFACTURED UNITS (NOT USED)

2.6 EQUIPMENT (NOT USED)

2.7 COMPONENTS

A. GRC:

1. All threads: NPT standard conduit threads with a 3/4-inch taper per foot:
 - a. Running conduit threads are not acceptable.
2. Hot-dip galvanized inside and out:
 - a. Ensures complete coverage and heats the zinc and steel to a temperature that ensures the zinc alloys with the steel over the entire surface.
 - b. Electro-galvanizing is not acceptable.
3. Manufactured in accordance with:
 - a. UL-6.
 - b. ANSI C80.1.

B. PCS:

1. The steel conduit, before PVC coating, shall be new, unused, hot-dip galvanized material, conforming to the requirements for Type GRC.
2. Coated conduit NEMA Standard RN-1:
 - a. The galvanized coating may not be disturbed or reduced in thickness during the cleaning and preparatory process.
3. Factory-bonded PVC jacket:
 - a. The exterior galvanized surfaces shall be coated with primer before PVC coating to ensure a bond between the zinc substrate and the PVC coating.
 - b. Nominal thickness of the exterior PVC coating shall be 0.040 inch except where part configuration or application of the piece dictates otherwise.
 - c. PVC coating on conduits and associated fittings shall have no sags, blisters, lumps, or other surface defects and shall be free of holes and holidays.
 - d. The PVC adhesive bond on conduits and fittings shall be greater than the tensile strength of the PVC plastic coating:
 - 1) Confirm bond with certified test results.
4. A urethane coating shall be uniformly and consistently applied to the interior of all conduits and fittings:
 - a. Nominal thickness of 0.002 inch.
 - b. Conduits having areas with thin or no coating are not acceptable.
 - c. All threads shall be coated with urethane.
5. The PVC exterior and urethane interior coatings applied to the conduits shall afford sufficient flexibility to permit field bending without cracking or flaking at temperature above 30 degrees Fahrenheit (-1 degree Celsius).
6. PCS conduit bodies and fittings:

- a. Malleable iron.
 - b. The conduit body, before PVC coating, shall be new, unused material and shall conform to appropriate UL standards.
 - c. The PVC coating on the outside of conduit bodies shall be 0.040-inch thick and have a series of ribs to protect the coating from tool damage during installation.
 - d. 0.002-inch interior urethane coating.
 - e. Utilize the PVC coating as an integral part of the gasket design.
 - f. Stainless steel cover screw heads shall be encapsulated with plastic to ensure corrosion protection.
 - g. A PVC sleeve extending 1 conduit diameter or 2 inches, whichever is less, shall be formed at each female conduit opening.
 - 1) The inside diameter of the sleeve shall be the same as the outside diameter of the conduit to be used.
 - 2) The sleeve shall provide a vapor- and moisture resistant seal at every connection.
- C. SLT:
- 1. Temperature rated for use in the ambient temperature at the installed location but not less than the following:
 - a. General purpose:
 - 1) Temperature range: -20 degrees Celsius to +80 degrees Celsius.
 - b. Oil-resistant:
 - 1) Temperature range: -20 degrees Celsius to +60 degrees Celsius.
 - 2. Sunlight-resistant, weatherproof, and watertight.
 - 3. Manufactured from single strip steel, hot-dip galvanized on all 4 sides before conduit fabrication.
 - 4. Strip steel spiral wound resulting in an interior that is smooth and clean for easy wire pulling.
 - 5. Overall PVC jacket.
 - 6. With integral copper ground wire, built in the core, in conduit trade sizes 1/2 inch through 1-1/4 inch.
- D. PVC:
- 1. Extruded from virgin PVC compound:
 - a. Schedule 40 unless otherwise specified.
 - b. Schedule 80 extra-heavy wall where specified.
 - 2. Rated for 90 degrees Celsius conductors or cable.
 - 3. Rated for use in direct sunlight.
- E. Conduit bodies:
- 1. Material consistent with conduit type:
 - a. Malleable iron bodies and covers when used with Type GRC.
 - b. Cast aluminum bodies and covers when used with Type RAC.
 - c. PVC bodies and covers when used with Type PVC.
 - d. PVC-coated malleable iron bodies and covers when used with Type PCS.
 - 2. Conduit bodies to conform to Form 8, Mark 9, or Mogul design:
 - a. Mogul design conforming to NEC requirements for bending space for large conductors for conduit trade sizes of 1 inch and larger with conductors #4 AWG and larger, or where required for wire-bending space.
 - 3. Gasketed covers attached to bodies with stainless steel screws secured to threaded holes in conduit body.

2.8 ACCESSORIES

- A. Connectors and fittings:
 - 1. Manufactured with compatible materials to the corresponding conduit.
- B. Insulated throat metallic bushings:
 - 1. Construction:
 - a. Malleable iron or zinc-plated steel when used with steel conduit.
 - b. Aluminum when used with aluminum conduit.
 - c. Positive metallic conduit end stop.
 - d. Integrally molded non-combustible phenolic-insulated surfaces rated at 150 degrees Celsius.
 - e. Use fully insulated bushings on nonmetallic conduit system made of high-impact 150 degrees Celsius rated non-combustible thermosetting phenolic.
- C. Insulated grounding bushings:
 - 1. Construction:
 - a. Malleable iron or steel, zinc-plated, with a positive metallic end stop.
 - b. Integrally molded non-combustible phenolic-insulated surfaces rated at 150 degrees Celsius.
 - c. Tin-plated copper grounding saddle for use with copper or aluminum conductors.
- D. Electrical unions (Erickson Couplings):
 - 1. Construction:
 - a. Malleable iron for use with steel conduit.
 - b. Aluminum for use with aluminum conduit.
 - c. Concrete tight, 3-piece construction.
 - d. Rated for Class I Division 1 Group D in hazardous areas.
- E. SLT fittings:
 - 1. Construction:
 - a. Malleable iron.
 - b. Furnished with locknut and sealing ring.
 - c. Liquidtight, raintight, oiltight.
 - d. Insulated throat.
 - e. Furnish as straight, 45-degree elbows, and 90-degree elbows.
 - f. Designed to prevent sleeving:
 - 1) Verify complete bonding of the raceway jacket to the plastic gasket seal.
 - g. Equipped with grounding device to provide ground continuity irrespective of raceway core construction. Grounding device, if inserted into raceway and directly in contact with conductors, shall have rolled-over edges for sizes under 5 inches.
 - h. Where terminated into a threadless opening using a threaded hub fitting, a suitable moisture-resistant/oil-resistant synthetic rubber gasket shall be provided between the outside of the box or enclosure and the fitting shoulder. Gasket shall be adequately protected by and permanently bonded to a metallic retainer.
 - 2. Corrosion-resistant and outdoor SLT fittings:
 - a. Construction:
 - 1) PVC-coated liquidtight fittings with a bonded 0.040-inch thick PVC coating on the metal connector to form a seal around the SLT conduit.
 - 2) Insulated throat and an integral sealing ring.
- F. Hubs for threaded attachment of steel conduit to sheet metal enclosures:
 - 1. Construction:
 - a. Insulated throat.
 - b. PVC-coated when used in corrosive areas.

- c. Bonding locknut.
 - d. Recessed neoprene o-ring to ensure watertight and dusttight connector.
 - e. 1/2-inch through 1-1/4-inch steel zinc electroplated.
 - f. 1-1/2-inch through 6-inch malleable iron zinc plated.
 - g. Aluminum with aluminum conduit.
 - 2. Usage:
 - a. All conduits in damp, wet, outdoor, and corrosive areas shall use threaded hubs for connections to sheet metal enclosures.
- G. Sealing fittings:
- 1. Construction:
 - a. 40-percent wire fill capacity.
 - b. PVC-coated when used in corrosive areas.
 - c. Malleable ductile iron with steel conduit.
 - d. Aluminum with aluminum conduit.
 - e. Type EYDX where drains are required.
 - f. Type EYSX where drains are not required.
 - g. UL listed for use in Class I, Division 1, Groups A, B, C, D; Class I, Division 2, Groups A, B, C, D; and Class II, Divisions 1 and 2, Groups E, F, and G.
 - 2. Sealing compound:
 - a. Fiber filler and cement as recommended by the sealing fitting manufacturer.
 - b. Approved for the conditions and use.
 - 1) Not affected by surrounding atmosphere or liquids.
 - c. Melting point shall be 200 degrees Fahrenheit minimum.
- H. PVC fittings:
- 1. Materials:
 - a. All devices shall be made of PVC, using the same materials as used for Type PVC conduit.
 - b. All metal hardware shall be stainless steel.
- I. Conduit markers:
- 1. As specified in the Identification for Electrical Systems section.

2.9 MIXES (NOT USED)

2.10 FABRICATION (NOT USED)

2.11 FINISHES (NOT USED)

2.12 SOURCE QUALITY CONTROL

- A. As specified in the Common Work Results for Electrical section.

PART 3 EXECUTION

3.1 EXAMINATION (NOT USED)

3.2 PREPARATION (NOT USED)

3.3 INSTALLATION

- A. As specified in the Common Work Results for Electrical section.

- B. General:
1. Conduit routing:
 - a. The electrical drawings are diagrammatic in nature:
 - 1) Install conduit runs as specified with schematic representation indicated on the Drawings and as specified.
 - 2) Modify conduit runs to suit field conditions, as accepted by the Engineer:
 - a) Make changes in conduit locations that are consistent with the design intent but are dimensionally different, or routing to bypass obstructions.
 - b) Make changes in conduit routing due to the relocation of equipment.
 - 3) The electrical drawings do not indicate all required junction boxes and pull boxes:
 - a) Provide junction boxes and pull boxes to facilitate wire pulling as required:
 - (1) To meet cable manufacturer's pulling tension requirements.
 - (2) To limit total conduit bends between pull locations.
 - b) Install junction boxes and pull boxes at locations acceptable to the Engineer.
 - b. The Contractor is responsible for any deviations in general location, conduit size, routing, or changes to the conduit schedule without the express written approval or direction by the Engineer:
 - 1) The Engineer is the sole source in determining whether the change is constituted as a deviation:
 - 2) Perform any changes resulting in additional conduits, or extra work from such deviations.
 - 3) Incorporate any deviations on the Record Documents.
 2. Use only tools recommended by the conduit manufacturer for assembling the conduit system.
 3. Provide adequate clearances from high-temperature surfaces for all conduit runs. Provide minimum clearances as follows:
 - a. Clearance of 6 inches from surfaces 113 degrees Fahrenheit to 149 degrees Fahrenheit.
 - b. Clearance of 12 inches from surfaces greater than 149 degrees Fahrenheit.
 - c. Keep conduits at least 6 inches from the coverings on hot water and steam pipes, 18 inches from the coverings on flues and breechings, and 12 inches from fuel lines and gas lines.
 - d. Where it is necessary to route conduits close to high-temperature surfaces, provide a high-reflectance thermal barrier between the conduit and the surface.
 4. Support conduit runs on water-bearing walls a minimum of 7/8-inch away from wall on an accepted preformed channel:
 - a. Do not run conduits within water-bearing walls unless otherwise indicated on the Drawings.
 5. Do not install 1-inch or larger conduits in or through structural members unless approved by the Engineer.
 6. Run conduits exposed to view parallel with or at right angles to structural members, walls, or lines of the building:
 - a. Install straight and true conduit runs with uniform and symmetrical elbows, offsets, and bends.
 - b. Make changes in direction with long radius bends or with conduit bodies.
 7. Install conduits with total conduit bends between pull locations less than or equal to 270 degrees.
 8. Route all exposed conduits to preserve headroom, access space and work space, and to prevent tripping hazards and clearance problems:
 - a. Install conduit runs so that runs do not interfere with proper and safe operation of equipment and do not block or interfere with ingress or egress, including equipment-removal hatches.

- b. Route conduits to avoid drains or other gravity lines. Where conflicts occur, relocate the conduit as required.
 - 9. When installing conduits through existing slabs or walls, make provisions for locating any possible conflicting items where the conduit is to penetrate. Use tone signal or X-ray methods to make certain that no penetrations will be made into the existing conduits, piping, cables, post-tensioning cables, etc.
 - 10. Plug conduits brought into pull boxes, manholes, handholes, and other openings until used to prevent entrance of moisture.
 - 11. Install conduits through wall and floor seals where indicated on the Drawings.
 - 12. For existing and new 2-inch and larger conduit runs, snake conduits with a conduit cleaner equipped with a cylindrical mandrel of a diameter not less than 85 percent of nominal diameter of the conduit:
 - a. Remove and replace conduits through which mandrel will not pass.
 - 13. Provide all sleeves and openings required for the passage of electrical raceways or cables even when these openings or sleeves are not specifically indicated on the Drawings.
 - 14. Install complete conduit systems before conductors are installed.
 - 15. Provide metallic conduits terminating in transformer, switchgear, motor control center, or other equipment conduit windows with grounding bushings and ground with a minimum No. 6 AWG ground wire.
 - 16. Underground conduits:
 - a. Install underground conduits, including conduit runs below slabs-on-grade in concrete-reinforced duct bank construction:
 - 1) As specified in the Duct Banks section.
 - b. Make underground conduit size transitions at handholes and manholes.
 - c. Install spare conduits in underground duct banks towards top center of runs to allow for ease of installation of future cables as conduits enter underground manholes and handholes.
 - d. Seal around conduit penetrations of below grade walls with a mechanical seal.
- C. Lighting and receptacle conduits:
 - 1. Provide conduit runs for lighting and receptacle circuits, whether or not indicated on the Drawings:
 - 2. Install conduits in accordance with the requirements of this Section unless otherwise indicated.
 - 3. Minimum conduit size:
 - a. 3/4-inch for exposed conduits.
 - b. 1-inch for underground or in-slab conduits.
 - 4. Provide conduit materials for the installed location as specified in the Common Work Results for Electrical section.
- D. Conduit usage:
 - 1. Exposed conduits:
 - a. Rigid conduit:
 - 1) Install the rigid conduit type for each location as specified in the Common Work Results for Electrical section.
 - 2) Minimum size: 3/4-inch.
 - b. Flexible conduit:
 - 1) Use flexible conduit for final connections between rigid conduit and motors, vibrating equipment, instruments, control equipment, or where required for equipment servicing:
 - a) Use Type SLT with rigid metallic conduit.
 - b) Use Type EFLX in Class I Division 1 locations.
 - 2) Minimum size: 3/4-inch:
 - a) 1/2 when required for connection to instruments.

- 3) Maximum length:
 a) Fixed equipment:

Conduit Trade Size	Flexible Conduit Length (inch)
3/4	18
1	18
1-1/4	18
1-1/2	18
2	36
2-1/2	36
3	36
3-1/2	38
4	40

- b) Removable instruments or hinged equipment:

(1) As required to allow complete removal or full movement without disconnecting or stressing the conduit.

2. Concrete-encased and embedded conduits:
 - a. Straight runs and bends less than 45 degrees:
 - 1) Type PVC Schedule 40.
 - b. Bends with total deflection greater than 45 degrees;
 - 1) PCS,
 - c. Entering and exiting duct bank, underground or embedded conduit runs a minimum 12 inches above and below grade, finished floor, or entering equipment:
 - 1) PCS.
 - d. Minimum size:
 - 1) 2-inch in duct banks.
 - 2) 1-inch for in-slab conduits.
 - 3) Provide conduit fittings to enlarge the conduit from the exposed size in the conduit schedule as required.
3. Direct-buried and sand-bedded duct bank conduits:
 - a. Type PCS.
 - b. Minimum size: 1-inch.
4. Below-slab conduits:
 - a. Type PCS.
 - b. Minimum size: 1-inch.
5. PVC-coated rigid metallic conduit:
 - a. Use specifically manufactured or machined threading dies to manufacturer's specifications to accommodate the PVC jacket.
6. GRC:
 - a. Conduit shall be cut square and reamed before threading.

E. Conduit joints and bends:

1. General:
 - a. Where conduit is underground, under slabs on grade, exposed to the weather, or in NEMA Type 4 or NEMA Type 4X locations, make joints liquidtight.
 - b. Keep bends and offsets in conduit runs to an absolute minimum.
 - c. All bends shall be symmetrical.
 - d. The following conduit systems shall use large-radius sweep elbows:
 - 1) Underground conduits.

- 2) Conduits containing fiber optic cables.
 - e. Provide large-radius factory-made bends for 1-1/4-inch trade size or larger.
 - f. Make field bends with a radius of not less than the requirements found in the NEC:
 - 1) The minimum bending radius of the cable must be less than the radius of the conduit bend.
 - 2) Make all field bends with power bending equipment or manual benders specifically intended for the purpose:
 - a) Make bends so that the conduit is not damaged and the internal diameter is not effectively reduced.
 - b) For the serving utilities, make bends to meet their requirements.
 - g. Replace all deformed, flattened, or kinked conduit.
 - 2. Threaded conduit:
 - a. Cut threads on rigid metallic conduit with a standard conduit-cutting die that provides a 3/4-inch per foot taper and to a length such that all bare metal exposed by the threading operation is completely covered by the couplings or fittings used. In addition, cut the lengths of the thread such that all joints become secure and wrench-tight just preceding the point where the conduit ends would butt together in couplings or where conduit ends would butt into the ends or shoulders of other fittings.
 - b. Thoroughly ream conduit after threads have been cut to remove burrs.
 - c. Use bushings or conduit fittings at conduit terminations.
 - d. On exposed conduits, repair scratches and other defects with galvanizing repair stick, Enterprise Galvanizing "Galvabar™," or CRC "Zinc It."
 - e. Coat conduit threads with an approved electrically conductive sealant and corrosion inhibitor that is not harmful to the conductor insulation:
 - 1) Apply to the male threads and tighten joints securely.
 - 2) Clean excess sealant from exposed threads after assembly.
 - f. Securely tighten all threaded connections.
 - g. Any exposed threaded surfaces must be cleaned and coated with a galvanizing solution so that all exposed surfaces have a galvanized protective coating.
 - 3. PVC:
 - a. Use approved solvent-weld cement specifically manufactured for the purpose. Spray-type cement is not allowed.
 - b. Apply heat for bends so that conduit does not distort or discolor. Use a spring mandrel as required to ensure full inside diameter at all bends:
 - 1) Utilize a heater specifically for PVC conduit as recommended by the conduit manufacturer.
- F. Conduit sealing and drainage:
- 1. Conduit drainage and sealing other than required for hazardous and classified areas:
 - a. Provide sealing and drainage in vertical drops of long (in excess of 20 feet), exterior, above-grade conduit runs at the points at which the conduit enters buildings, switchgear, control panels, lighting panelboards, and other similar enclosures.
 - b. Provide seal fittings with drains in vertical drops directly above grade for exterior and above-grade conduit runs that are extended below grade.
 - c. Provide conduit seals with drains in areas of high humidity and rapidly changing temperatures:
 - 1) Where portions of an interior raceway pass through walls, ceilings, or floors that separate adjacent areas having widely different temperatures.
 - d. Provide conduit seals similar to O-Z/Gedney (Type CSM) on all conduits between corrosive and non-corrosive areas.
 - e. Seal one end only of all underground conduits at highest point with O-Z/Gedney sealing (non-hazardous) filling, or equal.

2. Install seals with drains at any location along conduit runs where moisture may condense or accumulate. This requirement includes, but is not limited to, the following locations: control panels, junction boxes, pullboxes, or low points of the conduit.

G. Miscellaneous:

1. Provide electrical unions at all points of union between ends of rigid conduit systems that cannot otherwise be coupled:
 - a. Running threads and threadless couplings are not allowed.
2. Replace any conduits installed that the Engineer determines do not meet the requirements of this Specification.

3.4 ERECTION, INSTALLATION, APPLICATIONS, CONSTRUCTION (NOT USED)

3.5 REPAIR/RESTORATION (NOT USED)

3.6 RE-INSTALLATION (NOT USED)

3.7 COMMISSIONING (NOT USED)

3.8 FIELD QUALITY CONTROL

A. As specified in the Common Work Results for Electrical section.

3.9 ADJUSTING (NOT USED)

3.10 CLEANING (NOT USED)

3.11 PROTECTION

A. As specified in the Common Work Results for Electrical section.

3.12 SCHEDULES (NOT USED)

END OF SECTION

SECTION 26 13 30

DUCT BANKS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Electrical underground duct banks.
 - 2. Duct bank installation requirements.

1.02 REFERENCES

- A. As specified in the Common Work Results for Electrical section.

1.03 DEFINITIONS

- A. As specified in the Common Work Results for Electrical section.

1.04 SYSTEM DESCRIPTION

- A. Provide trenching, forming, , spacers, conduit, , backfill, and compaction necessary for the complete installation of the duct banks.
- B. Provide duct banks for all conduits installed below grade, on the site, below structures, or in contact with the earth, unless otherwise indicated on the Drawings.

1.05 SUBMITTALS

- A. Furnish submittals as specified in the Submittal Procedures section and the Common Work Results for Electrical section.
- B. Product data:
 - 1. PVC conduit spacers.
 - 2. Detectable underground marking tape.
 - 3. Pull line.
- C. Shop drawings:
 - 1. Submit site plan drawings of duct banks including underground profiles indicating all underground utilities.
 - 2. For duct bank routings crossing under building footers or foundations alternative to designed routings indicated on the Drawings:
 - a. Submit shop drawings detailing the new building footer crossing locations and plan drawings labeling all equipment to be installed on top of the new routing for approval by the project Structural Engineer.

1.06 QUALITY ASSURANCE

- A. As specified in the Common Work Results for Electrical section.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. As specified in the Common Work Results for Electrical section.

1.08 PROJECT OR SITE CONDITIONS

- A. As specified in the Common Work Results for Electrical section.

1.09 SEQUENCING

1.10 SCHEDULING (NOT USED)

1.11 WARRANTY

- A. As specified in the Common Work Results for Electrical section.

1.12 SYSTEM START-UP

- A. As specified in the Common Work Results for Electrical section.

1.13 OWNER'S INSTRUCTIONS (NOT USED)

1.14 MAINTENANCE (NOT USED)

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Conduit spacers:
 - 1. One of the following or equal:
 - a. Carlon Snap-Loc.
 - b. Cantex.
 - c. Osburn Associates, Inc.
- B. Detectable underground marking tape:
 - 1. One of the following or equal:
 - a. Blackburn Manufacturing Co.
 - b. Pro-Line Safety Products.
 - c. Panduit.
- C. Pull line:
 - 1. One of the following or equal:
 - a. Arnco.
 - b. Greenlee.
 - c. Osburn Associates, Inc.
- D. Duct seal:
 - 1. The following or equal:
 - a. OZ Gedney type DUX.

2.02 EXISTING PRODUCTS (NOT USED)

2.03 MATERIALS

- A. Provide conduit as specified in the Conduits section:
 - 1. Use duct suitable for use with 194 degree Fahrenheit rated conductors.

2.04 MANUFACTURED UNITS

- A. Conduit spacers:
 - 1. Provide conduit spacers recommended by the conduit manufacturer or specified above.
 - 2. Saddle type.
 - 3. Non-metallic, non-corrosive, non-conductive.
 - 4. Interlocking type:
 - a. Vertical interlocking.
 - b. Horizontal interlocking.
 - 5. Suitable for concrete encasement.
 - 6. Molded-in rebar holder.
 - 7. Accommodates 2-inch through 6-inch conduit sizes.
 - 8. Relieves the conduit from both horizontal and vertical stresses.
- B. Pull line:
 - 1. Minimum 1/4-inch wide, flat design.
 - 2. Polyester.
 - 3. Minimum pulling strength 1,200 pounds.
- C. Detectable marking tape:
 - 1. Provide a detectable tape, locatable by a cable or metal detector from above the undisturbed grade.
 - 2. Aluminum core laminated between polyethylene film.
 - 3. 6-inch wide red tape imprinted with black lettering stating "CAUTION - BURIED ELECTRIC LINE BELOW" or equivalent.
- D. Duct seal:
 - 1. Non-hardening sealing compound.
 - 2. Flexible, can be applied by hand.
 - 3. UL Listed for use with installed conductors.

2.05 EQUIPMENT (NOT USED)

2.06 COMPONENTS (NOT USED)

2.07 ACCESSORIES (NOT USED)

2.08 MIXES

2.09 FABRICATION (NOT USED)

2.10 FINISHES (NOT USED)

2.11 SOURCE QUALITY CONTROL (NOT USED)

PART 3 EXECUTION

3.01 EXAMINATION (NOT USED)

3.02 PREPARATION (NOT USED)

3.03 INSTALLATION

- A. As specified in the Common Work Results for Electrical section.
- B. Duct banks:
 - 1. Install duct banks at least 24 inches below finish grade, unless otherwise indicated on the Drawings.
 - 2. Damage minimization:
 - a. Conduit should not be left exposed in an open trench longer than is necessary.
 - b. Protect all underground duct banks against damage during pouring of concrete or backfilling.
 - 3. All plastic conduit fittings to be joined should be exposed to the same temperature conditions for a reasonable length of time before assembly.
 - 4. Provide No. 4/0 American Wire Gauge bare copper ground wire the entire length of duct bank and bond to the grounding system at each end of the duct bank.
 - 5. Install underground ducts to be self-draining:
 - a. Slope duct banks away from buildings to manholes, handholes, or pullboxes.
 - b. Slope duct banks uniformly from manholes, handholes, or pullboxes to manholes, handholes, or pullboxes or both ways from high points between manholes, handholes, or pullboxes.
 - c. Slope a minimum of 1/4 inch per 10 feet.
 - 6. Where new duct banks join to existing manholes, handholes, or pullboxes, make the proper fittings and fabricate the concrete envelopes to ensure smooth durable transitions, as indicated on the Drawings.
 - 7. Install pull line in spare conduits:
 - a. Provide adequate pull line at both ends of conduits to facilitate conductor pulling.
 - b. Cap above ground spare conduit risers at each end with screw-on conduit caps.
- C. Trenching:
 - 1. Trench must be uniformly graded with the bottom, rock free and covered with select material.
 - 2. Whenever possible, use the walls of the trench as forms for concrete encasement:
 - a. Forms are required where the soil is not self-supporting.
 - 3. Avoid damaging existing ducts, conduits, cables, and other utilities.
- D. Duct spacing:
 - 1. Separate conduits with manufactured plastic spacers using a minimum space between the outside surfaces of adjacent conduits of 2 inches, unless otherwise indicated on the Drawings:
 - a. Separate medium voltage ducts a minimum of 7.5 inches on center.
 - 2. Install spacers to maintain uniform spacing of duct assembly a minimum of 4 inches above the bottom of the trench during concrete pour. Install spacers on 8-foot maximum intervals:
 - a. Due to some distortion of conduit from heat, and other means, it may be necessary to install extra spacers within the duct bank:
 - 1) Install the intermediate set of spacers within normal required spacing to maintain the proper horizontal clearance:
 - a) Clearance is required to allow the proper amount of concrete to infiltrate vertically among the duct to ensure proper protection.
 - 3. Spacers shall not be located at the center of a bend:
 - a. Locate spacer in the tangent, free of the coupling on fabricated bends.
 - b. Locate spacers midway between the tangent and the center bend on trench formed sweeps.

- E. Terminating:
 - 1. Use bell ends in duct at entrances into cable vaults.
 - 2. Make conduit entrances into cable vaults tangential to walls of cable vault.
 - 3. Form trapezoidal transitions between duct bank and cable vaults as needed in order to ensure adequate cable bending radius for the duct bank-to-vault transition.
 - 4. Install duct seal in all conduits including spare conduits, at entrance to manholes/handholes, and building/equipment stub-ups. Form by hand to conduit and around cables to develop moisture barrier.
 - 5. New manhole or handhole applications, provide a single opening or "window" per duct bank, sized to accommodate the duct bank envelope.
 - F. Marking tape:
 - 1. Install a detectable marking tape 12 inches above the duct bank the entire length of the duct bank.
- 3.04 ERECTION, INSTALLATION, APPLICATION, CONSTRUCTION (NOT USED)
- 3.05 REPAIR/RESTORATION (NOT USED)
- 3.06 RE-INSTALLATION (NOT USED)
- 3.07 COMMISSIONING (NOT USED)
- 3.08 FIELD QUALITY CONTROL
- A. As specified in Section 26 05 00 - Common Work Results for Electrical.
- 3.09 ADJUSTING (NOT USED)
- 3.10 CLEANING
- A. Clean conduits of dirt and debris by use of an appropriately sized steel mandrel no less than 1/2 inch smaller than the inside diameter of the conduit.
- 3.11 PROTECTION
- A. As specified in Section 16050 - Common Work Results for Electrical.
 - B. Provide shoring and pumping to protect the excavation and safety of workers.
 - C. Protect excavations with barricades as required by applicable safety regulations.
- 3.12 SCHEDULES (NOT USED)

END OF SECTION

SECTION 26 13 40

BOXES

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Device boxes.
 - 2. Raceway system boxes.

1.2 REFERENCES

- A. As specified in the Common Work Results for Electrical section.
- B. American Association of State Highway and Transportation Officials (AASHTO):
 - 1. Standard Specifications for Highway Bridges.
- C. ASTM International (ASTM):
 - 1. A47 - Standard Specification for Ferritic Malleable Iron Castings.
 - 2. D149 - Standard Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies.
 - 3. D495 - Standard Test Method for High-Voltage, Low-Current, Dry Arc Resistance of Solid Electrical Insulation.
 - 4. D570 - Standard Test Method for Water Absorption of Plastics.
 - 5. D648 - Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position.
 - 6. D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
 - 7. D792 - Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement.
- D. Joint Industry Conference (JIC).
- E. Underwriters Laboratories, Inc. (UL):
 - 1. 94 - Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances.

1.3 DEFINITIONS

- A. As specified in the Common Work Results for Electrical section.
- B. Specific definitions:
 - 1. Arcing parts: Circuit breakers, motor controllers, switches, fuses, or any device intended to interrupt current during its operation.
 - 2. Raceway system boxes: Boxes that are used for wire and cable pullboxes, conduit junction boxes, or terminal boxes.

1.4 SYSTEM DESCRIPTION

- A. Provide outlet boxes for devices such as switches, receptacles, telephone and computer jacks, security systems, junction, and pullboxes for use in the raceway systems, etc.

- B. Provide boxes as indicated on the Drawings or as needed to complete the raceway installation.

1.5 SUBMITTALS

- A. Furnish submittals as specified in the Common Work Results for Electrical section.
- B. Product data:
 - 1. Manufacturer.
 - 2. Materials.
 - 3. Dimensions:
 - a. Height.
 - b. Width.
 - c. Depth.
 - d. Weight.
 - e. NEMA rating.
 - 4. Conduit entry locations.
 - 5. Catalog cut sheets.
 - 6. Installation instructions.
- C. Shop drawings:
 - 1. Include identification and sizes of pullboxes.

1.6 QUALITY ASSURANCE

- A. As specified in the Common Work Results for Electrical section.
- B. Regulatory requirements:
 - 1. Outlet boxes shall comply with all applicable standards of:
 - a. JIC.
 - b. NEC.
 - c. NEMA.
 - d. UL.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. As specified in the Common Work Results for Electrical section.

1.8 PROJECT OR SITE CONDITIONS

- A. As specified in the Common Work Results for Electrical section.

1.9 SEQUENCING

- A. As specified in the Common Work Results for Electrical.

1.10 SCHEDULING (NOT USED)

1.11 WARRANTY

- A. As specified in the Common Work Results for Electrical section.

1.12 SYSTEM START-UP

- A. As specified in the Common Work Results for Electrical section.

1.13 OWNER'S INSTRUCTIONS (NOT USED)

1.14 MAINTENANCE (NOT USED)

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. One of the following or equal:
 - 1. Cast device boxes:
 - a. Appleton.
 - b. Crouse - Hinds.
 - c. OZ/Gedney.
 - 2. Stainless steel enclosures:
 - a. Hoffman.
 - b. Stahlin.
 - c. Rittal.

2.2 EXISTING PRODUCTS (NOT USED)

2.3 MATERIALS (NOT USED)

2.4 MANUFACTURED UNITS

- A. Cast device boxes:
 - 1. Construction:
 - a. With internal green ground screw.
 - b. Furnished with a suitable gasketed cover.
 - c. With integral cast mounting lugs when surface mounted.
 - d. Conduit sizes range from 3/4 inch to 1 inch.
 - e. Tapered threaded hubs with integral bushing.
 - 2. Malleable iron boxes:
 - a. Conforming to ASTM A47 Grade 32510.
- B. Plastic coated cast device boxes:
 - 1. Construction:
 - a. With internal green ground screw.
 - b. Furnished with a suitable gasketed cover.
 - c. With integral cast mounting lugs when surface mounted.
 - d. Conduit sizes range from 3/4 inch to 1 inch.
 - e. Double coated with a nominal 0.002-inch (2 mil) urethane on both the interior and exterior before application of PVC coating.
 - f. With a minimum 0.040-inch (40 mil) PVC coating bonded to exterior.
 - g. With pressure sealing sleeve to protect the connection with conduit.
- C. Class I Division 1 areas:
 - 1. Provide boxes designed and listed for Class I Division 1 locations and group type atmosphere in which they will be used:
 - a. The approval ratings must be permanently marked on each item.
- D. Class I, Division 2 areas:
 - 1. For boxes not containing arcing parts:
 - a. As specified in the Common Work Results for Electrical section.
 - b. Pressed metal boxes are not allowed.
 - 2. For boxes containing arching parts provide:
 - a. Boxes designed and listed for Class I Division 1 locations and group type atmosphere in which they will be used:
 - 1) The approval ratings must be permanently marked on each item.

3. Cast iron Cast copper - free aluminum box and cover.
4. Precision machined flame path between box and cover with neoprene o-ring.
5. For applications requiring hinged cover, provide flexible hinge mounting either left or right side.
6. External flange.
7. Provisions for mounting pan.
8. Ground lug.
9. Stainless steel:
 - a. NEMA Type 4X:
 - 1) Boxes in locations subject to flooding or temporary submersion:
 - a) NEMA Type 6.
 - b. Fabricated from 14-gauge Type 316 stainless steel.
 - c. All seams continuously welded.
 - d. Door:
 - 1) Rolled lip around 3 sides.
 - 2) Attached to enclosure by means of a continuous stainless steel hinge and pin.
 - e. Neoprene door gasket to provide a watertight seal:
 - 1) Attached with an adhesive.
 - 2) Retained by a retaining strip.
 - f. Fabricate all external removable hardware for clamping the door to the enclosure body from heavy gauge stainless steel:
 - 1) With a hasp and staple for padlocking.
 - g. Provide large enclosures with door and body stiffeners for extra rigidity.
 - h. No holes or knockouts.
 - i. Finish:
 - 1) Brushed.
 - j. Stainless steel external mounting brackets when surface mounted.

2.5 EQUIPMENT (NOT USED)

2.6 COMPONENTS (NOT USED)

2.7 ACCESSORIES

A. Fasteners:

1. Electroplated or stainless steel in boxes with wiring devices.
2. Screws, nuts, bolts, and other threaded fasteners:
 - a. Stainless steel.

B. Provide breather and drain fittings where appropriate.

C. Internal panels:

1. Provide internal panels where required for mounting of terminal strips or other equipment.
2. With plated steel shoulder studs.
3. Steel with white polyester powder finish.

2.8 MIXES (NOT USED)

2.9 FABRICATION (NOT USED)

2.10 FINISHES (NOT USED)

2.11 SOURCE QUALITY CONTROL (NOT USED)

PART 3 EXECUTION

3.1 EXAMINATION (NOT USED)

3.2 PREPARATION (NOT USED)

3.3 INSTALLATION

A. As specified in the Common Work Results for Electrical section.

B. General:

1. Provide materials and construction suitable for environmental conditions at the location of the box as specified in the Common Work Results for Electrical section.
2. Provide outlet box materials to match the conduit system:
 - a. GRC - Cast ferrous boxes.
 - b. PCS - PVC coated cast ferrous boxes.
 - c. PVC - PVC boxes.
3. Solid type gang boxes:
 - a. For more than 2 devices.
 - b. For barriered outlets.
4. Support all wall mounted NEMA Type 4 or NEMA Type 4X boxes to maintain a minimum of 7/8-inch free air space between the back of the enclosure and the wall:
 - a. Use machined spacers to maintain air space; built-up washers are not acceptable.
 - b. Use stainless steel or nylon materials for spacers.
5. Use cast malleable iron boxes when box must support other devices.
6. Boxes serving luminaires or devices:
 - a. Use as pullboxes wherever possible.
7. Fit all cast boxes and pressed steel boxes for flush mounting in concrete with cast, malleable box covers and gaskets.
8. In terminal boxes, furnish terminals as indicated on the Drawings, with a minimum of 50 percent spare terminals:
 - a. Furnish wireways for discrete and analog/DC wiring.
 - b. Separate analog wiring from 120 V discrete or power wiring.
9. Size boxes in accordance with NEC requirements and to provide sufficient room for the future components and cables indicated on the Drawings.
10. For fire-rated construction, provide materials and installation for use in accordance with the listing requirements of the classified construction.

C. Outlet boxes:

1. Locate outlet boxes as indicated on the Drawings:
 - a. Adjust locations so as not to conflict with structural requirements or other trades.
2. Use deep threaded-hub malleable iron or aluminum boxes:
 - a. In hazardous areas.
 - b. Where exposed to the weather.
 - c. In unheated areas.
 - d. Where subject to mechanical damage:
 - 1) Defined as exposed boxes less than 10 feet above the floor.
 - e. To act as a pullbox for conductors in a conduit system.
 - f. Accommodate wiring devices.
3. Use deep threaded-hub plastic coated malleable iron boxes in corrosive and NEMA Type 4X area and when the conduit system is PVC coated steel.
4. Outlet boxes may be used as junction boxes wherever possible.

D. Pullboxes and junction boxes:

1. Size pullboxes in accordance with NEC requirements and to provide sufficient room for any future conduits and cables as indicated on the Drawings.

2. Install pullboxes such that access to them is not restricted.

E. For boxes not indicated:

1. Provide types and mountings as required to suit the equipment and that will be consistent with the conduit system and environmental conditions as indicated in the Common Work Results for Electrical section.
2. Outlet, switch, and junction boxes for flush-mounting in general purpose locations:
 - a. One-piece, galvanized, pressed steel.
3. Ceiling boxes for flush mounting in concrete:
 - a. Deep, galvanized, pressed steel.
4. Outlet, switch, and junction boxes where surface mounted in exposed locations:
 - a. Cast ferrous boxes with mounting lugs, zinc or cadmium plating finish.
5. Outlet, control station, and junction boxes for installation in corrosive locations:
 - a. Fiberglass reinforced polyester, stainless steel, or plastic coated steel to match the conduit system.
 - b. Furnished with mounting lugs.

F. Hazardous locations:

1. All metallic boxes, fittings, and joints shall utilize threaded connections to the conduit system.
2. All threaded connections shall be wrench tightened so that at least 5 threads are fully engaged.
3. Conduits entering and exiting metallic boxes in Class I Division 2 areas shall utilize approved grounding bushings to bond the conduits together.
4. Provide the following types of conduit bodies and boxes:
 - a. Malleable iron bodies and boxes with GRC or IMC conduit systems.
 - b. PVC coated conduit bodies and boxes with PCS conduit systems.

3.4 ERECTION, INSTALLATION, APPLICATION, CONSTRUCTION (NOT USED)

3.5 REPAIR/RESTORATION (NOT USED)

3.6 REINSTALLATION (NOT USED)

3.7 COMMISSIONING

A. As specified in the Commissioning section.

3.8 FIELD QUALITY CONTROL

A. As specified in the Common Work Results for Electrical section.

3.9 ADJUSTING (NOT USED)

3.10 CLEANING

A. As specified in the Common Work Results for Electrical section.

3.11 PROTECTION

A. As specified in the Common Work Results for Electrical section.

3.12 SCHEDULES (NOT USED)

END OF SECTION

SECTION 26 13 60

WIREWAY

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Wireway systems as indicated on the Drawings.

1.2 REFERENCES

- A. As specified in the Common Work Results for Electrical section.
- B. National Electrical Manufacturers Association (NEMA):
 - 1. ICS-6 - Industrial Control and Systems: Enclosures.
- C. Underwriter's Laboratories (UL):
 - 1. Article 870 - Wireways, Auxiliary Gutters, and Associated Fittings.

1.3 DEFINITIONS

- A. As specified in the Common Work Results for Electrical section.

1.4 SYSTEM DESCRIPTION

- A. System includes horizontal and/or vertical straight runs of wireway, fittings, covers, splices, barriers, and related accessory and supports:
 - 1. Connected to form a complete system.

1.5 SUBMITTALS

- A. Furnish submittals as specified in the Common Work Results for Electrical section.
- B. Product data:
 - 1. Technical information:
 - a. Catalog cut sheets.
 - b. Wireway construction and materials.
 - c. Maximum loading and span.
 - d. NEMA enclosure type.
 - 2. Dimensions:
 - a. Width.
 - b. Depth.
 - 3. Weight of wireway sections and fittings.
 - 4. Complete bill of materials.
 - 5. Manufacturer's installation instructions.
- C. Shop drawings:
 - 1. Provide complete details and scaled drawings for the layout of the installed wireway system showing all components and proposed mounting details.

- D. Calculations:
 - 1. Provide cross sectional area and fill calculations.
 - a. Cross sectional area and fill shall be in accordance with the NEC.
 - 2. Provide structural calculations to ensure that the installed system meets all structural, seismic as specified in the Common Work Results for Electrical section, wind as specified in the Common Work Results for Electrical Requirements section at the Project Site with respect to support and mounting:
 - a. Stamped by a professional engineer licensed in the state where the Project is being constructed.

1.6 QUALITY ASSURANCE

- A. As specified in the Common Work Results for Electrical section.
- B. Manufacturer qualifications:
 - 1. Member of NEMA for the manufacturer of wireway systems and fittings of types and capacities required.
- C. Wireway shall be UL listed and labeled.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. As specified in the Common Work Results for Electrical section.

1.8 PROJECT OR SITE CONDITIONS

- A. As specified in the Common Work Results for Electrical section.

1.9 SEQUENCING

- A. The Drawings indicate the general route of the wireway systems. Data presented on those drawings are as accurate as preliminary surveys and planning can determine until final equipment selection is made.
- B. Specifications and Drawings are for assistance and guidance but exact routing, locations, distances, and levels will be governed by actual field conditions. Make field surveys as part of the work before ordering material.

1.10 SCHEDULING (NOT USED)

1.11 WARRANTY

- A. As specified in the Common Work Results for Electrical section.

1.12 SYSTEM START-UP

- A. As specified in the Common Work Results for Electrical section.

1.13 OWNER'S INSTRUCTIONS (NOT USED)

1.14 MAINTENANCE (NOT USED)

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Metallic wireway:
 - 1. One of the following or equal:
 - a. B-Line.
 - b. Hoffman.
 - c. Hammond.
 - d. Rittal Electromate.
- B. Non-metallic wireway:
 - 1. One of the following or equal:
 - a. Hoffman.
 - b. Carlon.

2.2 EXISTING PRODUCTS (NOT USED)

2.3 MATERIALS (NOT USED)

2.4 MANUFACTURED UNITS (NOT USED)

2.5 EQUIPMENT

- A. Provide wireways as indicated on the Drawings with respect to:
 - 1. Type (lay-in or feed-through or trough).
 - 2. Dimensions.
 - 3. NEMA enclosure rating.
 - 4. Wireway material.

2.6 COMPONENTS

- A. Fittings:
 - 1. Elbows, tees, and crossings:
 - a. Of the same materials and construction as the straight runs.
 - 2. Expansion fittings:
 - a. Provide flexible or sliding fittings.
- B. Covers:
 - 1. Hinged on one side.

2.7 ACCESSORIES

- A. Mounting hardware:
 - 1. As specified in the Common Work Results for Electrical section.

2.8 MIXES (NOT USED)

2.9 FABRICATIONS (NOT USED)

2.10 FINISHES (NOT USED)

2.11 SOURCE QUALITY CONTROL

- A. Manufactured in accordance with NEMA ICS-6.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify all dimensions and route before ordering wireway:
 - 1. Make all necessary field measurements.
 - 2. Coordinate with all subcontractors and suppliers to determine structural dimensions and equipment dimensions to avoid all potential conflicts with other systems.

3.2 PREPARATION (NOT USED)

3.3 INSTALLATION

- A. As specified in the Common Work Results for Electrical section.
- B. Install the wireway per the manufacturer's guidelines and submitted installation instructions to meet the seismic and wind requirements at the project site.
- C. General:
 - 1. Install in straight runs as much as possible, minimizing the number of turns.
 - 2. Expansion fittings:
 - a. Install as recommended by the manufacturer to accommodate thermal expansion.
 - b. Install where wireway crosses structural expansion joints.
 - 3. Fittings:
 - a. Not all fittings are indicated on the Drawings:
 - 1) Provide all fittings required to suit the installation.
 - 4. Wireway supports:
 - a. Support wireway in accordance with manufacturer's instructions and as required by the seismic conditions.
 - b. Support bracket spacing shall meet the requirements of the wireway manufacturer, and NEC.
 - c. Provide wireway supports with channels under the entire width of wireway.
 - d. Secure wireway to supports with manufacturer-approved fittings.
 - 5. Mounting:
 - a. Oriented to allow hinged doors to be opened minimum 90 degrees.
 - b. Oriented to allow safe access to doors for maintenance and future installations.
 - 6. Wiring installation:
 - a. In accordance the NEC.
 - b. Begin wiring installation only after the complete raceway system is installed.
 - c. Verify that all wireway surfaces and accessories are smooth, free from burrs or sharp edges.
 - d. Only install wiring that is UL listed for wireway use.
 - 7. Wall penetrations:
 - a. Terminate wireway on both sides of penetration, and penetrate wall via conduits:
 - 1) Seal all open spaces inside and around conduits where they penetrate building exterior walls or fire-rated walls.
 - 2) Fill spare conduits with sealing compound.
 - 3) Provide sealing material in accordance with all applicable codes and regulations.

3.4 ERECTION, INSTALLATION, APPLICATION, AND CONSTRUCTION (NOT USED)

3.5 REPAIR/RESTORATION (NOT USED)

3.6 PRE-INSTALLATION (NOT USED)

3.7 COMMISSIONING

A. As specified in the Commissioning section.

3.8 FIELD QUALITY CONTROL

A. As specified in the Common Work Results for Electrical section.

B. Inspect entire wireway system for the following:

1. Secure anchoring.
2. Proper supports.
3. Burrs or sharp edges.
4. Sufficient clearance from ducts and piping, especially hot pipes.

3.9 ADJUSTING (NOT USED)

3.10 CLEANING

A. As specified in the Common Work Results for Electrical section.

3.11 PROTECTION

A. As specified in the Common Work Results for Electrical section.

3.12 SCHEDULES (NOT USED)

END OF SECTION

SECTION 26 15 00

LOW VOLTAGE WIRE CONNECTIONS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Wire connecting devices.
 - 2. Terminations.
 - 3. Splices.

1.2 REFERENCES

- A. As specified in the Common Work Results for Electrical section.
- B. ASTM International (ASTM):
 - 1. D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape.
- C. CSA International (CSA):
 - 1. C22.2 - No.197-M1983 (R2208) - PVC Insulating Tape.
- D. Underwriters Laboratories, Inc. (UL):
 - 1. 510 - Standard for Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape.

1.3 DEFINITIONS

- A. As specified in the Common Work Results for Electrical section.

1.4 SYSTEM DESCRIPTION

- A. Provide a complete system of wiring connectors, terminators, fittings, etc. for a complete wiring system suitable for the cables and conductors used.

1.5 SUBMITTALS

- A. Furnish submittals as specified in the Common Work Results for Electrical section.
- B. Product data:
 - 1. Catalog cut sheets.
 - 2. Installation instructions.

1.6 QUALITY ASSURANCE

- A. As specified in the Common Work Results for Electrical section.
- B. All materials shall be UL listed.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. As specified in the Common Work Results for Electrical section.

1.8 PROJECT OR SITE CONDITIONS

A. As specified in the Common Work Results for Electrical section.

1.9 SEQUENCING (NOT USED)

1.10 SCHEDULING (NOT USED)

1.11 WARRANTY

A. As specified in the Common Work Results for Electrical section.

1.12 SYSTEM START-UP

A. As specified in the Common Work Results for Electrical section.

1.13 OWNER'S INSTRUCTIONS (NOT USED)

1.14 MAINTENANCE (NOT USED)

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers for each type of technology are specified with the equipment in this Section.

2.2 EXISTING PRODUCTS (NOT USED)

2.3 MATERIALS (NOT USED)

2.4 MANUFACTURED UNITS (NOT USED)

2.5 EQUIPMENT

A. Control connections:

1. Use insulated ring type wire terminators for connections to all screw terminals:
 - a. With chamfered/funneled terminal barrel entry.
 - b. Deep internal serrations.
 - c. Long barrel design to reduce electrical resistance and increased insulator-barrel surface area to ensure that the insulator remains in contact with the barrel.
 - d. Electroplated-tin copper conductor.
 - e. Manufacturers: The following or equal:
 - 1) Thomas and Betts, Stakon.
2. For process equipment connections work from manufacturer's drawings.

B. Joints, splices, taps, and connections:

1. 600-volt conductors:
 - a. Use solderless connectors.
 - b. Use only plated copper alloy connectors or lugs:
 - 1) Aluminum connectors or lugs are not acceptable for copper conductors.
 - c. Under those specific conditions where aluminum conductors have been allowed or are specified then the connectors for aluminum conductors shall be specifically designed for that purpose.

- d. For wire Number 10 AWG and smaller use compression splice caps, with insulating caps:
 - 1) Manufacturers: The following or equal:
 - a) Buchanan, 2006S or 2011S, with 2007 or 2014 insulating caps.
 - e. For wire Number 8 AWG and larger, use heavy duty copper compression connectors:
 - 1) Manufacturers: One of the following or equal:
 - a) Burndy.
 - b) Thomas and Betts.
 - f. Heat shrink tubing:
 - 1) Suitable for indoors, outdoors, overhead, direct burial or submerged applications.
 - 2) Minimum shrink ratio: 4 to 1.
 - 3) Continuous operating temperature: -55 degrees Celsius to 110 degrees Celsius.
 - 4) Internally applied adhesive sealant.
 - 5) Cross-linked polyolefin:
 - a) Manufacturers: One of the following or equal:
 - (1) 3M, ITCSN.
 - (2) Thomas & Betts, Shrink-Kon.
2. Instrumentation class cable splices:
- a. Suitable for indoor, outdoors, weather exposed, direct buried, or submerged applications.
 - b. Utilizing an epoxy, polyurethane, and re-enterable compounds.
 - c. For use with shielded or unshielded plastic- and rubber-jacketed, signal, control, and power cables rated up to 1 kilovolt.
 - d. Two-part mold body with tongue and groove seams and built in spacer webbing.
 - e. Manufacturers: The following or equal:
 - 1) 3M, Scotchcast 72-N.
- C. Insulating tape:
- 1. General purpose insulating tape:
 - a. Minimum 7 mil vinyl tape.
 - b. Suitable for application in an ambient of -18 degrees Celsius (0 degrees Fahrenheit).
 - c. Operating range up to 105 degrees Celsius (220 degrees Fahrenheit).
 - d. Flame retardant, hot- and cold- weather resistant, UV resistant.
 - e. For use as a primary insulation for wire cable splices up to 600 VAC.
 - f. Meeting and complying with:
 - 1) ASTM D3005 Type I.
 - 2) UL 510.
 - 3) CSA C22.2.
 - g. Manufacturers: The following or equal:
 - 1) 3M, Scotch Number Super 33+.
 - 2. General-purpose color-coding tape:
 - a. Minimum 7 mil vinyl tape.
 - b. Suitable for application on PVC and polyethylene jacketed cables.
 - c. For use indoors and outdoors in weather protected enclosures.
 - d. Available with the following colors:
 - 1) Red.
 - 2) Yellow.
 - 3) Blue.
 - 4) Brown.
 - 5) Gray.
 - 6) White.
 - 7) Green.

- 8) Orange.
- 9) Violet.
- e. For use as phase identification, marking, insulating, and harnessing.
- f. Meeting and complying with:
 - 1) UL 510.
 - 2) CSA C22.2.
- g. Manufacturers: The following or equal:
 - 1) 3M, Scotch Number 35.

- 2.6 COMPONENTS (NOT USED)
- 2.7 ACCESSORIES (NOT USED)
- 2.8 MIXES (NOT USED)
- 2.9 FABRICATION (NOT USED)
- 2.10 FINISHES (NOT USED)
- 2.11 SOURCE QUALITY CONTROL (NOT USED)

PART 3 EXECUTION

- 3.1 EXAMINATION (NOT USED)
- 3.2 PREPARATION (NOT USED)
- 3.3 INSTALLATION

- A. As specified in the Common Work Results for Electrical section.
- B. Load connections:
 - 1. Connect loads to the circuits as indicated. Color-code all branch circuits as specified in Section 26 12 30 - 600-Volt or Less Wires and Cables.
- C. Zero to 600-volt systems:
 - 1. Make all connections with the proper tool and die as specified by the device manufacturer.
 - 2. Use only tooling and dies manufactured by the device manufacturer.
 - 3. Insulate all connections and splices with Scotch 33+ tape and Scotchfill, or pre-molded plastic covers, or heat shrink tubing and caps.
 - 4. Number all power and control wires before termination.
- D. Motor connections (600 volts and below):
 - 1. Terminate all leads and wires with compression type ring lugs.
 - 2. Terminations on all motor leads, including leads that are connected together to accommodate the motor voltage, and the machine wires entering the motor terminal box from the power source, shall have ring type compression lugs.
 - 3. Cover bolted connectors with a heat shrinkable, cross-linked polyolefin material formed as a single opening boot:
 - a. In damp and wet locations, use a complete kit containing mastic that shall seal out moisture and contamination.
 - b. Shrink cap with low heat as recommended by manufacturer.
 - 4. Wire markers shall be readable after boot installation.

5. Manufacturers: The following or equal:
 - a. Raychem, MCK.

3.4 ERECTION, INSTALLATION, APPLICATION, CONSTRUCTION (NOT USED)

3.5 REPAIR/RESTORATION (NOT USED)

3.6 RE-INSTALLATION (NOT USED)

3.7 COMMISSIONING

A. As specified in the Commissioning section.

3.8 FIELD QUALITY CONTROL

A. As specified in the Common Work Results for Electrical section.

3.9 ADJUSTING (NOT USED)

3.10 CLEANING (NOT USED)

3.11 PROTECTION

A. As specified in the Common Work Results for Electrical section.

3.12 SCHEDULES (NOT USED)

END OF SECTION

SECTION 26 21 00

UTILITY COORDINATION

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Coordination with the utility companies to provide service.
 - 2. Contractor's responsibilities for connecting to utilities and providing utility service to the facilities.
 - 3. Descriptions of utility services required.

1.2 REFERENCES

- A. As specified in the Common Work Results for Electrical section.

1.3 DEFINITIONS

- A. As specified in the Common Work Results for Electrical section.

1.4 SYSTEM DESCRIPTION

- A. Electrical service:
 - 1. Provide all Work and materials and bear all costs for providing temporary construction power and the permanent electrical service, including but not limited to:
 - a. All Work and materials not provided by the electric utility.
 - b. All permits and fees required by the electric utility.
 - 2. Provide electrical ducts, raceways, conductors and connections indicated on the Drawings, and all other Work and materials required for a complete electrical service, including but not limited to the following:
 - a. Electrical service conduits and conductors from the point of electric utility connection to the service entrance equipment.
 - b. Metering conduits from the instrument transformers to the meter.
- B. General:
 - 1. Coordinate and obtain inspections and final installation approval from the serving utilities and other authorities having jurisdiction.

1.5 SUBMITTALS

- A. Furnish submittals as specified in the Common Work Results for Electrical section.
- B. Certification:
 - 1. Submit certification that the intended installation has been coordinated with the utility companies.
 - 2. Include a narrative description of the utility's requirements and points of connection, names and telephone numbers for contacts at the utilities.

1.6 QUALITY ASSURANCE

- A. As specified in the Common Work Results for Electrical section.

- B. Materials and equipment used in performance of Electrical Work shall be listed or labeled by UL, or other equivalent recognized independent testing laboratory, for the class of service intended.
- 1.7 DELIVERY, STORAGE, AND HANDLING (NOT USED)
- 1.8 PROJECT OR SITE CONDITIONS
- A. As specified in the Common Work Results for Electrical section.
- 1.9 SEQUENCING (NOT USED)
- 1.10 SCHEDULING
- A. General:
 - 1. Before start of Site Work, make arrangements for temporary telephone and electrical service as required.
 - B. Electrical systems:
 - 1. Before bidding, the electrical contractor shall contact the utilities to determine the Work and materials that will be required from the Contractor, and all fees and permits that will be required, so that all utility systems furnished by the Contractor will be included in the bid.
 - 2. Coordinate Work with Engineer to minimize downtime of existing operating equipment and electrical distribution systems and to preclude unsafe operation:
 - a. Notify Owner 10 days before power interruptions.
 - b. Coordinate downtime with Owner and local electric utility.
 - 3. Before commencing Work, coordinate electric service entrance requirements with local electric utility to ensure that the installation will be complete as specified in these Contract Documents:
 - a. Ensure power transformer size, electrical characteristics, and location are consistent with the design and service voltage provided by the electric utility coordinated with other trades.
 - b. Arrange for utility revenue meter.
 - c. Coordinate installation of metering CTs and PTs furnished by the electric utility.
 - d. Pay any charges required by the electric utility for connection and turn-on.
 - C. Before commencing Site Work, coordinate underground conduit installations with other Work to eliminate conflicts and avoid interferences with other underground systems.
- 1.11 WARRANTY
- A. As specified in the Common Work Results for Electrical section.
- 1.12 SYSTEM START-UP
- A. As specified in the Common Work Results for Electrical section.
- 1.13 OWNER'S INSTRUCTIONS (NOT USED)
- 1.14 MAINTENANCE (NOT USED)

PART 2 PRODUCTS

2.1 MANUFACTURERS (NOT USED)

2.2 EXISTING PRODUCTS (NOT USED)

2.3 MATERIALS

A. Furnish materials in accordance with the applicable requirements of the utilities and as specified in these Specifications.

2.4 MANUFACTURED UNITS (NOT USED)

2.5 EQUIPMENT

A. Furnish equipment in accordance with the applicable requirements of the utilities and as specified in these Specifications.

2.6 COMPONENTS (NOT USED)

2.7 ACCESSORIES (NOT USED)

2.8 MIXES (NOT USED)

2.9 FABRICATION (NOT USED)

2.10 FINISHES (NOT USED)

2.11 SOURCE QUALITY CONTROL (NOT USED)

PART 3 EXECUTION

3.1 EXAMINATION (NOT USED)

3.2 PREPARATION (NOT USED)

3.3 INSTALLATION

A. As specified in the Common Work Results for Electrical section.

3.4 ERECTION, INSTALLATION, APPLICATION, CONSTRUCTION (NOT USED)

3.5 REPAIR/RESTORATION (NOT USED)

3.6 RE-INSTALLATION (NOT USED)

3.7 COMMISSIONING

A. As specified in the Commissioning section.

3.8 FIELD QUALITY CONTROL

A. As specified in the Common Work Results for Electrical section.

3.9 ADJUSTING (NOT USED)

3.10 CLEANING

A. As specified in the Common Work Results for Electrical section.

3.11 PROTECTION

A. As specified in the Common Work Results for Electrical section.

3.12 SCHEDULES (NOT USED)

END OF SECTION

SECTION 26 28 50

SURGE PROTECTIVE DEVICES

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. High-energy surge protective devices.

1.2 REFERENCES

- A. As specified in the Common Work Results for Electrical section.
- B. Institute of Electrical and Electronics Engineers (IEEE):
 - 1. C62.41.1 - Guide on the Surge Environment in Low-Voltage (1000 V and less) AC Power Circuits.
 - 2. C62.41.2 - Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits.
 - 3. C62.45 - Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000 V and Less) AC Power Circuits.
 - 4. C62.62- Standard Test Specifications for Surge Protective Devices (SPDs) for Use on the Load Side of the Service Equipment in Low Voltage (1000 V and less) AC Power Circuits.
- C. National Electrical Manufacturers Association (NEMA):
 - 1. 250 - Enclosures for Electrical Equipment (1000 V Maximum).
- D. Underwriters Laboratory:
 - 1. 1449, 4th Edition, Standard for Surge Protective Devices.

1.3 DEFINITIONS

- A. As specified in the Common Work Results for Electrical section.
- B. NEMA:
 - 1. Type 1 enclosure in accordance with NEMA 250.
 - 2. Type 4 enclosure in accordance with NEMA 250.
 - 3. Type 4X enclosure in accordance with NEMA 250.
 - 4. Type 12 enclosure in accordance with NEMA 250.
- C. Specific definitions:
 - 1. SPD: Surge protective device.
 - 2. SAD: Silicon avalanche diode.
 - 3. MOV: Metal oxide varistor.
 - 4. MCOV: Maximum continuous operating voltage.
 - 5. I_n: Nominal discharge current.
 - 6. VPR: Voltage protection rating.
 - 7. SCCR: Short circuit current rating.

1.4 SUBMITTALS

- A. Furnish submittals as specified in the Common Work Results for Electrical section.

- B. Product data:
 - 1. Furnish complete product data confirming detailed compliance or exception statements to all provisions of this Section.
 - 2. Manufacturer's catalog cut sheets indicating:
 - a. Manufacturer and model numbers.
 - b. Ratings of each SPD including but not limited to:
 - 1) Short circuit current rating.
 - 2) Nominal discharge current.
 - 3) Maximum continuous operating voltage.
 - 4) Voltage protection rating.
 - 5) System voltage.
 - 6) System frequency.
 - 7) Surge current capacity.
 - 3. Submit independent test data from a nationally recognized testing laboratory verifying the following:
 - a. Overcurrent protection.
 - b. UL 1449.
- C. Shop drawings:
 - 1. Provide electrical and mechanical drawings by the manufacturer that detail:
 - a. Unit dimensions.
 - b. Weights.
 - c. Components.
 - d. Field connection locations.
 - e. Mounting provisions.
 - f. Connection details.
 - g. Wiring diagram.
- D. Operation and maintenance manuals:
 - 1. Provide the manufacturer's manual with installation, start-up, spare parts lists, and operating instructions for the specified system.

1.5 QUALITY ASSURANCE

- A. As specified in the Common Work Results for Electrical section.
- B. Provide SPD units that are designed, manufactured, tested and installed in compliance with the following codes and standards:
 - 1. Institute of Electrical and Electronics Engineers (IEEE C62.41.1, C62.41.2, C62.45, C62.62).
 - 2. Federal Information Processing Standards Publication 94 (FIPS PUB 94).
 - 3. National Electrical Manufacturer Association.
 - 4. National Fire Protection Association (NFPA 20, 75 and 780).
 - 5. National Electric Code (NFPA 70).
 - 6. Underwriters Laboratories (UL 1449 4th Edition and UL 1283).
 - 7. International Electrotechnical Commission (IEC 801).

1.6 DELIVERY, STORAGE, AND HANDLING

- A. As specified in the Common Work Results for Electrical section.

1.7 PROJECT OR SITE CONDITIONS

- A. As specified in the Common Work Results for Electrical section.

1.8 SEQUENCING

- A. Coordinate with and provide SPD equipment to the electrical equipment manufacturer before final assembly and factory testing.

1.9 SCHEDULING (NOT USED)

1.10 WARRANTY

- A. As specified in the Common Work Results for Electrical section.
- B. Extended warranty:
 - 1. Furnish a manufacturer's full 5-year parts and labor warranty from date of shipment against any part failure when installed in compliance with manufacturer's written instructions, UL listing requirements, and any applicable national, state, or local electrical codes.
 - 2. Warranty shall include:
 - a. Direct, factory trained employees must be available within 48 hours for assessment of the problem.
 - b. A 24-hour toll-free 800-number for warranty support.

1.11 SYSTEM START-UP

- A. As specified in the Common Work Results for Electrical section.

1.12 OWNER'S INSTRUCTIONS (NOT USED)

1.13 MAINTENANCE (NOT USED)

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. One of the following or equal:
 - 1. Liebert.
 - 2. Eaton.
 - 3. Schneider Electric.
 - 4. General Electric.

2.2 SYSTEM DESCRIPTION

- A. Surge protective devices as an integral component of the electrical equipment or externally mounted as indicated on the Drawings.

2.3 EXISTING PRODUCTS (NOT USED)

2.4 MATERIALS (NOT USED)

2.5 MANUFACTURED UNITS

- A. Provide Type 1 or Type 2 SPD units as required for the locations indicated on the Drawings.
- B. Electrical requirements:
 - 1. SPD ratings are to be consistent with the nominal system operating voltage, phase, and configuration as indicated on the Drawings.

2. MCOV:
 - a. For the SPD and all components in the suppression path (including all MOVs, SADs, and selenium cells): Greater than 115 percent of the nominal system operating voltage.
3. Operating frequency:
 - a. 47 to 63 hertz.
4. SCCR:
 - a. 65 kAIC minimum, but not less than the equipment it is connected to as indicated on the Drawings.
 - b. The SCCR shall be marked on the SPD in accordance with UL 1449 and the NEC.
5. Nominal discharge current I_n :
 - a. 20 kA.
6. Maximum VPR:

Modes	<u>240/120</u>	<u>208Y/120</u>	480Y/277	480V
L-N, L-G, N-G	900	900	1,500	1,500
L-L	1,200	1,200	2000	2,000

7. Peak surge current:
 - a. Service entrance locations:
 - 1) 240 kA per phase minimum.
 - 2) 120 kA per mode minimum.
 - b. Branch locations:
 - 1) 120 kA per phase, minimum.
 - 2) 60 kA per mode minimum.
- C. Protection modes:
1. Provide SPD protection modes as follows:
 - a. Line to Neutral (L-N) where applicable.
 - b. Line to Ground (L-G).
 - c. Neutral to Ground (N-G), where applicable.
- D. Environmental requirements:
1. Storage temperature:
 - a. -40 degrees to 122 degrees Fahrenheit.
 2. Operating temperature:
 - a. 32 degrees to 140 Fahrenheit.
 3. Relative humidity:
 - a. 5 percent to 95 percent.
 4. Audible noise:
 - a. Less than 45 dBA at 5 feet (1.5 m).
 5. Operating altitude:
 - a. Zero to 12,000 feet above sea level.
- E. Provide surge protective devices that are suitable for application in IEEE C62.41.1, C62.41.2 Category A, B and C3 environments, as tested to IEEE C62.45.

2.6 EQUIPMENT (NOT USED)

2.7 COMPONENTS

- A. Enclosure:
1. Located in electrical equipment as indicated on the Drawings.
 2. External mounting:
 - a. NEMA Type 4X enclosure:

- 1) No ventilation openings.
 - b. Hinged cover requiring a tool for internal access.
 - c. Internal drawing pocket.
 - d. All monitoring indications must be visible without opening the door.
- B. Internal connections:
 - 1. Provide low impedance copper plates for intra-unit connections:
 - a. Attach surge modules using bolted connections to the plates for low impedance connections.
 - 2. Size all connections, conductors, and terminals for the specified surge current capacity.
- C. Surge diversion modules:
 - 1. MOV:
 - a. Where multiple MOVs are used in parallel, utilize computer matched MOVs to within 1 volt variance and tested for manufacturer's defects.
- D. Overcurrent protection:
 - 1. Individually fuse all components, including suppression, filtering, and monitoring components:
 - a. Rated to allow maximum specified nominal discharge current capacity.
 - b. Overcurrent protection that limits specified surge currents is not acceptable.
- E. Connections:
 - 1. Provide terminals to accommodate wire sizes up to #2 AWG.

2.8 ACCESSORIES

- A. Unit status indicators:
 - 1. Provide red and green solid-state indicators, with printed labels, on the front cover to redundantly indicate on-line unit status:
 - a. The absence of the green light and the presence of the red light indicate that surge protection is reduced and service is needed to restore full operation.
 - b. Indicates the status of protection on each mode or phase.
- B. Dry contacts for remote monitoring:
 - 1. Electrically isolated Form C dry contacts (1 A/125 VAC) for remote monitoring of system integrity, and indication of under voltage, phase and/or power loss.
- C. Provide an audible alarm which activates under any fault condition.
 - 1. Provide an alarm On/Off switch to silence the alarm.
 - 2. A visible LED will confirm whether alarm is On or Disabled.
 - 3. Locate both switches and the audible alarm on the unit's front cover.
- D. Provide an integral disconnect switch located in-line with the SPD enclosure:
 - 1. External manual operator.
 - 2. The switch shall disconnect all ungrounded circuit conductors from the SPD.
 - 3. The integral disconnect switch shall be capable of withstanding, without failure, the maximum published surge current magnitude and short circuit current without failure or damage to the switch.
- E. Interconnection cable:
 - 1. Interconnect the SPD to the power system using a manufacturer furnished assembly of low impedance coaxial cables installed in flexible conduit.
 - 2. Cable designed to transmit transients with minimal voltage drop.
 - 3. UL listed.

- 2.9 MIXES (NOT USED)
- 2.10 FABRICATION (NOT USED)
- 2.11 FINISHES (NOT USED)
- 2.12 SOURCE QUALITY CONTROL
 - A. Permanently affix surge rating to the SPD.
 - B. Perform manufacturer's standard factory test:
 - 1. Perform testing in accordance with UL 1449.

PART 3 EXECUTION

- 3.1 EXAMINATION (NOT USED)
- 3.2 PREPARATION (NOT USED)
- 3.3 INSTALLATION
 - A. As specified in the Common Work Results for Electrical section.
 - B. Follow the manufacturer's recommended installation practices and comply with all applicable codes.
 - C. Special techniques:
 - 1. Install the SPD with as short and straight conductors including ground conductor as practically possible:
 - a. Twist the input conductors together to reduce input conductor inductance.
 - 2. Interconnect the SPD to the power system using a manufacturer supplied interconnection cable consisting of low impedance coaxial cables installed in a flexible conduit.
 - 3. Do not subject SPD to insulation resistance testing.
- 3.4 ERECTION, INSTALLATION, APPLICATION, CONSTRUCTION (NOT USED)
- 3.5 REPAIR/RESTORATION (NOT USED)
- 3.6 RE-INSTALLATION (NOT USED)
- 3.7 COMMISSIONING
 - A. As specified in the Commissioning section.
- 3.8 FIELD QUALITY CONTROL
 - A. As specified in the Field Electrical Acceptance Tests section.
- 3.9 ADJUSTING (NOT USED)
- 3.10 CLEANING (NOT USED)
- 3.11 PROTECTION
 - A. As specified in the Common Work Results for Electrical section.

3.12 SCHEDULES (NOT USED)

END OF SECTION

SECTION 26 41 20

LOW VOLTAGE MOLDED CASE CIRCUIT BREAKERS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Low voltage molded case circuit breakers.

1.2 REFERENCES

- A. As specified in the Common Work Results for Electrical section.
- B. National Electrical Manufacturers Association (NEMA):
 - 1. AB 3. - Molded Case Circuit Breakers and Their Application.
- C. Underwriter's Laboratories (UL):
 - 1. 489 - Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures.
 - 2. 943 - Ground Fault Circuit Interrupters.

1.3 DEFINITIONS

- A. As specified in the Common Work Results for Electrical section.
- B. In accordance with UL 489.

1.4 SYSTEM DESCRIPTION

- A. Molded case thermal magnetic or motor circuit protector type circuit breakers as indicated on the Drawings and connected to form a completed system.

1.5 SUBMITTALS

- A. Furnish submittals as specified in the Common Work Results for Electrical section.
- B. Product data:
 - 1. Catalog cut sheets.
 - 2. Manufacturer's time-current curves for all molded case circuit breakers furnished.

1.6 QUALITY ASSURANCE

- A. As specified in the Common Work Results for Electrical section.
- B. Low voltage molded case circuit breakers shall be UL listed and labeled.

1.7 DELIVERY, STORAGE AND HANDLING

- A. As specified in the Common Work Results for Electrical section.

1.8 PROJECT OR SITE CONDITIONS

A. As specified in the Common Work Results for Electrical section.

1.9 SEQUENCING (NOT USED)

1.10 SCHEDULING (NOT USED)

1.11 WARRANTY

A. As specified in the Common Work Results for Electrical section.

1.12 SYSTEM START-UP

A. As specified in the Common Work Results for Electrical section.

1.13 OWNER'S INSTRUCTIONS (NOT USED)

1.14 MAINTENANCE (NOT USED)

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. One of the following or equal:

1. Eaton.
2. General Electric Co.
3. Schneider Electric.
4. ABB.

2.2 EXISTING PRODUCTS (NOT USED)

2.3 MATERIALS (NOT USED)

2.4 MANUFACTURED UNITS

A. General:

1. Conforming to UL 489.
2. Operating mechanism:
 - a. Quick-make, quick-break, non-welding silver alloy contacts.
 - b. Common Trip, Open and Close for multi-pole breakers such that all poles open and close simultaneously.
 - c. Mechanically trip free from the handle.
 - d. Trip indicating handle - automatically assumes a position midway between the manual ON and OFF positions to clearly indicate the circuit breaker has tripped.
 - e. Lockable in the "OFF" position.
3. Arc extinction:
 - a. In arc chutes.
4. Voltage and current ratings:
 - a. Minimum ratings as indicated on the Drawings.
 - b. Minimum frame size 100A.
5. Interrupting ratings:
 - a. Minimum ratings as indicated on the Drawings.
 - b. Not less than the rating of the assembly (panelboard, switchboard, motor control center, etc.).

- B. Motor circuit protectors:
 - 1. Instantaneous only circuit breaker as part of a listed combination motor controller.
 - 2. Each pole continuously adjustable in a linear scale with 'LO' and 'HI' settings factory calibrated.

2.5 EQUIPMENT (NOT USED)

2.6 COMPONENTS

- A. Terminals:
 - 1. Line and load terminals suitable for the conductor type, size, and number of conductors in accordance with UL 489.
- B. Case:
 - 1. Molded polyester glass reinforced.
 - 2. Ratings clearly marked.
- C. Trip units:
 - 1. Provide thermal magnetic or solid-state trip units as indicated on the Drawings.
 - 2. Thermal magnetic:
 - a. Instantaneous short circuit protection.
 - b. Inverse time delay overload.
 - c. Ambient or enclosure compensated by means of a bimetallic element.
 - 3. Solid state:
 - a. With the following settings as indicated on the Drawings.
 - 1) Adjustable long time current setting.
 - 2) Adjustable long time delay.
 - 3) Adjustable short time pickup.
 - 4) Adjustable short time delay.
 - 5) Adjustable instantaneous pickup.
 - 6) Adjustable ground fault pickup as indicated on the Drawings.
 - 7) Adjustable ground fault delay as indicated on the Drawings.
- D. Molded case circuit breakers for use in panelboards:
 - 1. Bolt-on type:
 - a. Plug-in type breakers are not acceptable.
 - 2. Ground fault trip devices as indicated on the Drawings.

2.7 ACCESSORIES(NOT USED)

2.8 MIXES (NOT USED)

2.9 FABRICATION (NOT USED)

2.10 FINISHES (NOT USED)

2.11 SOURCE QUALITY CONTROL

- A. Test breakers in accordance with:
 - 1. UL 489.
 - 2. Manufacturer's standard testing procedures.

PART 3 EXECUTION

3.1 EXAMINATION (NOT USED)

3.2 PREPARATION (NOT USED)

3.3 INSTALLATION

A. Install breakers to correspond to the accepted shop drawings.

3.4 ERECTION, INSTALLATION, APPLICATION, CONSTRUCTION (NOT USED)

3.5 REPAIR/RESTORATION (NOT USED)

3.6 RE-INSTALLATION (NOT USED)

3.7 COMMISSIONING (NOT USED)

3.8 FIELD QUALITY CONTROL

A. As specified in the Common Work Results for Electrical section.

3.9 ADJUSTING

A. Adjust trip settings in accordance with Protective Device Coordination Study as accepted by the Engineer and in accordance with manufacturer's recommendations.

B. Adjust motor circuit protectors in accordance with NEC and the manufacturer's recommendation based on the nameplate values of the installed motor.

3.10 CLEANING (NOT USED)

3.11 PROTECTION

A. As specified in the Common Work Results for Electrical section.

3.12 SCHEDULES (NOT USED)

END OF SECTION

SECTION 26 44 50

PANELBOARDS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Panelboards serving feeder circuits and branch circuits.

1.2 REFERENCES

- A. As specified in the Common Work Results for Electrical section.
- B. Underwriter's Laboratories, Inc. (UL):
 - 1. 67 - Standard for Panelboards.

1.3 DEFINITIONS

- A. As specified in the Common Work Results for Electrical section.

1.4 SYSTEM DESCRIPTION

- A. Circuit breaker panelboards as indicated in the panelboard schedules, one-lines, and where indicated on the Drawings:
 - 1. Service voltage and configuration as indicated on the panel schedules.

1.5 SUBMITTALS

- A. Furnish submittals as specified in the Common Work Results for Electrical section.
- B. Product data:
 - 1. Manufacturer of panelboard.
 - 2. Bill of material.
 - 3. Assembly ratings including:
 - a. Voltage.
 - b. Phase.
 - c. Continuous current.
 - d. Short circuit interrupting rating.
 - 4. NEMA enclosure type.
 - 5. Cable terminal sizes based upon actual feeder and sub-feeder conductors used.
 - 6. Furnish circuit breaker submittals as specified in the Low Voltage Molded Case Circuit Breakers section.
 - 7. For equipment installed in structures designated as seismic design category C, D, E, or F submit the following as specified in the Common Work Results for Electrical section:
 - a. Manufacturer's statement of seismic qualification with substantiating test data.
 - b. Manufacturer's special seismic certification with substantiating test data.
- C. Shop drawings:
 - 1. Drawings to contain:
 - a. Overall panelboard dimensions, interior panel dimensions, and wiring gutter dimensions:
 - 1) Height.
 - 2) Length.

- 3) Width.
 - b. Weight.
 - c. Anchoring locations.
 - d. Breaker layout drawing with dimensions:
 - 1) Location of the main, branches, solid neutral, and ground.
 - e. Conduit entry/exit locations:
 - 1) Identify all conduit entry/exit locations and restrictions.
 - f. Individual panel schedules identifying breaker locations, ratings, and nameplate designations within the panelboard, for every panelboard.
- D. Installation instructions:
 - 1. Detail the complete installation of the equipment including rigging, moving, and setting into place.
 - 2. For equipment installed in structures designated as seismic design category A or B:
 - a. Provide manufacturer's installation instructions and anchoring details for connecting equipment to supports and structures.
 - 3. For equipment installed in structures designated as seismic design category C, D, E, or F:
 - a. Provide project-specific installation instructions and anchoring details based on support conditions and requirements to resist seismic and wind loads as specified in the Common Work Results for Electrical section.
 - b. Submit anchoring drawings with supporting calculations.
 - c. Drawings and calculations shall be stamped by a professional engineer registered in the state where the Project is being constructed.
- E. Operations and maintenance manual:
 - 1. Provide a complete manual for the operation and maintenance of the panelboard, circuit breakers, devices, and accessories:
 - a. Including but not limited to:
 - 1) Instruction narratives and bulletins.
 - 2) Renewal parts lists.
 - 3) Time-current curves for all devices.
- F. Calculations:
 - 1. Detailed calculations or details of the actual physical testing performed on the panelboard to prove the panelboard is suitable for the seismic requirements at the Project Site.

1.6 QUALITY ASSURANCE

- A. As specified in the Common Work Results for Electrical section.
- B. Panelboards shall be UL listed and labeled.
 - 1. Where indicated as service entrance equipment, panelboards shall be UL labeled and listed "Suitable for Service Entrance."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. As specified in the Common Work Results for Electrical section.

1.8 PROJECT OR SITE CONDITIONS

- A. As specified in the Common Work Results for Electrical section.

1.9 SEQUENCING (NOT USED)

1.10 SCHEDULING (NOT USED)

1.11 WARRANTY

- A. As specified in the Common Work Results for Electrical section.

1.12 SYSTEM START-UP

- A. As specified in the Common Work Results for Electrical section.

1.13 OWNER'S INSTRUCTIONS (NOT USED)

1.14 MAINTENANCE (NOT USED)

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. One of the following or equal:
 - 1. Eaton.
 - 2. General Electric Co.
 - 3. Schneider Electric.
- B. Circuit breakers:
 - 1. Same manufacturer as the panelboard.

2.2 EXISTING PRODUCTS (NOT USED)

2.3 MATERIALS (NOT USED)

2.4 MANUFACTURED UNITS (NOT USED)

2.5 EQUIPMENT

- A. Provide panelboards with:
 - 1. Molded-case circuit breakers with trip ratings as shown on the panel schedules.
 - 2. Spares and spaces for future circuit breakers in panels as shown on the panel schedules.
- B. Short circuit rating:
 - 1. Provide panelboards with short-circuit ratings as indicated on the Drawings:
 - 2. Testing method in accordance with UL 67.
 - 3. Mark each panelboard with its maximum short circuit rating at the supply voltage.
 - 4. Panelboards shall be fully rated.

2.6 COMPONENTS

- A. Enclosure:
 - 1. NEMA enclosure type as indicated on the Drawings.
 - a. Where not indicated on the Drawings, as specified in the Common Work Results for Electrical section for the installed location.
 - 2. Minimum width: 20 inches.
 - 3. Gutter space in accordance with the NEC:
 - a. Minimum of 4 inches of gutter space.
 - 4. Dead-front, no live parts when the panelboard is in service.
 - 5. Enclose entire panelboard bus assembly in a corrosion resistant galvanized steel cabinet.

6. 4-piece front to provide ease of wiring access.
7. Lockable, hinged door over the protective devices with a flush, cylinder tumbler-type lock with catch and door pull.
 - a. Minimum 2 keys per panelboard.
 - b. Key all panelboard locks alike.
8. Circuit directory frame and card on the inside of the door.
9. Interior design such that replacement of circuit breakers does not require disturbing adjacent units or removal of the main bus connectors.
10. Outdoor locations: Provide NEMA Type 3R enclosures with a NEMA Type 3R outer enclosure (with a hinged door) and a NEMA Type 1 interior panelboard, unless otherwise indicated.

B. Bus:

1. General:
 - a. Tin-plated copper.
2. Phase bus:
 - a. Full size and height without reduction.
 - b. Dimensions and temperature rise in accordance with UL 67:
 - 1) Limit current density to less than 1,000 amps per square inch.
 - c. Insulate all current carrying parts from ground and phase-to-phase with a high dielectric strength insulator.
3. Ground bus:
 - a. Copper, solidly bonded.
4. Neutral bus:
 - a. Provide where indicated on the Drawings.
 - b. 100 percent rated.
 - c. Provide lugs for each outgoing feeder requiring a neutral connection.
5. Provide insulation barriers over the vertical bus behind the dead front shield to provide increased safety during field service.

C. Lugs:

1. UL listed for copper and aluminum wire:
 - a. Provide lugs rated for 75-degree Celsius terminations.
 - b. Provide bolted or compression main lug terminations as required for the incoming cable size.

D. Circuit breakers: As specified in the Low Voltage Molded Case Circuit Breakers section and as indicated on the Drawings:

1. Provide all circuit breakers with bolt-on connections:
 - a. Plug-in circuit breakers are not allowed.

2.7 ACCESSORIES

A. Surge protective devices:

1. Furnish panelboards with surge protective devices as indicated on the Drawings.
2. As specified in the Surge Protective Devices section.

B. Nameplates:

1. As specified in the Identification for Electrical Systems section.
2. Install on outside of door.
3. Indicating:
 - a. Panel designation.
 - b. Voltage.
 - c. Number of phases and configuration.

- C. Circuit identification labels:
 - 1. Provide index cards behind heavy clear plastic in cardholders on the inside of the doors.
 - 2. Type all information on the cards using designations in the panel schedules.
 - 3. Laminated on both sides.
 - D. Pad locking mechanism:
 - 1. Provide a pad locking attachment to allow circuit breakers to be locked in the off position.
 - 2. At a minimum, provide 1 mechanism per panelboard:
 - a. Provide multiple mechanisms if required to accommodate all circuit breaker frame sizes in the panelboard.
- 2.8 MIXES (NOT USED)
- 2.9 FABRICATION (NOT USED)
- 2.10 FINISHES
- A. Finish stand-alone panelboards with a primer, rust-resistant phosphate undercoat, and 2 coats of oven-baked enamel with manufacturer's standard gray.
 - B. Finish panelboards mounted in motor control centers to match the motor control center finish and color.
- 2.11 SOURCE QUALITY CONTROL (NOT USED)

PART 3 EXECUTION

- 3.1 EXAMINATION (NOT USED)
- 3.2 PREPARATION (NOT USED)
- 3.3 INSTALLATION
- A. As specified in the Common Work Results for Electrical section.
 - B. Install the equipment in accordance with the accepted installation instructions and anchorage details to meet the seismic and wind load requirements at the Project site.
 - C. General:
 - 1. Surface, flush or MCC mounted as indicated on the Drawings.
 - 2. Mount rigidly to structural members with exposed surfaces plumb and level to within 1/32 inch.
 - 3. Perform work in accordance with the manufacturer's instructions and shop drawings.
 - 4. Provide all brackets, hangers, supports, and hardware for mounting as required.
 - 5. In all NEMA Type 4 and NEMA Type 4X locations, mount panelboards on 7/8-inch deep stainless steel preformed channel, with channel running vertically from top to bottom of panelboard:
 - a. Use only stainless steel mounting hardware.
 - 6. Mount panelboard so that top operating handle is not more than 6 feet-7 inches above the operating floor.
- 3.4 ERECTION, INSTALLATION, APPLICATION, CONSTRUCTION (NOT USED)
- 3.5 REPAIR/RESTORATION (NOT USED)

3.6 RE-INSTALLATION (NOT USED)

3.7 COMMISSIONING

- A. Factory testing:
 - 1. Perform standard factory tests on the panelboards:
 - 2. Test in accordance with the latest version of NEMA and UL standards.

3.8 FIELD QUALITY CONTROL

- A. As specified in the Common Work Results for Electrical section.

3.9 ADJUSTING (NOT USED)

3.10 CLEANING

- A. As specified in the Common Work Results for Electrical section.

3.11 PROTECTION

- A. As specified in the Common Work Results for Electrical section.

3.12 SCHEDULES

- A. Circuiting within the panelboard shall match the panel schedules as indicated on the Drawings.
- B. Provide typewritten schedule in each panelboard.

END OF SECTION

SECTION 31 00 00

SITE EARTHWORK

PART 1. GENERAL

1.1 SUMMARY

- A. Perform earthwork.
- B. Meet requirements for excavation safety, or to facilitate construction due to wet conditions.
- C. Perform excavation regardless of type, nature, or condition of materials encountered.
- D. Contractor shall make his own estimate of the type and extent of the various materials to be excavated in order to accomplish the work.
- E. There will be no extra compensation for dewatering.

1.2 RELATED SECTIONS

- A. Section 31 23 33 - Trenching and Backfilling.

1.3 REFERENCES

- A. American Society for Testing and Materials, 1916 Race St. Philadelphia, PA 19103.
 - 1. ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb (2.49-kg) Rammer and 12-in. (304.8-mm) Drop.
 - 2. ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.
 - 3. ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 10 lb (4.54-kg) Rammer and 18-in. (457-mm) Drop.
 - 4. ASTM D2216 - Method for Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures.
 - 5. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
 - 6. ASTM D3017 - Test Method for Moisture Content of Soil and Soil-Aggregate in Place of Nuclear Methods (Shallow Depth).
- B. Occupational Safety and Health Administration (OSHA) Standard for Excavation and Trenches Safety System, 29 CFR 1926, Subpart P: Excavations.

1.4 DEFINITIONS

- A. Relative Compaction:
 - 1. The ratio, in percent, of the as-compacted field dry density to the laboratory maximum dry density as determined by the Standard Proctor Test, ASTM D698, or as determined by the Modified Proctor Test, ASTM D1557, as applicable.
 - 2. Corrections for oversize material may be applied to either the as-compacted field dry density or the maximum dry density, as determined by the Engineer.

- B. Optimum Moisture Content:
 - 1. Moisture content of the material for which the maximum dry density is obtained as determined by ASTM D698 or D1557.
 - 2. Field moisture contents shall be determined on the basis of the fraction passing the 3/4-inch sieve.

- C. Completed Course: A course or layer that is ready for the next layer or the next phase of construction.

1.5 SUBMITTALS

- A. Submit in accordance with the Frontend Documents.

- B. Provide the following:
 - 1. Samples of imported material.
 - 2. Samples of onsite material to be used as fill.
 - 3. Certification that imported materials conform to the Specification requirements along with copies of the test results from a qualified commercial testing laboratory.
 - 4. Proctor curves on fill material as prepared by approved laboratory.

1.6 PROJECT CONDITIONS

- A. Beginning work of this Section means acceptance of existing conditions.

PART 2. PRODUCTS

2.1 FILL

- A. Free from roots, organic matter, trash, and debris with maximum particle size of 1-1/2 inches.

- B. It is intended that structural backfill material be obtained from on site to the maximum extent possible.

2.2 IMPORTED GRANULAR FILL

- A. Provide granular fill beneath structures as noted on Drawings.
- B. Imported granular fill to consist of a natural or artificial mixture of gravel and soil mortar, uniformly well graded from coarse to fine.

2.3 TOPSOIL

- A. Selected topsoil at the site, properly stored and protected, free from roots, sticks, hard clay, and stones which will not pass through a 2-inch square opening.
- B. Provide imported topsoil of equal quality if required to accomplish the work.

2.4 COMPACTION EQUIPMENT

- A. Provide compaction equipment of suitable type and adequate to obtain the densities specified.
- B. Operate compaction equipment in strict accordance with the manufacturer's instructions and recommendations.
- C. Hand-operated equipment shall be capable of achieving the specified densities.

2.5 MOISTURE CONTROL EQUIPMENT:

- A. Provide equipment for applying water of a type and quality adequate for the work; it shall not leak; and be equipped with a distributor bar or other approved device to assure uniform application.
- B. Provide equipment for mixing and drying out material consisting of blades, discs, or other approved equipment.

2.6 WATER REMOVAL EQUIPMENT

- A. Provide and operate equipment adequate to keep excavation and trenches free of water.

2.7 IMPORTED MATERIAL ACCEPTANCE

- A. Import only if insufficient material is available on-site.
- B. Locate and arrange use of a site near the construction area for obtaining borrow material.
- C. Additional tests required at the borrow area:
 - 1. Standard Proctor.

2. Remolded permeability.
 3. Atterberg limits.
- D. Upon completion of removal of borrow material, grade the site to drain, place topsoil on disturbed areas, and establish grass.
- E. Cost for testing and imported material shall be the responsibility of the Contractor.

2.8 SELECTED MATERIAL ACCEPTANCE

- A. Provide samples for testing representative of the actual material to be installed in the work. Take samples from each 2,000 cubic yards of material stockpiled. Depending on the uniformity of the material, Engineer may request more frequent samples.
- B. Forward test results to the Engineer at least 10 days before the material is required for use. If tests indicate that the material does not meet Specification requirements, the material shall not be installed in the work.
- C. Material which is placed in the work but does not conform to the Specification requirements shall be removed and replaced at the Contractor's sole expense.

PART 3. EXECUTION

3.1 STRIPPING TOPSOIL

- A. Remove existing grass and overburden before excavating topsoil.
- B. Prior to beginning excavation or fill, strip the topsoil to a depth of at least 6 inches or to a depth sufficient to remove organic material and stockpile for future use.
- C. In general, remove topsoil where structures are to be built, trenches dug, and roads, parking lots, walks, and similar improvements constructed within the areas presently covered with topsoil.
- D. Store topsoil clear of the construction area.
- E. Take reasonable care to prevent the topsoil from becoming mixed with subsoil or eroding.

3.2 STRUCTURAL EXCAVATION

- A. Contractor shall be solely responsible for trench and excavation safety systems in accordance with ACT 291 of 1993 and OSHA requirements.
- B. Identify required lines, levels, and grades.

- C. Identify known underground utilities. Contractor will be responsible for locating utilities.
- D. The method of excavation is optional, however, no equipment shall be operated in a manner that will endanger existing structures and their integrity.
- E. Use excavation support system such as sheet piling where ever necessary.
- F. Allow for forms, working space, granular base, and finish topsoil where shown on Drawings or required.
- G. Do not carry excavation for footings and slabs deeper than the elevation shown on Drawings after allowing for base material. Excavation of material to depths below the grades indicated, unless so directed by the Engineer or Owner's representative, will be deemed unauthorized excavation.
- H. After required excavation, proof-roll site with minimum 20,000 lb. pneumatic-tired roller, loaded tri-axle dump truck, or similar equipment. Remove soft and organic-containing soil, miscellaneous debris, and roots. Fill and compact areas.
 - 1. Provide for observation of each paving area by geotechnical engineer to assess adequacy of bearing stratum. If observation indicated excessively soft and/or organic-containing soils, undercut, fill and compact areas and/or extend footing as directed by geotechnical engineer.
 - a. Include in base bid an allowance for 650 cu. yd. of unsuitable soil removal, fill material, and compaction of fill material.

3.3 DEWATERING EXCAVATION

- A. Remove water during periods when concrete is being deposited, pipe is being laid, and placing of backfill unless water settling is required, and at other times as required for efficient and safe execution of the work.
- B. Accomplish removal of groundwater in a manner that will preserve the strength of the foundation soils, will not cause instability of the excavation slopes, and will not result in damage to existing structures.
- C. Where necessary to these purposes, lower the water level in advance of excavation, utilizing wells, well points, or similar methods.
- D. Maintain the water level in the gravel stratum as measured in piezometers, a minimum of 3 feet below the prevailing excavation level or as needed to prevent bottom heave of the excavation.
- E. Open pumping, sumps, and ditches: If these result in boils, loss of fines, softening of the ground or instability of slopes, areas shall not be accepted.

- F. Install wells and well points with suitable screens and filters so that continuous pumping of fines does not occur.
- G. Operate well points continuously to prevent boils and loss of consolidation.
- H. Arrange discharge to facilitate collection of samples by Engineer.
- I. Avoid settlement or damage to adjacent property.
- J. Dispose of water in a manner that will not damage adjacent property, as approved.

3.4 GRANULAR FILL MATERIAL UNDER FACILITIES

- A. Place fill granular material as specified in this Section within the influence area beneath slabs, walks, structures, roads, and parking areas, and as shown on the Drawings.
- B. Do not exceed loose lifts of 6 inches.
- C. Compact each lift to not less than 95 Percent Modified Proctor Density.
- D. Place and compact a 6-inch layer of granular fill to at least 95 Percent Modified Proctor density immediately beneath spread footings, slabs on grade, or other concrete structures.
- E. Moisten material as required to aid compaction (± 2 percent optimum moisture).
- F. Place material in horizontal lifts and in a manner to avoid segregation.
- G. Correct and repair subsequent damage to slabs, piping, concrete structures, facilities, or other structures caused by settlement of fill material.

3.5 BACKFILL AND STRUCTURES

- A. Remove form materials and trash from excavation before placing backfill.
- B. Do not operate earth-moving equipment within 5 feet of walls of concrete structures for the purpose of depositing or compacting backfill material.
- C. Compact backfill adjacent to concrete walls with hand-operated tampers or similar equipment that will not damage the structure.
- D. Backfill water-holding basins only after satisfactory leakage tests have been conducted.
- E. Place earth fill in areas not designated to be structural fill or granular fill.

- F. Deposit material in maximum 6-inch loose lifts, and compact each lift to not less than 95 Percent Modified Proctor.

3.6 FILL NOT BENEATH STRUCTURES OR FACILITIES

- A. Place earth fill to the lines and grades shown.
- B. Place fill material in maximum 6-inch loose lifts and compact each lift to not less than 95 Percent Modified Proctor.
- C. Make proper allowance for topsoil where required.

3.7 MOISTURE CONTROL

- A. During compacting operations, maintain optimum practicable moisture content required for compaction purposes in each lift of fill.
- B. Maintain moisture content uniform throughout the lift.
- C. Add water to the material at the site of excavation. Supplement, if required, by sprinkling the fill.
- D. At the time of compaction, maintain the water content of the material at optimum moisture content, plus or minus 2 percentage points, except as otherwise specified for embankments.
- E. Do not attempt to compact fill material that contains excessive moisture.
- F. Aerate material by blading, discing, harrowing, or other methods, to hasten the drying process.

3.8 FIELD DENSITY TESTS

- A. Test Methods: ASTM D2922, D1556, D2216, and D3017.
- B. Cooperate with testing work by leveling small test areas designated by the Engineer.
- C. Backfill test areas.
- D. Field density test shall be performed for every 3,000 cubic yards of fill material placed.
- E. Engineer may order testing of lift of fill at any time, location, or elevation.

3.9 SITE GRADING

- A. Perform earthwork to lines and grades as shown on Drawings with proper allowance for topsoil where specified or shown on Drawings.
- B. Shape, trim, and finish slopes to conform with the lines, grades, and cross sections shown.
- C. Slopes shall be free of loose exposed roots and stones exceeding 3-inch diameter.
- D. Round tops of banks to circular curbs, in general, not less than a 6-foot radius.
- E. Neatly and smoothly trim rounded surfaces; over-excavating and backfilling to the proper grade are not acceptable.
- F. Finished site grading shall be reviewed by the Engineer.

3.10 DISPOSAL OF EXCESS EXCAVATION

- A. Dispose of excess excavated materials, not required or suitable for use as backfill or fill, outside of the area of work.
- B. Compact excess material as specified for fill, dress the completed disposal area to slopes no greater than 4:1 (horizontal:vertical), and slope to drain.

3.11 SETTLEMENT

- A. Settlement in backfill, fill, or in structures built over the backfill or fill, that may occur within the 1-year guarantee period in the General Conditions shall be considered to be caused by improper compaction methods.
- B. Restore structures damaged by settlement to original condition.

END OF SECTION

SECTION 31 10 00

SITE CLEARING

PART 1. GENERAL

1.1 SUMMARY

- A. Remove interfering or objectionable material from designated areas of Work.
- B. Preserve vegetation and existing objects designated to remain from injury or defacement.
- C. Cut trees only at direction of Engineer.
- D. Contractor shall be responsible for implementing and following a Storm Water Pollution Prevention Plan as required by the Arkansas Department of Environmental Quality and in accordance with NPDES ARR150000. The successful Bidder (Contractor) shall develop a Storm Water Pollution Prevention Plan to meet all State and Federal regulations and submit to the Engineer for review and approval prior to commencing work.

1.2 DEFINITIONS

- A. Clearing:
 - 1. Cutting, removing, and disposing of trees, snags, stumps, shrubs, brush, limbs, and other vegetative growth.
 - 2. Removing evidence of their presence from the surface, inclusive of sticks and branches greater than 2 inches in diameter or thickness.
 - 3. Removing and disposing of trash piles, rubbish, and fencing.
- B. Grubbing:
 - 1. Removing and disposing of wood or root matter below the ground surface remaining after clearing.
 - 2. Includes stumps, trunks, roots, or root systems greater than 2 inches in diameter or thickness to a depth of 18 inches below the ground surface.
- C. Stripping: Removing and disposing of organic sod, topsoil, grass and grass roots, and other objectionable material from the areas designated to be stripped that remain after clearing and grubbing.

1.3 RELATED SECTIONS

- A. Section 31 00 00 - Site Earthwork.

PART 2. MATERIALS

2.1 GENERAL

- A. Provide materials, suitable and in adequate quantity, required to accomplish Work of this Section.

PART 3. EXECUTION

3.1 PREPARATION

- A. Review with Engineer's representative the location, limits, and methods to be used prior to commencing Work under this Section.

3.2 CUTTING TIMBER

- A. Exercise care when clearing near the clearing limits to avoid damage to existing trees, vegetation, structures, or utilities which are outside of the clearing limits.
- B. Trees shall be leveled into the area to be cleared.
- C. Flush cut stumps not designated for grubbing by cutting to within 2 inches of the ground surface.
- D. Timber is the property of the Contractor.
- E. Dispose of stumps, limbs, brush, snags, non-marketable timber, and other vegetative growth off-site.

3.3 PRESERVATION OF TREES, SHRUBS, AND OTHER VEGETATION

- A. Trees, shrubbery, and other vegetation not designated for removal shall be protected from damage.
- B. Cut and remove tree branches only where, in the opinion of the Engineer, cutting is necessary to effect construction operation.
- C. Remove branches other than those required to effect the Work to provide a balanced appearance of any tree, as approved prior to removal.
- D. Treat scars resulting from the removal of branches with an approved tree sealant.

3.4 CLEARING AND GRUBBING LIMITS

- A. Clear and grub areas within the limits of construction.
- B. Clear and grub in stages as the construction area is increased to avoid unnecessary clearing and grubbing.

3.5 DISPOSAL OF CLEARING AND GRUBBING DEBRIS

- A. Haul the material from the Work site and dispose of in accordance with state, federal, and local laws. Off-site disposal shall be at the Contractor's sole expense.

3.6 AREAS TO BE STRIPPED

- A. The exact depth of stripping shall be determined by the Engineer.
- B. Topsoil requirements are specified in Section 31 00 00.
- C. Strip areas that are cleared and grubbed.
- D. Strip areas in stages to avoid unnecessary stripping.

3.7 DISPOSAL OF STRIPPINGS

- A. Do not mix strippings with borrow excavation.
- B. Stockpile topsoil from the strippings for use in landscape grading.
- C. Dispose of excess topsoil.
- D. Strippings not suitable for use as topsoil shall become the property of the Contractor and shall be removed from the site.

END OF SECTION

SECTION 31 11 00

CLEARING AND GRUBBING

PART 1. GENERAL

1.1 DESCRIPTION

- A. Work shall consist of cutting, removing from the ground, and properly disposing of trees, stumps, hedge, brush, roots, logs, weeds, rubbish, sod refuse dumps, sawdust piles, lumbering slash, and other materials within the designated area.
- B. The work shall also include selective clearing, preserving existing vegetation, scalping, and the preservation of objects designated to remain.

1.2 DEFINITIONS

- A. Clearing - The removal of all trees, brush, and other objectionable growth, and the removal and disposal of logs, rubbish piles, refuse dumps, sawdust piles, lumbering slash, and other objectionable matter from the surface of the ground in the areas shown on the plans or as designated by the Engineer.
- B. Grubbing - The grubbing and removal of all stumps, roots, and other objectionable matter, lying wholly or in part below the surface of the ground.
- C. Selective Clearing - The trimming of selected trees and shrubs, the removal from the ground and disposal of logs, root pods, brush, refuse dumps, and other undesirable debris, and the cutting, removal, and disposal of all undergrowth, stumps, and standing trees, except those trees and shrubs designated to be preserved. The selective clearing areas will be shown on the plans.
- D. Scalping - Areas not classified as clearing and grubbing and that are within construction limits shall be scalped, if appropriate. Scalping shall include the removal and disposal of material such as saplings less than 4-inches in diameter measured 12-inches above the ground, logs, brush, roots, grass, residue of agricultural crops, refuse dumps, and decayed matter.
- E. Clearing and Grubbing Trees - The cutting, grubbing and removal of individual, isolated trees and stumps greater than 4-inches diameter measured 12-inches above the ground as shown on the plans or designated by the Engineer to be removed.

PART 2. MATERIALS

2.1 GENERAL

- A. Provide materials suitable and in adequate quantity required to accomplish the work of this Section.

PART 3. EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

- A. The project site shall be cleared as defined above, except those objects designated to remain shall be carefully protected from abuse, marring, or damage during construction operations.
- B. Trees shall be felled and removed in such a manner as to avoid injury to other trees or objects designated to remain. In case of injury to bark, limbs, or roots of vegetation designed to remain, the Contractor shall repair such damage by corrective pruning or other appropriate methods. Trees or other debris falling outside the construction area shall be removed and disposed of according to these specifications.
- C. Holes remaining after removal of trees, stumps, etc. shall be backfilled with material approved by the Engineer and compacted as directed except in areas to be excavated. The Contractor shall complete the operation by blading, bulldozing, or other approved methods so that the site shall be free of holes, ditches, or other abrupt changes in elevations that resulted from the clearing and grubbing operations.

3.2 CLEARING AND GRUBBING

- A. The site shall be cleared of stumps, brush, logs, rubbish, trees, and shrubs, with the exception of such trees, shrubs, and areas designed on the plans or by the Engineer for preservation. Grubbing will not be required in areas that will have a fill height of 3-feet or more above disturbed stumps cut within 6-inches of the natural ground. Sound stumps may be left outside the construction limits when they are severed flush with or below the natural ground, or the slope line in areas to be rounded at the top of the back slopes.
- B. Merchantable timber in the clearing area shall become the property of Contractor, unless otherwise provided.
- C. When perishable material is burned, it shall be under the constant care of a competent watcher. Contractor is responsible for obtaining any and all permits for burning. Burning shall be accomplished at such times and in such manner that the surrounding vegetation, adjacent property, or anything designated to remain on the

site will not be jeopardized. Upon notice from the Engineer that meteorological conditions render burning undesirable, the Contractor shall cease all burning until notified by the Engineer that meteorological conditions are suitable for a resumption of burning operations.

- D. When specified, burning will not be permitted unless the material to be burned is placed in an incineration pit and an acceptable forced air combustion device is used that will minimize the emission of smoke, fly ash, and other pollutants. This device shall be constructed so that the forced air is directed over the fire by plenums or ducts. The use of open fans or mulch blowers will not be permitted.
- E. The Contractor shall comply with all Federal, State, County, and City laws, regulations, or ordinances applicable to the disposal of clearing and grubbing material. Materials and debris that cannot be burned shall be removed from the project site and disposed of at locations off the project, outside the limits of view from any public road, street, park, or other public facility. The Contractor shall make all necessary arrangements with the property owner for obtaining suitable disposal locations.
- F. Disposal operations and final cleanup of the site, including seeding and stabilization, shall comply with these specification requirements. When requested by the Engineer, the Contractor shall furnish copies of all agreements with property owners.

3.3 SELECTIVE CLEARING

- A. This work shall be performed in such a manner as to leave the designated areas in a park-like condition and susceptible to economical mowing. Disposal of all material shall comply with the methods set out in the Clearing and Grubbing requirements.
- B. Stumps, trees, and shrubs, except those designated to be preserved, shall be severed flush with or below the ground.
- C. Movement and operation of equipment shall be such that roots, branches, and trunks of trees and shrubs selected for retention will not be scarred, broken, or otherwise damaged to the extent that the life of the plant is endangered.

3.4 PRESERVED VEGETATION

- A. Trees, shrubs, brush, vines, and other natural perennial vegetation shall be protected in the areas designated as Preserved Vegetation.
- B. Areas designated as Preserved Vegetation shall not be used for parking, storage, or other construction support activities that will damage vegetation or compact the soil. Care shall be taken to prevent spills of materials hazardous to vegetation such as oil, hydraulic fluid, salts, etc.. Erosion and sedimentation control shall be such

that sediment is not deposited in depths greater than 2-inches within any portion of the Preserved Vegetation area.

- C. Clearing and grubbing may be required through preserved vegetation areas for drainage outlets, channels, or other required construction.

3.5 SCALPING

- A. The Contractor shall scalp areas where excavation or embankment is to be made, except that mowed sod need not be removed where the embankment to be constructed is more than 3-feet in height.
- B. All suitable material resulting from the scalping operation shall be placed on finished slopes, adjacent to the area from which it is obtained, after excavation or embankment operations are complete.
- C. Unsuitable material shall be disposed of as specified for Clearing and Grubbing.

END OF SECTION

SECTION 31 23 16.16

STRUCTURAL EXCAVATION AND BACKFILL

PART 1. GENERAL

1.1 DESCRIPTION

- A. This item shall govern for all excavation required for the construction of all structures, except pipe or box sewers but including sewer structures and appurtenances; for the disposal of all excavated material; and for backfilling around completed structures to the original ground level or as required by the plans. The work shall include all necessary pumping, bailing, sheathing, drainage, and the construction and removal of any required cofferdams. Unless otherwise provided, the work included herein shall provide for the removal of old structures or portions thereof (abutments, wingwalls, piers, etc.), trees and all other obstructions to the proposed construction.
- B. Excavation will not be classified, but will be considered as "Structural Excavation", which will include the removal of all materials encountered regardless of their nature or the manner in which they are removed as well as any required backfill.

1.2 RELATED SECTIONS

- A. Section 31 23 33 - Trenching and Backfilling.

1.3 STRUCTURAL EXCAVATION

- A. Unless specified on the plans, or approved otherwise by the Engineer, structural excavation shall be designated as follows:
 - 1. Width and Length - From a vertical plane outside the structure equal to the thickness of the footing or slab.
 - 2. Depth - From bottom of footing or slab to the finished groundline or natural groundline, whichever is lower in elevation.
 - 3. When caissons are provided, excavation is not permitted outside the outer face of the caissons.
- B. By definition, a cofferdam is a temporary or removable structure to keep surrounding earth, water, or both out of the excavation and may be earth, timber, steel, concrete or a combination thereof.
- C. A caisson is a permanent part of the substructure which sinks gradually into place as material is excavated within the area protected by its sidewalls. It may be either open well type or a pneumatic type caisson.

PART 2. PRODUCTS

2.1 BACKFILLING

- A. All backfills shall be constructed in layers approximately parallel to the finished grade. After completion of the backfill, it shall be continuously maintained to its finished grade, until the project is accepted.
- B. Each layer of embankment or backfill shall be uniform as to material, density and moisture content before beginning compaction. Water required to bring the material to the moisture content necessary for the required compaction shall be the responsibility of the Contractor.
- C. Unless otherwise indicated, backfill compacted mechanically shall be in loose lifts not exceeding 8- inches. Backfill shall be clean bank sand, unless otherwise directed by the Engineer, free from clay and clay lumps, shale, loam, organic matter, salts and other deleterious materials and having a plasticity index less than 3. Backfill shall be compacted to ninety-five (95) percent of Standard Proctor Density (ASTM D698) at a moisture content ranging from -2 to +3 percentage points above optimum.
- D. Do not place backfill against walls for a minimum of 7 days after structure has been in place. Place backfill against walls of partially completed structure only after approval of the Engineer. Backfill around abutments and piers shall be deposited on both sides to approximately the same elevation at the same time.
- E. Care shall be taken to prevent any wedging action or backfill against the structure and the slopes bounding the excavation shall be stepped or serrated to prevent such wedge action.
- F. No backfilling shall be done except in the presence of the Engineer, or his authorized representative.

2.2 CONSTRUCTION METHODS

- A. Excavation shall be done in accordance with the lines and grades indicated on the plans, or as established by the Engineer.
- B. The final elevation to which a foundation is to be constructed shall be as shown on the plans or as raised or lowered by written order of the Engineer when such alterations are judged proper to satisfactorily comply with the design requirements for the structure. Should it be found necessary, in the judgment of the Engineer to increase or decrease the depth of footings from that shown on the plans, the necessary alterations in the details of the structure shall be accomplished as directed by the Engineer. The City of Jonesboro shall have the right to substitute revised details resulting from a consideration of the changes in the design condition.

- C. When a structure is to rest on an excavated surface, special care shall be taken not to disturb the bottom of the excavation, and the final removal of the foundation material to grade shall not be performed until just before the footing is to be placed.
- D. Protect excavations from rainfall and surface water. If the supporting soil is exposed to adverse wet or dry conditions, excavate deeper and/or wider to sound material at no additional cost to the City of Jonesboro. Prior to such activity, the Contractor shall notify the Engineer.
- E. Excavated material required to be used for backfill may be deposited, by the Contractor, in storage piles at points convenient for rehandling of the material during the backfilling operations. The location of storage piles shall, however, be subject to the approval of the Engineer, who may require that the survey centerline of the structure and the transverse or hub line of any unit of the structure be kept free of any obstruction.
- F. Excavated material required to be wasted shall be disposed of as directed by the Engineer, and the disposal shall be in such manner as not to obstruct a stream or otherwise impair the efficiency or appearance of the structure or other parts of the work.

2.3 COFFERDAMS AND CAISSONS

- A. The term cofferdam wherever used in this specification designates any temporary or removable structure which is constructed to hold the surrounding earth, water, or both out of the excavation, whether such structure is formed of earth, timber, steel, concrete, or a combination of these. It thus includes earthen dikes, timber cribs, any type of sheet piling, removable steel sheets and the like and all necessary bracing; and it shall also be understood to include the use of pumping wells or well points for the same purpose. The cost of cofferdams shall be included as an incidental cost to excavation.
- B. The term caisson, wherever used in this specification, designates a permanent part of the substructure, so constructed as to sink gradually into place as material is excavated within the area protected by its sidewalls. Such caisson may be of either the open-well or pneumatic type and quantities for same will always be included as bid items separate from excavation.
- C. In addition to interior dredging, the lowering of caissons may be facilitated by the following methods:
 - 1. Addition of weight by increasing the thickness of caissons, where such increase is permitted by the type of design, shall be requested by the Contractor prior to beginning the work. Increased quantities due to this change shall be at the Contractor's expense.
 - 2. By the addition of removable loads to the caisson.
 - 3. The use of water or air jets placed around the caisson.

4. Steel shell caissons may be driven with a drop or air hammer if the Contractor, at his own expense, provides a suitable driving ring. The driving ring shall be of sufficient strength and the manner of driving shall be regulated to preclude damage to the caisson.
- D. When no provisions for caissons is shown on the plans, it shall be the intent of this specification to require that a suitable cofferdam be provided for all excavations where such cofferdam may be necessary to control water conditions or to preclude sliding and caving of the walls of the excavation. Where no ground or surface water is encountered, the cofferdam needs to be sufficient only to protect the workmen and to avoid cave-ins or slides extending beyond the excavation limits.
- E. The Contractor shall submit, to the Engineer, upon request, drawings showing his proposed method of cofferdam construction and other details left open to this choice, or not fully shown on the plans. All shoring designs must meet the requirements of OSHA Standard 1926.650.
- F. The type and clearance of the cofferdam, insofar as such details affect the character of the finished work, will be subject to the approval of the Engineer, but other details of design will be left to the choice of the Contractor, who will be responsible for the successful completion of the work. The interior dimensions shall be such as to provide sufficient clearance for the construction and removal of any required forms and the inspection of their exteriors and to permit pumping outside of the forms.
- G. In general, sheet piling cofferdams shall extend well below the bottom of the footings and shall be well braced and as water-tight as practicable.
- H. When foundation pilings are to be driven inside a caisson or cofferdam and when it is judged impractical to dewater the caisson or cofferdam before placing a concrete seal, the excavation may be extended below the footing grade to a depth sufficient to allow for swell of the material during pile driving operations. After the pilings have been driven, all foundation material that has risen to a level above the footing grade shall be removed. It is the intention of this provision to establish a construction tolerance to be applied when a foundation is being constructed under water. Where it is possible to dewater the caisson or cofferdam before a seal is placed, it is considered practicable to remove the foundation material to the exact footing grades after foundation pilings are driven. Backfilling in a foundation to compensate for excavation which has been extended below grade, will not be permitted. Such areas below grade shall be filled with concrete at the time the seals or base courses are placed, and the concrete quantities involved shall be at the Contractor's expense. All caisson and cofferdam designs must meet the requirements of OSHA Standard 1926.650.
- I. Caissons or cofferdams which tilt or move laterally during the process of sinking shall be righted or enlarged, as necessary, at the sole expense of the Contractor.

- J. Unless otherwise provided, cofferdams shall be removed by the Contractor after the completion of the substructure. The removal shall be affected in such a manner as not to disturb or mar the structure. In lieu of the entire removal of the cofferdams, the Engineer may require the Contractor to remove any portion of them or to leave them entirely in place.

2.4 PUMPING OR BAILING

- A. Pumping or bailing from the interior of any foundation enclosure shall be done in such a manner as to preclude the possibility of the movement of water through or alongside any concrete being placed. No pumping or bailing will be permitted during the time of the placing of concrete or for a period of at least 24 hours thereafter, unless it is done from a suitable sump separated from the concrete work by a water-tight wall. Pumping or bailing to dewater a sealed cofferdam or caisson shall not be started until the seal has set for at least 36 hours.

PART 3. EXECUTION

3.1 QUALITY ASSURANCE

- A. The Testing Laboratory's representative will determine the moisture density relationship for each material proposed for use as backfill, in accordance with ASTM Method D689. In place density will be determined in accordance with ASTM Methods D2922 or D1556, and with each type of construction.
- B. For walls and trenches, determine the in place density for each 200-foot of wall or trench, for each lift of fill placed.
- C. For building pads and parking areas, determine the in place density for each 4,000 square feet (500 square yards) for each lift of fill placed.

3.2 MEASUREMENT AND PAYMENT

- A. Will not be paid for directly, but will be considered subsidiary to the bid for structures requiring excavation and/or backfilling.

END OF SECTION

SECTION 31 23 33

TRENCHING AND BACKFILLING

PART 1. GENERAL

1.1 SUMMARY

- A. Work of this Section also includes:
 - 1. Backfill required by undercutting.
 - 2. Imported pipe zone material.
 - 3. Trench settlement repair, including replacing roadway surfacing, sidewalk, or other structures.
 - 4. Replacing damaged culverts.
- B. Trench excavation is classified as common excavation and includes removal of material of whatever types encountered including rock to depths shown or as directed by Engineer.
- C. Pipe zone includes full width of excavated trench from bottom of pipe to a point 6 inches above top outside surface of pipe barrel.
- D. Conform to federal, state, and local codes governing safe loading of trenches with excavated material.
- E. The right is reserved to modify the use, location, and quantities of the various types of backfill during construction as Engineer considers to be in the best interest of Owner.
- F. There shall be no extra compensation for dewatering. Contractor is to provide all necessary equipment including but not limited to pumps and hoses as needed to maintain the integrity of the site.
- G. There shall be no extra compensation for rock encountered in footing or trench excavation performed by standard heavy-duty equipment such as a Caterpillar D-8 dozer with single tooth ripper, a Caterpillar 330B tracked excavator equipped with rock teeth or equipment of similar power and capability. Rock not able to be excavated with this category of equipment will be compensated.

1.2 REFERENCES

- A. ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA, 19428-2959.
 - 1. ASTM D448 - Classifications for Standard Sizes of Aggregate and Bridge Construction.

2. ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5-lb. (2.49-kg.) Rammer and 12-inch (304.8-mm) Drop.
 3. ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 10-lb. (4.54-kg.) Rammer and 18-inch (457-mm) Drop.
 4. ASTM D2487 - Standard Classification of Soils for Engineering Purposes.
 5. ASTM D2922 - Test Methods for Density of Soils and Soil-Aggregates in Place by Nuclear Method.
- B. Occupational Safety and Health Administration (OSHA) Standard for Excavation and Trenches Safety System, 29 CFR 1926, Subpart P: Excavations.
- C. The Contractor shall be solely responsible for trench and excavation safety systems in accordance with Act 291 of 1993.

1.3 SUBMITTALS: Comply with Specifications.

PART 2. PRODUCTS

2.1 FOUNDATION STABILIZATION

- A. Crushed gravel or crushed rock, meeting the requirements of Class 7 of Division 300, Bases and Granular Surfaces of Standard Specifications for Highway Construction.

2.2 PIPE ZONE MATERIAL

- A. Crushed granular material conforming to ASTM D448, Size No. 7.
- B. Appropriately sized Class 7 crushed rock. In areas of soft trench sidewalls and for all sanitary sewer pipe zone material, crushed material must be used, compacted to 98 percent MDD, Standard Proctor.

2.3 COMMON FILL MATERIALS

- A. Material shall not contain pieces larger than 3 inches, and shall be free of roots, debris, or organic matter.

2.4 SELECT FILL MATERIALS

- A. Class 7, Class 3, and Class 4 as in accordance with Division 300, Bases and Granular Surfaces of Standard Specifications for Highway Construction.
- B. ASTM Soil Classification GC as set forth in ASTM Designation D2487-92. On site material may be used, provided it is in accordance with ASTM D2487-92.

2.5 TRENCH BACKFILL

- A. Backfill:
 - 1. Natural or artificial mixture of gravel and mineral soil mortar uniformly well graded from coarse to fine.
 - 2. Engineered fill per Section 31 00 00.
 - 3. Local regulatory agency Class 3, Class 4, or Class 7 as specified in this Section.
 - 4. All trench backfill under pavement or building is to be Class 7, compacted to 98 percent MDD, Modified Proctor.

2.6 COMPACTION EQUIPMENT

- A. Suitable type and adequate to obtain the amount of compaction specified.
- B. Operate in strict accordance with manufacturer's instructions and recommendations and maintain in such condition so that it will deliver manufacturer's rated compactive effort.

2.7 EXCAVATION EQUIPMENT

- A. Suitable type and adequate to perform the work required. Rock removal will be considered common excavation if removable by standard heavy duty equipment such as a Caterpillar D-8 Dozer with a single tooth ripper, a Caterpillar 330B tracked excavator equipped with rock teeth or equipment of similar power and capability.
- B. Operate in strict accordance with manufacturer's instructions and recommendations and maintain in such condition so that it will deliver manufacturer's rated effort.

PART 3. EXECUTION

3.1 PREPARATION

- A. Cut trees and brush as near to surface of ground as practicable, remove stumps, and pile for disposal.
- B. Do not permit excavated materials to cover brush or trees prior to disposal.

3.2 PREVENT TRENCH WATER AND ANIMALS FROM ENTERING PIPE

- A. When pipe laying is not in progress, including noon hours, open ends of pipe shall be closed; and no trench water, animals, or foreign material shall be permitted to enter the pipe.

3.3 DISPOSAL OF CLEARED MATERIAL

- A. Dispose of material in such a manner to meet requirements of state, county, and local regulations regarding health, safety, and public welfare.
- B. Dispose of nonflammable and flammable material off the construction site in an approved location.
- C. Do not leave material on the Project site, shove onto abutting private properties, or bury in embankments or trenches.

3.4 REMOVAL OF OBSTRUCTIONS

- A. Remove obstructions within trench area or adjacent thereto such as tree roots, stumps, abandoned piling, logs, and debris.
- B. Engineer may, if requested, make changes in the trench alignment to avoid major obstructions, if such alignment changes can be made without adversely affecting the intended function of the facility.
- C. Dispose of obstructions in accordance with this Section.

3.5 REMOVAL AND REPLACEMENT OF TOPSOIL

- A. Where trenches cross lawns, garden areas, pasturelands, cultivated fields, or other areas on which reasonable topsoil conditions exist, remove topsoil for a depth of 6 inches for full width of trench to be excavated.
- B. Use equipment capable of removing a uniform depth of material.
- C. Stockpile removed topsoil at regular intervals, and do not mix with other excavated material. Cover all stockpiled materials per Section 31 25 00 Erosion and Sedimentation Controls.
- D. Locate stockpiles so that material of one type is not mixed or stockpiled on material of another type.
- E. Minimum finished depth of topsoil over trenches: 8 inches.
- F. Imported topsoil may be substituted for stockpiling and replacing topsoil.
- G. Maintain finished grade of topsoil level with area adjacent to trench until final acceptance by Engineer.

- H. Repair damage to adjacent topsoil caused by work operations.
 - 1. Remove rock, gravel, clay, and other foreign materials from the surface.
 - 2. Re-grade.
 - 3. Add topsoil as required.

3.6 TRENCH WIDTH

- A. Minimum width of un-shored trenches where pipe is to be laid shall be 24 inches greater than the outside diameter of the pipe, or as approved; that is 12 inches on either side of the centrally laid pipe
- B. Maximum width at top of trench will not be limited, except where excess width of excavation would cause damage to adjacent structures or property or cause undue stresses on the pipe.
- C. Confine trench widths to allowable work area or construction easements, unless special written agreements have been made with Owner.

3.7 EXCAVATION

- A. Excavate trench to lines and grades shown or as established by Engineer with proper allowance for pipe thickness and for pipe base or special bedding when required.
- B. If trench is excavated below required grade, correct with foundation stabilization material.
- C. Place material over full width of trench in compacted layers not exceeding 6 inches deep to established grade with allowance for pipe base or special bedding.

3.8 PREPARATION OF TRENCH - LINE AND GRADE

- A. Do not deviate more than ½ inch from line or ½ inch from grade. Measure for grade at the pipe invert, not at the top of the pipe, because of permissible variation in pipe wall thickness.
- B. Grade the bottom of the trench by hand to the line and grade where the pipe is to be laid, with proper allowance for pipe thickness and for pipe base when specified or indicated.
- C. Remove hard spots that would prevent a uniform thickness of bedding.
- D. Check the grade with a straightedge and correct irregularities found.
- E. The trench bottom shall form a continuous and uniform bearing and support for the pipe at every point between bell holes, except that the grade may be disturbed for the removal of lifting tackle.

3.9 SHORING OF TRENCHES

- A. Shore trench when necessary to prevent caving during excavation in unstable material or to protect adjacent structures, property, workers, and the public.
- B. Increase trench widths accordingly by the thickness of the shoring material.
- C. Maintain shoring in place until pipe has been placed and backfilled at pipe zone.
- D. Remove shoring and as backfilling is done in a manner that will not damage pipe or permit voids in backfill.
- E. Conform to safety requirements of federal, state, and/or local public agency having jurisdiction for shoring and bracing of trenches. The most stringent of these requirements shall apply.

3.10 LOCATION OF EXCAVATED MATERIALS

- A. Place excavated material only within construction easement, right-of-way, or approved working area.
- B. Do not obstruct private or public traveled roadways or streets.

3.11 REMOVAL OF WATER

- A. Provide and maintain ample means and devices to promptly remove and dispose of water entering trench during time trench is being prepared for pouring of footings, pipe laying, during laying of pipe, and until backfill is completed.
 - 1. These provisions apply during the noon hour as well as overnight.
 - 2. Provide necessary means and devices, as approved, to positively prevent water from entering the construction area of another contractor.
- B. Dispose of water in a manner to prevent damage to adjacent property.
- C. Drainage of trench water through the pipeline under construction is prohibited.

3.12 FOUNDATION STABILIZATION

- A. When existing material in bottom of trench is unsuitable for supporting pipe or footing, excavate unsuitable material.
- B. Backfill trench to sub-grade of footing or pipe base with foundation stabilization material specified.
- C. Place foundation stabilization material over the full width of trench and compact in layers not exceeding 6 inches deep to required grade by making passes with a vibratory compactor (or equivalent).

- D. Material shall be considered unsuitable when it contains more than 5 percent organic material by volumetric sampling or when it will not support a reading of 1.5 on a hand penetrometer.

3.13 ROCK IN TRENCH

- A. Where rock is encountered in bottom of pipe trench, support pipe on a minimum of 4-inches of bedding material or one-eighth of the outside diameter of pipe, whichever is greater.
- B. Where rock is encountered in bottom of footing trench, excavate rock as needed to provide level bearing surface for footing.

3.14 PIPE ZONE BACKFILL

- A. Depth of the pipe zone above pipe barrel varies with pipe material.
- B. Particular attention must be given to area of pipe zone from invert to centerline of pipe to ensure firm support is obtained to prevent lateral movement of pipe during final backfilling of pipe zone.
- C. Backfill area of pipe zone from bottom of pipe to horizontal centerline of pipe by hand-placing material around pipe in 4-inch layers.
- D. Achieve continuous support beneath pipe haunches by “walking in” and slicing with shovel.
- E. Backfill area of pipe zone from horizontal centerline to top of pipe zone with pipe zone material as determined by class of backfill or shown in the documents.
- F. In lieu of selected material for pipe zone in upper portion of pipe zone, imported pipe zone material approved by Engineer for trench backfill may be substituted.

3.15 TRENCH BACKFILL ABOVE PIPE ZONE

- A. When backfill is placed mechanically, push backfill material onto slope of backfill previously placed and allow to slide down into trench.
- B. Do not push backfill into trench in such a way as to permit free fall of material until at least 2 feet of cover is provided over top of pipe.
- C. Under no circumstances allow sharp, heavy pieces of material to drop directly onto pipe or tamped material around pipe.
- D. Do not use backfill material of consolidated masses larger than ½ cubic foot.

3.16 EXCESS EXCAVATED MATERIAL

- A. Dispose of excess excavated material off project site in an approved area.

3.17 PIPE COVER

- A. Place select material from excavation over pipe to provide minimum coverage, as shown on Drawings or as directed by Engineer.

3.18 DRAINAGE DITCH RESTORATION

- A. Under-crossings of minor drainage ditches not covered in another Specification Section shall be backfilled so that upper 1 foot of material in ditch between ditch banks is clay.
- B. Compact material for full ditch width by 6 passes of vibratory compactor (or equivalent).

3.19 SETTLEMENT

- A. Correct settlement noted in backfill, fill, or in structures built over backfill or fill within warranty period.

END OF SECTION

SECTION 32 11 23

AGGREGATE BASE COURSE

PART 1. GENERAL

1.1 SUMMARY

- A. This item shall consist of a foundation course for surface course, for other base courses, or for pavements.
- B. It shall be constructed on the prepared subgrade, subbase, or other completed base course according to these specifications and in substantial conformity with the lines, grades, compacted thickness, and typical cross section shown on the plans.

PART 2. PRODUCTS

2.1 MATERIALS

- A. Aggregate Base Course shall be either gravel and/or crushed stone so proportioned as to meet the requirements for a class of aggregate specified in the following table:

Sieve,mm	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6	Class 7	Class 8	
				PERCENT PASSING					
75 (3")	100	100	100						
50 (2")	95-100	95-100	95-100						
37.5 (1-1/2")				85-100	100	100	100		
25.0 (1")								100	
19.0 (3/4")	60-100	60-100	60-100	60-100	60-100	50-90	50-90	65-100	
9.5 (3/8")	40-8-	40-80	40-80	40-80	40-80				
4.75 (#4)	30-60	30-60	20-60	30-60	30-60	25-55	25-55	25-55	
2.0 (#10)	20-50	20-50	20-45	20-45	20-45				
0.425 (#40)	10-35	10-35	10-35	10-35	10-35	10-30	10-30	10-30	
0.075 (#200)	3-15	3-15	3-12	3-12	3-12	3-10	3-10	3-10	
MAX. PLASTICITY INDEX (MINUS									
0.425 MATL.)	13	10	6	6	6	6	6	6	
(#40) MINIMUM PERCENT CRUSHED (RETAINED ON 4.75 mm [#4] SIEVE					15				
MINIMUM PERCENT CRUSHER-RUN MATERIAL						90	90	90	

- B. Class 7 and 8 shall be any mechanically crushed natural rock or stone of igneous, sedimentary, and/or metamorphic origin produced from a solid geological formation by quarrying method.

- C. The Contractor shall have the option of using any higher numbered class Aggregate Base Course than that specified, provided that payment will be for the class specified.
- D. Material furnished for Aggregate Base Course, Class 3 through Class 8, shall have a percent of wear by the Los Angeles Test not greater than 45 as determined by AASHTO T 96.
- E. When it is necessary to blend two or more materials, each material shall be proportioned separately through mechanical feeders to ensure uniform production. Premixing or blending to avoid separate feedings will not be permitted. Production of material by blending materials on the roadway to obtain a mixture that will comply with the requirements specified herein will not be permitted.
- F. For the purpose of this specification, shale and slate are not considered to be gravel or stone. The material furnished shall not obtain more than 5percent by weight of shale, slate, and other objectionable, deleterious, or injurious matter.
- G. For Class 1 and 2 materials, the fraction passing the 0.075 mm (#200) sieve shall not be greater than three-fourths of the fraction passing the 0.425 (#40) sieve. For Classes 3 through 8, the fraction passing the 0.075 mm (#200) sieve shall not be greater than two-thirds of the fraction passing the 0.425 mm (#40) sieve. For Classes 3 through 8 the fraction passing the 0.425 mm (#40) sieve shall have a liquid limit not greater than 25.
- H. To ensure that gravel is uniformly graded, the difference between the percent passing the various sieves shall be as follows for Classes 3, 4 and 5:

Sieve		Percent
19.0 mm - 9.5 mm	(3/4" - 3/8")	5 min.
9.5 mm - 4.75 mm	(3/8" - #4)	5 min.
4.75 mm - 2.00 mm	(#4 - #10)	5 min.
2.0 mm - 0.425 mm	(#10 - #40)	4 min.

- I. When the material contains aggregate larger than that specified above for the class called for in the Contract, the oversize aggregate shall be removed by screening or by screening and crushing. The removal of large size aggregate by hand methods will not be permitted.

PART 3. EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

- A. The base course material shall be placed on a completed and approved subgrade or existing base that has been bladed to substantially conform to the grade and cross section shown on the plans.
- B. The subgrade shall be prepared as specified in Section 31 00 00 - Site Earthwork, and shall be free from an excess or deficiency of moisture at the time of placing base course material.
 - 1. The subgrade shall also comply, where applicable, with the requirements of other items that may be contained in the Contract that provide for the construction, reconstruction, or shaping of the subgrade or the reconstruction of the existing base course.
- C. Base course material shall not be placed on a frozen subgrade or subbase.
- D. The aggregate shall be placed on the subgrade or other base course material and spread uniformly to such depth and lines that when compacted it will have the thickness, width, and cross section shown on the Drawings.
- E. If the required compacted depth of the base course exceeds 150 mm (6 inches), the base shall be constructed in two or more layers of approximate equal thickness. The maximum compacted thickness of any one layer shall not exceed 150 mm (6 inches) except when vibrating or other approved types of special compacting equipment are used, the compacted depth of a single layer of base course may be increased to 200 mm (8 inches) upon approval of the Engineer.
- F. The material shall be spread the same day that it is hauled. Spreading shall be performed in such a manner that no segregation of course and fine particles nor nests or hard areas caused by dumping the aggregate on the subgrade will exist. Care shall be taken to prevent mixing of subgrade or unspecified material with the base course material during the blading and spreading operation.
- G. Aggregate shall not be dumped or mixed on an existing or newly constructed ACHM course or PCC Pavement that will not be overlaid under the same Contract nor on any open graded base course. Mechanical spreading equipment shall be used, if necessary, to place the base course on the subgrade.
- H. If sufficient working space is not available to allow proper aeration or addition of water to the base, the base material shall be mixed by any satisfactory method before placement.

- I. Each course shall be thoroughly mixed for the full depth of the course and shall be compacted by any satisfactory method that will produce the density thereafter specified.
 - 1. The aggregate shall be maintained substantially at optimum moisture during the mixing, spreading, and compacting operations, water being added or the material aerated as may be necessary.
 - 2. The specified grade and cross section shall be maintained by blading throughout the compaction operation.
 - 3. The material in each course shall be compacted to a density, as determined by AASHTO T 238, Method B, of not less than 98 percent of the maximum laboratory density determined in the laboratory by AASHTO T 180, Method D.
 - 4. The aggregate shall be compacted across the full width of application.

- J. The compacted base course shall be tested for depth and any deficiencies corrected by scarifying, placing additional material, mixing, reshaping, and recompacting to the specified density, as directed.

- K. Where neither prime coat nor surfacing is provided in the same Contract with the base course, the material in the base course shall be uniformly compacted, stable, and free of segregated areas.

- L. The Contractor shall maintain the base course in a satisfactory condition until accepted.

3.2 QUALITY CONTROL

- A. To assure that the material used meets the requirements of the specifications, certain tests for quality control and acceptance will be performed as specified herein. The properties for which quality control and acceptance testing will be performed are gradation, density, moisture content, plasticity index, and thickness as specified in each Section.

- B. The maximum laboratory density shall be determined as follows:

% Retained - 4.75 mm (#4) Sieve	Test Method
10 Max.	AASHTO T 99, Method A
11 - 30	AASHTO T 99, Method C
31 Min.	AASHTO T 180, Method D

Note: In lieu of AASHTO T224, correction for coarse particles retained on the 3/4" (19.0 mm) sieve shall be determined by replacing with an equal mass of material passing the 3/4" (19.0 mm) sieve and retained on the #4 (4.75 mm) sieve.

- C. The in-place density shall be determined by using AASHTO T 310, Direct Transmission. The moisture content shall be determined by AASHTO T 310. A new maximum laboratory density and optimum moisture will be determined whenever the Engineer deems necessary or upon evidence provided by the Contractor.
- D. Tests for gradation, liquid limit, and plasticity index shall be performed by AASHTO T 11, T 27, T 89, and T 90.
- E. The Contractor shall furnish all personnel, equipment, and facilities necessary to perform the required sampling and testing.
- F. The Contractor shall provide the Engineer with the opportunity to observe all quality control sampling and testing.
- G. All quality control sampling and testing shall be performed by or under the direct supervision of a technician acceptable to the Owner. Test reports shall be signed and copies made available to the Engineer if requested.
- H. If the results of any tests show that the required minimum density has not been obtained, corrective action shall be taken, followed by a re-test at the same location. The original and re-test reports shall be cross referenced. All corrective actions shall be performed by the Contractor at no cost to the Owner.

3.3 ACCEPTANCE

- A. Acceptance testing for thickness (when specified on the Drawings), gradation, plasticity index, density, and moisture content will be based on lots. The size of standard lots will be 100 cubic yards. Partial lots, of any size, may be established by the Engineer at any time.
- B. Test methods for acceptance shall be the same as specified for quality control testing.
- C. The item of work being tested shall not be considered complete or accepted until passing test reports are submitted to the Engineer.
- D. The Contractor shall take one test for all properties in each lot or partial lot at a location randomly selected by the Engineer.
- E. In addition to the required acceptance tests, the Engineer may require the Contractor to test any location that, by visual observation, appears to be defective.

- F. The Contractor's acceptance sampling and testing procedures and results will be subject to independent assurance sampling and testing conducted by the Owner. The Contractor shall be required to make changes to the equipment and/or procedures if the such tests are unable to verify the Contractor's test results.
- G. All acceptance testing performed by the Contractor is subject to observation by the Engineer. All test reports shall be signed and submitted to the Engineer the next business day after the tests are performed.
- H. If a lot or a partial lot fails to meet the specifications, the Contractor shall remove and replace that lot or partial lot with acceptable material at no cost to the Owner. Tests will be performed on the replacement material as required for the original material. Acceptance of the replacement material will be the same as for the original material.
- I. Payment for the quantity in the original lot will be withheld or recovered, and released after the removal and replacement has been acceptably performed.

END OF SECTION

SECTION 32 16 23

CONCRETE CURBS AND SIDEWALKS

PART 1. GENERAL

1.1 SUMMARY

- A. Construction of concrete curbs and sidewalks.

1.2 RELATED SECTIONS

- A. Section 31 23 33 - Trenching and Backfilling.

1.3 REFERENCES

- A. American Concrete Institute, 22400 W. Seven Mile Road, Detroit, Michigan 48219.
 - 1. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete.
- B. American Society for Testing and Materials, 1961 Race Street, Philadelphia, Pennsylvania 19103.
 - 1. ASTM C94 - Specification for Ready-Mixed Concrete.
 - 2. ASTM C309 - Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - 3. ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5-lb (2.49-kg) Rammer and 12-in (304.8-mm) Drop.
 - 4. ASTM D994 - Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).

1.4 SUBMITTALS

- A. Submit complete information regarding concrete mix to Engineer for review in accordance with the requirements of ASTM C94, Alternate 2.

PART 2. PRODUCTS

2.1 CURB FORMS

- A. 2-inch dressed dimension lumber or metal of equal strength, free from defects that would impair appearance or structural quality of completed curb.
 - 1. Metal forms: Subject to approval of Engineer.
- B. Short-Radius Forms: 1-inch dressed lumber, plywood, or metal.

- C. Curb Face: No horizontal joints in form material closer than 7 inches from top of curb.
- D. Stakes and Bracing Materials: Provide as required to hold forms securely in place.

2.2 SIDEWALK FORMS

- A. 2-inch dressed lumber, straight and free from defects, or standard metal forms.
- B. Short-Radius Forms: 1-inch dressed lumber or plywood.
- C. Stakes and Bracing Materials: Provide as required to hold forms securely in place.

2.3 CRUSHED ROCK BASE

- A. Clean gravel or crushed rock conforming to requirements for granular fill as specified in 31 23 33.

2.4 EXPANSION JOINT FILLER

- A. 1/2-inch thick preformed asphalt-impregnated expansion joint material conforming to ASTM D994.

2.5 CONCRETE

- A. Ready mixed conforming to ASTM C94, Alternate 2.
- B. Compressive Strength: 3,000 psi at 28 days.
- C. Maximum Size of Aggregate: 1-1/2-inch.
- D. Slump: 2 to 4 inches.

2.6 CURING COMPOUND

- A. Liquid membrane-forming, clear or translucent, suitable for spray application.
- B. Conform to ASTM C309, Type 1.

2.7 ACCEPTANCE OF MATERIALS

- A. All materials shall be subject to inspection for suitability, as the Engineer may elect, prior to or during incorporation into the work.

PART 3. EXECUTION

3.1 EXCAVATION AND BACKFILL

- A. Excavate and backfill in accordance with Section 31 23 33.

3.2 PREPARATION OF SUBGRADE

- A. Bring the areas on which curbs and sidewalks are to be constructed to required grade on undisturbed ground and compact by sprinkling and rolling or mechanical tamping.
- B. As depressions occur, refill with suitable material and recompact until the surface is at the proper grade.
- C. Compact subgrade on fill to 95 percent of maximum density at optimum moisture content as determined by ASTM D698.

3.3 SETTING FORMS

- A. Construct forms to the shape, lines, grades, and dimensions called for on the Drawings.
- B. Stake wood or metal forms securely in place, true to line and grade.
- C. Brace forms to prevent change of shape or movement in any direction resulting from the weight of the concrete during placement.
- D. Construct short-radius curved forms to exact radius.
- E. Tops of forms shall not depart from grade line more than 1/8 inch when checked with a 10-foot straightedge.
- F. Alignment of straight sections shall not vary more than 1/8 inch in 10 feet.

3.4 CURB CONSTRUCTION

- A. Construct curbs to line and grade shown or established by the Engineer, and conform to the details shown.
- B. Place, process, finish, and cure concrete in conformance with this Section and the applicable requirements of ACI 614. Wherever requirements differ, the more stringent shall govern.
- C. Placement of Preformed Asphalt-Impregnated Expansion Joints (1/2 inch thick):
 - 1. Beginning and end of curved portions of the curb.

2. Connections to existing curbs.
 3. At drainage structures.
- D. Contraction Joints: All contraction joints shall be formed by sawing unless otherwise specified, and filled with a commercially available silicone product approved by the Engineer.
1. Contraction joints shall be constructed at 15 foot intervals.
 2. Contraction joints shall be 1/8 inch to 3/8 inch in width and 1-1/2 inch in depth.
 3. Contraction joints shall be constructed at right angles to the centerline and perpendicular to the surface of the curb and gutter.
 4. When curb and gutter is constructed adjacent to, or on rigid pavement, the same joint layout for pavement shall be used, where practicable.
- E. As soon as concrete has set sufficiently to support its own weight, remove the front form and finish all exposed surfaces.
1. Finish top of curb with a steel trowel.
 2. Finish edges with a steel edging tool.
 3. Rub formed faces with burlap sack or similar device to produce a uniformly textured surface, free from form marks, honeycomb, and other defects.
- F. Fill contraction joints with a commercially available silicone product approved by the Engineer.
- G. Curing:
1. Upon completion of finishing, apply approved curing compound to exposed surfaces of curb.
 2. Curing shall continue for a minimum of 5 days.
- H. Backfilling Curb: Upon completion of curing period, but not before 7 days has elapsed since pouring the concrete, backfill the curb as specified in Section 31 23 33.
- I. Adjusting:
1. Finished curb shall present a uniform appearance for both grade and alignment.
 2. Remove curb sections showing abrupt changes in alignment or grade or which are more than 1/4 inch away from location as staked or which are defective for any reason.
 3. Construct new curb at Contractor's expense.

3.5 SIDEWALK CONSTRUCTION

- A. Thickness of sidewalks shall be as shown on the Drawings.

- B. Place, process, finish, and cure concrete in conformance with this Section and the applicable requirements of ACI 614. Where the requirements differ, the more stringent shall govern.
- C. Placement of Preformed Asphalt Expansion Joints (1/2 inch thick):
 - 1. Where sidewalk ends.
 - 2. Around posts, poles, or other objects protruding through the sidewalk.
 - 3. Drainage structures.
 - 4. Adjacent to curb and gutter
- D. Transverse Joints:
 - 1. Joints shall be cut with a 1/4 inch joint at intervals not greater than the width of the walk being constructed, or as directed.
- E. Finish:
 - 1. Broom surface with fine hair broom at right angles to length of walk and tool at all edges, joints, and markings.
 - 2. Edges shall be rounded in a 1/4 inch radius, including edges at joints.
- F. Curing:
 - 1. Upon completion of finishing, apply an approved curing compound to exposed surfaces.
 - 2. Protection sidewalk from damage for period of 7 days.

END OF SECTION

SECTION 32 17 23

PAVEMENT MARKING

PART 1. GENERAL

1.1 SUMMARY

- A. Paint parking lot lines, letter, directional arrows, island curbs, and other areas as shown on the Drawings.

1.2 SUBMITTALS

- A. Provide the following:
 1. Paint System Data Sheet (PSDS) from paint manufacturer for each system used (sample form attached).
 2. Technical Data Sheets for each product used in the paint system.
 3. Copies of the paint system submittals to the coating applicator.

1.3 QUALITY ASSURANCE

- A. Inspection by Engineer, or waiver of inspection of any particular portion of the Work, shall not be construed to relieve Contractor of his responsibility to perform the Work in accordance with these specifications.

1.4 WARRANTY

- A. Contractor shall warrant to Owner and guarantee Work under this Section against defective workmanship and materials for a period of 1 year commencing on the date of final acceptance of the Work.

PART 2. PRODUCTS

2.1 PAINT

- A. Sherwin-Williams, Promar Traffic Marking, or approved equal.
 1. Yellow, Series No. B29Y2.
 2. White, Series No. B29W1.
 3. Medium blue, Series No. TM2133, Latex.
- B. Colors where shown on Drawings.

PART 3. EXECUTION

3.1 GENERAL

- A. Paint shall be applied in 2 coats to a clean dry surface using template or a striping machine. Stripes shall be a uniform width of 4 inches wide. Other markings shall be as shown on Drawings.

END OF SECTION

SECTION 32 39 00

MANUFACUTRED SITE SPECIALTIES

PART 1. GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Pre-Engineered Restroom Building
 - 2. Septic System for Pre-Engineered Restroom
 - 3. Bench.
- B. Products furnished, but not installed under this Section, include pipe sleeves and anchor bolts to be installed in paving.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For units with factory-applied color finishes.
- C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
 - 1. Size: Not less than 6-inch- (152-mm-) long linear components and 4-inch- (102-mm-) square sheet components.
 - 2. Full Size: Bench, Trash receptacle, Drinking Fountain.
- D. Product Schedule: For site furnishings. Use same designations indicated on Drawings.
- E. Maintenance Data: For site furnishings to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of site furnishing through one source from a single manufacturer.

1.5 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

PART 2. PRODUCTS

2.1 MATERIALS

- A. Steel and Iron: Free of surface blemishes and complying with the following:
 - 1. Plates, Shapes, and Bars: ASTM A 36/A 36M.
 - 2. Steel Pipe: Standard-weight steel pipe complying with ASTM A 53, or electric-resistance-welded pipe complying with ASTM A 135.
 - 3. Tubing: Cold-formed steel tubing complying with ASTM A 500.
 - 4. Mechanical Tubing: Cold-rolled, electric-resistance-welded carbon or alloy steel tubing complying with ASTM A 513, or steel tubing fabricated from steel complying with ASTM A 1011/A 1011M and complying with dimensional tolerances in ASTM A 500; zinc coated internally and externally.
 - 5. Sheet: Commercial steel sheet complying with ASTM A 1011/A 1011M.
 - 6. Perforated Metal: 0.1196-inch (3.0-mm) nominal thickness; manufacturer's standard perforation pattern.
- B. Anchors, Fasteners, Fittings, and Hardware: Stainless steel; tamperproof, vandal and theft resistant.
- C. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107; recommended in writing by manufacturer, for exterior applications.
- D. Galvanizing: Where indicated for steel and iron components, provide the following protective zinc coating applied to components after fabrication:
 - 1. Zinc-Coated Tubing: External, zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. (0.27 kg/sq. m) of zinc after welding, a chromate conversion coating, and a clear, polymer film. Internal, same as external or consisting of 81 percent zinc pigmented coating, not less than 0.3 mil (0.0076 mm) thick.
 - 2. Hot-Dip Galvanizing: According to ASTM A 123/A 123M, ASTM A 153/A 153M, or ASTM A 924/A 924M.

2.2 PRE-ENGINEERED RESTROOM BUILDING

- A. CXT, Incorporated, Spokane Industrial Park, 3808 North Sullivan Road, Building 7, Spokane, WA 99216; Phone: 800-696-5766
- B. CorWorth Restroom Facilities 1707 Colt Circle, Marble Falls, TX 78654, Phone 512-222-5454

- C. Public Restroom Company 2587 Business Parkway, Minden, NV 89423 Phone 775-783-1200.
- D. All required construction drawings, specifications, and permits pertaining to the restroom (i.e. plumbing, electrical, mechanical, etc.) are required to be provided by the bathroom manufacturer with Engineer seals from licensed professional engineers registered in the state of Arkansas.

2.3 SEPTIC SYSTEM

- A. Septic system to be designed and installed per design documents and specifications provided to Owner by Kevin Castleberry of Castleberry Septic System Designs, 2707 West 2nd, Pine Bluff, AR 71601.

2.4 FABRICATION

- A. Metal Components: Form to required shapes and sizes with true, consistent curves, lines, and angles. Separate metals from dissimilar materials to prevent electrolytic action.
- B. Welded Connections: Weld connections continuously. Weld solid members with full-length, full-penetration welds and hollow members with full-circumference welds. At exposed connections, finish surfaces smooth and blended so no roughness or unevenness shows after finishing and welded surface matches contours of adjoining surfaces.
- C. Pipes and Tubes: Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.
- D. Exposed Surfaces: Polished, sanded, or otherwise finished; all surfaces smooth, free of burrs, barbs, splinters, and sharpness; all edges and ends rolled, rounded, or capped.
- E. Factory Assembly: Assemble components in the factory to greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field.

2.5 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in

appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 STEEL FINISHES

- A. Baked-Enamel, Powder-Coat Finish: Manufacturer's standard, baked, polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.
 - 1. Color 2, Grey.

2.7 BENCHES

- A. Basis-of-Design Product: Subject to compliance with requirements
 - 1. DuMor, Inc., P.O. Box 142, Mifflintown, PA 17059; Model 88PL (recycled plastic, surface mount, grey).
 - 2. Victor Stanley, P.O. Drawer 330, Dunkirk, MD 20754; Model 32 (recycled plastic, surface mount, grey).
 - 3. Belson Outdoors, 627 Amersale Drive, Naperville, IL 60563; Model 982SM-BRN6 (recycled plastic, surface mount, grey).
 - 4. Or approved equal.
Frame: Steel

PART 3. EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.
- B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.
- C. Install site furnishings level, plumb, true, and securely anchored at locations indicated on Drawings.
- D. Pipe Sleeves: Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post

and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.

3.3 CLEANING

- A. After completing site furnishing installation, inspect components. Remove spots, dirt, and debris. Repair damaged finishes to match original finish or replace component.

END OF SECTION

SECTION 32 92 23

SODDING

PART 1. GENERAL

1.1 SUMMARY

- A. Provide slab sod, fertilizer, and water to establish and maintain grass. Owner shall provide access to water at no cost.
- B. Planting Period: As recommended by sod producer for time of year, subject to Landscape Architect's approval.

1.2 REFERENCES

- A. Federal Specifications.
 - 1. FS O-F-241 - Fertilizers, Mixed, Commercial.

1.3 DEFINITIONS

- A. Weeds: Includes Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.4 REGULATORY REQUIREMENTS

- A. Comply with regulatory agencies for herbicide composition.

1.5 QUALITY CONTROL

- A. Grass that has been cut more than 48 hours before placing shall not be used.
- B. Sod shall not be loaded in bulk on vehicles and dumped in bulk on planting site.
- C. Soil Analysis: For each un-amended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory approved by the Landscape Architect prior to setting Sod. Cooperative Extension Service is an acceptable soil testing lab.
 - 1. The soil-testing laboratory shall oversee soil sampling.
 - 2. Report suitability of tested soil for turf growth.
 - a. State recommendations for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.
 - b. Report presence of problem salts, minerals, or heavy metals; if present, provide additional recommendations for corrective action.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver to site, store, and protect products at site.
- B. Sod:
 - 1. Cut sod with approved sod cutters to minimum depth of 2-1/2 inches in satisfactory and uniform widths and convenient lengths for handling.
 - 2. Place cut sod flat, grass side up, on boards and haul to site with soil intact.
 - 3. Sod shall not hang over the edges of the boards.
- C. Fertilizer: Deliver in waterproof bags showing weight, chemical analysis, and name of manufacturer.

PART 2. MATERIALS

2.1 TOPSOIL

- A. Existing topsoil shall be reused where practical.
- B. Imported Topsoil:
 - 1. Furnished at sole expense of Contractor.
 - 2. Friable loam free from subsoil, roots, grass, excessive amounts of weeds, stone, and foreign matter; acidity range (pH) of 5.5 to 7.5; and containing a minimum of 4 percent and a maximum of 50 percent organic matter.

2.2 SLAB SODDING

- A. Type: Common Bermuda or as indicated on Landscape plans.
- B. Certified nursery grade cultivated grass sod, 95 percent weed free.
- C. Sod shall be live, fresh, and uninjured at time of placing.

2.3 FERTILIZER

- A. FS O-F-241, Type and Grade as recommended for grass, with fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil to the proportions of nitrogen, phosphoric acid, and soluble potash as recommended by County Extension Agent and/or seed manufacturer, subject to Engineer's approval.

2.4 WATER

- A. Clean, fresh, and free of substances or matter which could inhibit vigorous growth of grass.

2.5 HERBICIDES

- A. As recommended by sod producer and as approved by Landscape Architect.

PART 3. EXECUTION

3.1 PREPARATION

- A. Fine grade to eliminate uneven areas and low spots. Allow for thickness of topsoil and sod.
- B. Spread topsoil to minimum 4-inch depth and rake smooth.

3.2 FERTILIZING

- A. Apply approximately 90 percent over entire area to receive slab sodding.
- B. Apply remaining 10 percent over sod after placing and rolling.

3.3 SODDING

- A. Upon delivery to site transfer sod from boards to soil surface.
- B. Place slabs closely, leaving a minimum amount of space between slabs.
- C. Use appropriate tools to pull together slabs that do not fit closely.
- D. Do not handle sod by hand except when filling small cracks or at locations where it would be impractical to use boards.

3.4 ROLLING

- A. Roll slab sod as soon after planting as practicable with plain rollers or cultipackers.
- B. Tamp sod with approved hand methods where rolling is impractical.

3.5 MAINTENANCE

- A. Water to prevent grass and soil from drying out.
- B. Control growth of weeds.
- C. Apply herbicides in accordance with manufacturer's instructions.
- D. Remedy damage resulting from improper use of herbicides.

- E. Immediately re-sod areas which show bare spots.
- F. Protect sodded areas with warning signs during maintenance period.

END OF SECTION

SECTION 33 01 10

DISINFECTION OF WATER UTILITY PIPING

PART 1. GENERAL

1.1 WORK INCLUDED

- A. Disinfection of potable water distribution system.
- B. Test and report results.

1.2 REFERENCES

- A. American Water Works Association, 6666 West Quincy Avenue, Denver, Colorado 80235.
 - 1. AWWA C651-14- Standard for Disinfecting Water Mains (or latest edition).
 - 2. AWWA: *“The Ten States Standards for Water, 2007 Edition or latest version.”*

1.3 QUALITY ASSURANCE

- A. Testing Laboratory: Arkansas Department of Health.

1.4 REGULATORY REQUIREMENTS

- A. Conform to Arkansas Department of Health regulations for Work of this Section.

1.5 PROJECT RECORD DOCUMENTS

- A. Submit 3 copies of reports in accordance with Specifications.
- B. Disinfection report; accurately record:
 - 1. Type and quantity of disinfectant used.
 - 2. Date and time of start and completion of disinfectant injection.
 - 3. Test locations.
 - 4. Initial, 24-hour, and 48-hour disinfectant residuals (quantity in treated water) in ppm for each outlet tested.
 - 5. Date and time of start and completion of flushing.
 - 6. Disinfectant residual after flushing in ppm for each outlet tested.
- C. Bacteriological report; accurately record:
 - 1. Date issued, project name, and testing laboratory name, address, and telephone number.
 - 2. Time and date of water sample collection.
 - 3. Name of person collecting samples.

4. Test locations.
5. Initial and 24 hour disinfectant residuals in ppm for each outlet tested.
6. Coliform bacteria test results for each outlet tested.
7. Certification that water conforms, or fails to conform, to bacterial standards of Arkansas Department of Health.
8. Bacteriologist's signature.
9. **Harrisburg's** PWS ID Number is **431**.

1.6 STORAGE AND HANDLING

- A. The Contractor is reminded that chlorine is a powerful oxidant and reacts readily with foreign substances.
- B. Chlorine compounds shall be handled and stored in accordance with manufacturer's recommendations.

PART 2. PRODUCTS

2.1 CALCIUM HYPOCHLORITE

- A. Granular form or tablets containing 65 percent available chlorine by weight.
- B. Calcium hypochlorite intended for swimming pool disinfection is **not allowed**.

2.2 SODIUM HYPOCHLORITE

- A. Liquid form containing approximately 5 to 15 percent available chlorine.

PART 3. EXECUTION

3.1 PREPARATION

- A. Verify that piping system has been cleaned, inspected, and pressure tested.
- B. Perform scheduling and disinfection activity with startup, testing, adjusting, and balancing, and demonstration procedures, including coordination with related systems.

3.2 EXECUTION

- A. Provide and attach equipment required to execute Work of this Section.
- B. Utilize fire hydrants as blow-off points when possible.

- C. Fire hydrants shall not be used for sample points.
- D. Sample points constructed shall be a 3/4 inch or 1 inch copper riser pipe that shall extend adequately above the ground surface.
- E. During application of chlorine solution, prevent solution from flowing back into the distribution system.
- F. Disinfect piping system by one of the three following methods in accordance with ANSI/AWWA C651 (latest version):
 - 1. Tablet Method.
 - 2. Continuous Feed Method.
 - 3. Slug Method.
- G. Tablet Method:
 - 1. This method may only be used if pipes and appurtenances are kept clean and dry during construction.
 - 2. This procedure must not be used on solvent welded plastic or on screw joint steel pipe.
 - 3. If using granules:
 - a. Placement of calcium hypochlorite granules during construction: Calcium hypochlorite granules shall be placed at the upstream end of the first section of pipe, at the upstream end of each branch main, and at 500-ft (150-m) intervals. The quantity of granules at each location shall be as shown in Table 1.

Weight of calcium hypochlorite granules to be placed at beginning of main and at each 500-ft (150-m) interval

Pipe Diameter (<i>d</i>)			Calcium Hypochlorite Granules
	<i>in</i>	<i>(mm)</i>	<i>(g)</i>
4	(100)	1.7	(48)
6	(150)	3.8	(108)
8	(200)	6.7	(190)
10	(250)	10.5	(298)
12	(300)	15.1	(428)
14 and larger	(350 and larger)	D ² x 15.1	D ² x 428

Where D is the inside pipe diameter, in feet $D = d/12$

- 4. If using tablets:
 - a. Placement of calcium hypochlorite tablets during construction: Calcium hypochlorite tablets (5-grams) shall be placed in the upstream end of each section of pipe to be disinfected, including branch lines. Also, at least one tablet shall be placed in each hydrant branch and in other appurtenances. The number of 5-g tablets required for each pipe section

shall be $0.0012 d^2L$ rounded to the next higher integer, where d is the inside pipe diameter, in inches, and L is the length of the pipe section, in feet. Table 2 shows the number of tablets required for commonly used sizes of pipe. Calcium hypochlorite tablets shall be attached by an adhesive meeting the requirements of NSF/ANSI 61. There shall be adhesive only on the broadside of the tablet attached to the surface of the pipe. Attach tablets inside and at the top of the main. If the tablets are attached before the pipe section is placed in the trench, their positions shall be marked on the pipe exterior to indicate that the pipe has been installed with the tablets at the top.

Number of 5-g calcium hypochlorite tablets required for dose of 25 mg/L*

Pipe Diameter		Length of Pipe Section, ft (m)				
		13 (4.0) or less	18 (5.5)	20 (6.1)	30 (9.1)	40 (12.2)
in	(mm)	Number of 5-g Calcium Hypochlorite Tablets				
4	(100)	1	1	1	1	1
6	(150)	1	1	1	2	2
8	(200)	1	2	2	3	4
10	(250)	2	3	3	4	5
12	(300)	3	4	4	6	7
16	(400)	4	6	7	10	13

*Based on 3.25-g available chlorine per tablet

5. Filling and contact time: When installation has been completed, the main shall be filled with water such that the full pipe velocity is no greater than 1 ft/sec (0.3 m/sec). Fill rate must be carefully controlled to ensure tablets do not come loose from pipe. Precautions shall be taken to ensure that air pockets are eliminated. As an optional procedure, if required by the purchaser, water used to fill the new main shall be supplied through a temporary connection that shall include an appropriate cross-connection control device, consistent with the degree of hazard, for backflow protection of the active distribution system.

The chlorinated water shall remain in the pipe for at least 24 hr. If the water temperature is less than 41°F (5°C), the water shall remain in the pipe for at least 48 hr. A detectable free chlorine residual (≥ 0.2 mg/L) shall be found at each sampling point after the 24- or 48-hr period.

6. Refer to ANSI/AWWA C651 (latest version) for additional detail.

H. Continuous Feed Method:

1. After installation flush water line to remove particulates. Velocity in the water line shall not be less than 3 ft./sec.

2. Fill water line with water dosed with chlorine. Chlorine concentration shall not be less than 25 mg/l free chlorine.
 3. Retain chlorinated water in water line for 24 hours. Operate valves and hydrants during this time to disinfect.
 4. Chlorine residual in water shall not be less than 10 mg/l at the end of the 24 hour period.
 5. Refer to ANSI/AWWA C651 (latest version) for additional detail.
- I. Slug Method:
1. After flushing water line to remove particulates, slowly fill water line with water dosed with a 100 mg/l concentration of chlorine.
 2. Retain chlorinated water in water line for 3 hours.
 3. Measure the free chlorine residual in the water line as it is filled. If dosage drops below 50 mg/l during this time, stop flow and relocate chlorination equipment to the reduced level of where chlorine was detected. As flow is resumed, apply chlorine to restore the free chlorine in the water to not less than 100 mg/l.
 4. Operate valves and hydrants during this time to disinfect.
 5. Refer to ANSI/AWWA C651 (latest version) for additional detail.
- J. Final Flushing:
1. Flush water from water line until chlorine measurements are no higher than the chlorine residual that are found in the existing distribution system.
 2. Inspect environment where the chlorinated water is to be discharged. Add a neutralizing chemical as the chlorinated water is being discharged if area is in threat of environmental damage from the chlorinated water.
- K. Bacteriological Tests:
1. After final flushing and prior to the new water line being connected to the existing distribution system, two sets of acceptable water samples collected from the new water line and taken on consecutive days shall be submitted by the Contractor to the bacteriological laboratory at the Arkansas Department of Health in Little Rock, Arkansas.
 2. Samples shall be tested for bacteriological quality in accordance with Standard Methods for the Examination of Water and Wastewater per the American Public Health Association, AWWA, and Water Environment Association (latest edition) and shall show the absence of coliform organisms.
 3. If samples collected are positive, the disinfecting procedures and samples shall be repeated until two consecutive day samples are tested safe.

END OF SECTION

SECTION 33 05 05

HYDROSTATIC TESTING

PART 1. GENERAL

1.1 SUMMARY

- A. This Section covers test for water appurtenances and piping.

1.2 RELATED SECTIONS

- A. Section 33 05 31 – Polyvinyl Chloride Pressure Pipe and Fittings.

1.3 SUBMITTALS

- A. Submit testing procedures in accordance with Specifications.

PART 2. MATERIALS

2.1 WATER FOR HYDROSTATIC TESTING OF PRESSURE LINES

- A. Furnish water from the nearest hydrant or other suitable source for testing purposes.

PART 3. EXECUTION

3.1 HYDROSTATIC AND LEAK TESTING OF PRESSURE LINES

- A. Upon completion of installation, thoroughly clean new pipe:
 - 1. Flush with water to remove dirt, stones, pieces of wood, or other obstructions that may have entered pipe during construction.
 - 2. Flush pipelines at a minimum rate of 2.5 feet per second for a duration suitable to Engineer.
- B. Upon completion of installation, pressure test water pipelines:
 - 1. Conduct test in presence of Engineer and Owner.
 - 2. Minimum Pressure: 100 psig measured at the lowest elevation of the line.
 - 3. Duration: 2 hours.
 - 4. Repair visible leaks regardless of the amount of leakage.
- C. Provide water into pipeline for testing and flushing, including necessary:
 - 1. Pumps, gages (increment at 10 psi or less), and meters.
 - 2. Plugs and caps.
 - 3. Temporary blowoff piping to discharge water.
 - 4. Reaction blocking to prevent pipe movement during testing.

- D. Water source for the pump suction shall be potable water from the Owner's distribution system; vessel used shall be approved by the Engineer.
- E. Prevent contamination of the Owner's water distribution system.
- F. After pipelines or isolated sections of pipelines have been filled with water, increase the pressure to test pressure by means of a pump.
- G. Test pressure shall be 100 psi or 50 percent above normal operating pressure, whichever is greater for two (2) hours, except at the lowest elevation of the line, where the test pressure shall be 125 psig or 50 percent above normal operating pressure, whichever is greater.
- H. Duration of hydrostatic leakage test shall be 2 hours, or as specified by Engineer.
- I. Open interior valves, including fire hydrants and other appurtenances, open during tests.
- J. After the specified test pressure has been applied, the entire pipeline shall be checked in the presence of the Engineer giving particular attention to parts of the pipeline and the appurtenances that are exposed.
- K. If leaks are apparent, perform corrective work and replace material that is required to remedy the defect and stop the leaks at no extra cost to the Owner.
- L. If no leaks were apparent or after corrective work has been completed, the pipelines shall be subjected to a leakage test at the pressure specified with a meter inserted in the test pump discharge line.
- M. AWWA C600-17 leak test for Ductile Iron.
 - 1. Hydrostatic Testing shall comply with Section 5.2 of AWWA C600-17.
 - 2. Leakage Criteria to follow AWWA C600-17 Section 5.5.1.4 "Test Allowance."

$$L = \frac{S \times D \times (P^{0.5})}{148,000}$$

L = Quantity of makeup water in gallons per hour

S = Length of pipe section being tested, in feet

D = Nominal diameter of the pipe, in inches

P = Average test pressure during the hydrostatic test, in pounds per square inch (gauge)

- N. AWWA C605-13 leak test for PVC.
1. Hydrostatic Testing shall comply with Section 10.3 of AWWA C605-13.
 2. Leakage Criteria to follow allowable criteria found in AWWA C605-13 Section 10.3.6 "Test Allowance."

$$Q = \frac{L \times D \times (P^{0.5})}{148,000}$$

Q = Quantity of makeup water in gallons per hour

L = Length of pipe section being tested, in feet

D = Nominal diameter of the pipe, in inches

P = Average test pressure during the hydrostatic test, in pounds per square inch (gauge)

This formula is based on a testing allowance of 10.5 GPD/mile/inch of nominal pipe diameter at a test pressure of 150 psi.

- O. If test of pipe laid discloses leakage greater than the allowable leakage as calculated from the above formula, locate the leak or leaks and perform corrective work and replace material that is required in order to remedy the defect and stop the leak.
- P. Corrective work shall be approved by Engineer.

END OF SECTION

SECTION 33 05 31

POLYVINYL CHLORIDE PRESSURE PIPE AND FITTINGS

PART 1. GENERAL

1.1 SUMMARY

- A. Provide polyvinyl chloride (PVC) pipe and fittings.

1.2 RELATED SECTIONS

- A. Section 31 23 33 - Trenching and Backfilling.
- B. Section 33 05 05 - Hydrostatic Testing.

1.3 REFERENCES

- A. Arkansas Department of Health.
 - 1. ADH: *“Rules and Regulations Pertaining to Public Water Systems, latest Edition.”*
- B. ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA, 19428-2959.
 - 1. ASTM D1784 - Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
 - 2. ASTM D2241 - Specifications for Poly (Vinyl Chloride) (PVC) Pressure - Rated Pipe (SDR Series).
 - 3. ASTM D3139 - Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
 - 4. ASTM F477 - Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
- C. American Water Works Association, 6666 West Quincy Avenue, Denver, Colorado 80235.
 - 1. AWWA C110/A21.10-03 - American National Standard for Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. For Water and Other Liquids.
 - 2. AWWA C605-13 - Underground installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water.
 - 3. AWWA: *“The Ten States Standards for Water, 2007 Edition or latest version.”*

PART 2. PRODUCTS

2.1 PIPE

- A. PVC pressure pipe, Class 200, SDR-21 in compliance with ASTM D174 and manufactured from virgin PVC compound with a cell classification of 12454-B with gasket joints and integral bell for buried water piping.
- B. Pipe and fittings shall be manufactured in the United States. Foreign made products shall be unacceptable.
- C. Pipe shall be permanently marked at 5-foot intervals with the following information:
 - 1. Nominal size.
 - 2. Material code designation.
 - 3. Manufacturer's name or trademark and production record code.
 - 4. ASTM or AWWA certification.
 - 5. SDR designation.
- D. Warranty:
 - 1. Manufacturer of the pipe shall warrant product for a period of not less than one (1) year.
 - 2. Forward copies of warranty to the Owner.
 - 3. Replace defective materials at no extra cost to the Owner.

2.2 JOINTS

- A. Buried Pipe: Gasketed slip joint.
- B. Comply with ASTM D3139.
- C. Comply with AWWA standards.

2.3 FITTINGS

- A. Fittings: Ductile iron, 350 psi pressure class (or 1.5 times the working pressure, whichever is greater), cement-lined and seal-coated. Where taps are shown on fittings, tapping bosses shall be provided.
 - 1. Flanged Joint: ANSI/AWWA C110/A21.10-03 and ANSI B16.1, faced and drilled 125-pound ANSI standard.
 - 2. Mechanical Joint: ANSI/AWWA C110/A21.10-03 and ANSI/AWWA C110/A21.11-07.
 - 3. Flexible Joint: American Flex-Lox pipe or equal.
- B. Cement Linings: In accordance with ANSI A21.4.

- C. Fittings shall receive an exterior coating of 1 mil thick bituminous material in accordance with ANSI A21.4.
- D. Fittings shall have distinctly cast on them the manufacturer's identification, pressure rating, nominal diameter of openings, and the number of degrees or fraction of the circle on bends.

2.4 GASKETS

- A. As recommended by pipe manufacturer to conform to pipe.
- B. Comply with ASTM F477.

2.5 MARKING TAPE

- A. Install on pressure systems.
- B. Terra Tape "Extra Stretch."
- C. Or equal.

PART 3. EXECUTION

3.1 GENERAL

- A. Any connection to water main for the purpose of connecting any water line to the water main, shall use a minimum of Schedule 40, Polyvinyl chloride (PVC) pipe.
- B. Rigid PVC pipe shall be cut, made up, and installed in accordance with the pipe manufacturer's recommendations.
- C. Offset shall be as recommended by the manufacturer for the maximum temperature variation between time of installation and final use.

3.2 TRACE WIRE

- A. Furnish and install a 14-gage insulated copper trace wire with PVC pressure pipe.
- B. Run wire continuous from valve box to valve box, meter box, air release vault, cleanout, or other access points.
- C. Bring wire up inside boxes and vaults in an accessible method.
- D. Bring wire around or tape wire to each pipe section.

- E. Pipe testing shall include following trace wire.
- F. Wire breaks shall be repaired at no additional expense to the Owner.

3.3 MARKING TAPE

- A. On pressure installations of non-metallic pipe, metallic marking tape, Terra Tape Extra Stretch or equal shall be installed above the top of pipe or service line and 24 inches below finished grade.
- B. The tape shall be in addition to the trace wire specified.

3.4 THRUST BLOCKS

- A. Install 2,500 psi concrete thrust blocks at bends, wyes, or other thrust points on pressure piping.
- B. Block to bear against undisturbed soil and shall be of size and with bearing area as shown on Drawings.

3.5 TESTING

- A. Pressure lines shall be hydrostatically tested at the pressures listed in Section 33 05 05.
- B. Use pipe-locating equipment to test continuity of trace wire.
- C. Engineer shall observe and document trace wire test.

END OF SECTION

SECTION 33 05 31.11

POLYVINYL CHLORIDE GRAVITY SEWER PIPE

PART 1. GENERAL

1.1 SUMMARY

- A. Provide polyvinyl chloride (PVC) pipe and fittings for sewer lines.

1.2 RELATED SECTIONS

- A. Section 31 23 33 – Trenching and Backfilling.

1.3 REFERENCES

- A. American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103.
 - 1. ASTM D1784 - Specification for Rigid Poly(Vinyl Chloride)(PVC) Compounds and Chlorinated Poly(Vinyl Chloride)(CPVC) Compounds.
 - 2. ASTM F477 - Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

PART 2. PRODUCTS

2.1 PIPE

- A. PVC gravity sewer pipe, SDR-26 in compliance with ASTM D1784 and manufactured from virgin PVC compound with a cell classification of 12454-B with gasket joints and integral bell.
- B. Pipe and fittings shall be manufactured in the United States. Foreign made products shall be unacceptable.
- C. Pipe shall be permanently marked at 5-foot intervals with the following information:
 - 1. Nominal size.
 - 2. Material code designation.
 - 3. Manufacturer's name or trademark and production record code.
 - 4. ASTM or AWWA certification.
 - 5. SDR designation.
- D. Warranty:
 - 1. Manufacturer of the pipe shall warrant product for a period of not less than one (1) year.
 - 2. Forward copies of warranty to the Owner.

3. Replace defective materials at no extra cost to the Owner.

2.2 JOINTS

- A. Buried Pipe: Gasketed slip joint.
- B. Comply with ASTM D3139.

2.3 GASKETS

- A. As recommended by pipe manufacturer to conform to pipe.
- B. Comply with ASTM F477.

PART 3. EXECUTION

3.1 GENERAL

- A. Any connection to sewer main for the purpose of connecting any sewer line or field line to the sewer main, shall use a minimum of Schedule 40, Polyvinyl chloride (PVC) pipe.
- B. Rigid PVC pipe shall be cut, made up, and installed in accordance with the pipe manufacturer's recommendations.
- C. Offset shall be as recommended by the manufacturer for the maximum temperature variation between time of installation and final use.

3.2 TESTING

- A. Gravity sewer line shall be tested in accordance with Specifications.
- B. Engineer shall observe tests.

END OF SECTION

SECTION 33 14 16

WATER UTILITY DISTRIBUTION VALVES

PART 1. GENERAL

1.1 SUMMARY

- A. Furnish and install manually operated valves.

1.2 RELATED SECTIONS

- A. Section 33 05 31 - Polyvinyl Chloride Pressure Pipe and Fittings.

1.3 REFERENCES

- A. American Water Works Association, 6666 West Quincy Avenue, Denver, Colorado 80235.
 - 1. AWWA C500 (most current standards) - Gate Valves for Water and Sewerage Systems.
 - 2. AWWA C509 (most current standards) - Resilient-Seated Gate Valves for Water and Sewerage Systems.
- B. ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA, 19428-2959.
 - 1. ASTM A126 - Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
 - 2. ASTM B61 - Specification for Steam of Valve Bronze Castings.

PART 2. MATERIALS

2.1 GENERAL

- A. Items specified shall be the end products of one manufacturer in order to achieve standardization for operation, maintenance, spare parts, and manufacturer's services.
- B. Valves to be complete with necessary operators, valve boxes, extension stems, floor stands, worm and gear operators, operating nuts, etc., required for proper completion of work.
- C. Valves of equal quality by other manufacturers will be considered in accordance with the General Conditions.
- D. Renewable parts including discs, packing, and seats shall be of types recommended by valve manufacturer for intended service.

- E. Units shall have name of manufacturer and size of valve cast on the body or bonnet or shown on a permanently attached plate in raised letters.

2.2 DESIGN FEATURES

- A. Brass and bronze components of valves and appurtenances which have surfaces in contact with the water shall be alloys containing less than 16 percent zinc and 2 percent aluminum.
- B. Stainless steel Alloy 18-8 may be substituted for bronze at the option of the manufacturer and with the approval of the Engineer.
- C. All gland bolts on iron body valves shall be bronze and shall be fitted with brass nuts.

2.3 VALVE OPERATORS

- A. Open by turning counterclockwise.
- B. Worm and gear operators to be of totally enclosed design, so proportioned as to permit operation of the valve under full operating head with a maximum pull of 40 pounds on the operator.
- C. Self-locking type to prevent the disc or plug from creeping.
- D. Self-locking worm gears to be a one-piece design of gear bronze material, accurately machine cut.
- E. Worm to be hardened alloy steel with thread ground and polished.
- F. Reduction gearing to run in a proper lubricant.
- G. Provide gear operators with position indicators, where specified, to show the position of the valve disc or plug.
- H. Operators to be galvanized and painted the same color as the valve and associated pipeline.
- I. Buried valves to have 2-inch x 2-inch square operating nut.
- J. Above-ground valves to have handwheel operators.

2.4 VALVE BOXES

- A. Buffalo two-piece sliding type, cast iron, with 5-1/4-inch shaft of appropriate length for the installation.

- B. The word WATER shall be cast into the top of the lid.
- C. Extension pieces, if required, shall be the manufacturer's standard type.
- D. Manufacturers: Mueller H-10364, Clow Corporation F-2452, or equal.
- E. Furnish units complete with all necessary bases and accessories.

2.5 EXTENSION STEMS FOR VALVE OPERATORS

- A. Where the depth of the valve is such that its centerline is more than 4 feet below grade, provide operating extension stems to bring the operating nut to a point 6 inches below the surface of the ground and/or box cover.
- B. Constructed of steel.
- C. Complete with 2-inch square operating nut.
- D. Bolt to valve stem to prevent separation.

2.6 GATE VALVES

- A. Acceptable Manufacturers:
 - 1. Mueller, Model No. A-2360.
 - 2. American Flow Control, Product Series 500.
- B. Gate Valves:
 - 1. Resilient seat type in accordance with AWWA C509-01 with resilient wedge.
 - 2. Mechanical joint with non-rising stems and two inch square operating nut.
 - 3. Open by turning to the left or counter clockwise.
- C. Gate Valve Body and Bonnet:
 - 1. Cast iron.
 - 2. Conform to ASTM A126, Class B.
 - 3. "O" ring type seals and smooth unobstructed waterway when in fully open position.
 - 4. Mechanical joint ends underground; flange joint ends above ground.

2.7 TAPPING SLEEVES AND VALVES

- A. Acceptable Manufacturers:
 - 1. Mueller; Product H-615.
 - 2. Or equal.
- B. Resilient seat or resilient wedge with a flange on one side for connection to the tapping sleeve.

PART 3. EXECUTION

3.1 GENERAL

- A. Bolt holes of flanged valves shall straddle the vertical centerline of the pipe run.
- B. Prior to installing flanged valves, the flange faces shall be thoroughly cleaned.
- C. After cleaning, insert gasket and bolts, and tighten the nuts progressively and uniformly.
- D. If flanges leak under pressure, loosen or remove the nuts and bolts, reseal or replace the gasket, retighten or reinstall the nuts and bolts, and retest the joints.
- E. Joints shall be watertight at test pressures before acceptance.
- F. Thoroughly clean threads of screwed joints by wire brushing, swabbing, or other approved methods.
- G. Apply approved joint compound to threads prior to making joints.
- H. Joints shall be watertight at test pressures before acceptance.

3.2 PLACEMENT OF VALVES

- A. Buried valves shall be installed with valve boxes in accordance with the details shown on the Drawings.
- B. Buried valves shall have bolts protected by wrapping in polyethylene material.

3.3 ACCESS

- A. Location of valves shall be as required to provide accessibility for control and maintenance.

3.4 TESTING

- A. Valves: Test at same time adjacent pipeline is tested.
- B. Joints shall show no visible leakage under test.
- C. Repair joints that show signs of leakage prior to final acceptance.
- D. If there are any special parts of control systems or operators that might be damaged by the pipeline test, they shall be properly protected. The Contractor will be held responsible for damage caused by the testing.

- E. Valve manufacturer shall furnish an affidavit stating the materials options furnished comply with these and other referenced Specifications.

END OF SECTION

SECTION 33 37 24

BACKFLOW PREVENTION

PART 1. GENERAL

1.1 SUMMARY

- A. Provide reduced pressure backflow preventer, wye strainer, enclosure and appurtenances of the sizes indicated.

1.2 REFERENCES

- A. American Water Works Association, 6666 West Quincy Avenue, Denver, Colorado 80235.
 - 1. AWWA C510 - Standard for Double Check Valve Backflow-Prevention Assembly.
 - 2. AWWA C511 - Standard for Pressure-Reducing Principle Backflow-Prevention Assembly.
- B. American Society for Testing and Materials, 1961 Race Street, Philadelphia, Pennsylvania 19103.
 - 1. ASTM A126 - Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.

1.3 SUBMITTALS

- A. Submit under provisions of Specifications.
- B. Certificate of Compliance: Submit Certificates of Compliance attesting that materials provided are in compliance with referenced standards.

PART 2. MATERIALS

2.1 REDUCED PRESSURE BACKFLOW PREVENTER

- A. Manufacturer: Febco Backflow Prevention, CMB Industries, Model 825Y, or approved equal.
- B. Type: Reduce pressure assembly for high hazard service.
- C. Provide with modular relief valve, spring loaded "Y" type check valves, internal relief valve pressure sensing passages, replaceable relief valve seat ring, and internal parts shall be field serviceable.

- D. Assembly shall automatically reduce the pressure between the check valves (“zone”) to at least 5 psi lower than the inlet pressure. Should the differential between the upstream and the “zone” of the unit drop to 2 psi, the differential relief valve shall open and maintain the proper differential.
- E. Mainline valve body and caps including relief valve body and cover shall be bronze. Check valve moving member shall be center stem guide. Hydraulic sensing passage shall be internally located with the mainline and relief valve bodies and relief valve cover. Relief valve shall have removable seat ring. Seat disc shall be reversible. Shut-off valves and test cocks shall be full ported ball valves.
- F. Assembly shall be rated to 175 psi water working pressure and water temperature range from 32 degrees F. to 140 degrees F.

2.2 WYE STRAINER

- A. Manufacturer: Febco Backflow Prevention, CMB Industries, Model 650, or approved equal.
- B. Constructed of bronze.
- C. Machined seat in the body and tapered seat in the cap for accurate screen alignment. Provide with NPT blow-off connections.
- D. Screen: Flared opening on the upstream for unrestricted flow through strainer and constructed of 40 mesh stainless steel.

2.3 PROTECTIVE ENCLOSURE

- A. Manufacturer: Hot Box, Jacksonville, FL., Unit No. HB2, or approved equal.
- B. Features:
 - 1. Gel coated fiberglass mat, insulated with sprayed applied polyisocyanurate foam insulation frothed in place or board stock laminated between 2 layers of fiberglass mat.
 - 2. Lockable.
 - 3. Designed to protect to -30 degrees F.
 - 4. Mounting Hardware and Assembly Fasteners: Stainless steel.
 - 5. No wood or particle board shall be allowed in assembly.
 - 6. Multi-sectional enclosure shall fit together with overlapping “tongue and groove” joints and secured internally with mechanical fasteners.
- C. Enclosure shall be securely attached to concrete base with anchor brackets installed on the interior of the enclosure, through the flanged base of the enclosure itself or through a stainless steel anchor hinge.

- D. Provide with access panels for easy access. Access panels shall be secured with integral keyed locks. Loose hanging padlocks are not acceptable.
- E. Drain openings shall be designed to remain closed except when device is discharging water. Openings shall be designed to accommodate the maximum discharge of the device, and shall protect against intrusion of wind, debris, and animals through use of aluminum screens with flags.
- F. Heating equipment shall be provided and designed by the manufacturer of the enclosure to maintain an interior temperature of +40 degrees F. with an exterior outside temperature of -30 degree F. and a wind velocity of 15 mph. Heating equipment shall be UL, ETL, or CSA certified. Electrical power source for heat and accessories shall be G.F.I. protected, with 18 inches of clearance from receptacle base to grade.

PART 3. EXECUTION

3.1 INSTALLATION

- A. Install backflow preventor and wye strainer in accordance with manufacturer's instructions and as shown on Drawings.
- B. Enclosure shall be assembled and mounted per manufacturer's instructions and as shown on Drawings.
- C. Install enclosure pumb, level, and square.

3.2 ANCHOR BOLTS

- A. Protect threads and clean before nuts are attached and tightened.

3.3 TESTING

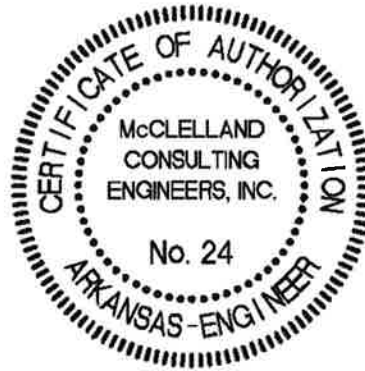
- A. Joints shall show no visible leakage.
- B. Repair joints that show signs of leakage prior to final acceptance.

END OF SECTION

April 27, 2020



Arkansas State Parks
1 Capitol Mall | 4B.215
Little Rock, Arkansas 72201



ATTN: Mr. Jordan Thomas
Chief Planner

RE: Geotechnical Investigation for
Lake Poinsett State Park Improvements
Harrisburg, Arkansas
MCE Project Number: 19-5825

Dear Mr. Thomas:

We are submitting herewith the report for the Geotechnical Investigation on the above-referenced project. We appreciate the opportunity to provide this service to you. If there are any questions regarding the Geotechnical Investigation, please contact us.

Sincerely,



A handwritten signature in blue ink, appearing to read "SJA".

Steven J. Head, PE
Principal | Geotechnical Department Head



Enclosure: Geotechnical Report

GEOTECHNICAL INVESTIGATION

Lake Poinsett State Park
Improvements
Harrisburg, Arkansas

MCE Project Number: 19-5825



Arkansas State Parks
1 Capitol Mall
Little Rock, Arkansas 72201

April, 2020

MCE McCLELLAND
CONSULTING
DESIGNED TO SERVE ENGINEERS, INC. *Little Rock
Fayetteville
Fort Smith
Tulsa*

1810 N. College Ave | PO Box 1229
Fayetteville, AR 72703-1229

www.mce.us.com

P: (479) 443.2377 | F: (479) 443.9241

GEOTECHNICAL REPORT

Lake Poinsett State Park Improvements

MCE Project Number: 19-5825

HARRISBURG, ARKANSAS

FOR



Arkansas State Parks

1 Capitol Mall

Little Rock, AR 72201

Executive Summary

This is a report of the findings of subsurface exploration for the proposed improvements at Lake Poinsett State Park in Harrisburg, Arkansas. This report includes information on surface materials and subsurface conditions in addition to providing recommendations for site preparation, building foundations, site grading, and pavement sections.

The following is a summary of significant findings:

- A total of three (3) project borings were conducted within the project area.
 - All three (3) borings had planned terminal depths of 15 feet below the existing surface elevations. Borings B-01 and B-03 achieved their planned terminal depths. Boring B-02 was terminated at two (2) feet below the existing surface elevations and was utilized to provide an accurate representation of the existing pavement section within the dimensions of State Park Road.
- Surface materials consisted of eight (8) to 10 inches of silty topsoil at boring locations B-01 and B-03, and approximately three (3) inches of flexible-asphalt pavement underlain by three (3) inches of coarse aggregate base material at boring location B-02.
- Groundwater was encountered by borings B-01 and B-03 at respective depths of approximately 1.5 and two (2) feet below existing ground elevations.

Table of Contents

Executive Summary	i
Introduction	1
Project Description	1
Table 1: Project Boring – Depths and Elevations	2
Laboratory Results	3
Table 2: Laboratory Test Method Designations.....	3
On-Site Soil Conditions	3
Site Geology	3
Figure 1: USDA Soil Survey Report Image.	4
Figure 2: USGS Image and Formation Key.....	5
IBC Site Classification	5
General Soil Conditions	5
Stratum I – Surface Materials	5
Stratum II – Fine-Grained Subgrade Materials.....	5
Stratum III – Coarse-Grained Subgrade Materials	6
Fine-Grained Soil Analyses	6
Engineer’s Analysis and Recommendations.....	7
Site Preparation and Grading	7
General Foundation Recommendations.....	8
Shallow Foundation Recommendations.....	8
Building Slab-on-Grade.....	9
Select Fill Material	9
Table 3: Compaction Requirements.....	10
Minimum Project Pavement Recommendations.....	10
Table 4: Minimum Recommended Project Pavement Sections.....	10
Construction Materials Testing and Special Inspections.....	11
Limitations and Reserved Rights	11
Appendix A: Boring Layout	12
Appendix B: Boring Logs	13
Appendix C: Laboratory Testing Results	14

GEOTECHNICAL REPORT

Lake Poinsett State Park Improvements

MCE Project Number: 19-5825

HARRISBURG, ARKANSAS

FOR



Arkansas State Parks

1 Capitol Mall

Little Rock, AR 72201

Introduction

A geotechnical investigation of subsurface soil conditions was conducted by McClelland Consulting Engineers, Inc. (MCE), for the proposed improvements at Lake Poinsett State Park in Harrisburg, Arkansas. The investigation was requested by Mr. Brett Budolfson of MCE and was authorized by Mr. Jordan Thomas, Chief Planner with the Arkansas State Parks, to investigate subsurface soil conditions at the project site and to prepare recommendations for site preparation & grading operations, foundation recommendations, pavement sections, and excavation considerations for the planned project.

Project Description

The project site is located within the boundaries of Lake Poinsett State Park in Harrisburg, Arkansas. Specifically, the project site is located on State Park Road approximately 0.25 miles southeast of the intersection with Highway 163. Our current understanding of the project scope is anticipated to include the new construction of a modular restroom building and pavement/parking lot improvements. At the time of preparing this report, final grading and design documents were not yet available. Therefore, we anticipate final pavement elevations to be at or very near those of the existing State Park Road. Similarly, we anticipate the finished floor elevation (FFE) of the proposed restroom structure to be within one (1) to two (2) feet of the existing surface elevations at the site.

The vegetation across the site primarily includes low-cut grass maintained through landscaping efforts and a moderate number of mature trees to the northeast of State Park Road. Vegetation to the southwest of the existing State Park Road, vegetation is heavily wooded with mature trees, shrubs, and groundcover. The proposed project area has a gentle downward slope from the southwest to the northeast with maximum grade differentials in the order of eight (8) feet.

We understand that the restroom building will likely be constructed of concrete masonry units (CMU) supported on a shallow foundation system consisting of continuous and individual (spread) foundations. The planned pavement/parking improvements are anticipated to consist of light-duty to standard-duty flexible-asphalt pavement sections. Additional sitework is likely to include pedestrian walkways and ADA accessible ramps.

Field Investigation

The subgrade conditions at the project site were investigated by three (3) total project borings. Two (2) of the project borings (B-01 and B-03) were conducted in greenspace on the south-southwest side of the existing State Park Road. The final boring (B-02) was conducted in the centerline of State Park Road between the two (2) greenspace borings. All of the project borings had planned terminal depths of 15 feet below the existing surface elevations. Borings B-01 and B-03 achieved their planned terminal depths of 15 feet. The drilling scope of boring B-02 was shortened to include the existing pavement section and immediate subgrade materials within the dimensions of the existing State Park Road. Boring B-02 was terminated at two (2) feet below the existing surface elevations in the area. The specific locations of the referenced project borings are provided on Plate 1 in Appendix A.

The surface materials at borings B-01 and B-03 consisted of a silty topsoil material with roots and organics in the upper eight (8) to 10 inches below existing ground elevations. The surface material at boring B-02 consisted of approximately three (3) inches of flexible asphalt pavement underlain by three (3) inches of coarse aggregate base.

Groundwater was encountered by two (2) boring locations (B-01 and B-03) at depths ranging from 1.5 to two (2) feet below the existing surface elevations at the time of drilling (ATD). Groundwater observations were made by the on-site crew both during drilling operations and at the completion. The installation and periodic measurement of monitoring wells would be required to establish seasonal piezometric surfaces below the project site. The specific locations of the referenced borings are provided in Appendix A on Plate 1.

All borings were conducted using a CME-45B truck-mounted drill rig utilizing solid stem augers. Soil samples were obtained at the depths indicated on the boring logs by the use of a two (2) inch diameter split-spoon sampler. The split-spoon sampler was driven by blows from a 140-pound automatic hammer dropped from a fixed height of 30 inches. The number of blows required to drive the split-spoon sampler the final 12 inches of an 18-inch drive, or portion thereof, is referred to as the Standard Penetration value, N, and is recorded on the boring logs in units of blows-per-foot.

Final drilled depths are shown as the depths achieved by the split-spoon sampler. The field tests performed beyond Standard Penetration Testing included visual soil classifications as well as groundwater observations. The visual soil classifications are given on the boring logs. The boring logs may be referenced in Appendix B on Plates 2 through 4. Table 1 below shows the depths and elevations that were achieved by the conducted project borings.

Table 1: Project Boring – Depths and Elevations

Boring Number	Surface Elevation	Surface Material Thickness (in)			Approximate Depth to Stable Subgrade (ft)	Total Depth Drilled (ft)	End of Boring Elevation (ft)
		Asphalt	Base	Topsoil			
B-01	312.0	N/A	N/A	10	3	15.0	297.0
B-02	311.0	3	3	N/A	N/A	2.0	309.0
B-03	311.5	N/A	N/A	8	3	15.0	296.5

Notes: Elevations shown in Table 1 are rounded to the nearest 0.5 foot based on the MCE Topographic Survey dated 4/3/2020.

*Depth to Stable Subgrade is an approximation to be used for budgetary purposes based on conditions at the time of the investigation.

Laboratory Results

Laboratory tests were performed on soil samples recovered from the borings. The laboratory tests were directed at determining the engineering properties of the project soil strata. The laboratory tests were conducted in accordance with the American Society for Testing and Materials (ASTM) designations.

The tests performed on samples from the borings included moisture contents, Atterberg Limits, and gradation analysis. The natural soil moisture content was determined for the selected soil samples to provide a moisture profile for each boring. Atterberg Limits tests (liquid and plastic limits) were performed on selected samples to aid in the soil classification and to help evaluate the volume-change characteristics of each soil stratum. Gradation analyses were performed on representative soil samples to aid in the soil classifications of the selected soil strata. Results of laboratory testing are provided on the boring logs and on the Laboratory Test Results Summary in Appendix C on Plate 8. A key to the terms and symbols used on the boring logs are also presented in Appendix B on Plates 5 through 7. Table 2 below shows the relevant test method designations performed on the project soil samples.

Table 2: Laboratory Test Method Designations

Test Method	Test Designation
Standard Practice for Description and Identification of Soils (Visual)	ASTM D2488
Standard Practice for Classification of Soils for Engineering Purposes (USCS)	ASTM D2487
Standard Test Method for Lab Determination of Water Content of Soil	ASTM D2216
Standard Test Method for Particle-Size Distribution of Soils Using Sieve Analysis	ASTM D6913
Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils	ASTM D4318

On-Site Soil Conditions

The following project sections provide data and analysis regarding onsite conditions at the project location, which include Site Geology, IBC Site Classification, and further detail regarding encountered onsite soils.

Site Geology

The project site is located in southcentral Poinsett County in eastern Arkansas. The following soil types exist in the project area according to current United States Department of Agriculture (USDA) and Natural Resources Conservation Service (NRCS) soil maps and descriptions:

- **Collins Silt Loam (Co)** – the northern and central portion of the project area.

The Collins Series consists of moderately well-drained, level soils on flood plains of local streams. These soils formed in loamy alluvium washed mainly from loess uplands. Permeability of Collins Series soils is moderate and the available water capacity is high.

- **Memphis-Loring Complex (MeE)** – majority of the project area

The Memphis Series consists of well-drained, moderately steep and steep soils on uplands. These soils formed in deposits of thick loess. Similar to Collins Series soils, permeability is moderate and available water capacity is high.

The above-referenced soils in the project area have moderate-to-high potentials for corrosion of concrete and steel materials used in construction. An image of the USDA Soil Survey and how it relates to the approximate project site is provided in Figure 1 below.



Figure 1: USDA Soil Survey Report Image.
The image was produced by the United States Department of Agriculture (USDA).
The red outline surrounds the area of investigation.

The project site is located in the Mississippian Embayment region of eastern Arkansas. According to maps and literature published by the United States Geological Survey and the Arkansas Geological Survey, the project area is underlain by the Claiborne Group. The Claiborne is chiefly non-marine in origin, but does contain some marine intervals. The unit is composed of medium- to very fine-grained sands, silts, and silty clays. The deposition of lignite beds present in the Group was controlled by the geologic environment. The lower contact of the Claiborne Group is poorly known but considered unconformable to the Wilcox Group. The thickness of the Claiborne ranges from a thin edge to 1,500 feet. Figure 2 on the next page shows the approximate project site with regard to the 1993 Geologic Map of Arkansas.

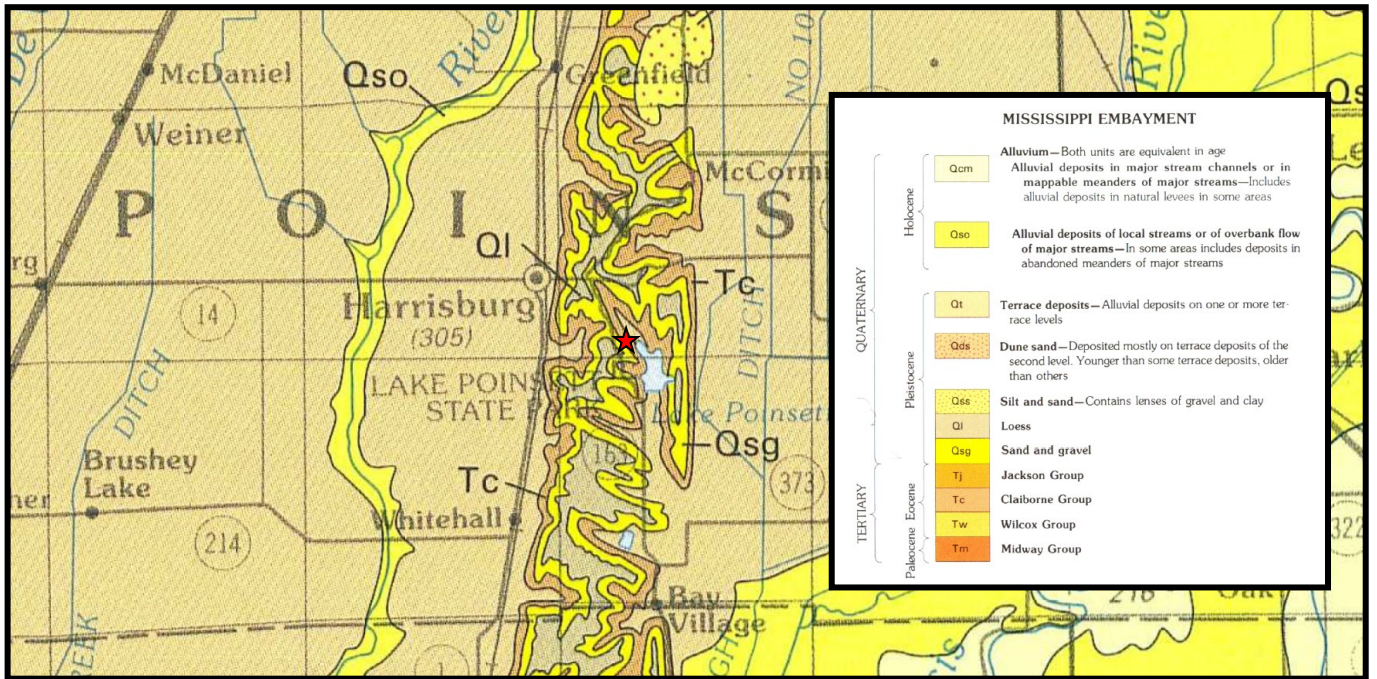


Figure 2: USGS Image and Formation Key.
 This information was produced by the Arkansas Geological Survey and the United States Geological Survey.
 The red star is the approximate project location.

IBC Site Classification

The soil profile for the project area is a Site Class D according to Section 1613 of IBC-2015. The site seismic classification determination may utilize spectral response accelerations S_{DS} and S_{D1} of **1.635g** and **0.926g** respectively, with reference to Section 1613.2 of the 2015 International Building Code and current Applied Technology Council (ATC) information based on a Risk Category II for site structures in the project area.

General Soil Conditions

The subsurface soil conditions at the site are described as below:

Stratum I – Surface Materials

Stratum I materials consisted of silty topsoil material with rootlets and existing flexible asphalt pavement materials. Project borings B-01 and B-03 encountered the referenced topsoil material at measured thicknesses of 10 and eight (8) inches respectively. The surface material at boring B-02 consisted of approximately three (3) inches of asphalt underlain by three (3) inches of coarse aggregate base material. The Contractor should anticipate an average thickness of 12 inches of silty topsoil material at the surface in greenspace areas, and approximately six (6) inches of pavement materials in existing pavement dimensions for planning and budgetary purposes. Reported thicknesses are only valid for the actual boring locations as thicknesses may vary in unexplored portions of the project site.

Stratum II – Fine-Grained Subgrade Materials

The fine-grained subgrade materials that make up Stratum II exhibited negligible to moderate plasticity characteristics. The Stratum II materials classified as Sandy Lean Clay (CL), Silt with Sand (ML), and Sandy Silty Clay (CL-ML). The Stratum II materials contained varying amounts and gradations of sand and gravel.

The CL materials were encountered as light brown to gray in color. Consistency values ranged from very stiff to hard with corresponding N-values ranging from 14 to 28. Soil moisture content for the CL materials ranged from 17.4 to 25.3 percent based on ASTM D2216.

The ML materials were encountered as brown to light brown and gray in color. Consistency values ranged from medium-stiff to very stiff with corresponding N-values ranging from 5 to 13. Soil moisture content for the ML materials ranged from 23.4 to 31.8 percent based on ASTM D2216.

The CL-ML materials were encountered as dark brown in color. Consistency values were medium-stiff with a corresponding N-value of 4. Soil moisture content for the CL-ML materials was determined to be 19.8 percent based on ASTM D2216.

Stratum III – Coarse-Grained Subgrade Materials

The coarse-grained subgrade materials that make up Stratum III exhibited negligible plasticity characteristics. The Stratum III materials classified as silty sand with gravel (SM). The Stratum III materials contained varying amounts and gradations of sand and gravel.

The SM materials were encountered as dark brown in color. Consistency values ranged from loose to medium-dense with corresponding N-values ranging from 4 to 16. Soil moisture content for the CL-ML materials ranged from 12.7 to 19.9 percent based on ASTM D2216.

Fine-Grained Soil Analyses

The fine fraction of the fine-grained CL materials has low to moderate plasticity characteristics and a low potential for volumetric changes due to changes in the soil moisture content. The Liquid Limit (LL) of the CL soils was determined to be 31, with a Plasticity Index (PI) of 15. The fine fraction of the CL materials made up approximately 56.3 percent of the CL soil mass as indicated by the results of gradation analyses from the borings.

The fine fraction of the fine-grained ML materials has negligible plasticity characteristics and a low potential for volumetric changes due to changes in the soil moisture content. The ML materials were determined to be non-plastic (NP). The fine fraction of the ML materials made up between 74.2 and 74.9 percent of the ML soil mass as indicated by the results of gradation analyses from the borings.

The fine fraction of the fine-grained CL-ML materials has low plasticity characteristics and a low potential for volumetric changes due to changes in the soil moisture content. The LL of the CL-ML materials was determined to be 24 with a PI of 6. The fine fraction of the CL-ML materials made up approximately 67.1 percent of the CL-ML soil mass as indicated by the results of gradation analyses from the borings.

The fine fraction of the coarse-grained SM materials has negligible plasticity characteristics and a low potential for volumetric changes due to changes in the soil moisture content. The SM materials were determined to be non-plastic (NP). The fine fraction of the SM materials made up approximately 24.5 percent of the SM soil mass as indicated by the results of gradation analyses from the borings.

Engineer's Analysis and Recommendations

We understand the current project scope is anticipated to include the new construction of a modular restroom building and pavement/parking lot improvements. The building is planned to be constructed out of concrete masonry units (CMU) supported on a conventional shallow foundation system. In addition to the construction of the restroom building, the project scope is anticipated to include associated pavement improvements. The pavement improvements will likely consist of paved parking and access drives, ADA parking, and pedestrian walkways. Project pavements are anticipated to include light-duty and standard-duty flexible-asphalt and rigid-concrete pavement sections.

Site Preparation and Grading

Stratum I surface materials consisted of brown silty topsoil as well as flexible asphalt pavement. The measured thickness of the silty topsoil ranged between eight (8) and 10 inches at boring locations B-01 and B-03. The flexible asphalt material at boring location B-02 measured approximately three (3) inches in thickness and was underlain by three (3) inches of coarse aggregate. Reported thicknesses are only valid for the actual boring locations as thicknesses may vary in unexplored portions of the project site. It is our recommendation that topsoil and all other surface materials including organics, roots, pavement materials, and any other deleterious material should be removed full-depth from beneath the footprint of the planned restroom structure and all pavement improvement areas. A minimum stripping depth of 12 inches should be anticipated in both existing greenspace and existing pavement areas for planning and budgeting purposes.

Additional care should be taken by the Contractor to prevent excessive saturation of the exposed subgrade soils, particularly the Stratum II and Stratum III soils, as these materials may potentially lose significant strength upon saturation. This can be achieved by providing positive drainage during construction and covering with select fill material soon after excavation, if applicable. The onsite subgrade soils will be especially susceptible to reduced shear strengths if construction occurs during historically wet portions of the calendar year.

Excavated slopes during construction should be benched or sloped to provide a minimum two-to-one horizontal-to-vertical (2H:1V) ratio. Construction slopes steeper than recommended may be unstable, particularly when introduced to moisture increases during precipitation events. Temporary shoring measures should be anticipated to stabilize construction slopes that are steeper than 2H:1V.

Subgrade Verification

Following stripping and initial grading and prior to placement of select fill material, the building footprint and parking improvement area subgrades should be proof-rolled with a tandem-axle fully-loaded dump truck weighing approximately 60,000 pounds, or equivalent construction equipment. If required, alternate means of subgrade verification may be utilized at the discretion of the Geotechnical Engineer. The proof-rolling should be observed by the Geotechnical Engineer or his/her representative to verify stable subgrade conditions. We anticipate that stable subgrade materials will be encountered at approximately 2.5 to three (3) feet below existing surface elevations. Any soft and/or yielding subgrade areas encountered should be repaired by undercutting and backfilling with select fill material. These recommendations are based on the relative density/consistency values of in-situ materials encountered at various depths beneath the recommended surface material stripping depths. A correlation of N-values as they relate to relative density/consistency of in-situ soils can be seen on Plate 7 in Appendix B.

General Foundation Recommendations

The foundations relevant to the modular restroom structure should be sized to meet three (3) conditions. First, the maximum stresses imposed on the foundation strata should not exceed the allowable bearing pressures as determined from the shear strength properties of the bearing strata. Secondly, foundations should be designed to limit the maximum anticipated total and differential settlement to magnitudes that will neither damage nor impair the use of the structure. Finally, the foundation system must also be designed to resist the anticipated lateral or overturning forces during the most critical loading conditions, including earthquake loadings.

These factors, as well as construction considerations related to the existing soil and ground conditions, were influential in the preparation of the recommendations presented hereinafter. All foundation excavations should be cleaned of loose soil, debris, and water prior to the placement of reinforcing elements and concrete. Foundation excavations should be observed by the Geotechnical Engineer or his/her representative to verify the stability of exposed soils, prior to the placement of select fill material, reinforcing elements, or concrete. Concrete should not be placed on frozen soil. Adequate control joints within any building structural walls should be used to control settlement that may occur between or along the footings.

Shallow Foundation Recommendations

Based on the final location and layout of the planned improvements, it is our anticipation that finished floor elevation (FFE) for the new restroom structure will be within one (1) to two (2) feet of the existing elevations. Based on our understanding of the current project scope and encountered subgrade materials; it is our opinion that a shallow foundation system composed of continuous and individual (spread) footings will be the most feasible option for the planned development. The structure footings should be excavated so that they may be placed a minimum of two (2) feet below the existing surface elevations, and bear on either medium-dense to dense native silty sand with gravel (SM), or a minimum of two (2) feet of select fill material. If soft and/or yielding subgrade areas are discovered within the structure footprint as a result of proof-rolling operations, those areas should be undercut to stable subgrade materials and backfilled with select fill.

Footings bearing on medium-dense to dense native silty sand with gravel (SM) or properly placed and compacted select fill material can utilize safe allowable bearing pressures of 1,800 psf for continuous foundations and 2,200 psf for spread or individual foundations. The allowable bearing pressures provide a minimum factor of safety of three (3) and were calculated using a minimum footing width of two (2) feet, a minimum footing thickness of one (1) foot, and a minimum footing depth of two (2) feet below exterior ground elevations, which is adequate to protect against frost heave in the project area.

Total long-term foundation settlement for footings in the recommended material with the assumed dimensions and loading is anticipated to be approximately ¾-inch and differential settlement between footings is anticipated to be in the order of ½-inch maximum between individual footings or 40-feet along footing lengths.

It is imperative to note that structure foundations should not bear on a combination of select fill materials and native materials as this may induce differential settlement beyond the values anticipated in this report. If fill operations are required to reach the planned finished subgrade elevations within any portion of the structure footprint, the remainder of the footprint should be undercut so that a minimum of two (2) feet of select fill material may be placed beneath all structure foundation elements.

Building Slab-on-Grade

A slab-on-grade may be utilized for the new restroom building, provided that a minimum four (4) inch cushion of sand, crushed stone or gravel is placed below the slab with a vapor barrier immediately below the concrete. It is our recommendation that a minimum of two (2) feet of select fill material be properly placed and compacted beneath the proposed slab-on-grade. It is also recommended that stable subgrade soils are exposed beneath the entire building pad, prior to placement of select fill material. Depending on final project documents and design, stable subgrade soils in the building pad area are anticipated being within the upper 2.5 to three (3) feet below existing surface elevations. As such, the undercut and subsequent placement of select fill material to planned finish subgrade elevations will likely satisfy the recommended two (2) feet of select fill placement and provide adequate support beneath the slab-on-grade.

Due to the anticipated depth to stable subgrade materials and the likelihood of fill materials being required beneath the planned slab-on-grade as a result of exposing these materials, it may be beneficial to excavate the entire building pad to an elevation that is a minimum of two (2) feet below the planned bottom of foundation elevations. The building pad should then be backfilled with select fill materials until finished subgrade elevations are achieved. Finally, the footings may be excavated and installed in the compacted fill material followed by the implementation of a slab-on-grade as recommended above. In this condition, the pad excavation and select fill material placement should extend a minimum of two (2) feet beyond the outside dimensions of the building pad. Select fill material under the building slab should be placed in maximum eight (8) inch compacted lifts at a minimum density of 98 percent of the maximum dry density as determined by the Standard Proctor Test, ASTM D 698. Thickened "bridging" lifts of select fill material should not be used within the building footprint. The select fill material should be compacted at a moisture content within three (3) percent of the laboratory-determined optimum moisture content per Table 3 on the following page.

Select Fill Material

Select fill material required for the project is recommended to be of locally available, homogenous material meeting Unified Soils Classification as an SC, SM, GC, or GM. It should be free of any organic matter, and should have a LL less than 35, a PI less than 20, and a maximum of 70% passing the No. 200 sieve.

Select fill material should be placed in maximum 8-inch compacted lifts at a minimum density of 98 percent of the maximum dry density as determined by the Standard Proctor Test (ASTM D698) or 95 percent of the maximum dry density as determined by the Modified Proctor Test (ASTM D 1557).

Variations to the above criteria may be considered for approval. Onsite soils should **not** be utilized as select fill material in building or pavement improvement areas. Onsite soils may be used as general fill outside of the structure footprint and within the anticipated parking improvement areas.

All fill and backfill should be placed in horizontal lifts. When placing fill next to existing slopes, the slope face should be stripped of all vegetation and the face "benched" to allow placement of horizontal lifts and bonding to the slope face.

Table 3, on the following page, provides the recommended compaction parameters for select fill and Class 7 base course on the project. Implementation of standard or modified proctors may vary by material type and should be per the recommendation of the Geotechnical Engineer.

Table 3: Compaction Requirements

Type of Material	Test Specifications	Minimum Dry Density (%)	Optimum Moisture Range (%)
Select Fill	ASTM D698	98	-3% to +3%
Base Course	ASTM D1557	95	Near Optimum

Minimum Project Pavement Recommendations

The pavement recommendations in this section are based on stable subgrade material and/or select fill material existing beneath planned pavement sections. This requirement would be provided by proper placement of approved select fill material and/or stable onsite material being verified by proof-rolling within the pavement subgrade dimensions. Minimum project pavement sections are recommended to be as shown in Table 4 below.

For the recommendations contained herein, light-duty pavements are considered to be those pavements used in site work and low-volume traffic areas such as pedestrian sidewalks and areas primarily subjected to passenger vehicles.

The standard-duty pavement recommendations in this section are intended to apply to higher-volume traffic areas, dumpster pads, loading areas, and any other pavement area dimensions that are to be periodically subjected to heavy trucks and machinery loads. The standard-duty pavements are recommended as performing similar to a typical city street pavement section. Heavy-duty pavement recommendations are not expected as being required on this project, due to the understood use of the project pavements regarding heavy truck traffic.

Table 4: Minimum Recommended Project Pavement Sections

		Light Duty	Standard Duty
Concrete Pavement	Portland Cement Concrete	4"	6"
	Class 7 Base Course (95% MPD)	6"	8"
	Stable Subgrade or Compacted Select Fill (98% SPD)	24"	24"

The pavement sections provided by Table 4 should be viewed as minimums and can be increased through the design process by the project Civil Engineer if warranted.

Groundwater – Site Dewatering

Groundwater was encountered by two (2) project borings (B-01 and B-03) at depths ranging between 1.5 and two (2) feet below the existing surface elevations at the time of drilling. We anticipate that the encountered groundwater is likely perched groundwater above higher consistency Stratum II and Stratum III materials and not the true groundwater table in the area. Water observations were made by the on-site crew both during drilling operations and at the completion of the borings. The installation and periodic measurement of monitoring wells would be required to establish seasonal piezometric surfaces below the project site. The specific locations of the referenced borings are provided in Appendix A on Plate 1.

Construction Materials Testing and Special Inspections

Construction materials testing and special inspection services are recommended to be provided by MCE to provide consistency with the recommendations in this report and the documentation of those recommendations being implemented during construction. Testing of the earthwork, concrete, paving, structure, and other phases is recommended to be conducted and documented during construction to assure the Owner and Engineer that the construction complies with the specifications.

In particular, field verification of earthwork operations will be required to confirm the recommendations contained herein. Additionally, all trenching and excavations should be conducted in accordance with Arkansas State Law and OSHA guidelines and requirements.

Limitations and Reserved Rights

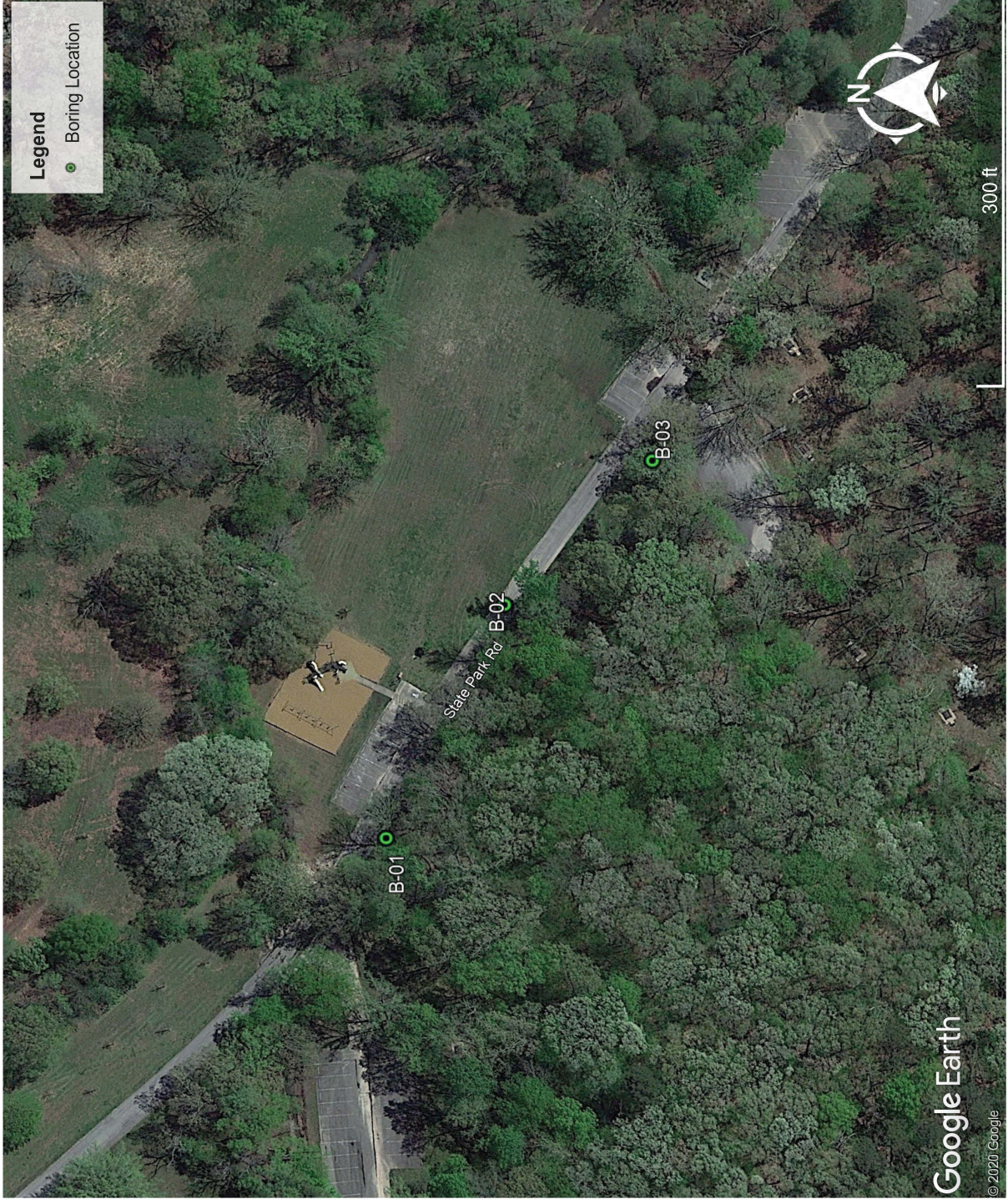
The recommendations and conclusions made in this report are based on the assumption that the subsoil conditions do not deviate appreciably from those disclosed in the subsurface exploration. Should significant subsoil variations or undesirable conditions be encountered during construction that is not described herein, the Geotechnical Engineer reserves the right to inspect these conditions for the purpose of reevaluating this report. A review of the final construction plans and specifications by this office is encouraged to ensure compliance with the intent of these recommendations.

Appendix A: Boring Layout



MCE McCLELLAND
CONSULTING
ENGINEERS, INC.
DESIGNED TO SERVE

Little Rock
Fayetteville
Fort Smith
Tulsa



1 Capitol Mall
Little Rock, Arkansas 72201

Project Number

19-5825



Lake Poinsett State Park Improvements Harrisburg, Arkansas

PLATE 1

Appendix B: Boring Logs



LOG OF BORING NUMBER B-01

Project Name: Lake Poinsett State Park Improvements
Project Number: 19-5825
Project Location: Harrisburg, Arkansas
Project Client: Arkansas State Parks
Geotechnical Engineer: Steven J. Head, P.E.
Drill Rig Operator: Coley Roach
Drill Rig Make/Model: CME 45B Truck Mounted Drill Rig
Drilling Method: Solid Stem Auger
Boring Location: See Plate 1

Drilling Date: 4/14/2020
Logged By: Roy Heavener/Mickey Brown
Surface Elevation: 312.0
Auger Refusal Depth: N/A
Planned Depth: 15 Feet
Completion Depth: 15.0 Feet
Groundwater Observation
At Time Of Drilling (ATD): 1.5 Feet
Prior to Backfill (PTB): Dry

This information pertains only to this boring and should not be interpreted as being indicative of the site.

Depth (ft)	Elevation (ft)	Sample Number	Symbol	USCS	N-Value	Description of Material	Moisture	Plastic Limit	Liquid Limit	Plasticity Index	% <#200	Lab Test Results	
												N-Values	Moisture Content
0	312	1		ML	5	TOPSOIL (10")	31.7					10	30
						SILT WITH SAND (ML): Brown; Medium-Stiff; Negligible Plasticity; Few Fine Gravel; Trace Coarse and Medium Sands; Few to Little Fine Sands; Moist to Wet							
3	309	2			11	- Stiff	26.1			NP	74.2	20	35
6	306	3			9		23.4					25	30
9	303	4			6	- Light Brown to Gray - Medium-Stiff to Stiff	27.3					25	35
12	300												
15	297	5			13	- Very Stiff	31.8			NP	74.9	25	35
						END OF BORING							

LOG OF BORING NUMBER B-02

Project Name: Lake Poinsett State Park Improvements
Project Number: 19-5825
Project Location: Harrisburg, Arkansas
Project Client: Arkansas State Parks
Geotechnical Engineer: Steven J. Head, P.E.
Drill Rig Operator: Coley Roach
Drill Rig Make/Model: CME 45B Truck Mounted Drill Rig
Drilling Method: Solid Stem Auger
Boring Location: See Plate 1

Drilling Date: 4/14/2020
Logged By: Roy Heavener/Mickey Brown
Surface Elevation: 311.5
Auger Refusal Depth: N/A
Planned Depth: 15 Feet
Completion Depth: 2.0 Feet
Groundwater Observation
At Time Of Drilling (ATD): Dry
Prior to Backfill (PTB): Dry

This information pertains only to this boring and should not be interpreted as being indicative of the site.

Depth (ft) Elevation (ft)	Sample Number	Symbol	USCS	N-Value	Description of Material	Moisture	Plastic Limit	Liquid Limit	Plasticity Index	% <#200	Lab Test Results	
											N-Values	Moisture Content
0 311.5	1		CL-ML	4	ASPHALT (3")	19.8	18	24	6	67.1	10	20
COARSE AGGREGATE (3")												
					SANDY SILTY CLAY (CL-ML): Dark Brown; Medium-Stiff; Negligible Plasticity; Trace Fine Gravel; Trace Coarse and Medium Sands; Little Fine Sands; Moist							
3 308.5					END OF BORING							
6 305.5												
9 302.5												
12 299.5												
15 296.5												

LOG OF BORING NUMBER B-03

Project Name: Lake Poinsett State Park Improvements
Project Number: 19-5825
Project Location: Harrisburg, Arkansas
Project Client: Arkansas State Parks
Geotechnical Engineer: Steven J. Head, P.E.
Drill Rig Operator: Coley Roach
Drill Rig Make/Model: CME 45B Truck Mounted Drill Rig
Drilling Method: Solid Stem Auger
Boring Location: See Plate 1


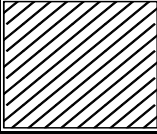
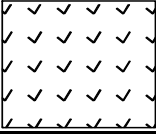
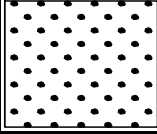
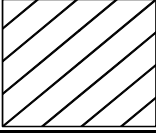
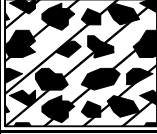

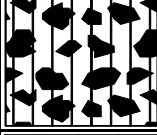

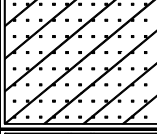
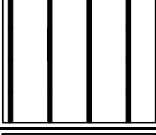
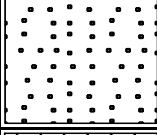
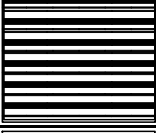
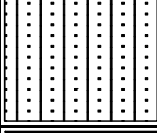
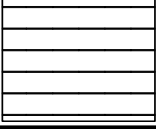
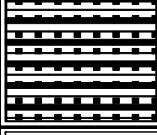

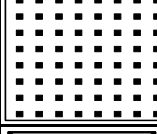

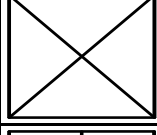

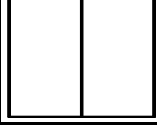
Drilling Date: 4/14/2020
Logged By: Roy Heavener/Mickey Brown
Surface Elevation: 311.0
Auger Refusal Depth: N/A
Planned Depth: 15 Feet
Completion Depth: 15.0 Feet
Groundwater Observation
At Time Of Drilling (ATD): 2 Feet
Prior to Backfill (PTB): Dry

This information pertains only to this boring and should not be interpreted as being indicative of the site.

Depth (ft) Elevation (ft)	Sample Number	Symbol	USCS	N-Value	Description of Material	Moisture	Plastic Limit	Liquid Limit	Plasticity Index	% <#200	Lab Test Results	
											N-Values Plastic Limit Moisture Content	Liquid Limit
0 311	1		SM	4	TOPSOIL (8")	19.9					10	20
					SILTY SAND WITH GRAVEL (SM): Dark Brown; Loose; Negligible Plasticity; Few to Little Coarse and Fine Gravel; Few Coarse and Medium Sands; Little to Some Fine Sands; Moist							
3 308	2			16	- Medium-Dense	12.7			NP	24.5	20	30
6 305	3			8	- Loose to Medium-Dense	16.6					20	30
9 302	4		CL	14	SANDY LEAN CLAY (CL): Light Brown to Gray; Very Stiff; Low to Moderate Plasticity; Trace Fine Gravel; Trace Coarse and Medium Sands; Some Fine Sands; Moist	25.3	16	31	15	56.3	20	30
12 299	5			28	- Hard	17.4					20	30
15 296					END OF BORING							

Symbols and Terms Used on Boring Logs

Symbols Used on Boring Logs

SYMBOL	MATERIAL TYPE	SYMBOL	MATERIAL TYPE
	Asphalt Paving		Concrete Paving
	Topsoil		Coarse Aggregate Base
	Low Plasticity Clay - CL		Clayey Gravels - GC
	High Plasticity Clay - CH		Silty Gravels - GM
	Clayey Silts - ML		Clayey Sands - SC
	Elastic Silts - MH		Poorly Graded Sands - SP
	Weathered Shale		Silty Sands - SM
	Shale		Weathered Sandstone
	Water During Investigation		Sandstone
	Water After Investigation		Bulk Sample
	Standard Penetration Test		Rock Core

Symbols and Terms Used on Boring Logs

ASTM Soil Terminology

Coarse-Grained Soils: More than 50% retained on a #200 (0.075mm) sieve.

Fine-Grained Soils: 50% or more passes a #200 (0.075mm) sieve.

Gravel: Material passing a 3" (75mm) sieve and retained on a #4 (4.75mm) sieve.

Coarse Gravel: Material passing a 3" (75mm) sieve and retained on a 3/4" (19.0mm) sieve.

Fine Gravel: Material passing a 3/4" (19.0mm) sieve and retained on a #4 (4.75mm) sieve.

Sand: Material passing a #4 (4.75mm) sieve and retained on a #200 (0.075mm) sieve.

Coarse Sand: Material passing a #4 (4.75mm) sieve and retained on a #10 (2.00mm) sieve.

Medium Sand: Material passing a #10 (2.00mm) sieve and retained on a #40 (0.457mm) sieve.

Fine Sand: Material passing a #40 (0.475mm) sieve and retained on a #200 (0.075mm) sieve.

Clay: Material passing a #200 (0.075mm) sieve that exhibits plasticity, and strength when dry ($PI \geq 4$).

Silt: Material passing a #200 (0.075mm) sieve that is non-plastic, and little strength when dry ($PI < 4$).

AASHTO Soil Terminology

Boulders & Cobbles: Material retained on a 3" (75mm) sieve.

Gravel: Material passing a 3" (75mm) sieve and retained on a #10 (2.00mm) sieve.

Coarse Sand: Material passing a #10 (2.00mm) sieve and retained on a #40 (0.475mm) sieve.

Fine Sand: Material passing a #40 (0.475mm) sieve and retained on a #200 (0.075mm) sieve.

Silt-Clay: Material passing a #200 (0.075mm) sieve.

Silt Fraction: Material passing a #200 (0.075mm) sieve and larger than 0.002mm.

Clay Fraction: Material smaller than 0.002mm.

Silty: Material passing a #4 (4.75mm) sieve with a $PI \leq 10$.

Clayey: Material passing a #4 (4.75mm) sieve with a $PI \geq 11$.

Coarse Aggregate: Aggregate retained on the #10 (2.00mm) sieve and consisting of hard, durable particles or fragments of stone, gravel or slag.

Fine Aggregate: Aggregate passing the #10 (2.00mm) sieve and consisting of natural or crushed sand, and fine material particles passing the #200 (0.075mm) sieve. The portion passing the #40 (0.425mm) sieves shall have a $LL \leq 25$ and a $PI \leq 6$.

Symbols and Terms Used on Boring Logs

In-Situ Shear Strengths

COARSE-GRAINED SOILS			FINE-GRAINED SOILS		
Penetration (blows/foot)		In-Situ Strengths	Penetration (blows/foot)		In-Situ Strengths
Auto	Manual		Auto	Manual	
0 - 3	0 - 4	Very Loose	< 2	< 2	Very Soft
3 - 8	4 - 10	Loose	2 - 3	2 - 4	Soft
8 - 23	10 - 30	Medium-Dense	3 - 6	4 - 8	Medium-Stiff
23 - 38	30 - 50	Dense	6 - 12	8 - 15	Stiff
> 38	> 50	Very Dense	12 - 23	15 - 30	Very Stiff
<small>NOTE: Modified based on 80% hammer efficiency (Automatic Hammer). In-situ strengths are based on Terzaghi, Peck & Meri, 1996.</small>			> 23	> 30	Hard

Material Structure Descriptors

Stratified: Alternating layers of varying material or color with layers at least 1/2" thick.

Laminated: Alternating layers of varying material or color with layers at least 1/4" thick.

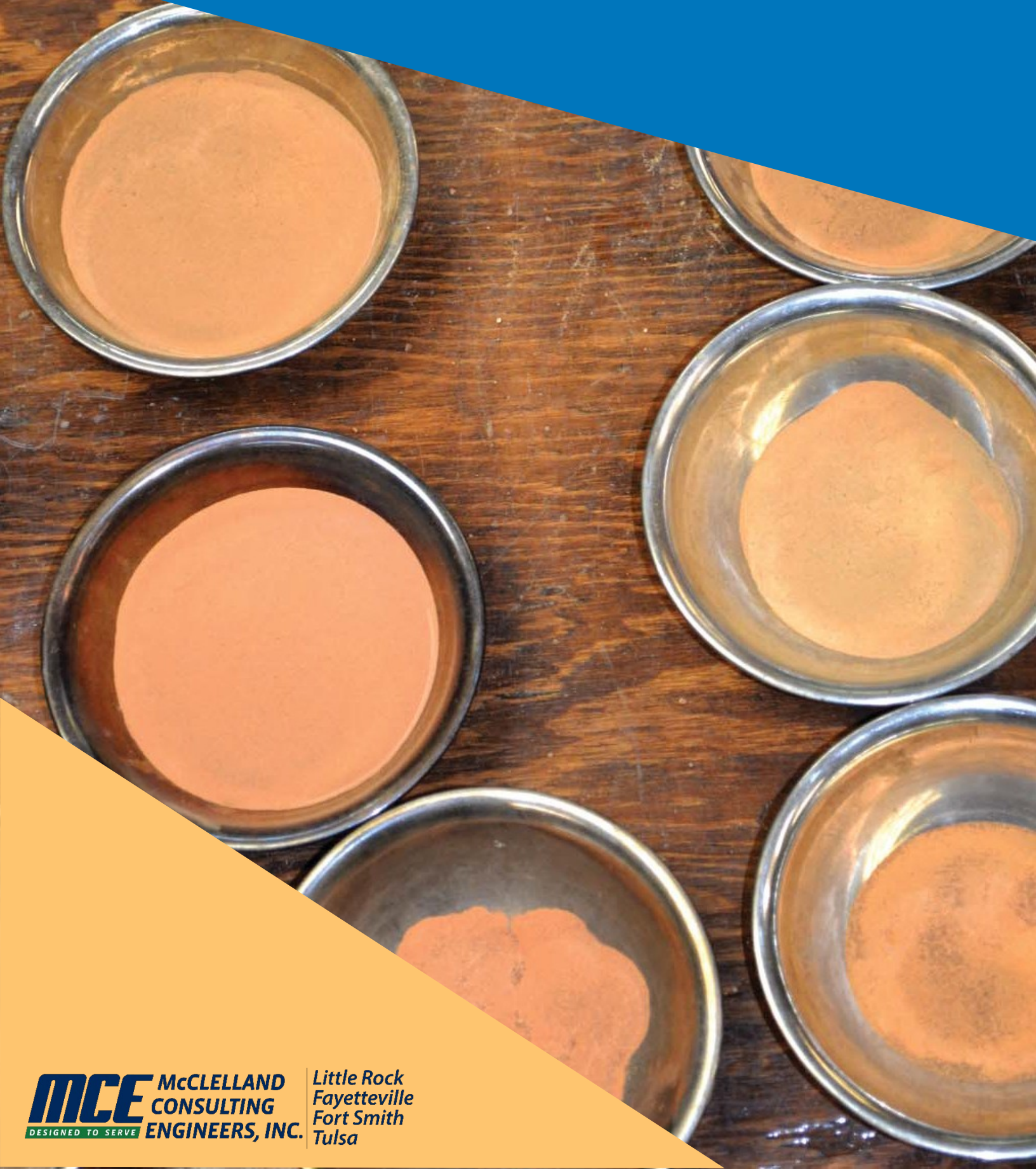
Fissured: Breaks along definite planes of fracture with little resistance.

Blocky: Fine-grained soils that can be broken down into small angular lumps which resist further breakdown.

Lensed: Inclusion of small pockets of different soils, such as small amount of sand scattered through a mass of clay.

Descriptor	Meaning
Trace	Less than 5%
Few	5% to 10%
Little	15% to 25%
Some	30% to 45%
Mostly	50% to 100%

Appendix C: Laboratory Testing Results



Project Name: Lake Poinsett State Park Improvements
 Project Number: 19-5825
 Project Location: Harrisburg, Arkansas
 Client: Arkansas State Parks

LABORATORY TESTING RESULTS

Boring Number	Sample Number	Description	Depth (ft)	Lab Moisture Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS Classification	ASHTO Classification	SIEVE ANALYSIS % FINER					Unit Dry Weight (pcf)	Compressive Strength (tsf)		
										3/4"	#4	#10	#40	#200				
B-01	1	Brown Silty Topsoil	0'	31.7														
	2	Brown Silt with Sand	2'6"	26.1		NP	ML	A-4(0)		94.8	92.2	88.8	74.2					
	3	Brown Silt with Sand	5'	23.4														
	4	Light Brown to Gray Silt with Sand	8'6"	27.3														
	5	Light Brown to Gray Silt with Sand	13'6"	31.8			NP	ML	A-4(0)		100.0	100.0	98.8	74.9				
B-02																		
	1	Dark Brown Sandy Silty Clay	6"	19.8	24	18	6	CL-ML	A-4(2)		95.9	94.0	90.2	67.1				
B-03																		
	1	Brown Silty Topsoil	0'	19.9														
	2	Dark Brown Silty Sand with Gravel	2'6"	12.7		NP	SM	A-2-4(0)		69.6	62.0	51.4	24.5					
	3	Dark Brown Silty Sand with Gravel	5'	16.6														
	4	Light Brown to Gray Sandy Lean Clay	8'6"	25.3	31	16	15	CL	A-6(5)		96.7	94.0	92.3	56.3				
5	Light Brown to Gray Sandy Lean Clay	13'6"	17.4															

Date: 8/30/2022



Arkansas
Department of Health
Keeping Your Hometown Healthy

SEPTIC TANK PERMIT

Customer Name: KEVIN CASTLEBERRY
Customer No: 7602132090

Transaction Date: 8/30/2022
Transaction No: 25369480 Created By: glawrence

Amount Received: \$30.00 Payment Method: Check No. 33595

Paid By: WHITTEN CONCRETE CO. LLC

Owner's Name:	ARKANSAS STATE PARKS LAKE POINSETT
Site Location:	5752 STATE PARK RD Harrisburg, Arkansas 72432
Subdivision:	N/A
Lot Number:	N/A
Designated Rep:	1315264 KEVIN CASTLEBERRY
Sanitarian:	Logan, Christopher

Thank you for your payment

Poinsett County Health Unit -
Harrisburg
119 N Main St

Harrisburg AR 72432



Arkansas Department of Health
Environmental Health Protection

Receipt Number
25369480

Individual Onsite Wastewater System Permit Application

Permit Type New Installation
 Alteration / Repair

Fee Schedule for Structures		
Structures 1500 sq ft or less	\$ 30.00	<input checked="" type="checkbox"/>
Structures more than 1500 sq ft and up to 2000 sq ft	\$ 45.00	<input type="checkbox"/>
Structures more than 2000 sq ft and up to 3000 sq ft	\$ 90.00	<input type="checkbox"/>
Structures more than 3000 sq ft and up to 4000 sq ft	\$120.00	<input type="checkbox"/>
Structures more than 4000 sq ft	\$150.00	<input type="checkbox"/>
Alteration and Repair	\$ 30.00	<input type="checkbox"/>

DR Environmental ID #

7 6 0 2 1 3 2 0 9 0

Part 1 Application

Treatment Type (check one)

Disposal Method (check one)

- | | | | |
|--|---|---|--|
| <input checked="" type="checkbox"/> STD = Standard Septic Tank | <input type="checkbox"/> ATU = Aerobic Treatment Plant | <input checked="" type="checkbox"/> STD = Standard Absorption Field | <input type="checkbox"/> LPD = Low Pressure Distribution |
| <input type="checkbox"/> ISF = Intermittent Sand Filter | <input type="checkbox"/> RSF = Re-circulating Sand Filter | <input type="checkbox"/> SUR = Surface Discharge | <input type="checkbox"/> HLD = Holding Tank |
| <input type="checkbox"/> PMF = Proprietary Media Filter | <input type="checkbox"/> RGF = Re-circulating Gravel Filter | <input type="checkbox"/> CPF = Capping Fill | <input type="checkbox"/> SRL = Serial Distribution |
| <input type="checkbox"/> OTH = Other (Describe) | <input type="checkbox"/> HLD = Holding Tank | <input type="checkbox"/> OTH = Other | <input type="checkbox"/> DRP = Drip Irrigation |

1. Owner's/Applicant's Name Arkansas State Parks "Lake Pointsett" 2. Phone Number 501-371-0272 Caleb Zimmerman

3. Mailing Address C/O Caleb Zimmerman, 7302 Kanis Rd, Little Rock, AR, 72204 4. County Pointsett

5. Address of Proposed System (if a 911 address is not available, attach detailed directions or map)
State Park Rd, Harrisburg, AR, 72432

6. Subdivision Name None 7. Approval Date None 8. Date Recorded None 9. Lot Number None

10. Lot Dimensions N/A 11. Total Area (Acres) 80.80 12. # Bedrooms # People 70 @ 5gpd 13. Daily Flow (GPD) 350

14. Brief Legal Description of Property (Attach a separate sheet of paper, if necessary)
S-5 T-10-S R-4-W

15. Water Supply (Specify supplier, if Public Water) Crowleys Ridge 16. GPS Coordinates 35.53126° N, 90.68397° W | 35.53070° N, 90.68426° W

17. Loading Rates (gpd/ft ²)	18. System Specifications			
Primary Area <u>.40</u>	a. Size of Septic Tank <u>1000</u> gal	f. Trench Depth <u>18</u> inches		
Secondary Area <u>.73</u>	b. Size of Dose Tank <u>1</u> gal	g. Trench Spacing <u>10</u> feet		
Percolation Test (min/in)	c. Absorption Area <u>1000</u> ft ²	h. Trench Media (List Below) <u>4" perf w/rock</u>	i. Trench Width	
Primary Area Avg <u>N/A</u>	d. Number of Field Lines <u>5</u>		<u>24</u>	in
Secondary Area <u>N/A</u>	e. Length of Field Lines <u>100</u> ft			in

TO THE OWNER
The permit for construction may be deemed invalid by the local Environmental Health Specialist before the start of construction, if the site and/or soil conditions have changed after approval of this permit, or if the information within this permit is inaccurate or has been found to be misrepresented. Approval for operation does not constitute a guarantee that the system will function properly. The approval states that the system was designed and installed according to the Arkansas Department of Health, Rules and Regulations Pertaining to Onsite Wastewater Systems, unless there are exceptions or deviations noted in the comments. A Permit for Construction is valid for one (1) year from the date of approval. The authorized agent must revalidate a permit more than one (1) year old prior to the start of any construction.

19. Utilization Verification
I hereby attest that item 12, the number of bedrooms (number of persons for commercial) and square footage of the structure that will utilize the designed individual onsite wastewater system in this permit application, is accurate. I have reviewed the permit application and understand the layout, installation, maintenance, operation and expense(s) that may be associated with this system.

Owner/Applicant Signature See Attn Date _____

20. I certify that I have conducted the above tests and that the above listed information is in accordance with the latest requirements of the Arkansas Department of Health Rules and Regulations Pertaining to Onsite Wastewater Systems.

Designated Representative Signature Kevin Castleberry Title 8/16/22
Print Name KEVIN CASTLEBERRY Date 8/16/22
Soil Certified Yes No Phone Number 870-692-5742

21. Approval of Health Authority
The information and specifications in the application has been reviewed and found to meet the requirements of the Arkansas Department of Health Rules and Regulations Pertaining to Onsite Wastewater Systems. A PERMIT FOR CONSTRUCTION is hereby issued.
Environmental Specialist Signature [Signature] EHS Number 3391 Date 9/1/2022

* Optional System Utilization Verification Form



Arkansas Department of Health
Environmental Health Protection

Receipt Number
25369480

Individual Onsite Wastewater System Permit Application

Permit Type

- New Installation
 Alteration / Repair

DR Environmental ID #

7602132090

- Homeowner
 Builder/Developer

Fee Schedule for Structures	
Structures 1500 sq ft or less \$ 30.00	<input checked="" type="checkbox"/>
Structures more than 1500 sq ft and up to 2000 sq ft \$ 45.00	<input type="checkbox"/>
Structures more than 2000 sq ft and up to 3000 sq ft \$ 90.00	<input type="checkbox"/>
Structures more than 3000 sq ft and up to 4000 sq ft \$ 120.00	<input type="checkbox"/>
Structures more than 4000 sq ft \$ 150.00	<input type="checkbox"/>
Alteration and Repair \$ 30.00	<input type="checkbox"/>

TO THE PROPERTY OWNER

Onsite Wastewater System Utilization Verification

Property location: Lake Poinsett, State Park Rd
(Address of Proposed System, City, State, Zip)

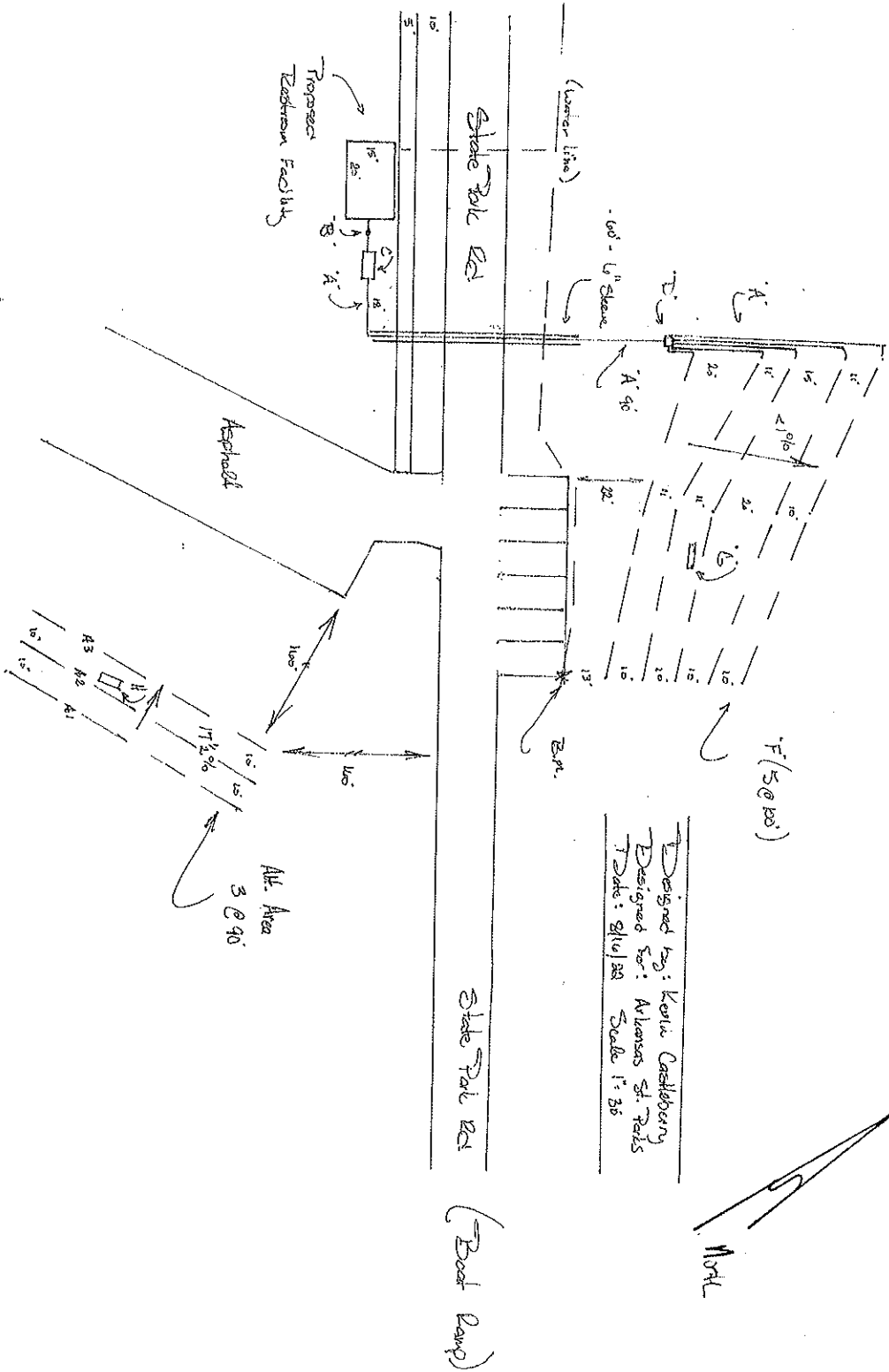
I hereby attest there are 70 bedrooms (70 number of persons for commercial) and the square footage of the structure that will utilize the designed onsite wastewater system in this permit application is accurate. I have reviewed the permit application and understand the layout, installation, maintenance, operation and expense(s) that may be associated with this system.

As Developer/Builder, I hereby attest that the above information is correct and prior to the sale of the property, I will convey, to the buyer, all information associated with this system.

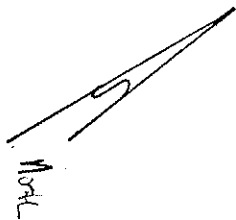
Owner/Applicant Signature *Chris Gyan*

Date 8/19/22

This document must be submitted with the permit application, if the Owner/Applicant Signature Section (number 19 on the EHP-19) is not signed.



Designed by: Kevin Castleberry
 Designed for: Arkansas St. Parks
 Date: 8/16/20 Scale: 1" = 35'



(Boat Ramp)

APPLICANT: ARKANSAS ST. PARKS "LAKE POINSETT"

ELEVATIONS (FT./IN)

	GROUND ELEV.	FLOW LINE ELEV.
BENCHMARK	9.0	
STUB OUT:	6.11	7.10
CLEAN OUT:	6.11	7.10
TANK IN:	6.11	8.1
TANK OUT:	6.10	8.4
D-BOX IN:	10.0	10.7
D-BOX OUT:	10.0	10.9

LINE #	BEG.	MID.	END	TR. BOTTOM	TR. DEPTH
#1	10.0	10.0	10.0	11.6	18
#2	10.4	10.4	10.4	11.10	18
#3	10.4	10.4	10.4	11.10	18
#4	10.8	10.8	10.8	12.2	18
#5	10.10	10.10	10.10	12.4	18
#6					
ALT. AREA					
BENCHMARK	25.0				
A1	2.2	2.2	2.2		
A2	4.0	4.0	4.0		
A3	5.8	5.8	5.8		

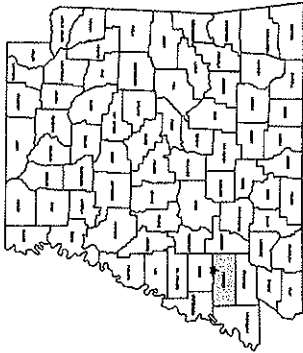
NOTES:

1. INSTALL A 1000 GALLON TANK.
2. SEPTIC TANK MUST HAVE MINIMUM 16" DIAMETER RISERS OVER BOTH THE INLET AND OUTLET BAFFLES.
3. INSTALL A TUF-TITE OUTLET FILTER IN TANK. (SEE SPEC SHEET)
4. CUT ASPHALT ROADWAY AND SLEEVE THE 4" EFFLUENT LINE WITH 6" PIPE UNDER THE ROAD AND TO A MINIMUM 10' PAST THE WATER SERVICE LINE
5. INSTALL DISTRIBUTION BOX WITH SPEED LEVELERS. IF TOP OF BOX IS UNDERGROUND ADD RISER EXTENSIONS TO BRING ABOVE NATURAL GROUND ELEVATION.
6. FIELD LINES CONSIST OF (5-100') LINES ON 10' CENTERS, OR AS MARKED.

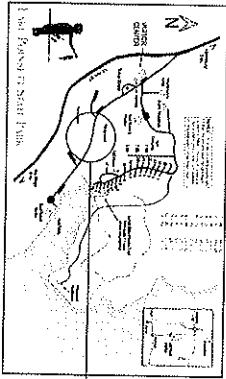
LEGEND:

- | | |
|----------------------------------|--------------------------|
| (A) <u>4" SCH. 40 PIPE</u> | (G) <u>PIT #1</u> |
| (B) <u>4" CLEAN OUT AND PLUG</u> | (H) <u>PIT #2</u> |
| (C) <u>SEPTIC TANK</u> | (I) <u>CURTAIN DRAIN</u> |
| (D) <u>DIST. BOX</u> | (J) |
| (E) <u>4" SDR 35 PIPE</u> | (K) |
| (F) <u>FIELD LINE LATERALS</u> | (L) |

STATE LOCATION MAP ★



VICINITY MAP



AREA OF WORK

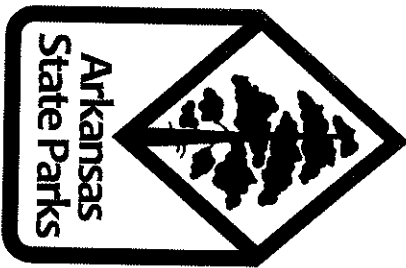
LAKE POINSETT ARKANSAS STATE PARKS DAY USE IMPROVEMENTS

PROJECT DESIGN TEAM

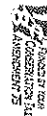
PLANNING AND DEVELOPMENT
ARKANSAS STATE PARKS DIVISION OF
ARKANSAS DEPARTMENT OF PARKS, HERITAGE AND TOURISM
ONE CAPITOL MALL
SUITE 4B.215
LITTLE ROCK, AR 72201
PH: (501) 682-1633
FAX: (501) 682-1199
WWW.ARKANSASSTATEPARKS.COM

INDEX TO DRAWINGS

- 1 - COVER
- 2 - RESOLUTION PLAN
- 3 - SITE PLAN
- 4 - GRADING & DRAINAGE PLAN
- 5 - UTILITY PLAN
- 6 - MISCELLANEOUS DETAILS I
- 7 - MISCELLANEOUS DETAILS II



PLANNING & DEVELOPMENT



QUALITY CONTROL REVIEW
A QUALITY CONTROL CHECK, INCLUDING THE APPROPRIATE COORDINATION AMONG DISCIPLINES, HAS BEEN MADE ON THE PROJECT'S DOCUMENTS, AND CORRECTIONS RELATED TO THIS CHECK HAVE BEEN MADE. THE CONSIDERED PARTICIPALS OWNER STATEMENTS AND COMMENTS ARE BEING FORWARDED SUBMITTED FOR REVIEW, ARE TO BE REVIEWED IN KNOWLEDGE AND ABILITY COMPLETE AND READY FOR REVIEW.
Name of Project leader

DFA: DIVISION OF BUILDING AUTHORITY
PROJECT #:



MICE PROJECT NO. 19-58235
MICE CONSULTING ENGINEERS, INC.
DESIGNED TO SERVE
http://www.mice-us.com
(501) 371-0272
7302 KANIS ROAD
LITTLE ROCK, ARKANSAS 72204

LITTLE ROCK, AR • FAYETTEVILLE, AR • FORT SMITH, AR • TULSA, OK

ARKANSAS DEPARTMENT OF PARKS, HERITAGE AND TOURISM

Stacy Hurst - Secretary

Shea Lewis - Director, State Parks

Chris Myers - Manager, Planning & Development

Kim Stew - Chief Engineer

LAKE POINSETT
ARKANSAS STATE PARKS
DAY USE IMPROVEMENTS

Lake Pointsett
State Park
5752 State Park Rd
Harrisburg, AR 72432
Ph. (870) 578 - 2066

Date	Comments



Arkansas State Parks
Division of Arkansas Dept. of Parks, Heritage & Tourism

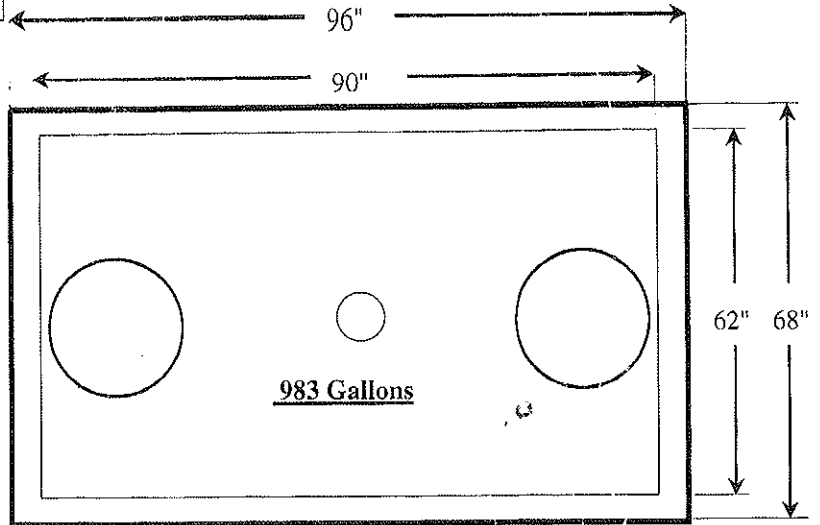
Arkansas State Parks
Planning & Development
One Capitol Mall
Suite 4B.215
Little Rock, AR 72201
Ph. (501) 682-1633
Fax. (501) 682-1199
www.arkansasstateparks.com

Project Information	Ark. Number 9002205
CHANGES	REVISIONS
1	1

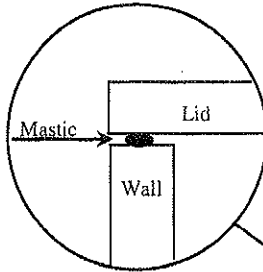
1000 - Gallon Single Compartment Septic Tank

TOP VIEW

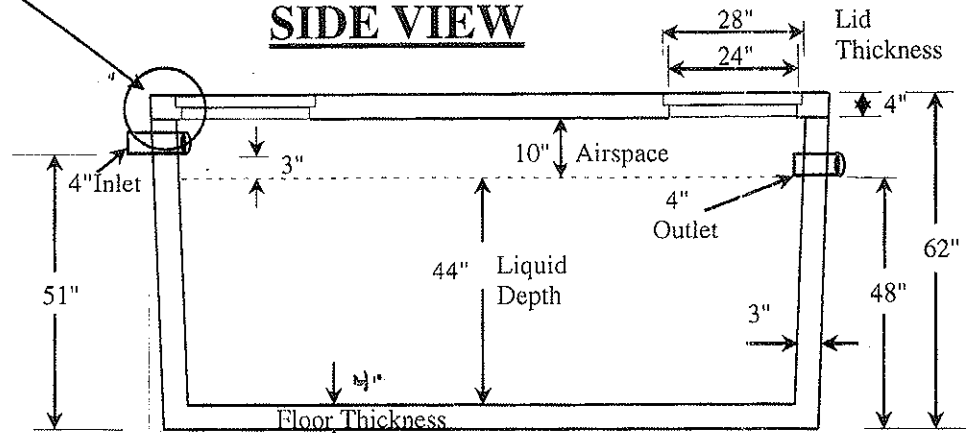
Drawings Not To Scale



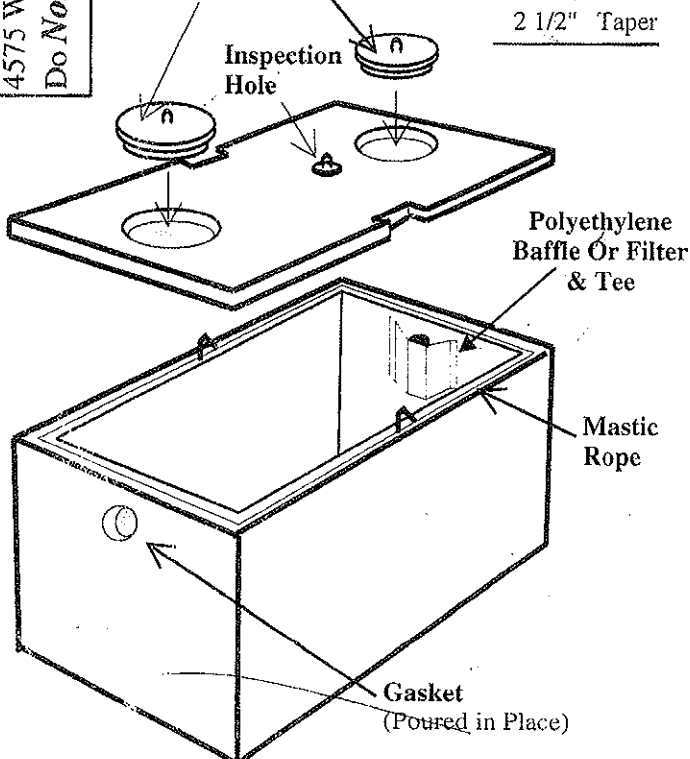
Enlarged Detail



SIDE VIEW



Manhole Lids/Openings



This is proprietary information, and remains the property of Del Zotto Products of Florida Inc. These Drawings and Dimensions have been drawn especially for:

WHITTEN CONCRETE CO.

2703 W. 2nd AVE.
PINE BLUFF, AR. 71601
PHONE: 870-534-6901
FAX: 870-534-6902

Drawing Approved By: _____

Date Approved: _____

The Company/Persons named above shall be given written permission upon purchase of the Concrete Form to duplicate and promote sales literature on this septic tank by: Del Zotto Products of Florida Inc.

1000 - Gallon Single Compartment Septic Tank

Drawing #: DZ-2

Drawing by: SMR Date: 1/19/2011

Property of: **Del Zotto Products of Florida Inc.**
4575 West Highway #40, Ocala, FL 34482 (352) 351-3834 Office
Do Not duplicate, Do Not reproduce without written permission.

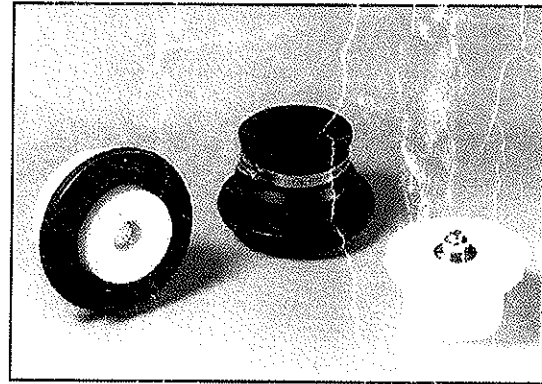


CAST-A-SEAL® 402/402F

CAST-IN BOOT-TYPE CONNECTOR
for 1-1/4" to 6" PVC Pipe
(32 mm - 150 mm)

What It Is

CAST-A-SEAL 402/402F is a watertight flexible connector that is cast into the structure when the concrete is poured. The connector is folded into the casting position and placed on the reusable heavy-duty solid plastic mandrel that is installed directly to the form. After the concrete is cured, the form is opened, removing the mandrel from the gasket, but leaving the **CAST-A-SEAL 402/402F** connector embedded in the concrete. The gasket is then simply unfolded at the jobsite and is tightened around the pipe using the supplied stainless steel take-up clamp.



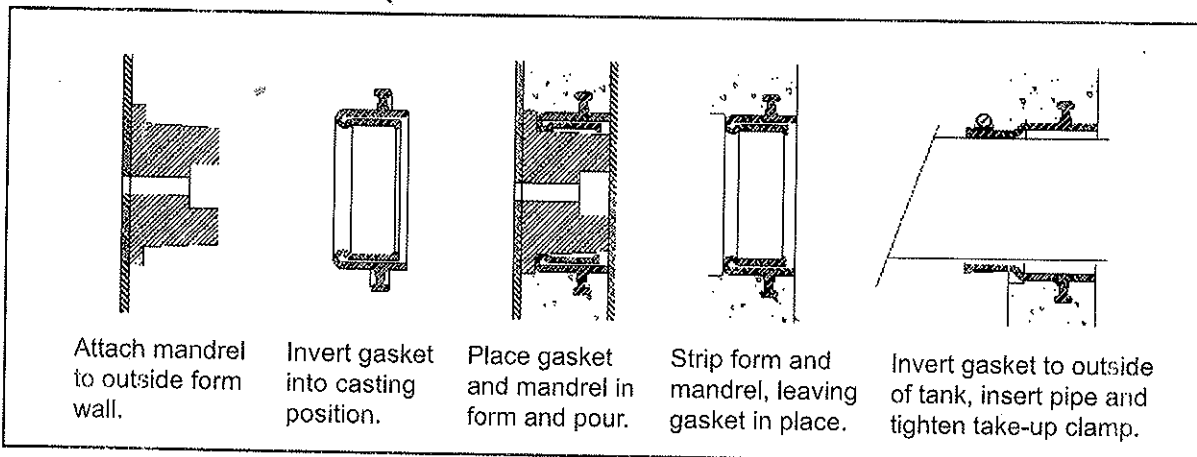
Why It's Better

- Simple cast-in design provides flexible watertight connection
- Eliminates infiltration and exfiltration
- Improves on-site system performance and minimizes maintenance
- Protects groundwater from unintended discharges
- Use in on-site treatment structures, grease interceptors, manholes, wet wells, pump and lift stations, stormwater structures, or any application requiring a flexible watertight connector

How It Performs

CAST-A-SEAL 402/402F meets or exceeds all requirements of the following Standards, Codes, Specifications and/or Test Methods:

- | | |
|--------------------|----------------------------|
| ASTM C 1227 | IAPMO Z1000 |
| ASTM C 1644 | IAPMO Z1001 |
| ASTM C 923 | NPCA Best Practices |
| ASTM C 1244 | NOWRA Model Code |
| ASTM C 1478 | |



Press-Seal believes all information is accurate as of its publication date. Information, specifications, and prices are all subject to change without notice. Press-Seal is not responsible for any inadvertent errors. Copyright 2012.



PRESS-SEAL GASKET CORPORATION

Protecting Our Planet's Clean Water Supply

Press-Seal Gasket is an ISO 9001:2008 Registered Company

800-348-7325 Fax (260) 436-1908

email: sales@press-seal.com

web: www.press-seal.com



Made in USA

Installation:

The Tuf-Tite EF-4 Effluent Filter is designed to extend the life of your drainfield by preventing solids from leaving the septic tank. The filter fits into a 4" PVC Tee Baffle which in many cases is already attached to the outlet pipe. If a Tee Baffle is not installed, install as shown in Figures 2 and 3, allowing enough clearance from the end of the tank to permit easy filter access.

1. Insert the EF-4 into the Tee Baffle with arrow on the top of the filter pointing toward the outlet pipe (as shown in Figure 1 and Figure 3).
2. Push down firmly until top of the EF-4 seats into hub of the Tee.

Maintenance:

The Tuf-Tite EF-4 Effluent Filter will, under normal conditions, operate efficiently for several years or more before requiring removal and cleaning. It is suggested that the unit be cleaned every time the tank is pumped or at least every three years.

1. Do not use plumbing during filter cleaning.
2. Pull the EF-4 straight out of the Tee.
3. Hose filter off, making sure that all solids fall back into the septic tank, not back into the Tee Baffle.
4. Replace filter as in installation instructions above.

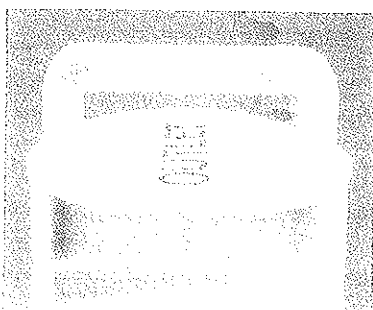


Figure 1:

Arrow on top of filter unit must point in the direction of the outlet pipe. Top rim of filter will seat in hub of Tee.

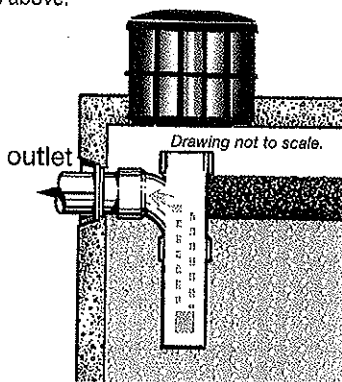


Figure 2:

Diagram of installed filter and Tee Baffle. Note: drawing is not to scale.

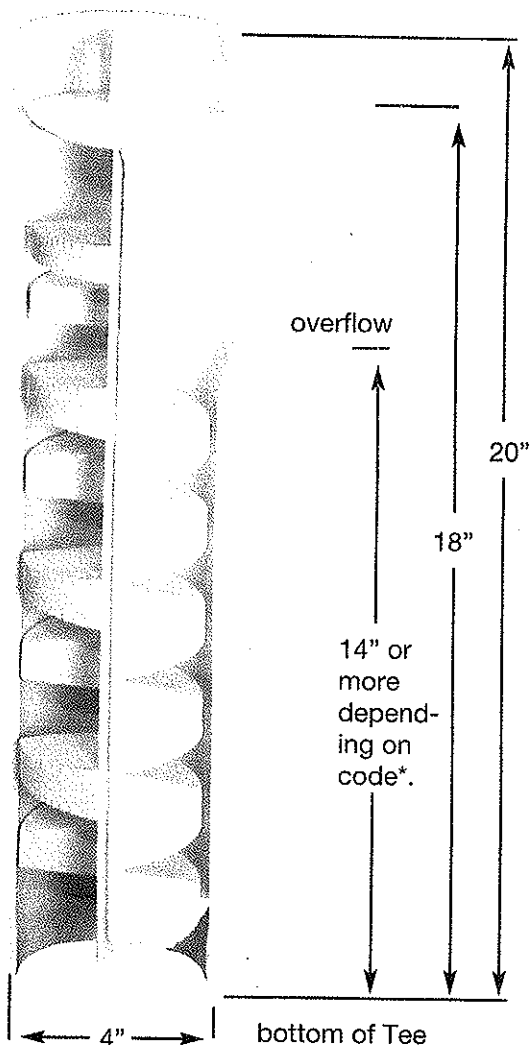


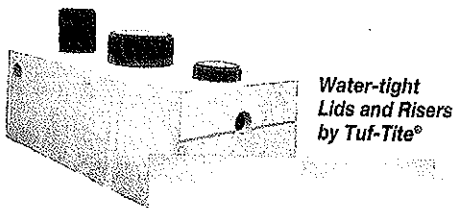
Figure 3:

Cutaway photo of EF-4 filter installed in 4" Tee Baffle. *Tee pipe may be extended by using bell end of SDR-35 pipe



Drainage and Septic Products

Tuf-Tite® Corporation
500 Capital Drive
Lake Zurich, Illinois 60047

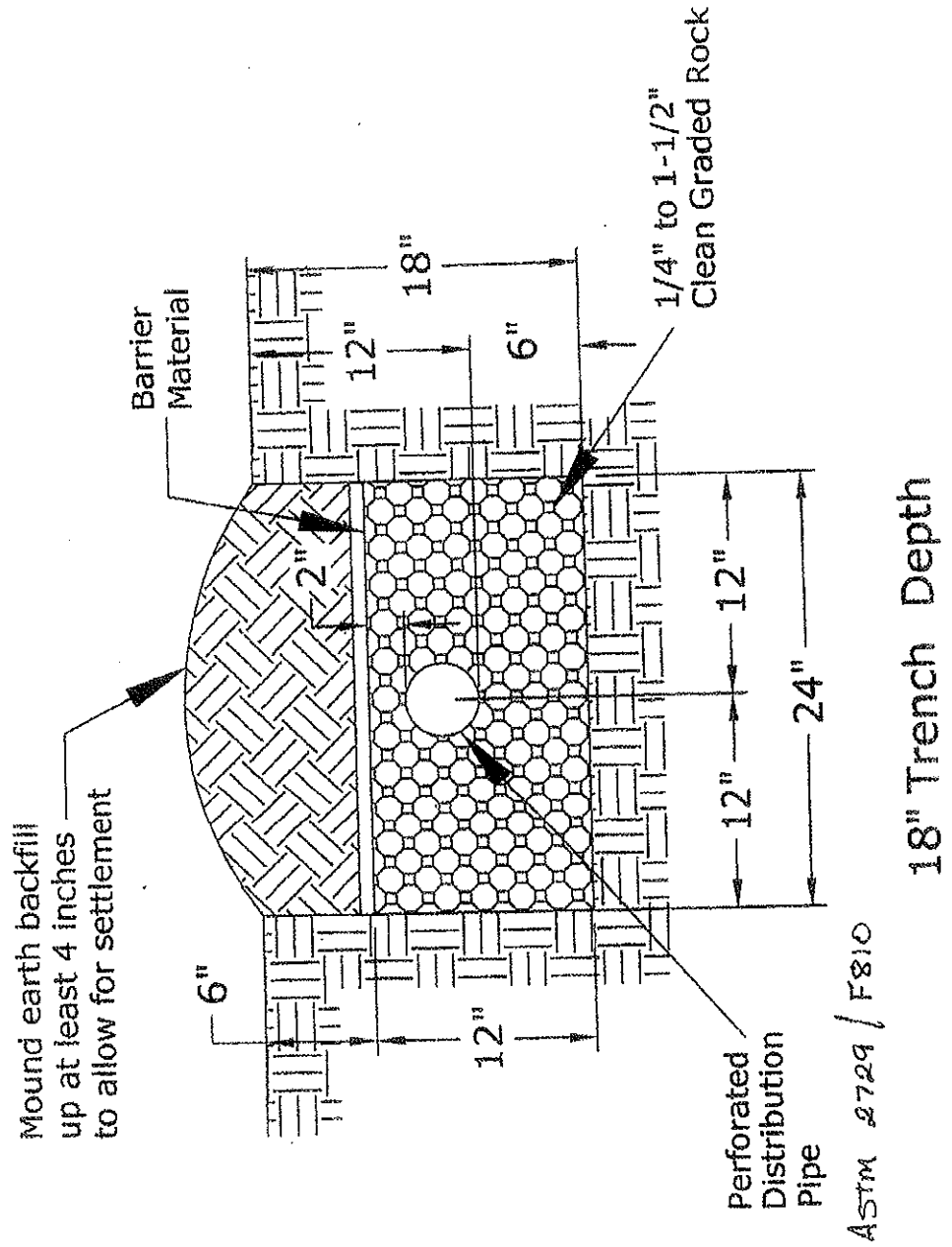


*Water-tight
Lids and Risers
by Tuf-Tite®*



fig. 9

Lateral Line Trench Detail



AR DEPT OF PARKS & TOURISM

Basic Sales Valuation Taxes

Basic Info

Parcel Number:	004-02686-0000
County Name:	Poinsett County
Property Address:	AR DEPT OF PARKS & TOURISM
Mailing Address:	AR DEPT OF PARKS & TOURISM 1 CAPITOL MALL LITTLE ROCK AR 72201
Collector's Mailing Address 	AR DEPT OF PARKS & TOURISM 1 CAPITOL MALL LITTLE ROCK, AR 72201
Total Acres:	80.86
Timber Acres:	0.00
Sec-Twp-Rng:	05-10-04
Lot/Block:	/
Subdivision:	
Legal Description:	PT NE 1/4 HARRISBURG
School District:	06 HARRISBURG
Homestead Parcel?:	No
Tax Status:	EXEMPT GOVERNMENT
Over 65?:	No

Google Maps 35°31'50.6"N 90°41'02.8"W



Map data ©2022 Google 200 ft



35°31'50.6"N 90°41'02.8"W

35.530707, -90.684113



Directions



Save



Nearby



Send to phone



Share



5752 State Park Rd, Harrisburg, AR 72432

**Individual Onsite System
Presite/Plan Review Check Sheet**

Applicant: Ar State Parks Lake Poinsett
 DR: Kevin Castleberry
 EHS: Chris Logan

Permit #: 25369480
 Date: 9/1/2022

PRE-SITE REVIEW			OMP SYSTEMS		
	Y	N		Y	N
1	✓		26		
2	✓		27		
3	✓		28		
4	✓		29		
5	✓		30		
6	✓		31		
7	✓		PLAT DRAWING		
8	✓		32	✓	
			33	✓	
			34	✓	
			35	✓	
			36	✓	
			37	✓	
			38	✓	
			39	✓	
			40	✓	
			41	✓	
			42	✓	
EHP-19			43	✓	
9	✓		44	✓	
10	✓		45	✓	
11	✓		46	✓	
12	✓		47	✓	
13	✓		48	✓	
14	✓		49	✓	
15	✓		50	✓	
16	✓		51		✓
17	✓		52		✓
PUMP SYSTEMS			53	✓	
18			54		✓
19					
20					
21					
22					
23					
24					
25					

Comments:

APPENDIX

**Contractor is responsible for adherence to all applicable
Federal and State Laws and Regulations
including, but not limited to,
the following and any applicable amendments:**

Ark Act 291 of 1993
Trench and Excavation Safety Systems

Code of Federal Regulations Title 29
website: <http://ecfr.gpoaccess.gov/>

Arkansas State Licensing Law for Commercial Contractors
website: www.arkansas.gov/club
