LOCKEBY & ASSOCIATES.

PROJECT MANUAL

Upgrade of Wastewater System
Arkadelphia Human Development Center

Arkansas Department of Human Services
Arkadelphia, Arkansas

For Construction

Prepared By:
LOCKEBY & ASSOCIATES, INC.
11300 N. Rodney Parham Rd, Suite 310
Little Rock, Arkansas 72212
Telephone: (501) 228-9800

April 22, 2026

CERTIFICATE OF AUTHORIZATION
LOCKEBY & ASSOCIATES, INC.
No. 603
ARKANSAS ENGINEER

STATE OF ARKANSAS
LICENSED PROFESSIONAL ENGINEER
No. 7848
04/23/2026
GLENN LOCKEBY

Lockeby & Associates, Inc. Project Number: 24-29
DBA Agency Project Number: 7102601

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FOR CONSTRUCTION

END OF SECTION 00 01 10

INVITATION TO BID
Section 00 11 16 / Rev: August 2025

Lockeby & Associates, Inc.	Wastewater System Upgrades
11300 N. Rodney Parham Rd, Suite 310 Little Rock, Arkansas 72212 501-228-9800	DBA Project #: 7102601 Owner/Agency: Arkansas Department of Human Services

1) You are invited to bid on a General Contract for the:
   Construction of: Wastewater System Upgrades
   Located At: Arkadelphia Human Development Center, 1 Prator Dr., Arkadelphia, AR. 71923
   Project Owner: Arkansas Department of Human Services
   Bid Type: Lump Sum Basis: Lowest Responsive and Responsible Bidder

2) There will be a Mandatory Pre-Bid Conference
   Date: Tuesday, May 19, 2026
   Time: 10:00 a.m.
   Location: 1 Prator Drive, Arkadelphia, Arkansas 71923. Contractors are asked to meet at the Wastewater Treatment Plant.

   The State reserves the right to schedule future meetings.

   Bids received from any bidder failing to attend any mandatory meeting(s) shall be declared responsive.

3) The Owner will receive bids until:
   Date: Tuesday, May 26, 2026
   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:

   Southern Reprographics, 901 West 7th Street, Little Rock, Arkansas 72201, (501) 372-4011.

5) Bid document deposit and refund information:
Prime bidders will be furnished three (3) sets of bidding documents. Bidders must deposit a check in the amount of $100.00 per set, payable to Lockeby & Associates, Inc. Deposits will be refunded to all prime bidders who return bidding documents in good condition within ten (10) days after the opening of bids. A bidder receiving a contract award may retain the bidding documents and the Bidder's deposit will be refunded. Prime bidders requiring additional sets and sub-bidders may purchase bidding documents through Southern Reprographics.

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

Southern Reprographics Plan Room, 901 West 7th Street, Little Rock, Arkansas 72201, (501) 372-4011.

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 Arkansas law, bidders must submit with their bid a completed Certifications for Contracting with the State of Arkansas (DBA 00 45 00) form.

To: **All Bidders**
From: **Division of Building Authority, Construction Section**
Re: **Common Bidding Mistakes**
Date: **8/1/2025**

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 and certifications, 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.

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.

6.4 Depending on the specific project requirements, **the following is a GENERIC list** of all possible bid forms that may be due with bid submittals. Bidders must verify each specific project's requirements in Section 00 41 13 to ensure they have provided all the required documentation with their submission.

Bid Submittal – due before stated date and time of bid opening (see Invitation to Bid Section 00 11 16):
00 41 13 Bid Form (all pages are always required)
00 43 13 Bid Security
00 43 22 Unit Prices Form (if required)
00 45 00 Certifcations for Contracting with the State of Arkansas Form

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. The State is not responsible for the opening of bids prior to bid opening date and time that are not properly marked.

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 hand delivery, by email: (dbaconst@arkansas.gov), or by facsimile fax: (501-682-5589) 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. Modifications must be verifiable with bid original signature party.

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

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

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

13. **APPLICABLE LAWS**.

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

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

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

13.4 State licensing laws for Contractors shall be complied with.

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

Potential Bidders are hereby notified that:

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

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

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

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

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

13.5 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.

13.6 Pursuant to Ark. Code Ann. §19-60-105, 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 and by completing the "Certifications for Contracting with the State of Arkansas" form included in section 00 45 00.

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.

13.7 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.

Each prospective contractor shall certify by signing the "Certifications for Contracting with the State of Arkansas" form. This certification shall be submitted as one of the bid submission 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.

13.8 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.

13.9 Pursuant to Ark. Code Ann. §25-1-1102 (Act 611 of 2023), 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 energy, fossil fuel, firearms, and ammunition industries and agrees for the duration of the contract not to engage in a boycott of these industries.

Each prospective contractor shall certify by signing the "Certifications for Contracting with the State of Arkansas" form. This certification shall be submitted as one of the bid submission documents. The Contract shall not be approved until the certification is completed and provided with the other bid documents necessary for contract approval.

13.10 Pursuant to Ark. Code Ann. §25-1-1203 (Act 758 of 2023), state agencies shall not enter into contracts with scrutinized companies or that employs scrutinized companies as a subcontractor for construction work unless the contract includes a written certification from the company is not a scrutinized company. State agencies shall require a company that submits a bid or proposal for a contract for goods and services to certify that the company is not a scrutinized company.

Note: A copy of the "Certifications for Contracting with the State of Arkansas" is included in section 00 45 00.

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 2025

Bid Date:	Tuesday, May 26, 2026
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 Human Services

Bid From: _____

_____

DBA Project Number: 7102601

Project Name: Wastewater System Upgrades

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

$ _____

Dollar Amount Is To Be Shown Numerically

2) Allowances:
Not Required

3) Unit Prices:
Not Required

4) Trench or Excavation Safety:
Required

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)

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: 120
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. Certifications for Contracting with the State of Arkansas

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: Wastewater System Upgrades **Project #: 7102601**

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 2025

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 Human Services, 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: 7102601 Wastewater System Upgrades

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.**

CERTIFICATIONS FOR CONTRACTING WITH THE STATE OF ARKANSAS

Section 00 45 00 / Rev: August 2025

DBA Project Number: 7102601

Project Name: Wastewater System Upgrades

Pursuant to Arkansas law, a Contractor must submit the below certifications prior to entering into a contract with a public entity for an amount as designated by the applicable laws.

1) **Israel Boycott Restriction:** For contracts valued at $1,000 or greater.

A public entity shall not contract with a person or company (the "Contractor") unless the Contractor certifies in writing that the Contractor is not currently engaged in a boycott of Israel. If at any time after signing this certification the Contractor decides to boycott Israel, the Contractor must notify the contracting public entity in writing. See Arkansas Code Annotated § 25-1-503.

2) **Illegal Immigrant Restriction:** For contracts valued at $25,000 or greater.

No state agency may contract for services with a Contractor who knowingly employs or contracts with an illegal immigrant. The Contractor shall certify that it does not knowingly employ, or contract with, illegal immigrants. See Arkansas Code Annotated § 19-60-105.

3) **Energy, Fossil Fuel, Firearms, and Ammunition Industries Boycott Restriction:** For contracts valued at $75,000 or greater.

A public entity shall not contract unless the contract includes a written certification that the Contractor is not currently engaged in and agrees not to engage in, a boycott of an Energy, Fossil Fuel, Firearms, or Ammunition Industry for the duration of the contract. See Arkansas Code Annotated § 25-1-1102.

4) **Scrutinized Company Restriction:** (Required with bid or proposal submission.)

A state agency shall not contract with a Scrutinized Company or a company that employs a Scrutinized Company as a subcontractor. A Scrutinized Company is a company owned in whole or with a majority ownership by the government of the People's Republic of China. A state agency shall require a company that submits a bid or proposal for a contract to certify that it is not a Scrutinized Company and does not employ a Scrutinized Company as a Scrutinized Company as a subcontractor. See Arkansas Code Annotated § 25-1-1203.

By signing this form, the Contractor agrees and certifies they are not a Scrutinized Company and they do not currently and shall not for the aggregate term of any resultant contract:

~ Boycott Israel

~ Knowingly employ or contract with illegal immigrants.

~ Boycott Energy, Fossil Fuel, Firearms, or Ammunition Industries.

~ Employ a Scrutinized Company as a subcontractor.

Arkansas Department of Human Services

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 2025

THIS AGREEMENT entered into this _____ by and between _____ hereinafter referred to as the Contractor, and Arkansas Department of Human Services 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 Clark County, designated as

Project # : 7102601

Project Name: Wastewater System Upgrades

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:

Tuesday, May 26, 2026

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

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

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

In: 120 Calendar Days
On or Before: N/A

If the Contractor fails to complete the work within the time limit herein specified, he shall pay to the Owner, as liquidated damages and not in the nature of a penalty, the sum specified in the Bid Form of for each calendar day delayed, it being understood and agreed between the parties hereto that the said sum fixed as liquidated damages is a reasonable sum, considering the 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 # : 7102601

Project Name: Wastewater System Upgrades

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 Human Services

Owner: Agency Name

Signature of Authorized Officer of the Agency | Date

Print Name | Title | Email Address

P.O. Box 1437, Slot W103 | Little Rock, AR 72203

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 2025

1) We _____, (Principal), and

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

and severally, unto Arkansas Department of Human Services, 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:
Wastewater System Upgrades
Project # 7102601 .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 2025

Project Name: Wastewater System Upgrades

DBA Project Number: 7102601 Owner/Agency: Arkansas Department of Human Services

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: Lockeby & Associates, Inc.

Address: 11300 N. Rodney Parham Rd, Suite 310
Little Rock, Arkansas 72212

Signature Title Date

Approval of Contractor:

Company Name: _____

Address: _____

_____

Signature Title Date

Approval of Owner-Agency:

Agency Name: Arkansas Department of Human Services

Address: P.O. Box 1437, Slot W103
Little Rock, AR 72203

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 2025

DBA Project Number: 7102601 Project Name: Wastewater System Upgrades

We, the undersigned parties, state:

1) The date of final completion for the above referenced project is herein established as: _____

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

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

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

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

Contractor:

_____
Contractor Company/Corporation Name

_____
By: Contractor Authorized Representative

_____
Print Name Date

Design Professional:

Lockeby & Associates, Inc.
Design Professional Firm Name

_____
By: Design Professional Authorized Representative

_____
Print Name Date

State Agency, Board & Commission:

Arkansas Department of Human Services
Owner/Agency Name

_____
By: Agency Authorized Representative

_____
Print Name Date

Division of Building Authority

_____
By: DBA Observer or Authorized Representative

_____
Print Name Date

Release of Claims
Section 00 65 19.13 / Rev: August 2025

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 # : 7102601

which was executed on: _____, on the following project:
Wastewater System Upgrades

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 2025

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 Wastewater System Upgrades

DBA Project # 7102601 ; Contract Date _____

_____ Contractor, and the Project Owner

Arkansas Department of Human Services ; 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 2025

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

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

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

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

7.3 PAYMENT FOR CHANGES IN THE WORK

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

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

ARTICLE 8 -- TIME

8.1 DEFINITIONS

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

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

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

8.2 PROGRESS

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

8.3 HOLIDAYS

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

8.4 DELAYS

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

ARTICLE 9 -- PAYMENTS AND COMPLETION

9.1 CONTRACT SUM

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

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

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

9.2 SCHEDULE OF VALUES

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

9.3 MEASUREMENT OF QUANTITIES

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

9.4 REQUESTS FOR PAYMENT

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

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

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

9.5 PERIODIC ESTIMATES FOR PAYMENT

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

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

9.6 PAYMENT FOR INCREASED OR DECREASED QUANTITIES

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

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

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

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

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

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

9.8 ACTION ON A REQUEST FOR PAYMENT AND FINAL PAYMENT

(See also 9.9)

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

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

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

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

9.8.2 The State shall process payments in accordance with Ark. Code Ann. §19-4-1410, 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. §19-4-1410.

9.9 PAYMENT FOR UNCORRECTED WORK

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

9.10 PAYMENT FOR REJECTED MATERIALS AND WORK

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

9.11 DATE OF SUBSTANTIAL COMPLETION

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

9.12 FINAL COMPLETION AND PAYMENT BY OWNER

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

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

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

9.13 PARTIAL OCCUPANCY OR USE

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

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

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

9.14 FINAL INSPECTION

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

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

9.15 ASSIGNMENT OF WARRANTIES

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

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

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

9.16 ACCEPTANCE AND FINAL PAYMENT

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

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

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

ARTICLE 10 -- PROTECTION OF PERSONS AND PROPERTY

10.1 GENERAL

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

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

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

ARTICLE 11 -- INSURANCE AND BONDS

11.1 INSURANCE REQUIREMENTS

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

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

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

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

11.1.4 Commercial Automobile Liability Insurance shall be secured and maintained in force during this 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 2025

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

1) Subparagraph 11.1.1, add the following sentence:

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

2) Subparagraph 11.1.2, add the following clause:

11.1.2.1 Workers' Compensation

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

3) Subparagraph 11.1.3, add the following clause:

11.1.3.1 Commercial General Liability

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

4) Subparagraph 11.1.4, add the following clause:

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

5) Subparagraph 11.1.5, add the following clause:

11.1.5.1 Umbrella Liability:	Each Occurrence:	$1,000,000

6) Subparagraph 11.1.6, add the following clause:

11.1.6.1 Pollution Liability:	Per Loss:	N/A
	Aggregate:	$0

7) Subparagraph 11.1.7, add the following clause:

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

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

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

End of Document

Health and Safety Requirements
Section 00 73 19 / Rev: August 2025

Pursuant to Ark. Code Ann. §22-9-212 et. Seq., the Contractor agrees that all trench or excavation having a depth of over five feet will be performed in accordance per the Section.

The Contractor agrees to provide all trench or excavation safety systems as mandated by Part 1926–Safety and Health Regulations for Construction, Subpart P – Excavations and any other applicable Federal Regulations. See attached Subpart P - Excavations.

The Contractor is responsible for completing all trench and excavation with proper safety in place during performance of the Work.

(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 professional 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

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.* (i) 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 inspection 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 sufficently 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.

(l) 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 sheer 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 America 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 ⅛-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 ⅛-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 pulverize 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 ravelling, 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 ½ horizontal to one vertical (½H: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.

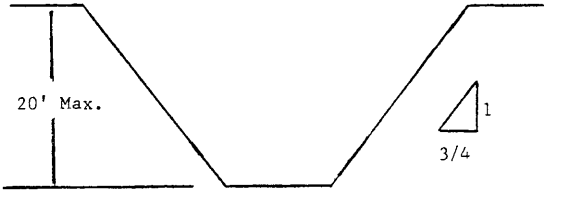
Figure B–1

Slope Configurations

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

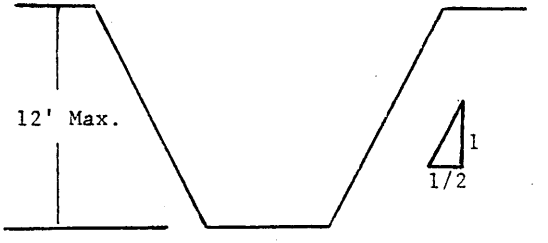
B–1.1 Excavations made in Type A soil.

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



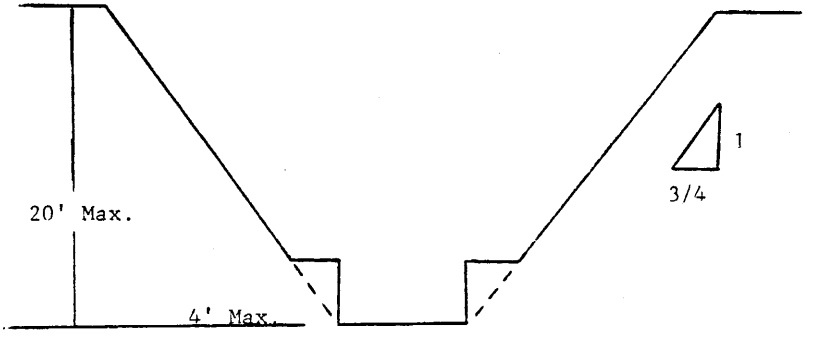
SIMPLE SLOPE—GENERAL

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.

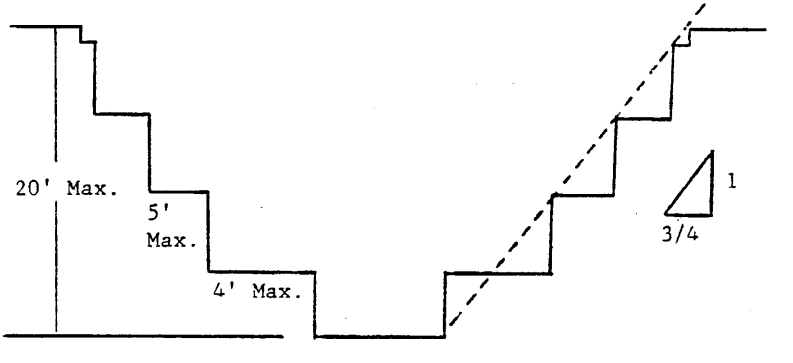


SIMPLE SLOPE—SHORT TERM

2. All benched excavations 20 feet or less in depth shall have a maximum allowable slope of ¾ to 1 and maximum bench dimensions as follows:

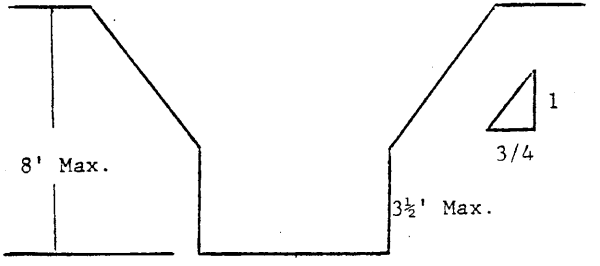


SIMPLE BENCH



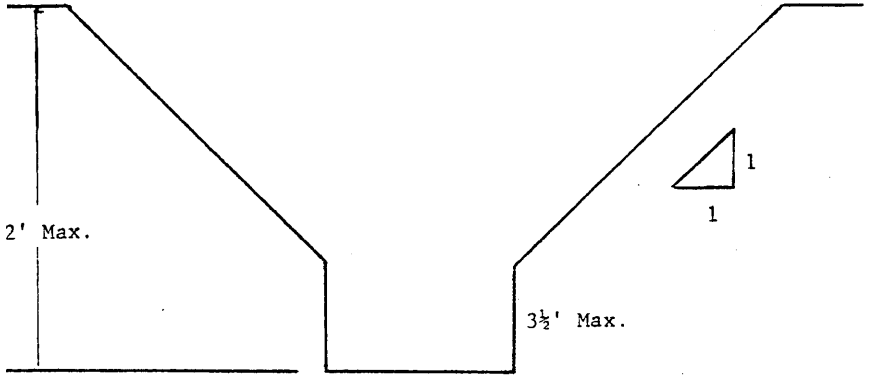
MULTIPLE BENCH

3. All excavations 8 feet or less in depth which have unsupported vertically sided lower portions shall have a maximum vertical side of 3½ feet.



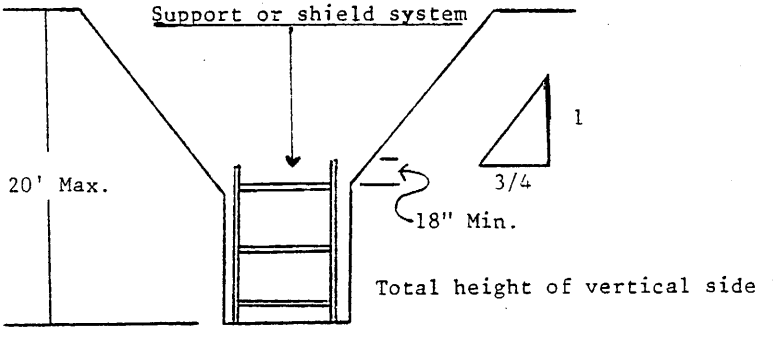
UNSUPPORTED VERTICALLY SIDED LOWER PORTION—MAXIMUM 8 FEET IN DEPTH

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.

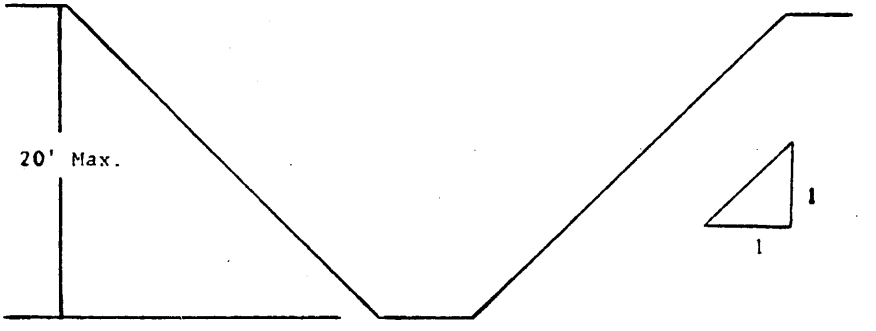


SUPPORTED OR SHIELDED VERTICALLY SIDED LOWER PORTION

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).

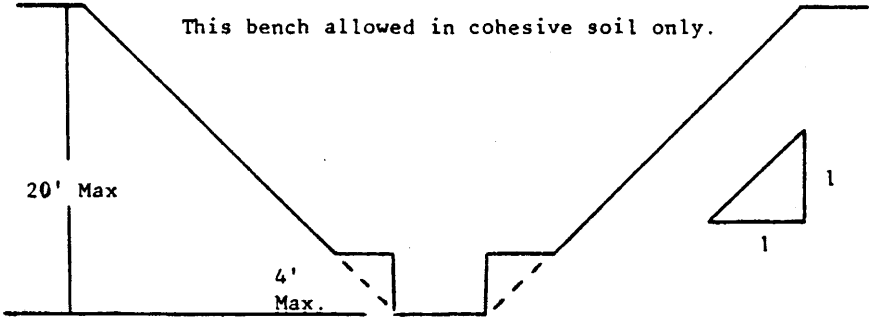
B–1.2 Excavations Made in Type B Soil

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

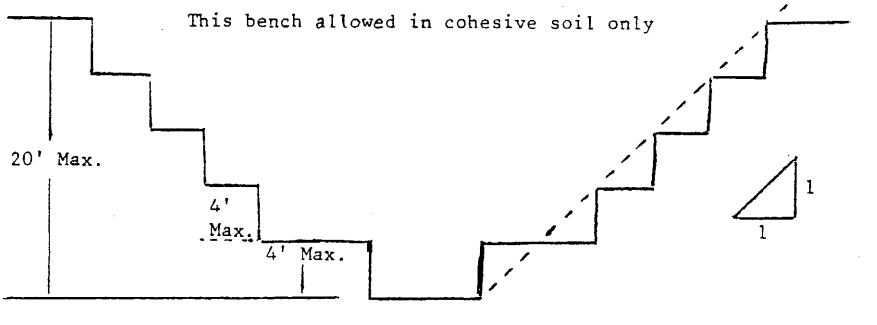


SIMPLE SLOPE

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:

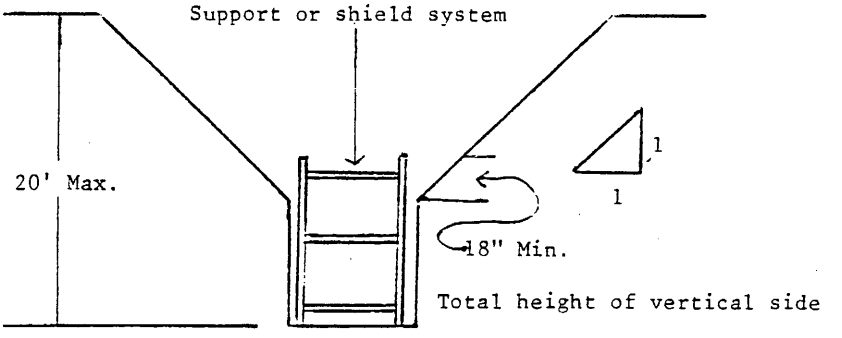


SINGLE BENCH



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.

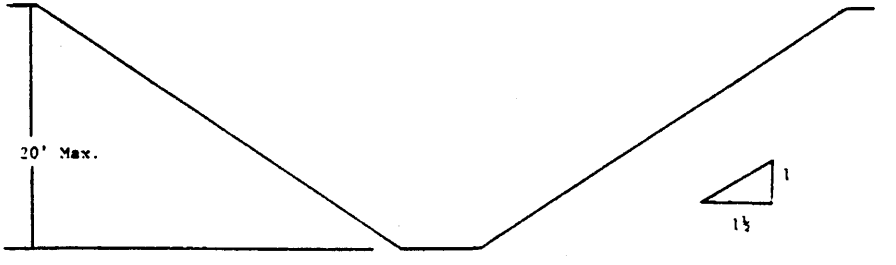


VERTICALLY SIDED LOWER PORTION

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

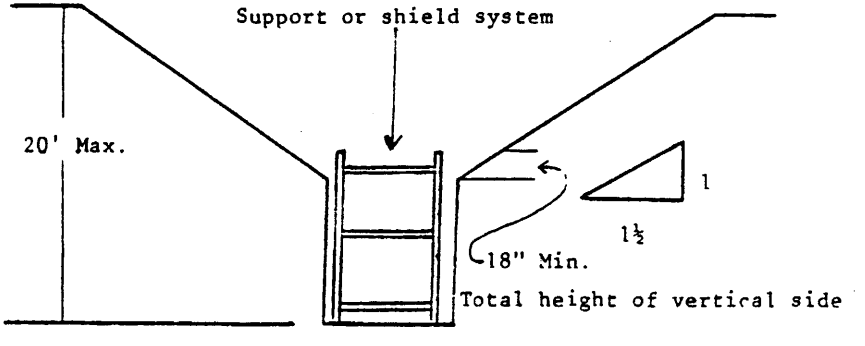
B–1.3 Excavations Made in Type C Soil

1. All simple slope excavations 20 feet or less in depth shall have a maximum allowable slope of 1½:1.



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 1½:1.

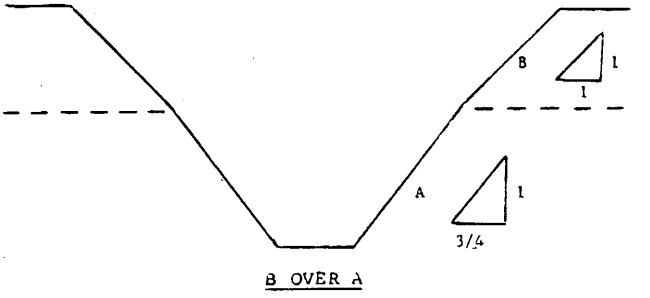


VERTICAL SIDED LOWER PORTION

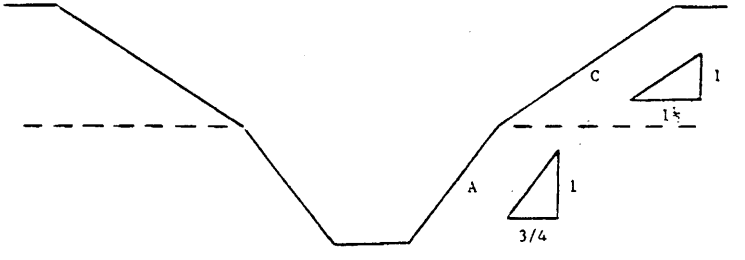
3. All other sloped excavations shall be in accordance with the other options permitted in §1926.652(b).

B–1.4 Excavations Made in Layered Soils

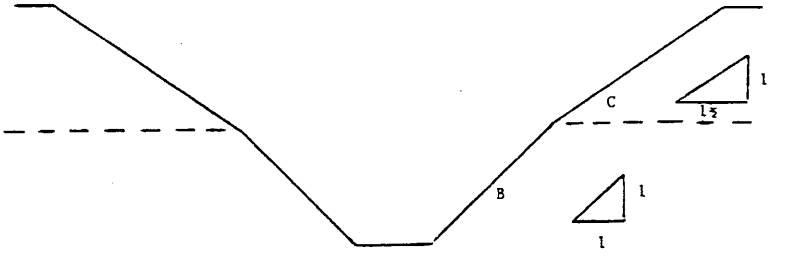
1. All excavations 20 feet or less in depth made in layered soils shall have a maximum allowable slope for each layer as set forth below.



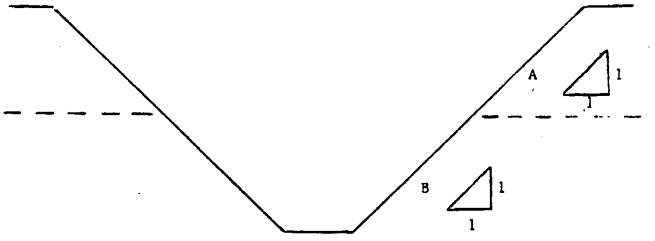
B OVER A



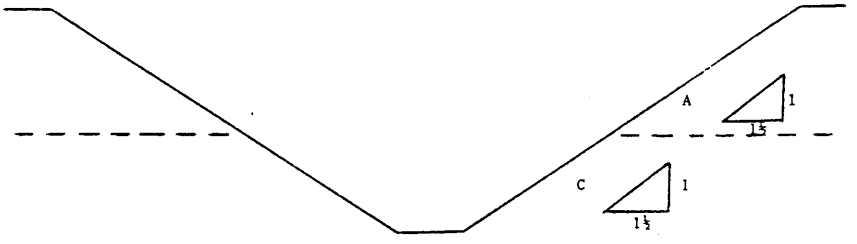
C OVER A



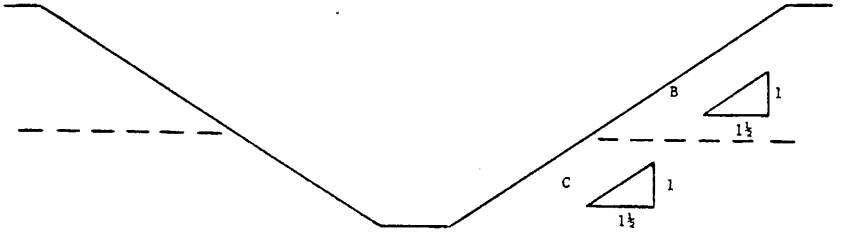
C OVER B



A OVER B



A OVER C



B OVER C

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 caveins 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 cross braces 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 X H + 72 psf (2 ft Surcharge)

DEPTH OF TRENCH (FEET)	SIZE (ACTUAL) AND SPACING OF MEMBERS **													
	CROSS BRACES							WALES		UPRIGHTS				
	HORIZ. SPACING (FEET)	WIDTH OF TRENCH (FEET)					VERT. SPACING (FEET)	SIZE (IN)	VERT. SPACING (FEET)	MAXIMUM ALLOWABLE HORIZONTAL SPACING (FEET)				
		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	4X6	6X6	6X6	4	Not Req'd	---				2X6	
	UP TO 8	4X4	4X4	4X6	6X6	6X6	4	Not Req'd	---					2X8
	UP TO 10	4X6	4X6	4X6	6X6	6X6	4	8X8	4			2X6		
	UP TO 12	4X6	4X6	6X6	6X6	6X6	4	8X8	4				2X6	
10 TO 15	UP TO 6	4X4	4X4	4X6	6X6	6X6	4	Not Req'd	---				3X8	
	UP TO 8	4X6	4X6	6X6	6X6	6X6	4	8X8	4		2X6			
	UP TO 10	6X6	6X5	6X6	6X8	6X8	4	8X10	4			2X6		
	UP TO 12	6X6	6X6	6X6	6X8	6X8	4	10X10	4				3X8	
15 TO 20	UP TO 6	6X6	6X6	6X6	6X8	6X8	4	6X8	4	3X6				
	UP TO 8	6X6	6X6	6X6	6X8	6X8	4	8X8	4	3X6				
	UP TO 10	8X8	8X8	8X8	8X8	8X10	4	8X10	4	3X6				
	UP TO 12	8X8	8X8	8X8	8X8	8X10	4	10X10	4	3X6				
OVER 20	SEE NOTE 1													

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

TABLE C-1.2

TIMBER TRENCH SHORING -- MINIMUM TIMBER REQUIREMENTS *

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

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

TABLE C-1.3

TIMBER TRENCH SHORING -- MINIMUM TIMBER REQUIREMENTS *

SOIL TYPE C P_a = 80 X H + 72 psf (2 ft. Surcharge)

DEPTH OF TRENCH (FEET)	SIZE (ACTUAL) AND SPACING OF MEMBERS**													
	CROSS BRACES									UPRIGHTS				
	HORIZ. SPACING (FEET)	WIDTH OF TRENCH (FEET)					VERT. SPACING (FEET)	SIZE (IN.)	VERT. SPACING (FEET)	MAXIMUM ALLOWABLE HORIZONTAL SPACING (FEET) (See Note 2)				
		UP TO 4	UP TO 6	UP TO 9	UP TO 12	UP TO 15				CLOSE				
5 TO 10	UP TO 6	6X8	6X8	6X8	8X8	8X8	5	8X10	5	2X6				
	UP TO 8	8X8	8X8	8X8	8X8	8X10	5	10X12	5	2X6				
	UP TO 10	8X10	8X10	8X10	8X10	10X10	5	12X12	5	2X6				
	See Note 1													
10 TO 15	UP TO 6	8X8	8X8	8X8	8X8	8X10	5	10X12	5	2X6				
	UP TO 8	8X10	8X10	8X10	8X10	10X10	5	12X12	5	2X6				
	See Note 1													
	See Note 1													
15 TO 20	UP TO 6	8X10	8X10	8X10	8X10	10X10	5	12X12	5	3X6				
	See Note 1													
	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 X H ± 72 psf (2 ft. Surcharge)

DEPTH OF TRENCH (FEET)	SIZE (S4S) AND SPACING OF MEMBERS **													
	CROSS BRACES							WALES		UPRIGHTS				
	HORIZ. SPACING (FEET)	WIDTH OF TRENCH (FEET)					VERT. SPACING (FEET)	SIZE (IN.)	VERT. SPACING (FEET)	MAXIMUM ALLOWABLE HORIZONTAL SPACING (FEET)				
		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	Not Req'd				4X6	
	UP TO 8	4X4	4X4	4X4	4X6	4X6	4	Not Req'd	Not Req'd					4X8
	UP TO 10	4X6	4X6	4X6	6X6	6X6	4	8X8	4			4X6		
	UP TO 12	4X6	4X6	4X6	6X6	6X6	4	8X8	4				4X6	
10 TO 15	UP TO 6	4X4	4X4	4X4	6X6	6X6	4	Not Req'd	Not Req'd				4X10	
	UP TO 8	4X6	4X6	4X6	6X6	6X6	4	6X8	4		4X6			
	UP TO 10	6X6	6X6	6X6	6X6	6X6	4	8X8	4			4X8		
	UP TO 12	6X6	6X6	6X6	6X6	6X6	4	8X10	4		4X6		4X10	
15 TO 20	UP TO 6	6X6	6X6	6X6	6X6	6X6	4	6X8	4	3X6				
	UP TO 8	6X6	6X6	6X6	6X6	6X6	4	8X8	4	3X6	4X12			
	UP TO 10	6X6	6X6	6X6	6X6	6X8	4	8X10	4	3X6				
	UP TO 12	6X6	6X6	6X6	6X8	6X8	4	8X12	4	3X6	4X12			
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-2.2

TIMBER TRENCH SHORING -- MINIMUM TIMBER REQUIREMENTS *

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

DEPTH OF TRENCH (FEET)	SIZE (S4S) AND SPACING OF MEMBERS **													
	CROSS BRACES							WALES		UPRIGHTS				
	HORIZ. SPACING (FEET)	WIDTH OF TRENCH (FEET)					VERT. SPACING (FEET)	SIZE (IN)	VERT. SPACING (FEET)	MAXIMUM ALLOWABLE HORIZONTAL SPACING (FEET)				
		UP TO 4	UP TO 6	UP TO 9	UP TO 12	UP TO 15				CLOSE	2	3	4	6
5 TO 10	UP TO 6	4X6	4X6	4X6	6X6	6X6	5	6X8	5			3X12 4X8		4X12
	UP TO 8	4X6	4X6	6X6	6X6	6X6	5	8X8	5		3X8		4X8	
	UP TO 10	4X6	4X6	6X6	6X6	6X8	5	8X10	5			4X8		
	See Note 1													
10 TO 15	UP TO 6	6X6	6X6	6X6	6X8	6X8	5	8X8	5	3X6	4X10			
	UP TO 8	6X8	6X8	6X8	8X8	8X8	5	10X10	5	3X6	4X10			
	UP TO 10	6X8	6X8	8X8	8X8	8X8	5	10X12	5	3X6	4X10			
	See Note 1													
15 TO 20	UP TO 6	6X8	6X8	6X8	6X8	8X8	5	8X10	5	4X6				
	UP TO 8	6X8	6X8	6X8	8X8	8X8	5	10X12	5	4X6				
	UP TO 10	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						WALES		UPRIGHTS				
	HORIZ. SPACING (FEET)	WIDTH OF TRENCH (FEET)				VERT. SPACING (FEET)	SIZE (IN)	VERT. SPACING (FEET)	MAXIMUM ALLOWABLE HORIZONTAL SPACING (FEET)				
		UP TO 4	UP TO 6	UP TO 9	UP TO 12	UP TO 15				CLOSE			
5 TO 10	UP TO 6	6X6	6X6	6X6	6X6	8X8	5	8X8	5	3X6			
	UP TO 8	6X6	6X6	6X6	8X8	8X8	5	10X10	5	3X6			
	UP TO 10	6X6	6X6	8X8	8X8	8X8	5	10X12	5	3X6			
	See Note 1												
10 TO 15	UP TO 6	6X8	6X8	6X8	8X8	8X8	5	10X10	5	4X6			
	UP TO 8	8X8	8X8	8X8	8X8	8X8	5	12X12	5	4X6			
	See Note 1												
	See Note 1												
15 TO 20	UP TO 6	8X8	8X8	8X8	8X10	8X10	5	10X12	5	4X6			
	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 D1.4 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 manufaturer.

(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.

(i) 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 Tables 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 × 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 × 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 × 3.5 × 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

FIGURE NO. 1
VERTICAL ALUMINUM HYDRAULIC SHORING (SPOT BRACING)

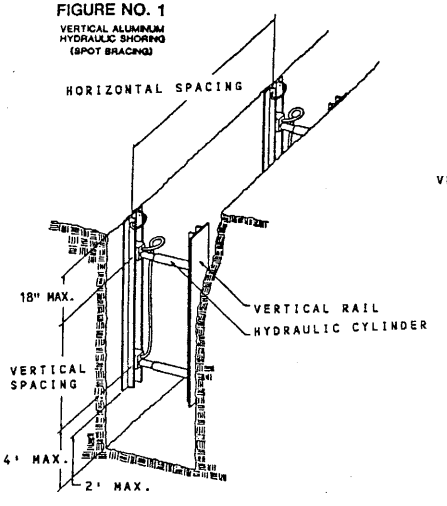


FIGURE NO. 2
VERTICAL ALUMINUM HYDRAULIC SHORING (WITH PLYWOOD)

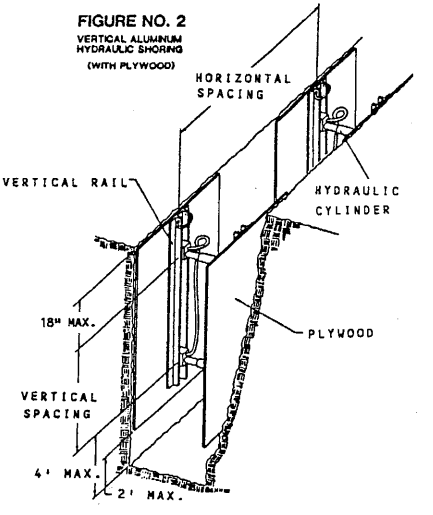


FIGURE NO. 3
VERTICAL ALUMINUM HYDRAULIC SHORING (STACKED)

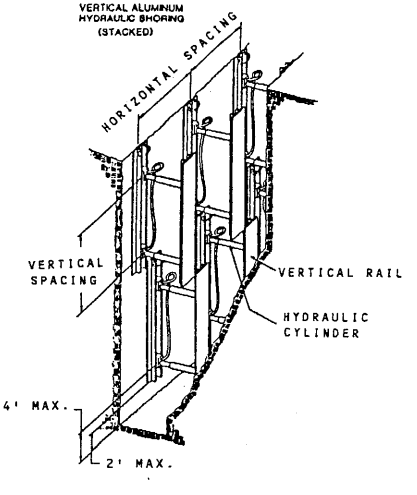


FIGURE NO. 4
ALUMINUM HYDRAULIC SHORING WALER SYSTEM (TYPICAL)

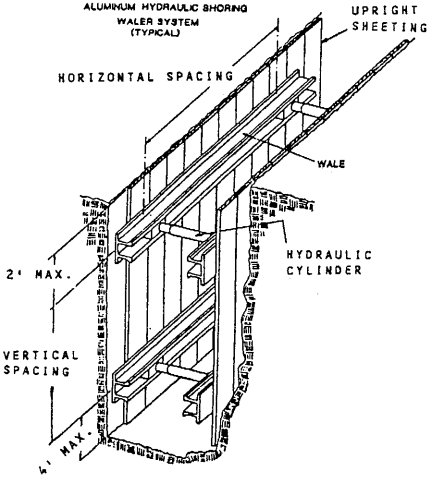


TABLE D - 1.1
ALUMINUM HYDRAULIC SHORING
VERTICAL SHORES
FOR SOIL TYPE A

DEPTH OF TRENCH (FEET)	HYDRAULIC CYLINDERS				
	MAXIMUM HORIZONTAL SPACING (FEET)	MAXIMUM VERTICAL SPACING (FEET)	WIDTH OF TRENCH (FEET)		
			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	8				
OVER 15 UP TO 20	7				
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				
	MAXIMUM HORIZONTAL SPACING (FEET)	MAXIMUM VERTICAL SPACING (FEET)	WIDTH OF TRENCH (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		
			WIDTH OF TRENCH (FEET)						MAX.HORIZ.SPACING (ON CENTER)		
	VERTICAL SPACING	SECTION MODULUS*	UP TO 8		OVER 8 UP TO 12		OVER 12 UP TO15		SOLID SHEET	2 FT.	3 FT.
			HORIZ. SPACING	CYLINDER DIAMETER	HORIZ. SPACING	CYLINDER DIAMETER	HORIZ. SPACING	CYLINDER DIAMETER			
(FEET)	(FEET)	(IN^3)									
OVER 5 UP TO 10	4	3.5	8.0	2 IN	8.0	2 IN NOTE(2)	8.0	3 IN	—	—	3x12
		7.0	9.0	2 IN	9.0	2 IN NOTE(2)	9.0	3 IN			
		14.0	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 NOTE(2)	6.0	3 IN	—	3x12	—
		7.0	8.0	3 IN	8.0	3 IN	8.0	3 IN			
		14.0	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 NOTE(2)	5.5	3 IN	3x12	—	—
		7.0	6.0	3 IN	6.0	3 IN	6.0	3 IN			
		14.0	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		
			WIDTH OF TRENCH (FEET)						MAX.HORIZ SPACING (ON CENTER)		
	VERTICAL SPACING (FEET)	* SECTION MODULUS (IN^3)	UP TO 8		OVER 8 UP TO 12		OVER 12 UP TO 15		SOLID SHEET	2 FT.	3 FT.
			HORIZ. SPACING	CYLINDER DIAMETER	HORIZ. SPACING	CYLINDER DIAMETER	HORIZ. SPACING	CYLINDER DIAMETER			
OVER 5 UP TO 10	4	3.5	6.0	2 IN	6.0	2 IN NOTE(2)	6.0	3 IN	3x12	—	—
		7.0	6.5	2 IN	6.5	2 IN NOTE(2)	6.5	3 IN			
		14.0	10.0	3 IN	10.0	3 IN	10.0	3 IN			
OVER 10 UP TO 15	4	3.5	4.0	2 IN	4.0	2 IN NOTE(2)	4.0	3 IN	3x12	—	—
		7.0	5.5	3 IN	5.5	3 IN	5.5	3 IN			
		14.0	8.0	3 IN	8.0	3 IN	8.0	3 IN			
OVER 15 UP TO 20	4	3.5	3.5	2 IN	3.5	2 IN NOTE(2)	3.5	3 IN	3x12	—	—
		7.0	5.0	3 IN	5.0	3 IN	5.0	3 IN			
		14.0	6.0	3 IN	6.0	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

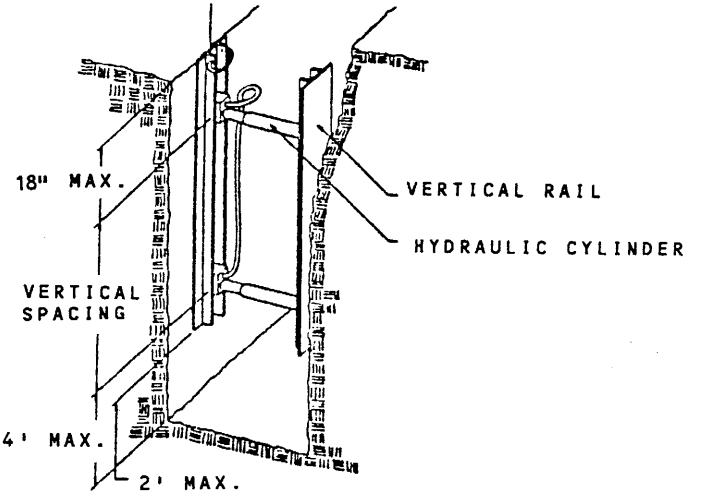


Figure 2. Pneumatic/hydraulic Shoring

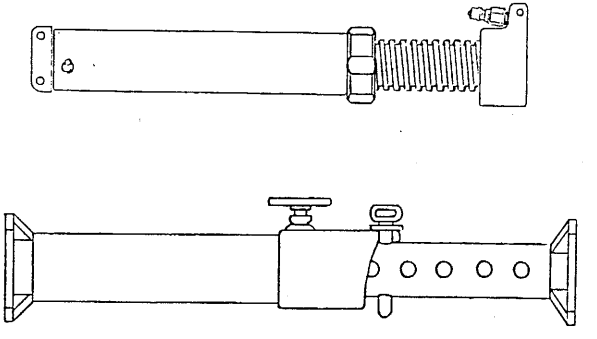


Figure 3. Trench Jacks (Screw Jacks)

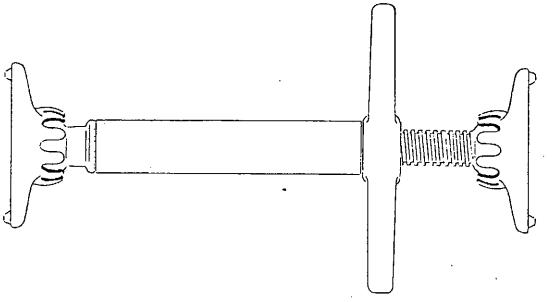
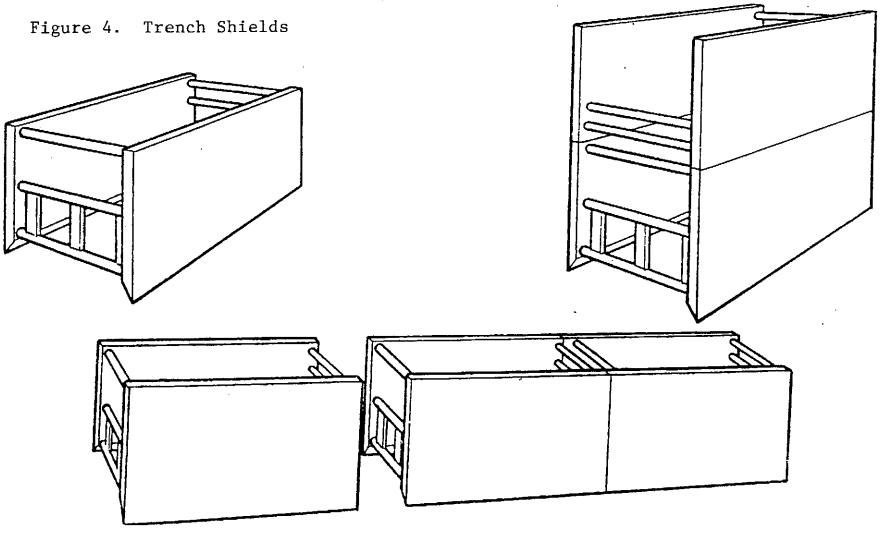


Figure 4. Trench Shields



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).

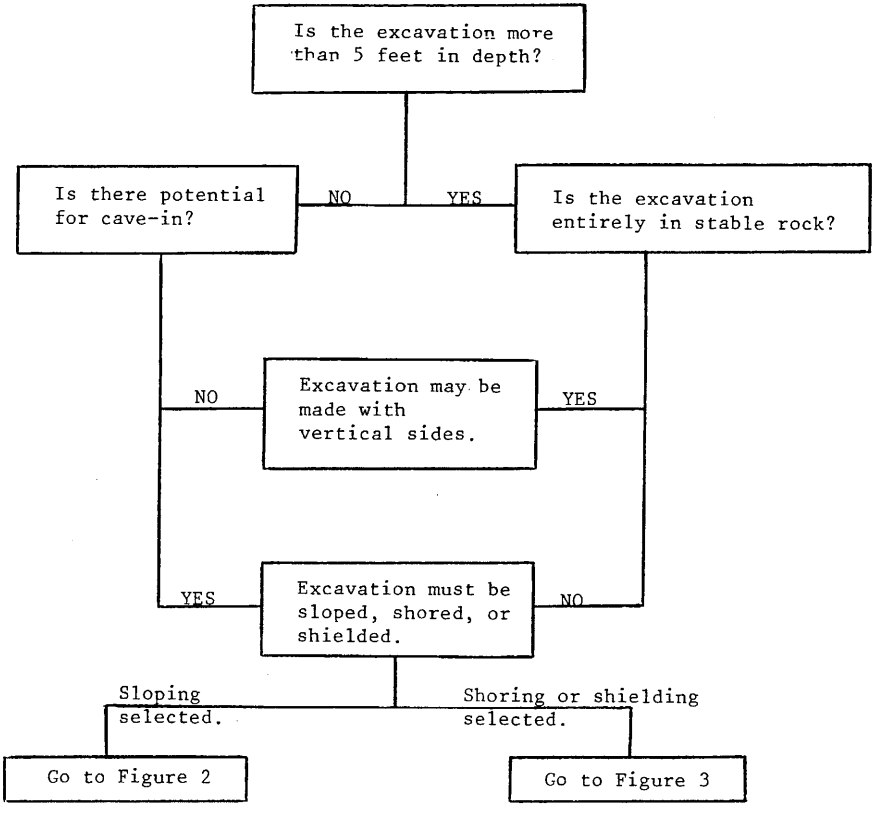


FIGURE 1 - PRELIMINARY DECISIONS

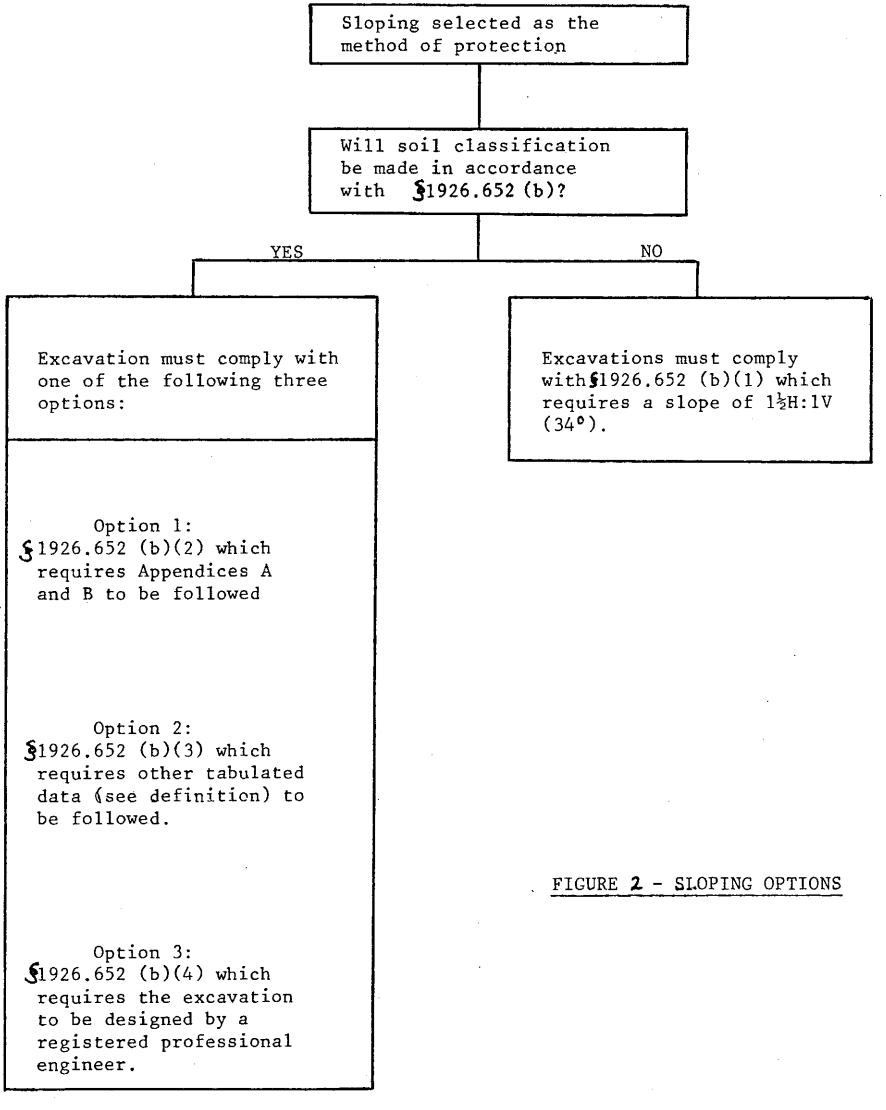


FIGURE 2 - SLOPING OPTIONS

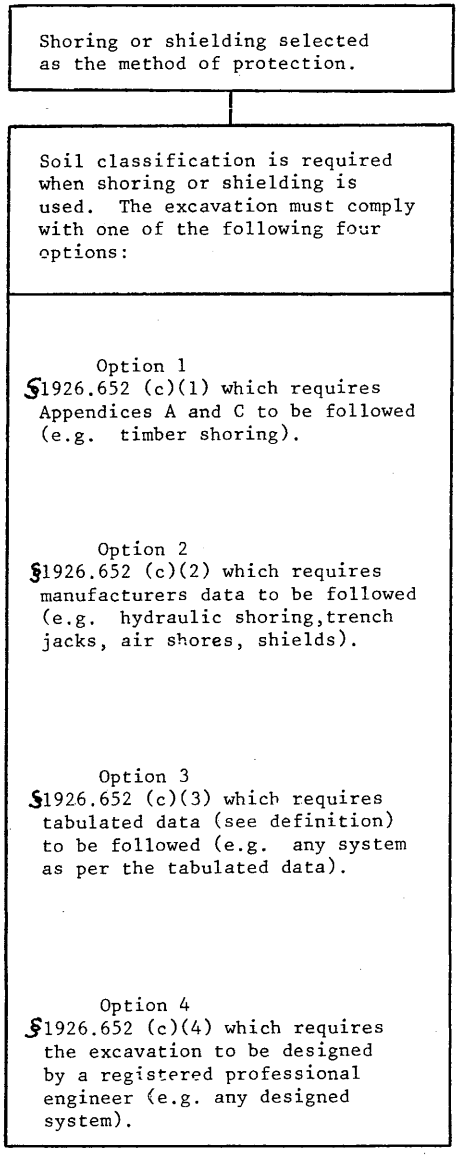


FIGURE 3 - SHORING AND SHIELDING OPTIONS

Wage Rate Requirements
Section 00 73 43 / Rev: August 2025

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

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: ☐ Yes ☐ No Subcontractor Name:

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

Your Last Name: First Name: M.I.

Address:

City: State: Zip Code: Country:

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

FOR INDIVIDUALS *

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

Position Held	Mark (x)		Name of Position of Job Held (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.)	
	Current	Former		From MM/YY	To MM/YY	Person's Name(s)	Relation
General Assembly							
Constitutional Officer							
State Board or Commission Member							
State Employee							

☐ **None of the above applies**

FOR AN ENTITY (BUSINESS) *

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

Position Held	Mark (x)		Name of Position of Job Held (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 (%)	Position of Control
General Assembly								
Constitutional Officer								
State Board or Commission Member								
State Employee								

☐ **None of the above applies**

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

Contract and Grant Disclosure and Certification Form

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

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

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

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

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

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

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

Signature _____ Title _____ Date _____

Vendor Contact Person _____ Title _____ Phone Number _____

Agency Use Only

Agency Number	Agency Name	Agency Contact Person	Contact Phone #	Contract or Grant Number
710 - 2601	Arkansas Department of Human Services	Craig Parsons	501-682-6551	7102601

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

BIDDING ADDENDA
Section 00 91 13 / Rev: August 2025

Date:

Addendum Number:

Project Number: 7102601

Agency Name: Arkansas Department of Human Services

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

1 **INVITATION TO BID**

2 **SPECIFICATIONS**

3 **DRAWINGS**

SECTION 01 10 00 - SUMMARY

PART 1 - GENERAL

SUMMARY

PROJECT NUMBER

The assigned project number is **7102601.**

PROJECT DESCRIPTION

This project includes the upgrade of the wastewater system on the campus of the Arkadelphia Human Development Center in Arkadelphia, Arkansas. More specifically, the existing wastewater treatment plant located on the grounds of the Arkadelphia Human Development Center will be abandoned and no longer used or operated. A sanitary sewer pump station will pump the entire sanitary sewer output of the campus to an existing sanitary sewer manhole owned and operated by the Caddo Valley Wastewater System.

The Work also includes the furnishing and installation of all other components as indicated on the construction documents.

PROJECT LOCATION

Arkadelphia ay Human Development Center

a. 1 Prator Drive
b. Arkadelphia, Arkansas 71923
c. Clark County

PROJECT INFORMATION

Owner Name and Address:

a. Department of Human Services
b. P.O. Box 1437 Slot W103
c. Little Rock, AR 72203
d. Pulaski County

Professional Design Firm:

a. Lockeby & Associates, Inc.
b. 11300 N. Rodney Parham, Suite 310
c. Little Rock, AR 72212
d. Pulaski County

CONTRACT DESCRIPTION

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, alternative bids, or assignments will be considered.

Perform Work of the Contract under a stipulated sum contract with the Owner in accordance with the Conditions of Contract.

Conditions of the contract shall be in accordance with the requirements specified on the construction documents and in the project manual.

Standards and criteria under this contract shall be in accordance with the Arkansas Department of Transformation and Shared Services Minimum Standards & Criteria.

CONTRACTOR'S USE OF SITE AND PREMISES

Access to site: Limited to the hours established in the Pre-Construction Conference or other form acceptable to owner.

a. Contractor to coordinate working hours with owner. The Facility will remain operational during construction

PART 2 - PRODUCTS

PRODUCT REQUIREMENTS

Products shall be in accordance with the requirements specified in the project manual and as shown on the construction documents.

PART 3 - EXECUTION

EXECUTION AND CLOSEOUT REQUIREMENTS

Execution and Closeout shall be in accordance with the requirements specified in the project manual and as shown on the construction documents.

END OF SECTION 01 10 00

SECTION 01 20 00 - PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

SCHEDULE OF VALUES

Submit a printed schedule on Contractor's standard form or electronic media printout, as accepted by Owner.

Submit Schedule of Values in duplicate within 10 days after date established in Notice to Proceed.

Format: Identify each line item with number and title of the major specification Section. Identify site mobilization, bonds and insurance.

Include within each line item, a direct proportional amount of Contractor's overhead and profit.

Revise schedule to list approved Change Orders, with each Application for Payment.

Form to be used: AIA G703.

APPLICATIONS FOR PROGRESS PAYMENTS

Payment Period: Submit at intervals stipulated in the Agreement.

Form to be used: AIA G702 and G703.

Execute certification by signature of authorized officer.

Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.

List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.

Submit three original copies of each Application for Payment.

Substantiating Data: When A/E or Owner requires substantiating information, submit data justifying dollar amounts in question.

Any request including payment for off-site stored products must include affidavits attesting to off-site stored products and insurance certificates covering same.

A new Contract and Grant Disclosure and Certification form will be required with any change order if a new subcontractor is involved and that subcontractor's contract is over $25,000.

The Contractor’s Release of Claims form and Consent of Surety forms must be submitted with final pay request in order for pay request to be processed.

MODIFICATION PROCEDURES

For minor changes not involving an adjustment to the Contract Sum or Contract Time, Architect will issue instructions directly to Contractor.

For other required changes, Architect will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.

Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.

DEFECT ASSESSMENT

Replace the Work, or portions of the Work, not conforming to specified requirements.

If, in the opinion of the A/E it is not practical to remove and replace the Work, the A/E will direct an appropriate remedy or adjust payment.

The defective Work may remain, but the Contract Sum adjusted to a new sum at the discretion of the Owner.

The defective Work will be partially repaired to the instructions of the A/E, and the Contract Sum will be adjusted to a new sum at the discretion of the Owner.

The individual specification sections may modify these options or may identify a specific formula or percentage sum reduction.

The authority of the A/E to assess the defect and identify payment adjustment is final.

Non-Payment For Rejected Products: Payment will not be made for rejected products for any of the following:

Products wasted or disposed of in a manner that is not acceptable.
Products determined as unacceptable before or after placement.
Products not completely unloaded from the transporting vehicle.
Products placed beyond the lines and levels of the required Work.
Products remaining on hand after completion of the Work.
Loading, hauling, and disposing of rejected products.

APPLICATION FOR FINAL PAYMENT

Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 20 00

SECTION 01 25 00 - SUBSTITUTION PROCEDURES

PART 1 GENERAL

DEFINITIONS

Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.

Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.

a. Unavailability.

b. Regulatory changes.

Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.

a. Substitution requests offering advantages solely to the Contractor will not be considered.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

GENERAL REQUIREMENTS

A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:

Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.

Agrees to provide the same warranty for the substitution as for the specified product.

Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.

Waives claims for additional costs or time extension that may subsequently become apparent.

Agrees to reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.

Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.

Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.

Limit each request to a single proposed substitution item.

RESOLUTION

Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.

Architect will notify Contractor in writing of decision to accept or reject request.

ACCEPTANCE

Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

END OF SECTION 01 25 00

SECTION 01 30 00 - ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

SECTION INCLUDES

Coordination and project conditions.

Pre-construction meeting.

Pre-installation meeting.

Progress meetings.

Construction progress schedule.

Weather days

Submittals.

COORDINATION AND PROJECT CONDITIONS

Coordinate scheduling, submittals and Work of the various sections of the Specification Manual to ensure efficient and orderly sequence of installation of interdependent construction elements.

Verify utility requirements and characteristics of operating equipment are compatible with site utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to and placing in service such equipment.

Coordinate completion and clean-up of Work of separate sections on a daily basis and in final preparation for the Substantial Completion inspection.

Coordinate routine and special schedule requirements with the Owner regarding access to the site. Minimize disruption of existing on-site daily activities.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

PRE-CONSTRUCTION MEETING

A-E will schedule a pre-construction meeting after the completed Contract Agreement has been approved by the Division of Building Authority.

Attendance Required: Owner, A-E, Division of Building Authority representative and Contractor representatives.

Agenda:

Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal requests, Change Orders and Contract closeout procedures.

Scheduling.

PRE-INSTALLATION MEETING

When required in individual specification sections, convene a pre-installation meeting at the site prior to commencing work of the section.

Required attendance of parties directly affecting or affected by Work of the specific section.

PROGRESS MEETINGS

Schedule and administer meetings throughout progress of the work at maximum bi-monthly intervals.

Attendance Required: Job superintendent,Owner, Architect, as appropriate to agenda topics for each meeting.

CONSTRUCTION PROGRESS SCHEDULE

If preliminary schedule requires revision after review, submit revised schedule within 10 days.

Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.

Include written certification that major contractors have reviewed and accepted proposed schedule.

Within 10 days after joint review, submit complete schedule.

Submit updated schedule with each Application for Payment.

Distribute copies of reviewed schedules to Project site file, subcontractors, suppliers, and other concerned parties.

Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

Submit a computer generated horizontal bar with separate line for each major portion of Work or operation, identifying first work day of each week.

Indicate estimated percentage of completion for each item of Work at each submission.

Revisions to Schedules:

Indicate progress of each activity to date of submittal, and projected completion date of each activity.

Identify activities modified since previous submittal, major changes in scope, and other identifiable changes.

Provide narrative report to define problem areas, anticipated delays, and impact on Schedule. Report corrective action taken, or proposed, and its effect, including the effect of changes on schedules of separate contractors.

DAILY CONSTRUCTION REPORTS

Prepare a daily construction report recording the following information concerning events at Project site and project progress:

Date.

High and low temperatures, and general weather conditions.

Safety, environmental, or industrial relations incidents.

Meetings and significant decisions.

Stoppages, delays, shortages, and losses. Include comparison between scheduled work activities (in Contractor's most recently updated and published schedule) and actual activities. Explain differences, if any. Note days or periods when no work was in progress and explain the reasons why.

Testing and/or inspections performed.

Signature of Contractor's authorized representative.

WEATHER DAYS

Completion date shown on the Bid Form, Section 00 41 13, paragraph 5 does not include allowance for adverse weather delays. The contractor may request additional time based upon delays resulting from adverse weather which prohibits the safe and proper execution of the work. The Contractor may request whole days or fractions thereof when the start of work or suspension of the work due to adverse weather prevents work from occurring for any time during normal workdays.

Adverse weather includes but is not necessarily limited to the following events:

Excessive precipitation including, rain, fog, freezing rain, snow, sleet or hail where the work area is unsafe due to slip or fall hazards, or the work surfaces are unsuitable for the installation of the work in accordance with the manufacturer’s installation requirements. Precipitation delays can extend beyond the occurrence of the precipitation event when the hazardous conditions do not abate immediately.

Excessive wind conditions which threaten the safety of workers or pose a hazard for materials or tools being blown away from the immediate work areas resulting in hazards to the building, property, building employees or general public. Due to the height of the work area above ground excessive wind conditions shall be considered events where sustained winds above 20 MPH or gusting winds above 25 MPH occur during the work hours.

Extreme heat hazards occur when outdoor dry bulb temperatures exceed 100-degrees Fahrenheit for more than 1-hour during the work period or when the combination of temperature result in a heat-index equal or exceed 105-degrees Fahrenheit for more than 1-hour.

Ozone Action Days when declared by the National Weather Service, ADEQ, or other authorized Government agency and when construction operations involve the use of volatile organic compounds (VOC), hydro-carbon based or petroleum based products which contribute to the development of ozone. Contractor should suspend operations which contribute to ozone creation until the Ozone alert has expired.

Extreme cold hazards occur when the outdoor dry-bulb falls below the minimum application temperature recommended by the material manufacturer for the proper handling and installation

of the product. Installation of materials shall not resume until the application surface temperature raise above the manufacture's minimum recommendations.

The Contractor shall submit documentation from the National Weather Service or other sources acceptable to the Owner when requesting additional time for adverse weather delays.

REQUESTS FOR **INFORMATION (RFI)**

Definition: A request seeking one of the following:

An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in Contract Documents.

A resolution to an issue which has arisen due to field conditions and affects design intent.

Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.

Prepare a separate RFI for each specific item.

a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
b. Do not forward requests which solely require internal coordination between subcontractors.

Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.

Include in each request Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.

Unacceptable Uses for RFIs: Do not use RFIs to request the following::

a. Approval of submittals (use procedures specified elsewhere in this section).
b. Approval of substitutions (see Section - 01 60 00 - Product Requirements)
c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).

Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.

Official Project name and number, and any additional required identifiers established in Contract Documents.

Owner's, Architect's, and Contractor's names.

Discrete and consecutive RFI number, and descriptive subject/title.

Issue date, and requested reply date.

Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).

Annotations: Field dimensions and/or description of conditions which have engendered the request.

Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.

Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.

RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.

Indicate current status of every RFI. Update log promptly and on a regular basis.

Note dates of when each request is made, and when a response is received.

SUBMITTALS FOR REVIEW

When the following are specified in individual sections, submit them for review:

Product data.

Shop drawings.

Samples for selection.

Samples for verification.

Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.

Samples will be reviewed for aesthetic, color, or finish selection.

After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 78 00 - Closeout Submittals.

SUBMITTALS FOR INFORMATION

When the following are specified in individual sections, submit them for information:

Design data.
Certificates.
Test reports.
Inspection reports.
Manufacturer's instructions.
Erection Drawings.
Other types indicated.

Submit for Architect's knowledge as contract administrator or for Owner.

SUBMITTALS FOR PROJECT CLOSEOUT

Submit Correction Punch List for Substantial Completion.

Submit Final Correction Punch List for Substantial Completion.

When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 78 00 - Closeout Submittals:

Project record documents.
Operation and maintenance data.
Warranties.
Bonds.
Other types as indicated.

Submit for Owner's benefit during and after project completion.

NUMBER OF COPIES OF SUBMITTALS

Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.

Documents for Information: Submit 5 copies.

Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.

After review, produce duplicates.
Retained samples will not be returned to Contractor unless specifically so stated.

SUBMITTAL PROCEDURES

General Requirements:

Use a separate transmittal for each item.
Use a single transmittal for related items.
Apply Contractor's stamp, signed or initialed certifying that review, approval, 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.

a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.

Deliver each submittal.

a. Deliver submittals to Architect at business address.
b. Send submittals in electronic format via email to Architect.

Schedule submittals to expedite the Project, and coordinate submission of related items.

a. For each submittal for review, allow 10 days excluding delivery time to and from the Contractor.

Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.

When revised for resubmission, identify all changes made since previous submission.

Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.

Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.

Product Data Procedures:

Submit only information required by individual specification sections.

Collect required information into a single submittal.

Do not submit (Material) Safety Data Sheets for materials or products.

Shop Drawing Procedures:

Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.

Do not reproduce Contract Documents to create shop drawings.

Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.

Samples Procedures:

Identify each item to allow review for applicability in relation to shop drawings showing installation locations.

SUBMITTAL REVIEW

Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action.

Submittals for Information: Architect will acknowledge receipt and review. See below for actions to be taken.

Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.

Notations may be made directly on submitted items and/or listed on appended Submittal Review cover sheet.

Architect's and consultants' actions on items submitted for review:

Authorizing purchasing, fabrication, delivery, and installation:

a. "Approved", or language with same legal meaning.

b. "Approved as Noted, Resubmission not required", or language with same legal meaning.

1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.

c. "Approved as Noted, Resubmit for Record", or language with same legal meaning.

1) Resubmit corrected item, with review notations acknowledged and incorporated. Resubmit separately, or as part of project record documents.

Not Authorizing fabrication, delivery, and installation:

a. "Revise and Resubmit".

1) Resubmit revised item, with review notations acknowledged and incorporated.

b. "Rejected".

1) Submit item complying with requirements of Contract Documents.

Architect's and consultants' actions on items submitted for information:

Items for which no action was taken:

a. "Received" - to notify the Contractor that the submittal has been received for record only.

Items for which action was taken:

a. "Reviewed" - no further action is required from Contractor.

END OF SECTION 01 30 00

SECTION 01 32 16 - CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

SUBMITTALS

Within 10 days after date established in Notice to Proceed, submit preliminary schedule.

Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.

Within 10 days after joint review, submit complete schedule.

Submit updated schedule with each Application for Payment.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

PRELIMINARY SCHEDULE

Prepare preliminary schedule in the form of a horizontal bar chart.

CONTENT

Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.

Identify each item by specification section number.

Coordinate content with schedule of values specified in Section 01 20 00 - Price and Payment Procedures.

Provide legend for symbols and abbreviations used.

BAR CHARTS

Include a separate bar for each major portion of Work or operation.

Identify the first work day of each week.

NETWORK ANALYSIS

Prepare network analysis diagrams and supporting mathematical analyses using the Critical Path Method.

Illustrate order and interdependence of activities and sequence of work; how start of a given activity depends on completion of preceding activities, and how completion of the activity may restrain start of subsequent activities.

REVIEW AND EVALUATION OF SCHEDULE

Participate in joint review and evaluation of schedule with Engineer at each submittal.

Evaluate project status to determine work behind schedule and work ahead of schedule.

After review, revise as necessary as result of review, and resubmit within 10 days.

UPDATING SCHEDULE

Maintain schedules to record actual start and finish dates of completed activities.

Indicate progress of each activity to date of revision, with projected completion date of each activity.

Annotate diagrams to graphically depict current status of Work.

DISTRIBUTION OF SCHEDULE

Distribute copies of updated schedules to Contractor's project site file, to subcontractors, suppliers, Engineer, Owner, and other concerned parties.

Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

END OF SECTION 01 32 16

SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 GENERAL

SECTION INCLUDES

Test Reports.

Manufacturer's Instructions

References and Standards.

Control of Installation.

TEST REPORTS

Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.

Test Reports: After each test/inspection, promptly submit one copy of report to Architect and to Contractor.
Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.

Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

MANUFACTURER'S INSTRUCTIONS

Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.

Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for Owner.
Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.

REFERENCES AND STANDARDS

For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.

Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from Contract Documents by mention or inference otherwise in any reference document.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

CONTROL OF INSTALLATION

Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

Comply with manufacturers' instructions, including each step in sequence.

Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

Have work performed by persons qualified to produce required and specified quality.

Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

Verify that existing conditions are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.

Examine and verify specific conditions described in individual specification sections.

Verify that utility services are available, of the correct characteristics and in the correct locations.

DEFECT ASSESSMENT

Replace Work or portions of the Work not complying with specified requirements.

END OF SECTION 01 40 00

SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

SECTION INCLUDES

Temporary Utilities:

Temporary electricity.

Temporary lighting for construction purposes.

Temporary sanitary facilities.

Temporary heating.

Temporary cooling.

Temporary ventilation.

Telephone service.

Temporary water service.

Temporary sanitary facilities.

TEMPORARY UTILITIES

Owner will provide the following:
Electrical power and metering, consisting of connection to existing facilities.

TEMPORARY ELECTRICITY

Provide power outlets for construction operations, with branch wiring and distribution boxes located as required. Provide flexible power cords as required.

Permanent convenience receptacles may not be utilized during construction.

TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

Provide and maintain lighting for construction operations as required to maintain a safe working space.

Provide and maintain lighting to exterior staging and storage areas entire site after dark for security purposes.

TEMPORARY SANITARY FACILITIES

Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

Maintain daily in clean and sanitary condition.

BARRIERS

Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

VEHICULAR ACCESS AND PARKING

Coordinate access and haul routes with Owner.

Provide and maintain access to fire hydrants, free of obstructions.

WASTE REMOVAL

Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

FIELD OFFICES

Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack, and drawing display table.

Existing facilities shall not be used for field offices or for storage.

Locate offices and sheds a minimum distance of 30 feet from existing and new structures.

Permanent facilities shall not be used for field offices or for storage.

Storage Areas and Sheds: Size to storage requirements for products of individual Sections, allowing for access and orderly provision for maintenance and for inspection of products to requirements of Section 01 60 00.

Preparation: Fill and grade sites for temporary structures to provide drainage away from buildings.

WATER CONTROL

Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

EROSION AND SEDIMENT CONTROL

Plan and execute construction by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.

Minimize amount of bare soil exposed at one time.

Provide temporary measures such as berms, dikes, and drains, to prevent water flow.

Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.

Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

POLLUTION CONTROL

Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations.

Comply with pollution and environmental control requirements of EPA, AP&L, and the Arkansas Department of Environmental Quality.

REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

Remove temporary utilities, equipment, facilities, materials, prior to Substantial Completion inspection.

Clean and repair damage caused by installation or use of temporary work.

At completion of Work remove buildings, foundations, utility services, and debris. Restore areas. Provide hydro-seed under any storage facility placed on existing grass

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 50 00

SECTION 01 60 00 - PRODUCT REQUIREMENTS

PART 1 GENERAL

SECTION INCLUDES

Submittals

Products.

Product delivery requirements.

Product storage and handling requirements.

Product substitution procedures.

SUBMITTALS

Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

PART 2 PRODUCTS

EXISTING PRODUCTS

Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.

Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.

Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.

NEW PRODUCTS

Provide new products unless specifically required or permitted by Contract Documents.

PRODUCT OPTIONS

Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

PRODUCT DELIVERY REQUIREMENTS

Transport and handle products in accordance with manufacturer's instructions.

Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

PRODUCT STORAGE AND HANDLING REQUIREMENTS

Store and protect products in accordance with manufacturers' instructions.

Store with seals and labels intact and legible.

Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.

For exterior storage of fabricated products, place on sloped supports above ground.

Provide insured off-site storage and protection when site does not permit on-site storage or protection.

Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

PART 3 EXECUTION

SUBSTITUTION LIMITATIONS

See Section 01 25 00 - Substitution Procedures.

END OF SECTION 01 60 00

SECTION 01 70 00 - EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

SUBMITTALS

Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
Structural integrity of any element of Project.
Integrity of weather exposed or moisture resistant element.
Efficiency, maintenance, or safety of any operational element.

Project Record Documents: Accurately record actual locations of capped and active utilities.

PROJECT CONDITIONS

Use of explosives is not permitted.

Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.

Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.

Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.

Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.

Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

PART 2 PRODUCTS

PATCHING MATERIALS

New Materials: As specified in product sections; match existing products and work for patching and extending work.

Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

PART 3 EXECUTION

LAYING OUT THE WORK

Verify locations of survey control points prior to starting work.

Promptly notify Architect of any discrepancies discovered.

Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:

GENERAL INSTALLATION REQUIREMENTS

Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

Make neat transitions between different surfaces, maintaining texture and appearance.

CUTTING AND PATCHING

Whenever possible, execute the work by methods that avoid cutting or patching.

Perform whatever cutting and patching is necessary to:

Complete the work.

Fit products together to integrate with other work.

Provide openings for penetration of mechanical, electrical, and other services.

Match work that has been cut to adjacent work.

Repair areas adjacent to cuts to required condition.

Repair new work damaged by subsequent work.

Remove samples of installed work for testing when requested.

Remove and replace defective and non-complying work.

Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

Patching:

Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

PROGRESS CLEANING

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

PROTECTION OF INSTALLED WORK

Protect installed work from damage by construction operations.

Provide special protection where specified in individual specification sections.

Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

FINAL CLEANING

Use cleaning materials that are nonhazardous.

Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.

Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

SPARE MATERIALS

Provide spare finishes material stock, filters, parts, maintenance items and other extra products in quantities specified in individual specification sections and package each separately.

Label each package with the project name and location used within the project. Deliver to secured location at the project site or to Owner representative and place as directed.

CLOSEOUT PROCEDURES

Make submittals that are required by governing or other authorities.

Notify Architect when work is considered ready for Architect's Substantial Completion inspection.

Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.

Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.

Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

END OF SECTION 01 70 00

SECTION 01 74 23
FINAL CLEANING

PART 1 GENERAL

1.01 SUMMARY

A. The work covered under this section of the specifications shall include all labor, tools, materials and equipment required for the complete and satisfactory cleaning up and dressing up of the work areas under this contract.

PART 2 PRODUCT

2.01 CLEAN UP

A. After the construction work is completed, all refuse and debris resulting from the work shall be cleaned up and disposed of to the satisfaction of the Engineer. Structures shall be washed or swept out and left neat and clean. All excess excavation, waste concrete, wiring, piping, lumber or other refuse shall be removed from the site of the work and the site leveled, graded, and dressed up until it is neat, smooth and workmanlike.

PART 3 EXECUTION

3.01 MEASUREMENT AND PAYMENT

A. The cost of all work under this section shall be included in the lump sum price and no portions of the required work will be paid for separately.

END OF SECTION

SECTION 01 78 00 - CLOSEOUT SUBMITTALS

PART 1 GENERAL

SUBMITTALS

Provide (2) closeout binders with the following information included as applicable to the project:

Project Record Documents: Submit documents to Architect with claim for final Application for Payment.

Operation and Maintenance Data:

a. Final air balance reports
b. Equipment product information

Warranties and Bonds:

a. Contractor's one year warranty letter
b. Roof warranty
c. Termite certificate

Approvals:

a. Fire Marshal approval
b. State plumbing and HVAC inspection reports

Release of Claims

Consent of Surety

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

PROJECT RECORD DOCUMENTS

Maintain on site one set of the following record documents; record actual revisions to the Work:

Drawings.

Specifications.

Addenda.

Change Orders and other modifications to the Contract.

Reviewed shop drawings, product data, and samples.

Manufacturer's instruction for assembly, installation, and adjusting.

OPERATION AND MAINTENANCE DATA

Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

For Each Product, Applied Material, and Finish:

Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

For Each Item of Equipment and Each System:

Description of unit or system, and component parts.

Identify function, normal operating characteristics, and limiting conditions.

Include performance curves, with engineering data and tests.

Complete nomenclature and model number of replaceable parts.

Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

SECTION 02 00 00
EXISTING CONDITIONS

PART 1 GENERAL

1.01 SUMMARY

A. Clear, grub, and prepare site as required by the Contract Documents, as shown on the plans, and as necessary for access, stringing of pipeline materials, and construction of the pipeline and appurtenant structures. Clear, grub, and prepare site as required by the Contract Documents, as shown on the plans, and as necessary for access and construction of meter stations, tank, and appurtenant structures.

B. Read all special conditions of easements noted on the plans before entering properties.

C. Make no alteration of the property that is expressly prohibited by the special conditions of the easement. Protection of existing structures, trees, or vegetation indicated on the contract documents to remain. Unless otherwise shown, the grading limit is the work limit.

D. Notify Arkansas One Call when approaching a site to be prepared.

E. Remove and dispose of all debris.

F. Remove interfering or objectionable material from designated areas of Work.

G. Strip the top 6 inches of surface material from areas which will be disturbed by construction activities and stockpile for finish grading and revegetation.

H. Preserve vegetation and existing objects designated to remain from injury or defacement.

I. Erosion/sedimentation program is required for this project and shall be the Contractor's responsibility for permitting and at the Contractor's cost. The program is as outlined in Section 31 2500, Erosion Control, of these specifications. Scheduling constraints, stabilization of disturbed areas, and other requirements of this program shall be strictly adhered to. Any and all penalties which are imposed on the Owner for failure to comply with these provisions shall be paid by the Contractor. Construct temporary erosion control system as shown on the plans or as described in the erosion control specification and as required by the Permits to protect adjacent properties and water resources from erosion and sedimentation.

J. Bidders shall visit the site and acquaint themselves with existing conditions.

K. Conditions existing at time of inspection for bidding purposes will be maintained by Contractor during construction, in so far as practical. Sites shall be finished, graded, seeded, mulched and put back in order at the end of construction on all contracts.

L. Variations to conditions or discrepancy in actual conditions as they apply to site preparation operations are to be brought to the attention of the Engineer prior to the commencement of any site work.

1.02 DEFINITIONS

A. Clearing shall consist of the felling, trimming, and cutting of trees into sections and the satisfactory disposal of the trees and other vegetation designated for removal including down timber, snags, and brush larger than 2 inches in diameter and all rubbish, trash, and fencing in the areas to be cleared. Tree stumps shall be removed. Grading shall be such that the site is mowable.

B. Grubbing shall consist of the removal and disposal of stumps, roots larger than 3 inches in diameter, and matted roots.

C. Stripping shall consist of removing and stockpiling the top 6 inches of surface material from all areas which are disturbed by the construction operations. Stockpiled surface material will be used for finish grading.

1.03 RELATED SECTIONS

A. Section 32 23 16 - Trench Excavation, Backfill, and Compacting.
B. Section 31 25 00 - Erosion Control.

1.04 SUBMITTALS

A. Produce photographs or videotape, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued by anyone as damage caused by construction activities. If damage is not pre-documented, then the contractor shall be responsible for all necessary repairs.
B. All agreements between the Contractor and Land Owners shall be in writing and shall be submitted to the Engineer prior to the area being disturbed.

1.05 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
   1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
   2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
B. Utility Locator Service: Notify utility locator service (Arkansas One-Call System, Inc.) for area where Project is located before site clearing.
C. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.
D. Contractor is responsible for providing access to Owner, Engineer, and others as required to travel around site for reviewing construction progress.
E. Do not commence site clearing until the easement boundaries are clearly established and verified.

PART 2 MATERIALS

2.01 GENERAL

A. Provide materials, suitable and in adequate quantity, required to accomplish Work of this Section.

PART 3 – EXECUTION

3.01 PREPARATION

A. Review with Engineer's representative the location, limits, and methods to be used prior to commencing Work under this Section. Contractor is responsible for survey to locate pipeline easement boundaries.
B. Protect and maintain benchmarks and survey control points from disturbance during construction. Protect property corners and all other survey monuments from damage or

displacement. If a marker needs to be removed, it shall be referenced by a licensed land surveyor and replaced, as necessary, by the same.

C. Locate and clearly flag trees and vegetation to remain or to be relocated.

D. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

E. 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.

F. Where the proposed route has been surveyed and marked in the field and it becomes clear that utility poles or their guy wires and anchors are in conflict with the pipeline, then the Contractor shall arrange and pay for the utility company to relocate the pole and/or guy anchor as necessary to clear the trench excavation. The cost of this relocation shall be incidental in the payment for the installed pipe as itemized.

G. Local, State, and Federal regulations restrict certain activities in wetlands or designated buffer areas. Prior to commencing activities, the Contractor shall ascertain how these may apply to the project.

H. Work within or near public ways will require permits for street openings, driveway locations, and borings from the Arkansas Highway and Transportation Department or the jurisdiction who has authority of the public way. The Contractor shall notify the Engineer prior to working within a public way. Provide traffic control as required, in accordance with the U.S. Department of Transportation "Manual of the Uniform Traffic Control Devices" and the state highway department requirements. The Contractor shall be responsible for preparing, submitting, and receiving approval of a traffic control plan and for all work within the public right-of-way.

I. Permits for burning are subject to local approval.

J. Locate and identify existing utilities that are to remain and protect them from damage.

K. Conduct operations with minimum interference to public or private accesses and facilities. Maintain access and egress at all times and clean or sweep any roadways daily or as required by the governing authority. At such times as deemed necessary by the Owner or Engineer, dust control shall be provided with sprinkling systems or equipment provided by the Contractor.

3.02 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Comply with requirements of Section 31 25 00 - Erosion Control.

B. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.

C. All areas impacted by site preparation activities shall be immediately seeded if trenching activities do not occur within 30 days.

D. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

E. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.03 CLEARING AND GRUBBING

A. Remove obstructions, trees, and shrubs to permit installation of new construction.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated. Refer to conditions of the easement as noted on the plans.

2. Remove stumps, roots, obstructions, and debris extending to a minimum depth of 18 inches below exposed subgrade.

3.04 PRESERVATION OF TREES, SHRUBS, AND OTHER VEGETATION

A. Protect trees, shrubbery, and other vegetation from damage except for that specifically designated for removal. Protect trees, plant growth, and features designated to remain as final landscape.

B. Cut and remove tree branches only where, in the opinion of the Engineer, that cutting is necessary to effect construction operation.

C. Remove branches other than those required to affect 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.

3.05 CLEARING AND GRUBBING LIMITS

A. Fill depressions, to subgrade elevation to avid water ponding, caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated. Satisfactory fill material shall be placed in horizontal payers not exceeding 8" loose depth, and thoroughly compacted per fill requirements of this section and these specifications.

B. Clear and grub in stages. Avoid advancing clearing and grubbing unnecessarily too far in advance of pipe laying to reduce potential for erosion.

C. Stumps and grubbings may either be burned on the site in an area designated or chipped on site and used for erosion control. The ash from burning shall be mixed with four parts loam to one-part ash and used for restoration of the landscape.

3.06 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. On-site disposal of tree trunks and limbs will be considered if burning or chipping is used and the burning and placement of chips does not endanger lives and property or interfere with seeding operations.

B. Do not leave material on the Project site, shove onto abutting private properties, or bury in embankments or trenches. If material is disposed onto adjoining private property with landowner's agreement, such agreements shall be in writing and submitted to Engineer.

C. Contractor shall be responsible for all damage caused by burning operations.

D. Do not burn if a "Burn Ban" has been issued for the county.

3.07 STRIPPING AND STOCKPILING OF SURFACE MATERIAL

A. Topsoil shall consist of organic surficial soil found in depth of not less than 6-inches.

B. Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones, and other objects over 1" in diameter, weeds, roots, and other objectionable material.

C. Remove surface material to a depth of 6-inches for full width of the disturbed area and stockpile for finish grading. Strip topsoil form areas that are to be filled, excavated, landscaped, or re-graded to such a depth that it prevents intermingling with underlaying subsoil or questionable materials.

D. Cut heavy growths of grass from areas before stripping and remove with the rest of the cleared vegetative material.

E. Stockpile surface material in storage piles in areas where directed and do not mix with other excavated material. Construct storage piles to freely drain surface water. Cover

storage piles as required to prevent windblown dust. Seed stockpiled material to prevent erosion, if stockpile not utilized within 30 days.

F. Locate stockpiles so that material of one ownership is not transported and stockpiled on property of another ownership.

G. Use equipment capable of removing a uniform depth of material.

H. Use stockpiled material for finish grading for minimum depth of 6 inches. Imported topsoil may be substituted for stockpiling and replacing of surface material.

I. Dispose of unsuitable topsoil as specified for waste material, unless otherwise directed by the Engineer. Excess topsoil shall be removed from the site by the Contractor unless specifically noted otherwise on the Drawings.

END OF SECTION

SECTION 02 00 01
TRENCH SAFETY

PART 1 GENERAL

1.01 SUMMARY

A. The work covered under this section of the specifications shall include all labor, tools, materials and equipment required for the trench safety under the contract.

PART 2 PRODUCTS

2.01 STANDARDS

A. OSHA standards for excavation & trench safety systems (29 CFR 1926, Subpart P) are hereby made a part of these specifications and the contractor is reminded that these regulations must be complied with at all times.

PART 3 EXECUTION

3.01 MEASUREMENT AND PAYMENT

A. Measurement shall be for the entire job and will cover all trench or excavation required by the project under a lump sum. The unit price stated in the proposal shall be full compensation for compliance with these regulations.

B. Sum shall include all labor and materials necessary to satisfactorily comply with the OSHA standards.

END OF SECTION

SECTION 02 40 00
CUTTING AND REPLACING SPECIAL SURFACES

PART 1 GENERAL

1.01 SCOPE

A. The work covered under this section of the specifications shall include all work involved in cutting and replacing special surfaces, including gravel and bituminous and concrete roads, driveways, walks, or parking areas and fences, shrubbery, lawn sod, masonry walls and culverts.

PART 2 PRODUCTS

2.01 DISTURBED SURFACES

A. Whenever it becomes necessary in excavating to disturb special surfaces such as paved or gravel roadways, drives, walks or parking areas, the original surface shall be restored after completion of the backfill. In these instances, care shall be used in making the backfill to eliminate future settlement and the surface shall be restored using the same type of materials that were used in the original surface.

B. Immediately prior to cutting concrete or bituminous surfaces, a chalk line shall be made along both sides of the trench at the proper width and the pavement trimmed along a straight and vertical line. No claims will be allowed for additional width of pavement cut and replaced occasioned by this requirement.

C. In gravel-surfaced streets and other areas, the gravel will be disturbed in excavating for trenches. After the backfill has been so placed that no further appreciable settlement will occur, gravel over the trench shall be replaced to the same compacted thickness as the original surfacing. During construction, also, the gravel on the remainder of the street not occupied by the trench may be covered with dirt from the excavation. After completion of the backfill, such dirt shall be removed or additional gravel shall be placed on the street until the surfacing is as weather-resistant and traffic resistant as the original surfacing.

D. Wherever it becomes necessary in excavating to cut fences or disturb lawns, shrubbery, masonry walls, etc., these surfaces shall be restored to their original condition immediately after completion of the backfill.

E. Fences shall be restored to their original condition using the same type of materials that were used in their original construction.

F. Trenches where lawn sod has been disturbed shall be backfilled in accordance with applicable provisions of these specifications and compacted by hand, if necessary. After replacing the sod, it shall be covered loosely with earth, tamped lightly to protect the roots, and sprinkled with water.

G. Shrubbery shall be taken up ahead of construction, stored, and replanted after completion of the backfill. Damaged shrubbery shall be replaced by the contractor at his expense.

PART 3 EXECUTION

3.01 MEASUREMENT AND PAYMENT

A. All cost associated with the cutting and replacing special surfaces shall be included in the various unit price proposal items as stated in the bid document. No separate compensation will be granted for the work covered in this specification.

END OF SECTION

Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

DEMONSTRATION AND INSTRUCTION

Demonstrate operation and maintenance of products to Owner personnel prior to date of Final Inspection.

ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.

Where systems involve more than one specification section, provide separate tabbed divider for each system.

Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

END OF SECTION 01 78 00

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 GENERAL

SUBMITTALS

Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.

Test Reports: Submit report for each test or series of tests specified.

Sustainable Design Submittal: If any fly ash, ground granulated blast furnace slag, silica fume, rice hull ash, or other waste material is used in mix designs to replace Portland cement, submit the total volume of concrete cast in place, mix design(s) used showing the quantity of portland cement replaced, reports showing successful cylinder testing, and temperature on day of pour if cold weather mix is used.

QUALITY ASSURANCE

Perform work of this section in accordance with ACI 301 and ACI 318.

Follow recommendations of ACI 305R when concreting during hot weather.

Follow recommendations of ACI 306R when concreting during cold weather.

PART 2 PRODUCTS

FORMWORK

Formwork Design and Construction: Comply with guidelines of ACI 347R to provide formwork that will produce concrete complying with tolerances of ACI 117.

Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.

Form Facing for Exposed Finish Concrete: Contractor's choice of materials that will provide smooth, stain-free final appearance.

Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.

Form Ties: Cone snap type that will leave no metal within 1-1/2 inches of concrete surface.

REINFORCEMENT MATERIALS

Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).

Type: Deformed billet-steel bars.

Finish: Unfinished, unless otherwise indicated.

Reinforcement Accessories:

Tie Wire: Annealed, minimum 16 gauge, 0.0508 inch.

Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.

CONCRETE MATERIALS

Cement: ASTM C150/C150M, Type I - Normal Portland type.

Blended, Expansive Hydraulic Cement: ASTM C845/C845M, Type K.

Fine and Coarse Aggregates: ASTM C33/C33M.

Lightweight Aggregate: ASTM C330/C330M.

Fly Ash: ASTM C618, Class C or F.

Calcined Pozzolan: ASTM C618, Class N.

Silica Fume: ASTM C1240, proportioned in accordance with ACI 211.1.

Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

ADMIXTURES

Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

Air Entrainment Admixture: ASTM C260/C260M.

CONCRETE MIX DESIGN

Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
Replace as much Portland cement as possible with fly ash, ground granulated blast furnace slag, silica fume, or rice hull ash as is consistent with ACI recommendations.

Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.

Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.

Normal Weight Concrete:
Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 4,000 pounds per square inch.
Fly Ash Content: Maximum 15 percent of cementitious materials by weight.
Calcined Pozzolan Content: Maximum 10 percent of cementitious materials by weight.
Silica Fume Content: Maximum 5 percent of cementitious materials by weight.
Water-Cement Ratio: Maximum 40 percent by weight.
Total Air Content: 4 percent, determined in accordance with ASTM C173/C173M.
Maximum Slump: 3 inches.
Maximum Aggregate Size: 5/8 inch.

PART 3 EXECUTION

PREPARATION

Formwork: Comply with requirements of ACI 301. Design and fabricate forms to support all applied loads until concrete is cured, and for easy removal without damage to concrete.

INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

Comply with requirements of ACI 301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.

PLACING CONCRETE

Place concrete in accordance with ACI 304R.

FLOOR FLATNESS AND LEVELNESS TOLERANCES

Maximum Variation of Surface Flatness:
Exposed Concrete Floors: 1/4 inch in 10 feet.
Under Seamless Resilient Flooring: 1/4 inch in 10 feet.
Under Carpeting: 1/4 inch in 10 feet.

Correct the slab surface if tolerances are less than specified.

Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

CONCRETE FINISHING

Repair surface defects, including tie holes, immediately after removing formwork.

Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.

CURING AND PROTECTION

Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

END OF SECTION 03 30 00

SECTION 26 05 00 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 GENERAL

REFERENCES

NECA (National Electrical Contractors Association) Standard of Installation.

NETA ATS (International Electrical Testing Association) Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

DESIGN REQUIREMENTS

Select materials, sizes and types of anchors, fasteners and supports to carry the loads of equipment and raceway, including weight of wire and cable in raceway.

SUBMITTALS

Submittals shall be in accordance with Section 01 30 00 Administration Requirements.

Product Data: Submit grounding electrodes and connections; for fastening components; and nameplates, labels and markers.

QUALIFICATIONS

Manufacturer: Company specializing in manufacturing products specified in this section.

FIELD MEASUREMENTS

Verify field measurements prior to fabrication.

PART 2 PRODUCTS

MECHANICAL CONNECTORS

Description: Bronze connectors, suitable for grounding and bonding applications, in configurations required for particular installation.

FORMED STEEL CHANNEL

Description: Galvanized.

PART 3 EXECUTION

EXAMINATION

Verify final backfill and compaction has been completed before driving rod electrodes.

INSTALLATION

Grounding and Bonding Installation:

Install rod electrodes at locations indicated. Install additional rod electrodes as required to achieve specified resistance to ground.

Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.

Locate and install anchors, fasteners and supports in accordance with NECA "Standard of Installation".

Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.

Supports:

Fabricate supports from structural steel or formed steel members. Rigidly weld members or use hexagon-head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.

Install surface-mounted cabinets and panelboards with minimum of four anchors.

Non-Rated Surfaces:

When the opening is through a non-fire rated wall, floor, ceiling or roof the opening must be sealed using an approve type of material.

Use galvanized sheet metal sleeves in hollow wall penetrations to provide a backing for the sealant. Grout area around sleeve in masonry construction.

Install escutcheons or floor/ceiling plates where pipe, penetrates non-fire rated surfaces in occupied spaces. Occupied spaces for this paragraph include only those rooms with finished ceilings and the penetration occurs below the ceiling.

At interior partitions, pipe penetrations are required to be sealed for all clean rooms, laboratories, most hospital spaces, computer rooms, tele/data/com rooms and similar spaces where the room pressure or odor transmission must be controlled. Apply sealant to both sides of the penetration in such a manner that the annular space between the pipe sleeve and the pipe is completely filled.

END OF SECTION 26 05 00

SECTION 26 05 19 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

SUBMITTALS

Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.

QUALITY ASSURANCE

Comply with requirements of NFPA 70.

PART 2 PRODUCTS

CONDUCTOR AND CABLE APPLICATIONS

Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

Nonmetallic-sheathed cable is not permitted.

Underground feeder and branch-circuit cable is not permitted.

Service entrance cable is not permitted.

Armored cable is not permitted.

Metal-clad cable is not permitted.

CONDUCTOR AND CABLE GENERAL REQUIREMENTS

Provide products that comply with requirements of NFPA 70.

Provide products listed, classified, and labeled as suitable for the purpose intended.

Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

Comply with NEMA WC 70.

Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

Conductor Material:

Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.

Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.

Tinned Copper Conductors: Comply with ASTM B33.

Conductor Color Coding:

Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.

Color Coding Method: Integrally colored insulation.

a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.

Color Code:

a. 240/120 V High-Leg Delta, 3 Phase, 4 Wire System:
   1) Phase A: Black.
   2) Phase B: Red
   3) Phase C (High Leg): Orange
   4) Neutral/Grounded: White.
b. 240/120 V, 1 Phase, 3 Wire System:
   1) Phase A: Black.
   2) Phase B: Red.
   3) Neutral/Grounded: White.

c. Equipment Ground, All Systems: Green.

SINGLE CONDUCTOR BUILDING WIRE

Description: Single conductor insulated wire.

Conductor Stranding:

Feeders and Branch Circuits:

a. Size 10 AWG and Smaller: Solid.
b. Size 8 AWG and Larger: Stranded.

Control Circuits: Stranded.

Insulation Voltage Rating: 600 V.

Insulation:

Copper Building Wire: Type THHN/THWN or THHN/THWN-2.

WIRING CONNECTORS

Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

Connectors for Grounding and Bonding: Comply with Section 26 05 26.

Wiring Connectors for Splices and Taps:

Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.

Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.

Wiring Connectors for Terminations:

Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.

Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.

Mechanical Connectors: Provide bolted type or set-screw type.

Compression Connectors: Provide circumferential type or hex type crimp configuration.

ACCESSORIES

Electrical Tape:

Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.

Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.

Wire Pulling Lubricant:

Listed and labeled as complying with UL 267.

Suitable for use with conductors/cables and associated insulation/jackets to be installed.

Suitable for use at installation temperature.

Cable Ties: Material and tensile strength rating suitable for application.

PART 3 EXECUTION

INSTALLATION

Circuiting Requirements:

Include circuit lengths required to install connected devices within 10 ft of location indicated.

Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.

Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.

Install products in accordance with manufacturer's instructions.

Perform work in accordance with NECA 1 (general workmanship).

Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.

Install conductors with a minimum of 12 inches of slack at each outlet.

Make wiring connections using specified wiring connectors.

Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.

Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

END OF SECTION 26 05 19

SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

SUBMITTALS

Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.

QUALITY ASSURANCE

Comply with requirements of NFPA 70.

PART 2 PRODUCTS

GROUNDING AND BONDING REQUIREMENTS

Do not use products for applications other than as permitted by NFPA 70 and product listing.

Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

Grounding System Resistance:

Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect. Precipitation within the previous 48 hours does not constitute normally dry conditions.

Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.

Between Grounding Electrode System and Major Electrical Equipment Frames, System Neutral, and Derived Neutral Points: Not greater than 0.5 ohms, when tested using "point-to-point" methods.

Grounding Electrode System:

Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.

a. Provide continuous grounding electrode conductors without splice or joint.

Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.

Service-Supplied System Grounding:

For each service disconnect, provide grounding electrode conductor to connect neutral (grounded) service conductor to grounding electrode system. Unless otherwise indicated, make connection at neutral (grounded) bus in service disconnect enclosure.

For each service disconnect, provide main bonding jumper to connect neutral (grounded) bus to equipment ground bus where not factory-installed. Do not make any other connections between neutral (grounded) conductors and ground on load side of service disconnect.

Bonding and Equipment Grounding:

Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.

Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.

Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.

Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.

Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.

GROUNDING AND BONDING COMPONENTS

General Requirements:

Provide products listed, classified, and labeled as suitable for the purpose intended.
Provide products listed and labeled as complying with UL 467 where applicable.

Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 05 26:
Use insulated copper conductors unless otherwise indicated.

Connectors for Grounding and Bonding:
Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.

PART 3 EXECUTION

INSTALLATION

Install products in accordance with manufacturer's instructions.

Perform work in accordance with NECA 1 (general workmanship).

Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.
Outdoor Installations: Unless otherwise indicated, install with top of rod 6 inches below finished grade.

Make grounding and bonding connections using specified connectors.
Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.

END OF SECTION 26 05 26

SECTION 26 05 33.13 - CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

SUBMITTALS

Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.

QUALITY ASSURANCE

Comply with requirements of NFPA 70.

PART 2 PRODUCTS

CONDUIT APPLICATIONS

Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, manufacturer's instructions, and product listing.

Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.

Underground:

Exterior, Direct-Buried: Use galvanized steel rigid metal conduit (RMC) or rigid PVC conduit.

Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC) for conduits 2" and larger. Use galvanized steel electrical metallic tubing (EMT) for conduits

Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC).

Exposed, Exterior, Not Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC).

Exposed, Exterior, Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC).

Flexible Connections to Vibrating Equipment:

Dry Locations: Use flexible metal conduit (FMC).

Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit (LFMC).

Maximum Length: 6 feet unless otherwise indicated.

CONDUIT - GENERAL REQUIREMENTS

Comply with NFPA 70.

Provide conduit, fittings, supports, and accessories required for complete raceway system.

Provide products listed, classified, and labeled as suitable for purpose intended.

Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

Fittings:

Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.

Material: Use steel or malleable iron.

Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

FLEXIBLE METAL CONDUIT (FMC)

Description: NFPA 70, Type FMC standard-wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems.

Fittings:

Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

Material: Use steel or malleable iron.

LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.

Fittings:

Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

Material: Use steel or malleable iron.

GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT)

Description: NFPA 70, Type EMT galvanized steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

Fittings:

Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

Material: Use steel or malleable iron.

Connectors and Couplings: Use compression/gland or set-screw type.

a. Do not use indenter type connectors and couplings.
b. Do not use set-screw type connectors and couplings.

Damp or Wet Locations, Where Permitted: Use fittings listed for use in wet locations.

RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.

Fittings:

Manufacturer: Same as manufacturer of conduit to be connected.

Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

ACCESSORIES

Conduit Joint Compound: Corrosion-resistant, electrically conductive compound listed as complying with UL 2419; suitable for use with conduit to be installed.

PART 3 EXECUTION

INSTALLATION

Install products in accordance with manufacturer's instructions.

Install conduit in accordance with NECA 1.

Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.

Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.

Conduit Routing:

Conceal conduits unless specifically indicated to be exposed.

Conduits in the following areas may be exposed, unless otherwise indicated:

a. Electrical rooms.
b. Mechanical equipment rooms.

Connections and Terminations:

Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.

Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.

Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.

Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.

Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect conductors.

Underground Installation:

Minimum Cover, Unless Otherwise Indicated or Required:

a. Underground, Exterior: 18 inches.
b. Under Slab on Grade: 12 inches to bottom of slab.

Conduit Sealing:

Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:

a. Where conduits enter building from outside.

END OF SECTION 26 05 33.13

SECTION 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

SUBMITTALS

Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.

PART 2 PRODUCTS

IDENTIFICATION REQUIREMENTS

Identification for Equipment:

Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.

a. Panelboards:
   1) Identify panelboard name/designation.
   2) Identify ampere rating.
   3) Identify voltage and phase.
   4) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.

b. Enclosed switches and circuit breakers:
   1) Identify voltage and phase.

Service Equipment:

a. Use identification nameplate to identify each service disconnecting means.

Identification for Conductors and Cables:

Color Coding for Power Conductors 600 V and Less: Comply with Section 26 05 19.

IDENTIFICATION NAMEPLATES AND LABELS

Identification Nameplates:

Materials:

a. Indoor Clean, Dry Locations: Use plastic nameplates.
b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.

Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.

a. Exception: Provide minimum thickness of 1/8 inch when any dimension is greater than 4 inches.

Stainless Steel Nameplates: Minimum thickness of 1/32 inch; engraved or laser-etched text.

Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch; engraved or laser-etched text.

PART 3 EXECUTION

INSTALLATION

Install products in accordance with manufacturer's instructions.

Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.

END OF SECTION 26 05 53

SECTION 26 24 16 - PANELBOARDS

PART 1 GENERAL

SUBMITTALS

Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.

QUALITY ASSURANCE

Comply with requirements of NFPA 70.

PART 2 PRODUCTS

PANELBOARDS - GENERAL REQUIREMENTS

Provide products listed, classified, and labeled as suitable for the purpose intended.

Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

Bussing: Sized in accordance with UL 67 temperature rise requirements.

Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.

Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.

Conductor Terminations: Suitable for use with the conductors to be installed.

Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.

Boxes: Galvanized steel unless otherwise indicated.

a. Provide wiring gutters sized to accommodate the conductors to be installed.

Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

PANELBOARDS

Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

Conductor Terminations:

Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.

Main and Neutral Lug Type: Mechanical.

Bussing:

Phase and Neutral Bus Material: Copper.

Ground Bus Material: Copper.

Circuit Breakers:

Provide bolt-on type.

Provide thermal magnetic circuit breakers unless otherwise indicated.

Enclosures:

Provide surface-mounted enclosures unless otherwise indicated.

Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.

Provide clear plastic circuit directory holder mounted on the inside of the panelboard door. Provide a complete circuit directory in typed text (no handwriting).

OVERCURRENT PROTECTIVE DEVICES

Molded Case Circuit Breakers:

Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.

Conductor Terminations:

a. Lug Material: Copper, suitable for terminating copper conductors only.

Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.

Do not use tandem circuit breakers.

Do not use handle ties in lieu of multi-pole circuit breakers.

Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.

PART 3 EXECUTION

INSTALLATION

Perform work in accordance with NECA 1 (general workmanship).

Install products in accordance with manufacturer's instructions.

Install panelboards in accordance with NECA 407 and NEMA PB 1.1.

Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.

Provide grounding and bonding in accordance with Section 26 05 26.

Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on isolated/insulated ground bus.

Provide filler plates to cover unused spaces in panelboards.

END OF SECTION 26 24 16

SECTION 26 28 16.13 - ENCLOSED CIRCUIT BREAKERS

PART 1 GENERAL

SUBMITTALS

Product Data: Provide manufacturer's standard catalog pages and data sheets for circuit breakers, enclosures, and other installed components and accessories.

QUALITY ASSURANCE

Comply with requirements of NFPA 70.

PART 2 PRODUCTS

ENCLOSED CIRCUIT BREAKERS

Description: Units consisting of molded case circuit breakers individually mounted in enclosures.

Provide products listed, classified, and labeled as suitable for the purpose intended.

Short Circuit Current Rating:
Provide enclosed circuit breakers with listed short circuit current rating as indicated on the drawings.

Enclosed Circuit Breakers Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.

Conductor Terminations: Suitable for use with the conductors to be installed.

Provide thermal magnetic circuit breakers unless otherwise indicated.

Provide insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.

Provide solidly bonded equipment ground bus in each enclosed circuit breaker, with a suitable lug for terminating each equipment grounding conductor.

Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.
Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.
Provide surface-mounted enclosures unless otherwise indicated.

Provide externally operable handle with means for locking in the OFF position.

PART 3 EXECUTION

INSTALLATION

Install products in accordance with manufacturer's instructions.

Perform work in accordance with NECA 1 (general workmanship).

Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

Provide grounding and bonding in accordance with Section 26 05 26.

END OF SECTION 26 28 16.13

SECTION 26 28 16.16 - ENCLOSED SWITCHES

PART 1 GENERAL

SUBMITTALS

Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.

QUALITY ASSURANCE

Comply with requirements of NFPA 70.

PART 2 PRODUCTS

ENCLOSED SAFETY SWITCHES

Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.

Provide products listed, classified, and labeled as suitable for the purpose intended.

Horsepower Rating: Suitable for connected load.

Voltage Rating: Suitable for circuit voltage.

Conductor Terminations: Suitable for use with the conductors to be installed.

Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.

Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.

Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.

Heavy Duty Switches:

Comply with NEMA BS 31047.

Conductor Terminations:

a. Provide mechanical lugs unless otherwise indicated.
b. Lug Material: Copper, suitable for terminating copper conductors only.

PART 3 EXECUTION

INSTALLATION

Install products in accordance with manufacturer's instructions.

Perform work in accordance with NECA 1 (general workmanship).

Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

Provide grounding and bonding in accordance with Section 26 05 26.

END OF SECTION 26 28 16.16

SECTION 31 25 00
EROSION CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary measures required to control erosion and sediment during construction. This includes measures to meet the requirements of the National Pollutant Discharge Elimination System (NPDES) administered by the Environmental Protection Agency (EPA) and also the requirements for the COE Section 404 permit in the Information for Bidders including requirements for an erosion control and sedimentation plan for the State of Arkansas.
B. Erosion Control Plan (ECP)
C. Storm Water Construction General Permit - Owner and Contractor as Permittees
D. Storm Water Pollution Prevention Plan (SWPPP)
E. Notice of Intent (NOI)
F. Temporary straw bale dike
G. Stabilized construction entrance
H. Silt fence
I. Trench Plugs
J. Sediment basin with stone and pipe outlet
K. Interceptor Dikes
L. Trench Plugs
M. Flexible Down Drains
N. Non-vegetative Soil Stabilization
O. Temporary Seeding and Re-Vegetation
P. Stream and River Crossings
Q. Wetlands
R. Notice of Termination (NOT)

1.02 DEFINITION

A. For purposes of this specification "...waters of the United States..." shall mean any stream, lake or wetland in which it is intended to dredge (including excavation) or place fill material. In this project every stream will be considered to meet the above definition. Refer to the Section 404 Permit for a listing of the named creeks that will be crossed.

1.03 REFERENCES

A. ASTM D751--Coated Fences.
B. ASTM D3786--Hydraulic Bursting Strength of Knitted Goods and Non-woven Fabrics.
C. ASTM A116--Zinc Coated (Galvanized) Steel Woven Wire Fence Fabric.
D. ASTM D698--Test for Moisture Density Relations for Soils (Standard).

1.04 RELATED SECTIONS

A. Section 32 23 16 - Trench Excavation, Backfilling, Compacting.

1.05 SUBMITTALS

A. Product Data
   1. Silt fencing.
   2. Non-woven filter fabric.
   3. Rip Rap source and character.

B. Submit the SWPPP and the Construction General Permit application forms.

C. Inspection Reports and Certificates
   1. Submit periodic inspection reports and certificates required for SWPPP.
      a. Every 7 days or
      b. Within 24 hours following a storm event producing 0.5 inches of rain or more.
   2. Submit Contractor/Subcontractor certifications required for SWPPP.
      a. Submit weekly report (Log) for COE.

D. Submit revisions or modifications to the erosion and sediment control plan and SWPPP.

1.06 MAINTENANCE

A. Maintain erosion control devices as necessary to comply with permit requirements. This includes any revisions or modifications to the SWPPP. Any work required for modifications, revisions and maintenance shall be the responsibility of the Contractor and shall not be a basis for additional compensation.

B. Remove and dispose of sediment deposits. If a project spoil site is not designated on plans, dispose of sediment at a location not in a stream or flood plain. Offsite disposal will be the responsibility of the Contractor. Sediment to be placed at the project site shall be spread, compacted and stabilized. Sediment shall not be allowed to flush into stream or drainage way. If sediment has been contaminated, it shall be disposed of in accordance with existing federal, state and local regulations.

C. Equipment and vehicles shall be prohibited by the Contractor from maneuvering on areas outside of dedicated rights-of-way and easements for construction unless special permission has been obtained from landowners and that permission shall be in writing. A copy of the written permission shall be given to the Engineer. Damages caused by construction traffic to erosion and sedimentation control systems shall be repaired immediately.

1.07 INDEMNIFICATION

A. Contractor shall be responsible for the cost of all claims, costs, losses, fines, penalties, or damages charged to Owner or Engineer due to Contractor's failure to comply with the requirements identified in this section.

PART 2 PRODUCTS

2.01 MATERIALS

A. Straw bales shall weigh a minimum of fifty (50) pounds and shall be at least thirty (30) inches in length. Bales shall be composed entirely of vegetable matter and be free of seeds. Binding shall be wire or nylon string, jute or cotton binding is unacceptable. Bales shall be used for not more than two months before being replaced. However, if weather conditions cause biological degradation of the bales, they shall be replaced sooner than

the two month time period to prevent a loss of structural integrity of the bale dike or structure.

B. Stone material shall consist of rip-rap and it shall be placed in a layer of at least 12 inches thick. It shall also meet the following characteristics;
   1. Hard and durable quarry stone meeting abrasion resistance specified in ASTM C535.
   2. Bulk density not less than 160 pounds per cubic feet (dry).
   3. The least dimension shall not be less than 1/3 the greatest dimension.
   4. Unless otherwise directed in the field at least 60 percent of the material furnished shall weigh not less than 75 pounds each with no dimension less than 4 inches and at least one dimension 12 inches.
   5. A gradation known as “B” stone or sometimes called “coarse rock fill” may be used.

C. Geotextile Fabrics shall be a non-woven polypropylene fabric designed specifically for use as a soil filtration media. Fabric shall have an approximate weight of 6 oz/yd2, and shall conform to the following

Designation	Topic	Value
ASTM D4632	Grab Strength (lbs.)	200
ASTM D4632	Grab Elongation	15%
ASTM D4533	Trapezoidal Tear (lbs)	50
ASTM D751	Burst (psi)	320
ASTM D751	Puncture (psi)	80
ASTM D4751	Equivalent Opening Size (EOS) (mm)-	50% or less soil retention for Soils in which EOS passes a #200 mesh sieve & Greater than a #30 Sieve More than 50% passes a #200 mesh sieve Greater than a #50 Sieve
ASTM D4491	Permeability (k)	
	For Soils in Which:	EOS:
	Critical/Severe	k (fabric) >10k (soil)
	Normal Applications	k (fabric) >k (soil)

D. Geotextile Silt Fence Fabric shall be a nylon reinforced polypropylene fabric having a reinforcing cord running the entire length to the top edge of the fabric. The fabric must meet or exceed the following criteria

Test Designation	Topic	Average Roll Minimum Value
ASTM D4632	Grab Strength (lbs.)	90 lbs. @ 12"/minute
ASTM D4632	Grab Elongation	15% @ 12"/minute
ASTM D4751	Equivalent Opening Size (EOS)	U.S. sieve No. 20
ASTM D4491	Permissivity	>.01 $sec.^{-1}$
ASTM D4355	UV Resistance (500 hours exposure)	70%

E. Fence Posts for Silt Fence shall be galvanized steel "T" posts of sufficient length to support the silt fence system.
F. Woven Wire Support for Silt Fence W1.4, 4" x 4", zinc coated (galvanized) steel woven wire fabric conforming to ASTM A116.
G. Corrugated Metal Pipe 16-gauge helical wound galvanized corrugated metal pipe.

PART 3 EXECUTION

3.01 PREPARE APPLICATION AND OBTAIN A STORM WATER CONSTRUCTION GENERAL PERMIT

A. Comply with requirements for COE Erosion Control Plan (ECP) and Storm Water Construction General Permit.
B. Prepare required documents and obtain Storm Water Construction General Permit.
C. Work and materials required for installation, modification, and maintenance of erosion control shall be incidental to the contract.

3.02 NOTICE OF INTENT (NOI)

A. Contractor shall submit a Notice of Intent (NOI) at least 10 days prior to the start of construction as required by the NPDES regulations.
B. Contractor shall be responsible for NOI application fee.

3.03 TIME OF DISTURBANCE

A. In recognition of the fact that the single most important factor in erosion and sedimentation control is the reduction of the amount of time between initial ground disturbance and the establishment of permanent post construction stabilization of the surface, the Contractor shall make all efforts to schedule and sequence his work to minimize that time. Those efforts shall be documented within the schedule.

3.04 TEMPORARY MEASURES

A. During pipeline construction various preventative measures may be required to minimize the potential for soil erosion and stream siltation. These measures are outlined in the articles to follow. Most are temporary but some are permanent.
B. Inspect and repair or replace components of all erosion and sedimentation control systems as specified for each type of system. Unless otherwise directed, maintain the erosion and sedimentation control systems until the project is accepted by the Owner. Remove erosion and sedimentation control systems promptly when directed by the Owner. Discard removed materials off site.
C. A temporary construction entrance shall be installed at any point where traffic will be entering or leaving the construction site to or from a public right-of-way, street, alley, sidewalk or parking area. The purpose of a stabilized construction entrance is to reduce or eliminate the tracking or flowing of sediment onto public rights-of-way. The entrance must be properly graded or incorporate a drainage swale to prevent runoff from leaving the construction site. The length of the entrance shall be as required, but not less than twenty (20) feet.
D. The temporary construction entrance shall be maintained in a condition which will prevent tracking or flowing of sediment onto public rights-of-way. This may require

periodic top dressing with additional stone as conditions demand and repair and/or clean-out of any measures used to trap sediment. All sediment spilled, dropped, washed or tracked onto public rights-of-way must be removed immediately by the Contractor.

E. When necessary, wheels must be cleaned to remove sediment prior to entrance onto public right-of-way. When washing is required, it shall be done on an area stabilized with crushed stone (Type "A" rip-rap or “B” stone) which drains into an approved sediment trap or sediment basin. All sediment shall be prevented from entering any storm drain, ditch or watercourse using approved methods.

3.05 SEDIMENT BARRIERS

A. Natural vegetation acts as an effective filter medium to remove silt from surface runoff and is a cost-effective means of sediment control. Leave as much natural vegetation as possible without interfering with construction. Consider using cedar branches or small cedar trees removed from the easement as materials in sediment control. These branches or trunks may be woven together and placed on down slopes or creek banks to minimize rain induced erosion. They are sometimes called brush barriers. Other species offer similar potential for use in controlling sediment transport on down slopes.

B. Straw bales are typically used downstream of a creek crossing in a line laterally across the creek. They may also be used on down slopes and at the top bank of a creek. Straw bales shall be embedded into the soil a minimum of four (4) inches and securely anchored using 3/8-inch diameter steel stakes or 2" x 2" wood stakes driven through the bales into the ground a minimum of 18 inches. Straw bales are to be placed or butted directly adjacent to one another leaving no gap between them. Do not place the strings binding the bales together into the ground

C. In some instances, both straw bales and silt fences are used together. Particularly where a silt fence cannot withstand the velocity of flowing water by itself or the down slope is too steep. In some cases, silt fencing may consist of nylon reinforced polypropylene netting supported by woven wire mesh, (W1.4 x W1.4), and galvanized steel posts set a minimum depth of 2 feet and spaced not more than 6 feet on center. A 6-inch wide trench is to be cut 6 inches deep at the toe of the fence on the uphill side to allow the fabric to be laid below the surface and backfilled with gravel. Fabric shall overlap at abutting ends a minimum of 3 feet, and shall be joined such that no leakage or bypass occurs. Remove accumulated sediment when the depth reaches 6 inches as measured against the side of the fence.

D. In some cases, a stream has sufficient flow to make the use of straw bales or ordinary silt fences impractical and futile. In this case a turbidity curtain may be used. A turbidity curtain is made of polyester plastic material and has a floatation boom located along the top edge and weighted load line or chain in the bottom edge. The bottom edge should be doubly reinforced. The sediment in the flowing water is filtered out by the curtain fabric and settles along the bottom front. Collected sediment must be removed before the mass exceeds the breaking strength of the anchoring lines or the anchoring posts

3.06 INTERCEPTOR DIKES

A. Interceptor dikes act as a barrier to runoff. They are frequently used when straw bales and silt fences would be in the way of traffic up and down the easement or when the slope is so great that they become impractical. Interceptor dikes may be driven over by construction equipment with little negative effect to either. They interrupt and divert

storm water flow off the cleared easement onto undisturbed vegetated surfaces which still retain the ability to trap or store sediment before reaching the stream below. On long slopes, a series of dikes should be used. When properly used they prevent storm water runoff from causing extensive erosion of the slope. Runoff water spilling off the end of the interceptor dike is filtered by a straw bale anchored there.

B. Interceptor dikes shall be installed prior to and maintained for the duration of construction and shall intercept no more than five (5) acres of runoff. Dikes shall have a minimum top width of 2 feet and a minimum height of compacted fill of 18" measured from the top of the existing ground at the up-slope toe to top of the dike and having side slopes of 3 to 1 or flatter. The channel which is formed by the dike must have a minimum slope of one (1) percent for the entire length to an outlet. When the slope exceeds three (3) percent, or velocities exceed one foot per second (regardless of slope), stone stabilization is required. Plant grass on dikes not requiring stone stabilization.

C. Interceptor dikes shall be constructed at the following spacing

SLOPE	SPACING (feet)
5 to 15 %	150
15 to 30 %	100
30 % or greater	50

D. Geotextile fabric shall be placed beneath the rock and shall conform to these specifications. The purpose of this is to filter out sediment carried by water passing through the rock. Rock shall consist of fist and slightly larger stone with little or no fines or particles passing the 1" sieve. Rock shall be graded similar or equal to “B” stone as defined by ASTM and many railroads where it used for stabilization.

E. Dried sediment shall be removed from the interceptor dikes when it has been deposited to a depth of one half the height of the dike.

3.07 TRENCH PLUGS

A. Trench plugs or ditch line breakers are similar to interceptor dikes in purpose and construction. They are typically constructed of earth filled sacks. Trench plugs prevent erosive runoff velocities from developing in the trench in the same manner that diversion berms accomplish this goal at the surface along the easement. The trench plug serves to form a catch basin for runoff in the trench, trapping the soil and preventing it from being washed out of the trench. Trench plugs remain in place until the pipe is laid across the stream.

B. After a storm event water will collect behind the trench plug. The water must be removed but it is likely to be laden with sediment or silt. If time allowed (say overnight) a considerable amount of clarification would occur. But if it must be removed immediately by pumps then the discharge end of the pump hose can be situated in settling basin formed by straw bales and filter fabric. The basin can have whatever shape is convenient; round, square, rectangular, and be located adjacent to the trench preferably in a flat area. The area seeping through the fabric and/or straw bales is filtered to remove the silt. It is described in more detail in the following article.

3.08 SEDIMENT BASIN WITH STONE AND PIPE OUTLET

A. Provide sediment basins at locations shown and/or located as needed by Contractor's construction sequence.

B. Unless otherwise indicated, compact embankments of sediment basin in maximum 8-inch lifts. Compaction density shall be at a minimum of 90 percent Standard Proctor ASTM D-698 density. Protect embankments from erosion by grassing or other Owner approved methods.

C. Install stone and pipe outlets for sediment basin at location shown and/or located as needed by Contractor's construction sequence.

D. Inspect sediment basin after each rainfall, daily during periods of prolonged rainfall, and a minimum of once a week. Maintain basin dimensions necessary to obtain the needed basin volume. Repair and replace damaged components of the basin.

3.09 FLEXIBLE DOWN DRAINS

A. Temporary Down Drains can be installed wherever extremely steep drainage ways having potentially significant flow are cut by easement excavation and severe erosion of the cut face is likely. Flexible closed conduit type or rigid open conduit type down drain is installed in accordance with the manufacturer’s instructions (if any). The down drain should be designed and situated such that no by-passing of run-off or leakage occurs. DOWN DRAINS should discharge into a stilling basin lined with a 4" layer of “B” stone or other suitable material.

3.10 NONVEGATATIVE SOIL STABILIZATION

A. Temporary, non-vegetative soil stabilization is employed to provide protection against excessive soil erosion over short term period (less than a year). The method employed is in general, site specific. Non-vegetative soil stabilization is used to reinforce vegetative measures and is not required where vegetative stabilization provides long term soil protection. In general, non vegetative methods are required in areas which will experience high water flows or could experience high runoff velocities (disturbed slopes steeper than 2:1) Methods employed include:

1. Mulching
2. Chemical soil stabilizers (binders)
3. Brush and slash
4. Netting and matting
5. Stone coverage

B. Mulch should consist of straw; hay applied at an appropriate rate of 70 to 120 lbs per 1000 square feet is typical. Mulch anchoring should be implemented promptly where it is applicable and should be achieved by one of the following methods:

1. Peg and twine
2. Mulch nettings, jute matting, and biodegradable plastic
3. Mulch anchoring tool

3.11 TEMPORARY SEEDING AND REVEGETATION

A. Soil to be stockpiled for more than 30 days or disturbed areas on which there will be no construction for 12 months should be stabilized to prevent erosion. Fertile earth will normally vegetate naturally and further stabilization will not be necessary. But frequently in the Ozark region this is not the case. If natural germination is not observed within a reasonable time (say 30 days in season) the disturbed area should be temporarily seeded. Seeding rates and mixtures are found in the specification section by that title.

B. The need for temporary re-vegetation of a pipeline should only occur when new lines are established during the spring and summer period. If new lines are established in the fall winter period the permanent re-vegetation plan will be used. If the need arises to temporarily re-vegetate an area during the cool season it is recommended that a mixture of Austrian winter pea, rye, oats and winter wheat is used. This mixture provides considerable height diversity, erosion control and a seed supply to wildlife that will have greater benefits than any single winter planted crop.

C. The combination of milo, millets, and the Arkansas mix incorporated into the temporary re-vegetation plan provides an excellent structural diversity to the pipeline and should have good benefits in controlling erosion. By combining a variety of annuals, quality seed supplies will be available for a longer period compared to any single crop. All the crops listed for temporary re-vegetation can be planted with a broadcast seeder from after last frost through July.

3.12 STREAM AND RIVER CROSSINGS

A. Stream crossings must be accomplished during the time period stipulated in the approved permit.

B. For pipeline crossings of streams or creeks utilizing conventional trenching techniques two plans are proposed for sediment control in stream or creek bed. The Contractor shall investigate both or shall submit another for review and approval.

C. PLAN ONE is used when rock is encountered in the stream bed and PLAN TWO is used when a mud or silt deposit is already present in the stream bed. Both plans are used when the stream is non navigable as defined by the Corps of Engineers.

D. PLAN ONE requires straw bales and/or silt fencing to be installed across the entire width of the stream downstream of the trench construction area. The straw bales/fencing shall be held in place by whatever means that are effective possibly including wire cables and or stakes downstream of the bales. These sediment controls shall be installed prior to construction activities in the stream bed and shall remain in place until all activities are completed. All ground contours shall be restored to their original condition.

E. PLAN TWO also requires the use of straw bales and silt fencing. Like PLAN ONE these materials are installed downstream of the trench in advance of construction using wire cables and stakes such that the entire width of the stream is covered. The principal difference this plan and PLAN ONE is that a small narrow pit is dug immediately in front of the bales or fencing so that silt that is transported up against them by the current has a place to deposit.

F. It is the intention that all sediment control measures be continually used and maintained until the re-vegetation program has matured sufficiently to stop the flow of silt into the waterway.

G. In cases where a waterway is crossed that are also used by local water utilities as a source for eventual public consumption, the Contractor will give the affected utility at least 48 hours advance notice before beginning excavation.

H. Where the open cut method of pipeline installation is employed across streams the excavation will be kept to a minimum to prevent disturbing natural vegetation as much as possible. No foreign materials will be allowed to be deposited back into the trench. Only that soil which came out of the trench will be allowed back into it minus any trash that may have been there as well. If additional fill materials are needed, they shall be taken from another spot along the stream bottom or along the bank but only from an

approved borrow source that is either along the easement or else imported from completely off site.

I. Excavation of the pipeline trench shall not result in the relocation of the stream channel different from where it was before work began. Neither shall the excavation restrict stream flow or cause a water surface rise upstream which in any way jeopardizes life or property.

3.13 WETLANDS

A. Refer to conditions within the Army Corps of engineers permit for any specific details not otherwise listed here.

B. Construction across wetlands should be performed so that the disturbance of wetland vegetation is minimized. Construction methods should minimize the extent of equipment usage in wetland areas. One possible approach would be to assemble as many sections of pipe as possible on dry ground and then pull the pipe into position in the trench from equipment located on “mud boards” or timbers. This is possible with certain types of restrained joint pipe. Using this same technique, mud boards would also be used to support trenching and backfilling equipment. Spoil can be piled in a ridge along the pipe trench. Gaps 50 to 100 feet wide should be left at intervals of about 500 feet to provide for natural circulation or drainage of water.

C. After construction, wetland areas shall be restored and maintained in non-woody wetland vegetation. Excess backfill should be disposed of on dry land rather than on wetland. In no instance should additional fill be placed on any wetland or floodplain area. The easement should be restored to its preconstruction contours.

3.14 NOTICE OF TERMINATION (NOT)

A. Contractor shall submit a Notice of Termination (NOT) as required by the NPDES Regulations.

3.15 CORPS OF ENGINEERS PERMITS

A. If the Contractor contemplates building vehicular stream crossings for use with either on or off-road rubber-tired vehicles then it shall be his responsibility to obtain the necessary COE permits. Such crossings include the use of temporary culvert pipes covered by large granular fill materials forming a berm or dam across the stream in question.

B. Comply with requirements of permit included in Contract Documents.

END OF SECTION

SECTION 32 23 16
TRENCH EXCAVATION, BACKFILL, AND COMPACTING

PART 1 GENERAL

1.01 SUMMARY

A. The Work under this Section includes providing all labor, materials, tools, and equipment necessary for excavation and embankment construction to the lines, grades, and cross sections indicated in the Drawings or as directed by the Engineer. Work of this Section includes:
   1. Excavating trenches for water or sanitary sewer line.
   2. Crushed granular stone backfill required by over-excavation or for trench stabilization.
   3. Pipe zone embedment material.
   4. Trench settlement repair, including replacing roadway surfacing, sidewalk, or other structures.
   5. Replacing damaged culverts.
   6. Trench excavation and safety requirements

B. All excavation shall be unclassified excavation, and shall consists of excavation and disposal of all materials, of whatever character, encountered in the Work. Trench excavation is classified as common excavation and includes removal of material of whatever types encountered to depths shown or as directed by Engineer. Rock excavation is incidental to trenching. There shall be no additional payment for rock excavation.

C. For excavation, pipe zone includes full width of excavated trench from 4 inches below 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. Refer to appendix for copy of Trench Excavation Safety Rules and Recommendations as required by Act 291 of 1993.

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. Contractor is responsible for excess excavated material disposal off-site.

G. Note and adhere to special conditions, set forth in easement documents executed by property owners and shown on the drawings.

1.02 RELATED SECTIONS

A. Section 33 01 30.13 – Sewer Line Testing.

1.03 REFERENCES

A. American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103.
   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- Classification of Soils for Engineering Purpose

5. ASTM D2922 - Test Methods for Density of Soils and Soil-Aggregates in Place by Nuclear Method.

C. Occupational Safety and Health Administration (OSHA) Standard for Excavation and Trenches Safety System, 29 CFR 1926, Subpart P, Excavations. The Contractor shall be solely responsible for trench and excavation safety systems in accordance with Act 291 of 1993.

D. American Water Works Association.
   1. M41 - Ductile Iron Pipe and Fittings; Laying Conditions Type 2 and Type 3.

PART 2 PRODUCTS

2.01 FOUNDATION STABILIZATION MATERIAL

A. Coarse natural gravel or crushed quarry rock (limestone, sandstone, granite), angular or rounded.

B. Free from dirt, clay balls, or organic material.

C. Uniformly graded from 6" down to approximately 1" and no more than 10 percent by weight passing the #200 sieve size.

D. Similar or equal to “B” stone as defined by ASTM (or certain quarry nomenclature).

E. Used to bridge over unacceptably soft and yielding soils through granular interlocking and friction forces between the particles. Not intended for direct contact with the pipe. Cover with pipe zone material as defined below.

2.02 PIPE ZONE MATERIALS

A. Bedding: 4 inch or greater thickness of material beneath the pipe.

B. Embedment: Material placed beneath the haunches of the pipe, and above the spring line up to a plane 6 inches above the crown of the pipe.

C. Characteristics:
   1. Free of rocks, stones, clods or clay balls larger than 1.5" in any direction.
   2. Naturally occurring or quarry produced.
   3. Originating from the trench excavation or imported from elsewhere.
   4. Classified as any of the following in accordance with ASTM 2487; GW, GP, GM, SW, SP, SM or a combination of them.
   5. Free of vegetation, organic matter, roots, muck, peat, frozen soil, refuse, wood, or other deleterious material deemed unacceptable by the Engineer.
   6. Having suitable moisture content and workability to enable shovel slicing, hand tamping or machine compaction around the pipe.

D. Examples of acceptable Pipe Zone Material:
   1. Spoil from the trench which has been screened or sifted to exclude large particles as above.
   2. Grit as defined by commercial quarries producing such material.
   3. Sand such as used in concrete or mortar.
   4. ASTM D448 Size No. 67 Stone.
   5. Washed stone bedding size 1/4-inch to 3/4-inch. (Special Pipe Bedding).

2.03 COMMON FILL MATERIALS

A. All material placed in the trench from a point 6 inches above the crown of the pipe to the surface.

B. Excavated spoil except no rock, stones or lumps larger than 12 inches in diameter or in the greatest direction.
C. Excluded material includes roots, tree branches, refuse, trash, concrete, scrap metal, plastics, paper and any other deleterious material deemed unacceptable by the Engineer.

2.04 TRENCH BACKFILL UNDER PAVEMENT
A. Granular Backfill:
1. Natural or artificial mixture of gravel and soil mortar uniformly well graded from coarse to fine.
2. AASHTO Class 3, Class 4, or Class 7.

2.05 COMPACTION EQUIPMENT
A. Compaction wheel for bucket, or compaction bucket for compacting trench. Suitable type and adequate, as determined by the Engineer, to obtain the amount of compaction specified.
B. Operate in strict accordance with manufacturer's instructions and recommendations and maintain conditions so that it delivers manufacturer's rated compactive effort.

2.06 IMPORTED SURFACE MATERIAL
A. Suitable sandy loam from an approved source.
B. Possess friability and a high degree of fertility.
C. Free of clods, roots, gravel, rocks, and other inert material.
D. Free of quack grass, horsetail, and other noxious vegetation and seed.
E. Acidity range (pH) of 5.5 to 7.5.
F. Minimum of 4 percent and maximum of 50 percent organic matter.

PART 3 EXECUTION

3.01 PREPARATION
A. Where clearing or partial clearing of right-of-way is necessary, complete prior to start of trenching.
B. Refer to Section 02 00 00 – Existing Conditions for conflicts with above ground utilities particularly poles and guy wires and anchors
C. Do not permit excavated materials to cover brush or trees prior to disposal.

3.02 STRIPPING AND STOCKPILING OF SURFACE MATERIAL
A. Remove surface material to a depth of 6 inches for full width of disturbed areas and stockpile for finish grading.

3.03 TRENCH WIDTH
A. Minimum width of unsheeted trenches where pipe is to be laid shall be 18 inches greater than the outside diameter of the pipe, or as approved.
B. Maximum width at top of trench shall be limited, especially 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 dedicated rights-of-way or construction easements, unless special written agreements have been made with affected property owner.

3.04 EXCAVATION

A. Material excavated is defined as unclassified excavation regardless of the material encountered.

B. Excavate trench to lines and grades shown or as established by Engineer with proper allowance for pipe bells and uniform bearing throughout the length of the pipe.

C. If trench is excavated below required grade whether due to instability of soils or other reason, correct with foundation stabilization material.

D. Place material over full width of trench in compacted layers not exceeding 6 inches deep to established grade with allowance for pipe bedding.

3.05 PREPARATION OF TRENCH - LINE AND GRADE

A. Grade the bottom of the trench to the line and grade where the pipe is to be laid, with proper allowance for pipe thickness and for pipe bedding when specified or indicated.

B. Prepare trench for Laying Condition as indicated by product manufacturer:

1. Type 2 Laying Condition: Allowed in areas of ductile iron pipe not requiring rock excavation or restrained joints.
2. Type 3 Laying Condition: Required in areas of rock excavation, restrained joint pipe, Steel pipe or PVC pipe. Laying Condition may be obtained by scarifying trench bottom with bucket teeth, or other suitable method approved by Engineer, to a depth of 4 inches.

C. The trench shall be excavated to such depth so that the minimum cover indicated is obtained after allowing for pipe diameter and bedding thickness.

D. Remove hard spots that would prevent a uniform thickness of bedding.

E. The trench bottom shall form a continuous and uniform bearing and support for the pipe at every point between bell holes.

F. Engineer may, if requested, allow changes in the trench alignment to avoid major unforeseen obstructions, if such alignment changes can be made within the easement or right-of-way without adversely affecting the future operation and maintenance of the pipeline.

G. “Loose Select Material” is defined as ‘native soil excavated from the trench, free of rocks, foreign material, and frozen earth’.

H. “Select Backfill” shall be sand or granular material of the quality herein specified. Select backfill material shall have a size and gradation falling within the following limits:

Sieve Size	Percentage Passing Sieve
½”	100
No. 4	50-100
No. 200	15 Maximum

The minus two hundred (200) portion of the material expressed as a percentage multiplied by the Plasticity Index shall not exceed one hundred (100). The material shall be compacted to a relative compaction of eighty percent (80%).

“Class 7 Stone” consists of durable particles of crushed stone free of silt, clay, or other unsuitable materials and shall have a percentage of wear of not more than 40% when tested in accordance with ASTM C131 or C535. When material is subjected to five (5) cycles of the sodium sulfate soundness test in accordance with ASTM C88, Sodium Sulfate

Solution, the weighted percentage of loss shall not exceed 12%. The source of the material shall be approved by the Engineer and meet the following gradation in accordance with ASTM D448, size number 6:

Sieve Size	Percentage Passing Sieve
1”	100
¾”	90 – 100
½”	20 – 55
3/8”	0 – 15
No. 4	0 – 5

3.06 SHORING, SHEETING, AND BRACING OF TRENCHES

A. Sheet and brace 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 sheeting or trench box.

C. Maintain sheeting or trench box in place until pipe has been placed and backfilled at pipe zone.

D. Remove shoring and sheeting or trench box 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, or local public agency having jurisdiction for sheeting, shoring, and bracing of trenches; the most stringent of these requirements shall apply.

3.07 LOCATION OF EXCAVATED MATERIALS

A. Place excavated material only within construction easement, or approved working area.

B. Do not obstruct private or public traveled roadways or streets.

3.08 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 pipe laying, during laying of pipe, and until backfill at pipe zone 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.

3.09 FOUNDATION STABILIZATION

A. When existing material in bottom of trench is unsuitable for supporting pipe, excavate unsuitable material to the depth necessary or indicated by the Engineer.

B. Backfill trench to subgrade of 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 or if deemed by the Engineer unable to adequately support the pipe.

E. In areas where trench stabilization material is directed to be placed by the Engineer (or his representative) place a thin layer of select material on top taken from the trench spoil pile to cushion the pipe and to prevent point bearing of the pipe on the trench stabilization material which may have sharp points.

3.10 ROCK IN TRENCH

A. Where rock is encountered in bottom of trench, install bedding material over it as shown on the drawings.
B. Do not allow pipe to be subjected to point bearing on rock anywhere along its length.
C. No part of any bell or coupling shall be in contact with the trench bottom, trench walls, or granular embedment when the pipe is jointed.
D. Minimum Bedding Thickness: 4 inches, minimum.
E. Extend pipe zone material up pipe sides one sixth of outside diameter of the pipe, minimum.
F. Backfill over pipe as shown or specified.

3.11 PIPE ZONE BACKFILL

A. The pipe zone is defined as shown on the drawings.
B. Particular attention shall be given to area of pipe zone from flow line to centerline of pipe to ensure firm support is obtained to prevent lateral movement of pipe during final backfilling of pipe zone.
C. Backfill from bottom of pipe to horizontal centerline (spring line) 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. Lightly compact. (Defined by the type and in the details).
E. Backfill from horizontal centerline (spring line) to 6" above crown of pipe with pipe zone material. Lightly compact.
F. If the Engineer determines that the existing material at the trench site is insufficient or unsuitable for use as selected material for pipe zone in upper portion of pipe zone, provide suitable material from other trench excavation along pipeline or imported pipe zone material.
G. Special attention shall be given to compactive efforts near ponds to prevent leakage from ponds.

3.12 TRENCH BACKFILL ABOVE PIPE ZONE

A. From a plane above the crown of the pipe to the ground surface as shown on the drawings.
B. When backfill is placed mechanically, push backfill material onto slope of backfill previously placed and allow to slide down into trench.
C. Do not push backfill into trench in a way to permit free fall of material until at least 2 feet of cover is provided over top of pipe.
D. Under no circumstances allow sharp, heavy pieces of material to drop directly onto pipe or tamped material around pipe.
E. Do not use backfill material of consolidated masses larger than ½ cubic foot.
F. Use compaction equipment to obtain approximately 80% of standard proctor density on the backfill above the pipe zone up to the ground surface.
G. Type I Trench (Normal) for Water Line Trenches:
    1. Use in areas with low erosion potential and are not paved.

2. Backfill trench above pipe zone with approved excavated trench materials.
3. In untraveled areas on private or public street or road rights-of-way, leave trench with backfill material neatly mounded not more than 6 inches above existing ground for entire width of trench.
4. In lawn or garden areas, backfill trench and maintain it level with existing adjacent grade.
5. In other locations, estimate and provide amount of backfill material required so that after normal settlement finished surface will meet existing grade.
6. Neatly windrow material over trench, and remove excess.
7. Replace surface soil in top 6 inches.
8. Excess or deficiency of backfill material which becomes apparent after settlement and within warranty period shall be corrected by regrading, disposal of excess material, and adding additional material where required.
9. Remove rocks larger than 2 inches from upper 6 inches of backfill. Remove rocks from surface.
10. Remove trash, construction debris, materials, brush, and other foreign objects.

3.13 EXCESS EXCAVATED MATERIAL

A. Dispose of excess excavated material off project site in an approved area. Do not leave rocks from excavation on ground surface.

B. Broken concrete, asphalt, and other debris resulting from pavement or sidewalk removal, excavated rock in excess of the amount permitted to be installed in trench backfill above the pipe zone, debris encountered in excavation work and other similar waste materials shall be suitably disposed of away from the site of the Work.

C. If acceptable to the Owner (and the property owner from whom the easement for this pipeline has been obtained), excess earth from the excavation may be distributed directly over the trench and within the temporary easement to a maximum depth of 6 inches above the original ground surface elevation at or across the trench and sloping uniformly each way.

D. Material thus wasted shall be carefully finished with a drag, blade machine, or other suitable tool to a smooth, uniform surface without obstructing drainage as mentioned in subsequent articles of this specification.

E. Wasting of excess material in the above manner will not be permitted where the line of trench crosses or is within a railroad, public road, or highway right of way or is within some other utilities pre-existing easement.

F. The disposal of waste and excess excavated materials, including hauling, handling, grading, and surfacing, shall be incidental to the cost of the pipeline and no separate payment will be made therefore.

3.14 TEMPORARY CLEAN UP

A. Contractor shall not leave trenches open overnight without approval of the Engineer.

B. Contractor shall install temporary fencing around excavation at pipe end, at end of workday.

C. Clean-up shall be a continuous operation. If the Engineer determines clean-up activities are not proceeding in a timely manner, the Contractor shall suspend other work and devote his entire effort to clean-up until the Engineer determines that clean-up work has been caught up.

3.15 DRAINAGE MAINTENANCE AND RESTORATION

A. Trenches across roadways, driveways, walks, or other traffic ways adjacent to drainage ditches or watercourses shall not be backfilled prior to completion of backfilling the trench on the upstream side of the traffic way, to prevent impounding water after the pipe has been laid.

B. Bridges and other temporary structures required to maintain traffic across such unfilled trenches shall be constructed and maintained by the Contractor.

C. Backfilling shall be done so that water will not accumulate in unfilled or partially filled trenches. All material deposited in roadway ditches or other watercourses crossed by the line of trench shall be removed immediately after backfilling is completed and the original section, grades, and contours of ditches or watercourses shall be restored. Surface drainage shall not be obstructed any longer than necessary and shall by no means be left obstructed overnight or for the weekend.

D. Where indicated on Drawings, provide concrete arch, or rip rap on ditch banks.

3.16 SETTLEMENT

A. The Contractor shall be responsible for all settlement of backfills, fills, and embankments which may occur during the warranty period (one year) stipulated in the General Conditions.

B. The Contractor shall make or cause to be made, all repairs or replacements made necessary by the settlement within 7 days after notice by the Engineer or Owner.

END OF SECTION

SECTION 33 01 30.13
SEWER LINE TESTING

PART 1 GENERAL

1.01 SUMMARY

A. This section covers the testing of pipe materials, joints, or other materials incorporated into the sanitary sewer line and leakage tests to determine water tightness.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.01 SANITARY SEWER PIPE

A. All pipe and pipe materials will be accepted on the manufacturer's certificate that the pipe meets with the specification requirements and has been tested in accordance with the latest ASTM standard procedure for testing pipe, pipe joints, or other material unless specific tests are requested by the Sewer Department. All pipe and pipe materials shall be subject to permeability and hydrostatic tests.

3.02 LEAKAGE TESTS OF GRAVITY SEWERS

A. All sewers shall pass leakage tests as specified herein. The leakage test must be performed in the presence of a representative of the Sewer Department and/or an Engineer's representative. The contractor is required to provide 24 hours' notice upon beginning testing procedures. Leakage tests for water tightness of gravity sewer lines shall be completed in accordance with one of the two following procedures described below.

3.03 INFILTRATION-EXFILTRATION TESTS

A. Clay, PVC, other Non-Ferrous Pipes and Ductile Iron Pipe:
The pipeline shall not leak under exterior ground water pressures in excess of 100 gallon per inch of nominal pipe diameter, per mile of pipeline, per 24 hours. If, in the opinion of the Sewer Department, the ground water table at the time of testing is too low to produce dependable results, EXFILTRATION tests shall be run. Allowable limits of EXFILTRATION shall be 100 gallons per inch of nominal pipe diameter, per mile of pipeline, per 24 hours. If the water table is too high, EXFILTRATION will not be used. The methods of testing for leakage shall be approved by the Sewer Department.

3.04 LEAKAGE TEST BY LOW PRESSURE AIR LOSS

A. As an alternate to the water infiltration-EXFILTRATION tests prescribed in this section, sanitary sewer main extensions and building sewers may be tested for water tightness by low pressure air loss, as described below.
Procedure:
1. Plug all pipe outlets with suitable test plugs. Brace each plug securely.

2. Pipe air supply to pipeline to be tested so that air supply may be shut off, pressure observed, and air pressure released from the pipe without entering the manhole.
3. A valved branch should be left in the supply line past the shutoff valve terminating in a ¼" female pipe thread for installation of the Sewer Department's test gauge.
4. Add air slowly to portion of pipe under test until test gauge reads between 3.5 and 3.0 psi.
5. Shut air supply valve and allow at least two minutes for internal pressure to stabilize.
6. Determine time in seconds for pressure to fall 0.5 psi, and compare to the following table:

Pipe Size	TIME
4	2.5 minutes
6	4.0 minutes
8	5.0 minutes
10	6.5 minutes
12	7.5 minutes
15	9.5 minutes

7. Compare observed time with minimum allowable times as indicated in the above table.
8. Where ground water level is above the crown of the pipe being tested, test pressures should be increased accordingly.
9. Air testing of manholes shall be Vacuum Testing of Manholes and shall conform to the Owner Water and Sewer standard specifications. These testing methods are described below.

B. Vacuum Testing of Manholes:

Precast Manholes:

1. Precast manholes shall be vacuum tested prior to backfilling. All life holes shall be plugged with an approved non-shrink grout. All pipes entering the manholes shall be plugged, taking care to securely brace the plug from being drawn into the manhole.
2. The test head shall be placed at the inside of the cone section and seal inflated in accordance with the manufacturer's recommendations.
3. A vacuum of (10) ten inches of mercury shall be drawn and the vacuum pump shut off. With valves closed, the time shall be measured for the vacuum to drop to (9) inches.
4. The manhole shall pass if the time is greater than 60 seconds for 48 inch diameter, 75 seconds for 60 inch diameter, and 90 seconds for 72 inch diameter. If a manhole fails the initial test, necessary repairs shall be made on the exterior of the structure with an approved non-shrink grout while the vacuum is still being drawn. Retesting shall proceed until a satisfactory test is obtained.

Poured-in-Place Manholes:

1. Poured-in-place manholes shall be vacuum tested prior to backfilling. All pipes entering the manholes shall be plugged, taking care to securely brace the plug from being drawn into the manhole.
2. The test head shall be placed at the inside of the cone section and the seal inflated in accordance with the manufacturer's recommendations.

3. A vacuum of (10) ten inches of mercury shall be drawn and the vacuum pump shut off. With valves closed, the time shall be measured for the vacuum to drop (9) nine inches.
4. The manhole shall pass if the time is greater than 60 seconds for 48 inch diameter, 75 seconds for 60 inch diameter, and 90 seconds for 72 inch diameter. If a manhole fails the initial test, necessary repairs shall be made with an approved non-shrink grout while the vacuum is still being drawn. Retesting shall proceed until a satisfactory test is obtained.

3.05 SAFETY PROVISIONS FOR AIR TESTING

A. Plugs used to close the sewer pipe for the air test must be securely braced to prevent the unintentional release of a plug which can become a high velocity projectile. Gauges, air piping manifolds, and valves shall be located at the top of the ground. No one shall be permitted to enter a manhole where a plugged pipe is under pressure. Four pounds (gauge) air pressure develops a force against the plug in a 12" diameter pipe of approximately 450 pounds. Pipes larger than 24" in diameter shall not be air tested because of the difficulty of adequately blocking the plugs.

3.06 FORCE MAIN LEAKAGE TESTS

A. Leakage tests for force mains shall be made by filling the force main with water and increasing the pressure to testing pressure of 125%, of working pressure.
B. The duration of the leakage test shall be two hours or as specified by Owner.
C. The maximum leakage per hour for cast iron, ductile iron, PVC or concrete pipe shall be calculated by the following formulas:

All rubber gasket or o-ring joints (cast iron and concrete)

L = S*D* P (SQUARE ROOT)/133,200
L = Allowable Leakage (gallons per hour)
S = Length of Pipeline Tested in feet
D = Nominal Diameter (inches)
P = Test Pressure (psi)

D. The force main will not be accepted until the actual leakage is equal to or less than the allowable. In addition, all obvious leaks shall be repaired.

3.07 LEAKS ENCOUNTERED IN FINAL INSPECTION

A. In addition to passing the above-described leakage tests, all obvious running leaks which may be observed in the final inspection shall be satisfactorily repaired.

3.08 FLEXIBLE CONDUIT MANDREL TEST

A. All flexible conduits shall be tested with a mandrel for deflection of no more than 5%. Pipe with a deflection of more than 5% will not be accepted. Mandrel tests shall not be performed within 30 days of the placement and backfilling of line to be tested.

3.09 MEASUREMENTS AND PAYMENT

A. The cost of all testing shall be included in the unit price bid for sewer line or force main and it shall include all the equipment, materials, and labor incidental to the pressure

testing and acceptance of the operating authority (city or owner). No additional payments shall be made for repairs or corrections required by the testing process.

END OF SECTION

SECTION 33 11 13
PUBLIC WATER UTILITY DISTRIBUTION PIPING

PART 1 GENERAL

1.01 SUMMARY

A. General: The Contractor shall furnish and install Ductile Iron Pipe and PVC Pipe and all appurtenances, complete in place, all in accordance with the requirements of the Contract Documents. Where standards, specifications or methods are cited without dates, the reference shall be construed to apply to the latest revision in effect at the time of contract.

1.02 RELATED SECTIONS

A. Section 31 23 00 - Trench Excavation, Backfill, and Compacting.
B. Section 33 11 13.01 - Hydrostatic Testing of Water Distribution System.
C. Section 33 13 00 - Disinfection of Water Distribution System.

1.03 REFERENCES

A. Ductile Iron Pipe Research Association, 245 Riverchase Parkway, Birmingham, AL.
   1. Handbook of Ductile Iron Pipe, Current Edition.
B. American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103.
   1. ASTM A126 - Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
   2. ASTM B61 - Specification for Steam of Valve Bronze Castings.
   3. ASTM D1784 - Specification for Rigid Poly (Vinyl Chloride)(PVC) Compounds and Chlorinated Poly(Vinyl Chloride)(CPVC) Compounds.
   4. ASTM D2241 - Specification for Rigid Poly (Vinyl Chloride)(PVC) Pressure Rated Pipe
   5. ASTM D3139 - Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
   6. ASTM F477 - Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
C. American Water Works Association
   1. AWWA C104 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings.
   2. AWWA C105 - Polyethylene Encasement for Ductile Iron Pipe Systems.
   3. AWWA C110 - Ductile Iron and Gray Iron Fittings, 3-in through 48-in for Water and Other Liquids.
   4. AWWA C111 - Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.
   5. AWWA C115 - Flanged Ductile Iron Pipe with Ductile Iron or Gray Iron Threaded Flanges.
   6. AWWA C150 - Thickness Design of Ductile-Iron Pipe.
   7. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds.
   8. AWWA C153 - Ductile Iron Compact Fittings, 3-in through 24-in and 54-in through 64-in for Water Service.
   9. AWWA C500 - Gate Valves for Water and Sewerage Systems.
   10. AWWA C502 - Dry Barrel Fire Hydrants.

11. AWWA C509 - Resilient-Seated Gate Valves for Water and Sewerage Systems.
12. AWWA C510 - Standard for Double Check Valve Backflow-Prevention Assembly.
13. AWWA C511 - Standard for Pressure-Reducing Principle Backflow-Prevention Assembly.
14. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.
15. AWWA C605 - Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water
16. AWWA C651 - Standard for Disinfecting Water Mains.
17. AWWA C900 - Standard for Poly(Vinyl Chloride)(PVC) Pressure Pipe, 4 inch through 12 inch, for Water Distribution.
18. AWWA C905 - Standard for Poly(Vinyl Chloride)(PVC) Water Transmission Pipe, Nominal Diameters 14 Inch through 36 Inch.

D. American Welding Society
   1. AWS D11.2 Guide for Welding Iron Casting.

E. Manufacturers Standardization Society (MSS)
   1. MSS SP-60- Connecting Flange Joint between Tapping Sleeves and Tapping Valves.
   2. MSS SP-111- Gray Iron and Ductile Iron Tapping Sleeves.

1.04 SUBMITTALS

A. Shop Drawings/Lay Schedules: The Contractor, upon request, shall submit catalog cuts of pipe and fittings in accordance with the requirements of this Section.
   1. Certified dimensional drawings of all valves, fittings, and appurtenances.
   2. Certified dimensional drawings of joints, showing the manufacturer's allowable deflections.
   3. Copies of the manufacturer's approved installation instructions for the types of joints being used.

B. Certificate of Compliance: Submit Certificates of Compliance attesting that materials provided are in compliance with referenced standards.

1.05 AS-BUILT DRAWINGS

A. Prior to submitting the Final Estimate for payment, the Contractor shall provide to the Engineer a record set of As-Builts indicating the exact location of all hydrants, valves, tees, and mains for this project. The As-Builts shall be precise and neat such that the Owner can locate the new water main appurtenances in the field without damaging other utilities. Contractor shall locate all mains, hydrants, meters, valves, etc. using GPS equipment.

1.06 QUALITY ASSURANCE

A. Inspection: All pipes shall be subject to inspection at the place of manufacture, in accordance with the provisions of the referenced standards, as supplemented by the requirements herein.

B. Plant Access: During the manufacture of the pipe, the Engineer shall be given access to all areas where manufacturing and testing is in process and shall be permitted to make all inspections necessary to confirm compliance with the Specifications.

C. Tests: Except as modified herein, all materials used in the manufacture of the pipe shall be tested in accordance with requirements as applicable.

D. Test Costs: The Manufacturer shall perform said material tests at no additional cost to the

Owner. The Engineer shall have the right to witness all testing conducted by the Manufacturer, provided that the Manufacturer's and Contractor's schedule is not delayed for the convenience of the Engineer.

E. Third Party Inspection: All pipe material suppliers shall be ISO 9001 or 9002 registered or provide the services of an independent inspection agency. Prior to the start of manufacturing, any manufacturer not meeting the ISO registration requirements shall submit to the Engineer the name of an independent inspection agency for approval. The independent inspection agency shall be responsible for sample monitoring of chemical and mechanical test, sample visual inspection of quality assurance tests performed on in-process pipe and fittings, and a sample visual and dimensional inspection on finished product for this project. A certified inspection report from the independent inspection agency of all witnessed tests shall be supplied to the Engineer within ten (10) days of completion of pipe manufacturing. Chemical samples shall be taken from each ladle of iron and the Manufacturers' chemical control limits shall be maintained for at least the following elements: carbon, sulfur, phosphorus, silicon, magnesium, chromium, manganese, tin, aluminum, cerium, copper, and lead. When chemical values fall outside the Manufacturers' control limits, additional mechanical property test shall be performed to assure minimum mechanical properties are met. All this shall be done at the Owner's discretion.

F. Factory Hydrostatic Test: All ductile iron pipe shall be subject to a factory hydrostatic test of at least 500 psi for a period of not less than 10 seconds; for 30 inches and larger the pressure will then be elevated to a peak pressure that induces a stress in the pipe wall equivalent to 75% of the minimum specified yield strength of ductile iron (42,000 psi) as calculated by the following formula:

$$P = \frac{2fs\ t}{D}$$

WHERE:

P = peak hydrostatic pressure.

fs = 31,500 psi, stress in pipe wall during hydrostatic test, which shall be 0.75 times the minimum yield strength of the ductile iron in tension (42,000 psi).

t = nominal wall thickness, in.

D = outside diameter, in.

G. Affidavits: Upon request the Contractor shall submit affidavits of compliance from the Manufacturer for the following:

1. Ductile iron pipe in accordance with the requirements of AWWA C151 (latest revision) and these specifications.
2. Cement mortar lining of ductile iron pipe, specials and fittings in accordance with the requirements of AWWA C104 and these specifications.
3. Polyethylene encasement for ductile iron piping in accordance with AWWA C105 (if specified).
4. Rubber gasket joints for ductile iron pressure pipe and fittings in accordance with the requirements of AWWA C111 and these specifications.
5. Charpy impact testing of ductile iron used in the manufacture of pipe shall be performed in accordance with AWWA C151.The minimum corrected absorbed energy (ft-lb.) shall be as follows: 7 ft-lb. at 70 F + 10 F.

6. Low temperature impact tests shall be made from at least 10% of the test pipe to assure compliance. The minimum corrected absorbed energy (ft-lb.) shall be as follows: 3 ft-lb at -40° F
7. The affidavits of compliance shall be certified by a registered professional engineer.

H. Field Quality Assurance: Every effort shall be taken to assure the pipe is undamaged before installation. The contractor shall carefully unload pipe from the trucks when stringing alongside the trench. Use only slings or harness made of webbing or other material which will not damage the outside or the inside of the pipe. Do not use fork lifts that may damage the lining of the pipe or fittings.

1.07 INSPECTION

A. Materials at Factory: At the discretion of the Engineer, all materials are subject to inspection and approval at the plant of the manufacturer. All materials shall meet the requirements hereinafter specified, and the Contractor shall have made by a Laboratory, approved by the Engineer, tests showing the material does meet the specifications.

PART 2 PRODUCTS

2.01 DUCTILE IRON PIPE

A. Manufacturers (no exception):
1. American Cast Iron Pipe Company
2. U.S. Pipe
3. Griffin Pipe Products Co.
4. Equal

B. General: Ductile iron pipe shall conform to AWWA C151, latest revision, and ANSI 21.51, latest revision, subject to the following supplemental requirements. The pipe shall be of the diameter and class shown, shall be furnished complete with rubber gaskets in accordance with ANSI 21.11/AWWA 111 (latest revisions), and as indicated in the Contract Documents. All specials and fittings shall be provided as required under the Contract Documents. The ductile iron pipe, specials, and fittings shall be American made.

C. Laying Lengths: Pipe laying lengths shall be provided in 18 or 20-foot nominal lengths with allowable trim pipe lengths in accordance with AWWA C151 and special shorter lengths provided as required by the Drawings.

D. Design Parameters: All ductile iron pipe shall be designed and manufactured in accordance with AWWA C150 and AWWA C151, respectively, for the following minimum operating conditions:
1. The minimum internal design pressure shall be 150 psi with a 100-psi surge allowance, with a safety factor of 2, for a total internal design pressure of 500 psi. No reduction of safety factor for transient pressures shall be allowed.
2. The external loads design criteria shall be a minimum of 4' depth of cover at 120 lbs. per cubic feet soil weight and live load based on one AASHTO H-20 truck load. The thickness design of ductile iron pipe shall be in accordance with AWWA C150.
3. The horizontal deflection of cement mortar lined ductile iron pipe resulting from external load conditions shall not exceed 3% of the pipe diameter.
4. The pipe trench, per AWWA C150, for design purposes shall be: Laying Condition Type 2- Flat Bottom Trench with Backfill Lightly consolidated (roughly 70 to 80%

of standard proctor density) to centerline of pipe, as a minimum. For restrained joint pipe and pipe installed in rock trenches the Laying Condition increases to Type 3 which is pipe bedded in 4 inches of loose soil (or trench bottom raked with bucket teeth to the equivalent depth) and backfill lightly consolidated to the top of the pipe.

5. For purposes of restrained joint calculations per the Ductile Iron Pipe Research Association (DIPRA) method, the soil classification (as described in DIPRA's "Thrust Restraint Design for Ductile Iron Pipe", latest edition) for both the native trench soil and also the backfill soil to surround the pipe shall be silt.

E. Minimum Pipe Class: Ductile iron pipe shall conform to AWWA C151. All pipes shall have a minimum pressure rating as indicated below, or higher ratings as indicated on the drawings.

Pipe Sizes (inch)	Pressure Class (psi)
4-12	350
14-20	250
24	200
30-64	150

F. Joint Design: The pipe supplier shall be responsible for furnishing all fittings. Ductile Iron Pipe and fittings shall be furnished with push-on joints; push on restrained joints, mechanical joints, flanged joints, and grooved joints as required.

1. Push-on Joints: Push-on joints shall conform to AWWA C111. Unless otherwise specified gasket material shall be standard styrene butadiene copolymer (SBR). Push-on joints shall be Fastite, as manufactured by American Ductile Iron Pipe, or approved equal. The pressure rating for push-on joints shall be a minimum of 350 psi or the specified pressure rating of the pipe, whichever is less. Standard allowable joint deflection for 4"- 30" Fastite pipe (or equal) shall be 5 degrees, for 36" Fastite pipe (or equal) shall be 4 degrees, and for 42"- 64" Fastite pipe (or equal) shall be 3 degrees. Allowable deflection of American's Fastite joint (or equal) "Special Deflection Bells" for 36"- 42" shall be 5 degrees and for 48"- 64" shall be 4 degrees.

2. Restrained joints: Restrained joints shall be "Flex Ring®" or "Lok-Ring®" restrained joints manufactured by American Ductile Iron Pipe, "TR Flex®" restrained joint as manufactured by U.S. Pipe Co. or "Snap-Lok®" as manufactured by Griffin Pipe Products, Inc. Field adaptable restraint shall be provided through the use of "Fast Grip®" or "Field Flex Ring®" as manufactured by American Ductile Iron Pipe or "Field-Lok®" or "TR Flex Gripper®" as manufactured by U.S. Pipe Co. These systems shall be boltless, push on restrained devices. When restrained joints require factory welding, the Manufacturer shall qualify all welding procedures and welders used to produce the product per the requirements of a documented quality assurance system based on ANSI/AWS D11.2.

3. Restrained joints and restrained joint pipe shall be rated for the minimum pressure shown in Table below, or the specified pressure rating of the pipe, or that shown on the plans, whichever is less. The manufacturer shall furnish test results showing that restrained joints in the sizes specified have been successfully tested to at least twice the specified pressure rating of the joint without leakage or failure. Tests shall be performed on pipe with nominal metal thickness less than or equal to that specified for the project. Make use of restrained gaskets when available for pipe pressure class. When gaskets are not available for

pressure class, fabricated restrained joint pipe is allowed.

RESTRAINED JOINT PRESSURE RATINGS, (psi) & ALLOWABLE JOINT DEFLECTIONS
(Limited to the pressure rating of the pipe)

JOINT SIZE	FAST-GRIP	FIELD FLEX-RING	FLEX-RING
4" - 12"	350 / 5		350 / 5
14"	250 / 4	350 / 4	350 / 4
16"	250 / 3	350 / 3.75	350 / 3.75
18"	250 / 3	350 / 3.75	350 / 3.75
20"	250 / 3	350 / 3.5	350 / 3.5
24"	250 / 3	350 / 3	350 / 3
30"	150 / 2.5	250 / 2.5	250 / 2.5

4. Restrained Flanged Adapters: Provide restrained flanged adapters suitable for joining flange and plain end ductile iron pipe at locations shown on the drawings. Provide Series 2100 MEGAFLANGE® by EBAA Iron, or approved equal.
5. Flanged Joints & Pipe: Candidate pipe for 4"- 54" flanged pipe thread-fabrication shall be Special Thickness Class 53 and for 60" & 64" flanged thread-fabrication shall be Pressure Class 350 ductile iron pipes, all in accordance with AWWA C115. Threaded companion flanges for ductile iron pipe shall be ductile iron in accordance with AWWA C115, not ANSI B16.1. Bolt circle and bolt holes match those of ANSI B16.1 class 125 and ANSI B16.5 class 150 flanges. The flanges shall be rated for at least 250 psi working pressure. The threaded flanges shall be individually fitted and machine tightened on the pipe ends. Bolts, gaskets and installation shall be in accordance with AWWA C115, Appendix A requirements, and flanged gaskets shall be NSF 61 certified Toruseal® gaskets as manufactured by American Ductile Iron Pipe, with a special seal design. NSF 61 certified Toruseal® gaskets must be used for all 54" & 64" flanged piping, for all glass-lined piping, and for all buried flanged joints. Gaskets shall be full face NSF61 certified Toruseal® design for all service installations. Gaskets for flanged ductile iron pipe must not have the larger inside diameters provided by the requirements of ANSI B16.21. Flange facing shall be smooth or with shallow serrations per AWWA C115.
6. Joints and Fittings: Flange fittings shall be ductile iron in accordance with AWWA C110 (latest revision) or ANSI/AWWA C153/A21.53 (latest revisions). Bolt circle and bolt holes match those of ANSI B16.1 class 125 and ANSI B16.5 class 150 flanges. The flanges shall be rated for at least 250 psi working pressure. Bolts, gaskets and installation shall be in accordance with AWWA C110 or ANSI/AWWA C115/21.11 (latest revisions) and flanged gaskets shall be NSF 61 certified Toruseal® gaskets as manufactured by AMERICAN, with a special seal design. NSF 61 certified Toruseal® gaskets must be used for all 54" and 64" flanged piping, for all glass-lined piping, and for all buried flanged joints. Gaskets shall be full face NSF 61 certified Toruseal® design for all service installations. Gaskets for flanged ductile iron pipe must not have the larger inside diameters provided by the requirements of ANSI B16.21 (latest revision). Flange facing shall be smooth or with shallow serrations per AWWA C110 (latest revision) or ANSI/AWWA C153/A21.53 (latest revisions).
7. Welded-on Thrust Collars: Welded-on thrust collars, for wall pipe and pipe thrust restraint, shall be welded steel collars designed for the thrust generated by 250

psi working pressure with a safety factor of at least two (2.0) against failure. Welded-on thrust collars shall be as manufactured by American Ductile Iron Pipe or pre-approved equal. The manufacturer shall qualify all welding procedures and welders per the requirements of a documented quality assurance system based on ANSI/AWS D11.2.

8. Mechanical Joints: Mechanical joints shall conform to AWWA C111. Bolts shall be high strength, low alloy steel per AWWA C111. Unless otherwise specified, gasket material shall be standard styrene butadiene copolymer (SBR) per this standard.
9. Grooved Joints: Grooved pipe and groove joints (where submitted on and approved by the Engineer) shall be in accordance with AWWA C606. Rigid radius groove dimensions shall be utilized. Flexible grooves shall be provided as necessary for settlement or expansion as determined and approved by the Engineer and as specifically shown on the contract drawings. Gasket material shall be Grade "M" halogenated butyl. Bolts shall be heat treated plated carbon steel, track head, conforming to the physical properties of ASTM A-183, minimum tensile strength 110,000 psi. Grooved ductile iron pipe shall be Special Thickness Class 53 for 4"-16", Class 54 for 18", Class 55 for 20", and Class 56 for 24"-36".
10. Flexing Couplings: Provide flexible pipe couplings of the gasketed, sleeve type where shown on the drawings. Provide DRESSER STYLE 38® suitable for joining ductile iron pipe, or approved equal. Supply couplings with working pressures which meet or exceed the joining pipe rating. Provide connecting bolts made of ASTM A-276, type 316 stainless steel.
11. Restrained Flanged Adapters: Provide restrained flanged adapters suitable for joining flange and plain end ductile iron pipe at locations shown on the drawings. Provide Series 2100 MEGAFLANGE® by EBAA Iron, or approved equal.

G. Cement Mortar Lining

1. General: Ductile iron pipe shall be internally lined with cement-mortar lining in accordance with AWWA C104, by a high speed, centrifugal process. The quality system of the manufacturer shall be registered to an ISO 9000 quality standard by an accredited registrar. Grinding of linings shall not be allowed. The finished cement lining shall be uniformly smooth and the linings shall comply with AWWA C104.
2. Material: The cement used shall be a Portland Cement. Sand shall consist of inert, hard, strong, and durable silica grains. The water used in the cement mortar shall be potable, and free from injurious quantities of organic matter, alkali, salt or other impurities that might reduce the strength, durability, or other desirable qualities of the lining. All material in contact with water shall be certified to meet the requirements of ANSI/NSF Standard 61. The cement mortar shall contain not less than one part of cement to two parts of sand, by volume.
3. Lining Thickness: Cement lining thicknesses shall be per AWWA C104 either single or double thickness and as shown in Table below:

Nominal Pipe Diameter	Minimum Lining Thickness
3-12	1/16
14-24	3/32
30-64	1/8

4. Surface Preparation: All surfaces to be mortar lined shall be cleaned as necessary

to remove foreign matter that could interfere with the adherence of the cement mortar or protrude through the lining.

5. Repairs: All repairs of handling or other damage shall be made in accordance with the recommendations of the Manufacturer and shall be reasonably smooth and may not project into the waterway.

PIPE DIAMETER	WORKING PRESSURE	111/4,22 1/2, 45, 90 FITTINGS RESTRAINED TYPE	30 AND 60° FITTING RESTRAINED TYPE
4-16”	350 psi	Mechanical Joint w/Megalug ™*	Push on w/Fast Grip™ or Field Lok™ Gasket
18-24”	200, 250	Mechanical Joint w/Megalug ™*	Push on w/Fast Grip™ or Field Lok™ Gasket
18-24”	300, 350	Flex Ring ™	Flex Ring™ Mechanical Joint w/Megalug™
30”	150	Mechanical Joint w/Megalug ™*	Push on w/Fast Grip™ or Field Lok™ Gasket
30”	200, 250	Mechanical Joint w/Megalug ™*	Push on w/Fast Grip™ or Field Lok™

* MEGALUGS REQUIRED ON ALL FITTINGS WITHIN RESTRAINED JOINT LENGTH

2.02 DUCTILE IRON FITTINGS

A. General: Fittings shall be ductile iron in accordance with AWWA C153, latest revisions. All fittings and accessories shall be made in the United States.

B. Cement Lining: Fittings shall be internally lined with cement mortar and internally lined with one mil seal coat in accordance with AWWA C104. The cement lining thicknesses shall be equal to or greater than those for comparable size pipe.

C. Buried Service Fittings: Shall generally conform to the following table for the size, and type fitting in question.

D. Above Ground Service Fittings: Fittings, sizes 4” – 64”, with flanged joints shall be rated for 250 psi working pressure. Fittings, sizes 4” – 36”, with grooved joints shall be rated for 250 psi working pressure. Grooved couplings shall be rated for 250 psi working pressure for 4” – 18” and 150 psi working pressure for 20” – 36”. Flanged joints for 12” and smaller sizes may be rated for 350 psi when used with AMERICAN NSF 61 certified Toruseal® or approved equal gaskets.

E. Fittings 2 inches or larger: Where taps are shown on fittings, tapping bosses shall be provided.

1. Flanged Joint: ANSI/AWWA C153 and ANSI B16.1, faced and drilled 125-pound ANSI standard.
2. Mechanical Joint: ANSI/AWWA C153 and ANSI/AWWA C111.
3. Push-on Joint: American Fastite ANSI/AWWA C153 or equal.

F. Fittings shall receive an exterior coating of 1 mil material in accordance with ANSI A21.4, latest revision.

G. Fittings shall have distinctly cast on them the manufacturer’s identification, pressure rating, nominal diameter for openings, and the number of degrees or fraction of the circle on bends.

H. Restrained Joints: Where restrained joints are specified, use a combination of Megalug

and Mechanical Joint fitting and American Fast-Grip gasket as specified herein.

2.03 PVC PIPE

A. PVC Plastic Pipe and Fittings shall be that manufactured and furnished by Johns-Manville, Capco, Corlon, Clow, U.S. Pipe, or equal. The pipe manufacturer, if not listed above, shall provide written verification that their pipe meets all the regulations and specifications of this section. The pipe supplier shall be responsible for furnishing all fittings and shall certify, in writing to the Engineer, that fittings furnished are designed specifically for use with the pipe manufactured and furnished. Fittings shall be manufactured of the ductile iron and be mechanical joint of the size shown on the plans. No PVC fittings shall be used under any circumstances. Pipe shall be joined by means of a rubber ring bell joint which shall be integral and homogeneous part of pipe barrel. Refer to the drawings for the specific pressure class required.

B. PVC pipe shall conform to all requirements and criteria of the Commercial Standards CS 256-63 and the manufacturer shall certify, in writing to the Engineer, that pipe furnished has been inspected and tested in strict accordance. Pipe shall be marked in accordance with CS 256-63. PVC pipe shall be manufactured from virgin unplasticized polyvinyl chloride, Type I, Grade I resin. Pipe shall conform to CS 256-63, ASTM D2241, ASTM D 1784, and NSF approved. Refer to the drawings for the specific pressure class required. PVC pipe for use with gaskets shall be jointed with approved natural rubber rings. The PVC pipe shall be in accordance with the Health Department's Policy Statement: Policy Statement: PVC Pipe for Public Water Systems, and Ten State Standards.

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.

E. Joints
   1. Buried Pipe: Gasketed slip joint with SBR rubber gaskets
   2. Comply with ASTM D3139 and ASTM F1483

2.04 RESTRAINING GLANDS

A. Restraining glands designed to use radially oriented cupped screws that indent the pipe barrel with points are not allowed.

B. For ductile iron pipe mechanical joint restraining glands provide 1100 Series MEGALUG® restraints by EBAA Iron of Eastland Texas, or equal.

C. For PVC pipe provide 2000 PV Series MEGALUG® restraints by EBAA Iron of Eastland, Texas, or equal.

D. For restrained flanged ductile iron fittings provide MEGAFLANGE® restraining glands by EBAA Iron of Eastland, Texas, or equal.

2.05 MISCELLANEOUS SMALL PIPING

A. Install the pipe specified in this article within or near master meter stations, tanks, and pump stations and where called for on the drawings.

B. The pipe shall be permanently imprinted with manufacturer's brand name, pipe size, commercial standard notation, identification of the National Sanitation Foundation approval, recommended working pressure and production code.

C. Copper Service Tubing: Copper pipe installed underground shall be Type "K", soft temper. Solder type wrought copper fittings shall be used, except on potable water lines, which shall utilize compression fittings. Buried potable water supply lines 3/4" diameter and smaller shall be copper pipe. Pipe dimensions and tolerance shall correspond with copper tubing sizes.

D. Where HDPE Pipe 3 inch diameter and smaller is called for on the drawings it shall meet the requirements of AWWA C901. Chemical feed lines and sampling lines that are buried or in the chemical feed duct shall be HDPE.

2.06 THRUST RESTRAINT

A. General: Plugs, caps, tees, bends deflecting 11.25-degrees or more, and fire hydrants shall be provided with thrust blocking and/or retainer glands or metal tie rods as directed. Valves shall be security anchored or provided with thrust blocking to prevent movement.

B. Concrete Thrust Blocks: Concrete having a minimum 28 days strength of 2,500 psi shall be placed between the fittings and undisturbed ground. The thrust and bearing sides of the blocks shall be poured directly against the fitting and undisturbed earth. The sides of the blocking not subject to thrust may be poured against form. Blocking shall be placed so that the fitting will be accessible for repair. The minimum area of bearing shall be as shown however actual area of bearing shall be increased to provide sufficient bearing area when low strength soils are encountered.

C. Retainer Gland: Retainer glands shall be used on ductile iron pipe only and be designed and manufactured in accordance with DIPRA-01. The gland shall be rated for 350 psig by Underwriter Laboratories. Restraining shall be accomplished by wedge acting lugs tightened by bolts with break-away heads to provide uniform pressure.

D. Metal Tie Rods: Tie rod joints shall consist of threaded tie rods connected to joints with eye blots or lugs or lugged fittings. All rods, eyebolts, couplings, and nuts shall be ¾-inch high strength ASTM A242 (latest revision) (CorTen) corrosion resistant steel. The minimum number of rods used on 4-inch and 6-inch joints shall be two (2), three (3) rods for 8 inch pipe, four (4) for 10 inch pipe and six (6) rods for 12 inch pipe.

E. Megalug Joint Restraint: Mechanical joint restraint shall include a restraining mechanism which, when actuated, imparts multiple wedging action against the pipe, increasing its resistance as the pressure increases. Flexibility of the joint shall be maintained after burial. Glands shall be manufactured of ductile iron conforming to ASTM A536, latest revision. Restraining devices shall be of ductile iron heat treated to a minimum hardness of 370 BHN. Dimensions of the gland shall be such that it can be used with the standardized mechanical joint bell and tee-head bolts conforming to ANSI/AWWA A21.11 and ANSI/AWWA C153/A21.53 of latest revision. Twist-off nuts shall be used to insure proper actuating of the restraining devices.

F. The mechanical joint restraint device shall have a working pressure of at least 250 psi with a minimum of safety factor 2:1 and shall be EBAA Iron, Inc. MEGALUG or equal.

2.07 PLUGGING DEAD ENDS

A. Standard plugs shall be inserted into the bells of all dead ends of pipes, tees, or crosses, and spigot ends shall be capped. Plugs or caps shall be jointed to the pipe or fittings in the appropriate manner.

2.08 WET CONNECTIONS

A. Where existing wet lines are to be tied on to new mains directed by the Engineer, the Contractor shall make necessary wet connections. This work shall be done to cause the least inconvenience.

2.09 PIPE HANGERS AND PIPE SUPPORTS

A. All exposed piping shall be suitably supported by pipe hangers or pipe supports. Supports and hangers shall be of the types specified herein or shown on the drawings. Supports or hangers for small piping shall be spaced so that no deflection of the piping will occur between adjacent supports.

B. All supports and hangers shall be installed and adjusted so that the loads are equally distributed throughout any one run of piping.

C. Small piping shall be supported from continuous concrete inserts and trapeze hangers, wall brackets, or other accessories as required by the particular installation. Small piping supports shall be Grinnell, Unistrut, Beeline, or approved equivalent. Floor mounted pipe supports shall be Standon Model S89 or S90 or equal.

D. All carbon steel hangers extending from the ceiling shall be hot-dipped galvanized coated unless specified or shown otherwise.

E. Floor mounted pipe supports shall be painted with two component epoxy paints as specified in the 'Painting' section of these specifications.

PART 3 EXECUTION

3.01 CONSTRUCTION

A. Water mains shall be installed in strict accordance with plans and these specifications. Work shall be planned and arranged so that the existing service shall be interrupted to the least possible degree. Access to property along the route of the proposed construction shall be maintained at all times. The Contractor shall layout and mark construction routes in accordance with the plans and specifications in advance of the construction. No deviations shall be made form line grade and location shall be made except as directed by the Engineer. All materials for each run of pipe or service installation shall be on hand prior to beginning excavation.

B. The Contractor and any subcontractors shall be responsible for the total compliance to all federal, state, and local ordinances, laws and regulations as it relates to safe construction practices and to protecting the employees and the public's general health. The Contractor shall ensure that all Occupational and Health Administration (OSHA) regulations and standards are followed during all phases of the construction period. The Owner or the Engineer shall not be responsible for making the Contractor to adhere to the OSHA regulations and standards.

C. In transportation, unloading, and handling of Ductile Iron Pipe and PVC pipe, the pipe shall not be dropped, let roll and collide with another pipe, or be subjected to any unnecessary jar, impact, or other treatment that might crack or otherwise damage the pipe. Under no

circumstances shall pipe or accessories be dropped or dumped into the trench.

D. Before laying the pipe in trench, the bottom of the trench shall be carefully graded and prepared and bell holes excavated do that the pipe shall have a uniform support along its entire length except at bell holes, and shall not be allowed to rest on hard supports through a portion of its length only. Pipe shall have not less than thirty-six (36") of cover over the top of the pipe, except as otherwise specified or directed.

E. All foreign matter or dirt shall be removed from the inside of the pipe before it is lowered in the trench and the pipe shall be kept clean during and after laying. Care shall be taken to prevent dirt from entering the joint space and at all times when pipe laying is not in progress the open ends of the pipe shall be closed by using a suitable cap or plug to prevent trench water, foreign matter, and dirt from entering the pipe line.

F. Cutting of the pipe for inserting valves, fittings, or closure pieces shall be done in accordance with the manufacturer's recommendations in a neat and workmanlike manner without damage to the pipe. Prior to joining the pipe and/or fittings, the plain ends of the pipe and bells of the pipe and/or fittings shall be thoroughly cleaned, removing all foreign matter from the bells.

G. Whenever necessary to deflect water pipe from a straight line, either in the vertical or horizontal plan to avoid obstructions, or where long radius curves are permitted, the degree of deflection at any joints shall not be greater than that which will allow a safe deflection at the joints. Allowable deflections shall be established by the pipe manufacturer.

H. The Contractor shall arrange for a qualified representative of the pipe manufacturer to supervise and instruct the pipe line foreman and crews in the proper assembly and installation of the pipe, if the foreman and crews are not familiar with the pipe supplied. The Engineer's observer will be required to report, in writing, the actual location and deviations from the proper described assembly and installation. Unless such deviations are corrected by the Contractor within twenty-four (24) hours, the Engineer's observer shall have the authority and will be directed to suspend all pipe laying operations until such repairs are made to his complete satisfaction. Only then will the work be allowed to continue.

I. Prior to joining the pipe and/or fittings, the plain ends of the pipe and bells of the pipe and/or fittings shall be thoroughly cleaned, removing all foreign matter from the bells.

J. Regardless of the type of pipe used, joints shall be made in strict compliance with instruction and directions of the manufacturer. Lubricants used shall be that supplied by the manufacturer and no substitutes will be allowed. The Contractor shall be solely responsible for keeping sufficient supply on hand.

K. All cut pieces of pipe shall be beveled as required by the recommendations of the manufacturer.

L. Attention is called to the fact that only first-class materials and workmanship will be accepted.

M. All pipe and fittings shall be installed in accordance with the applicable drawings, with tracer wire, if required. A tracer wire (12 gauge bar copper) must be installed by wrapping the line once along each joint of pipe. The tracer wire will be connected to a "ground rod" with the rod being accessible in a 6" water valve box. This rod and valve box shall be installed adjacent to every marker sign. Detectable metallic marking tape must be buried 18" above the pipe.

N. Thrust blocks shall be required at all bends and tees and shall be poured against undisturbed earth.

O. A ten (10) foot horizontal separation shall be maintained between water mains and sewer lines. Where water mains and sewer mains cross, sewer mains shall be laid to provide a distance of eighteen inches (18") between the outside of the sewer main and the outside of the water main. The water line shall be laid so that the center of a full joint of pipe will correspond to the point of crossing, thereby placing the joints of the water line their greatest possible distance from the water main. The water line shall cross above sewer lines.

P. Sub-Surface Explorations: Whenever necessary to determine the location of the existing pipes, valves, or other underground structures, the Contractor shall examine all available records and shall make all explorations and excavations for such purpose. Where existing mains are to be tied into, the Contractor shall excavate and examine the tie-in locations prior to ordering and valves or fittings for the tie-in. No additional compensation will be allowed for conditions different from shown on the plans, but the Contractor will be paid according to the unit price for materials actually required in the tie-in.

Q. Barricades, Guards, and Safety Provisions: To protect persons from injury, ad to avoid property damage, adequate barricades, construction signs, torches, red lanterns, and guards as required shall be placed and maintained during the progress of the construction work and until it is safe for traffic to use the trenched highways. Rules and regulations of the local, state, and federal authorities respecting safety provisions shall be observed.

R. Interruption of water service: No valve or other control on the existing system shall be operated for any purposes by the Contractor without approval of the Engineer, and all consumers affected by such operation shall be notified by the Contractor at least one hour before the operation and advised of the probable time when the service will be restored. In all cases all interrupted services will be restored before the end of the working day.

S. Temporary support, adequate protections and maintenance of all underground and surface utility structures, drains, sewers, and other obstructions encountered in the process of the work shall be furnished by the Contractor at his own expense.

T. Flows of Drains and Sewers Maintained: Adequate provisions shall be made for the flow of sewers, drains, and water courses encountered during construction, and the structures which may have been disturbed shall be satisfactorily restored upon completion of the work. All sanitary sewer services will be restored to operation before the end of the work day.

3.02 UNDERCROSSING OF CONSTRUCTED HIGHWAYS AND RAILROADS

A. General: At locations shown on the plans the Contractor shall construct an undercrossing by one of the methods specified below to provide a structure for utilities or traffic that shall not create a hazard, produce interruption of traffic that shall not create a hazard, produce interruption of traffic or require additional maintenance by Highway Department or Railroad Company.

B. The Contractor shall secure all necessary permits, easements, right-of-ways, and post whatever security bonds as may be required by the Highway Department or Railroad at no additional cost of the Owner.

C. The Contractor shall provide a scaled drawing showing proposed location dimensions of casing, type and method of installation for approval prior to initiating work. Access pits, lead and tail ditches shall be protected by sheeting and bracing as required to provide safe working conditions during progress of job. Replacement of excavation and grassing shall be at no cost to the State Highway Department and Railroads and to standards to

original roadway construction.

D. Public liability and property damage shall be required of the Contractor at limits approved by the Department or Railroad.

E. For railroad and highway undercrossings, all materials, methods, limits and depths of construction shall be in accordance with the State Highway Department Specifications and no less than the following minimums: Limits of casing installation shall be not less than 2 feet outside the shoulder line unless specifically approved.

Minimum cover over casing pipe shall be not less than 2 feet, except the sizes 30 inches and larger shall require not less than one diameter of cover. Minimum pipe wall thickness shall be as follows:

Outside Diameter (inches)	Minimum Pipe Wall Thickness (inches)
8-5/8	0.188
10-3/4	0.188
12-3/4	0.188
16	0.219
18	0.250
20	0.281
24	0.344
30	0.406
36	0.469

For jacking method the minimum pipe walls for smooth steel pipe shall be as above. Corrugated steel (metal) pipe shall be minimum No. 10 gauge, galvanized and fully asphalt coated and concrete pipe shall be tongue and groove type, Class IV minimum.

G. Boring Method: Smooth wall new steel pipe meeting the required materials standards shall be installed with suitable equipment providing a mechanically augered bore followed immediately by the casing pipe, without the use of water at any time during the work, to produce firm and continuous contact with the unremoved earth in the highway subgrade or fill.

H. Jacking Method: Casing pipe installed by excavation from within the pipe while the pipe advances into excavated areas shall be guided by a jacking frame and rails to maintain line and grade. Not more than 6 inches excavation ahead of the casing pipe will be allowed during installation. Voids outside the jacked casing shall be filled with pumped cement grout, applied at a pressure of not less than 40 psi where an annular space between the casing and earth is established.

3.03 EXPOSED PIPING

A. All exposed piping shall be installed in a neat and workmanlike manner. All piping runs shall be truly horizontal or vertical and parallel to adjacent building construction except where specifically shown otherwise on the drawings. Piping shall be adequately supported by temporary supports during installation. Permanent supports, as specified and as shown on the drawings, shall then be placed so that the pipe loads are supported

thereon. Small piping installed along walls or beneath roof slabs shall be adequately supported with approved devices. Spacing of such supports shall be required to prevent deflection of the pipe between supports.

B. Copper pipe shall be insulated from supports. Copper pipe shall be wrapped with two layers of plastic adhesive tape (30 mill thickness) at each pipe support to prevent contact with other metals.

END OF SECTION

SECTION 33 3100
SANITARY SEWERAGE UTILITES

PART 1 GENERAL

1.01 SCOPE

A. The work covered by this section of the Specifications shall include the furnishing and installation of Ductile Iron Pipe and Fittings for the sewer lines in strict accordance with these specifications and the applicable drawings.

1.02 CONSTRUCTION

A. In the transportation, unloading and handling of Ductile Iron Pipe, the pipe shall not be dropped, let roll and collide with another pipe, or be subjected to any unnecessary jar, impact, or other treatment that might crack or otherwise damage the pipe. Under no circumstances shall pipe or accessories be dropped or dumped into the trench.

B. Before laying the pipe in trench, the bottom of the trench shall be carefully graded and prepared and bell holes excavated so that the pipe shall have a uniform support along its entire length except at bell holes, and shall not be allowed to rest on hard supports through a portion of its length only. A cushion of selected material, 4" minimum, uniformly graded shall be provided for all pipes. Pipe shall have not less than thirty-six inches (36”) of cover over the top of the pipe, except as otherwise specified or directed. (See detail “Bedding").

C. All foreign matter or dirt shall be removed from the inside of the pipe before it is lowered in the trench and the pipe shall be kept clean during and after laying. Care shall be taken to prevent dirt from entering the joint space and at all times when pipe laying is not in progress, the open ends of the pipe shall be closed by using a suitable cap or plug to prevent trench water, foreign matter and dirt from entering the pipe line.

D. Cutting of the pipe for inserting fittings, or closure pieces shall be done in accordance with the manufacturer's recommendations in a neat and workmanlike manner without damage to the pipe. Prior to joining the pipe and/or fittings, the plain ends of the pipe and bells of the pipe and/or fittings shall be thoroughly cleaned, removing all foreign matter from the bells.

E. Regardless of the type of pipe used, joints shall be made in strict compliance with instructions and directions of the manufacturer. Lubricants used shall be that supplied by the manufacturer and no substitutes will be allowed. The contractor shall be solely responsible for keeping sufficient supply on hand.

F. All cut pieces of pipe shall be beveled as required by the recommendations of the manufacturer. Attention is called to the fact that only first-class materials and workmanship will be accepted. All pipe and fittings shall be installed in accordance with the manufacturer's instructions and directions and in accordance with the applicable drawings.

G. The contractor shall arrange for a qualified representative of the pipe manufacturer to supervise and instruct the pipeline foreman and crews in the proper assembly and installation of the pipe, if the foreman and crews are not familiar with the pipe supplied. The Engineer's observer will be required to report, in writing, the actual location and deviations from the proper described assembly and installation. Unless such deviations are corrected by the contractor within twenty-four (24) hours, the Engineer's observer shall have the authority and will be directed to suspend all pipe laying operations until

such repairs are made to his complete satisfaction. Only then will the work be allowed to continue.

H. Thrust blocks shall be required at all bends and tees and shall be poured against undisturbed earth.

I. A ten (10) foot horizontal separation shall be maintained between potable water mains and sewage mains. Where water mains and sewer mains cross, sewer mains shall be laid to provide a distance of eighteen inches (18") between the outside of the sewer main and the outside of the water main. The water main shall be laid so that the center of a full joint of pipe will correspond to the point of crossing, thereby placing the joints of the water main their greatest possible distance from the sewer main. The water line shall cross above sewer lines.

PART 2 PRODUCTS

2.01 INTERIOR AND EXTERIOR LINING FOR DUCTILE IRON PIPE AND FITTINGS

A. All gravity and force main pipe and fittings shall be furnished with a 40 mil nominal dry film thickness protective lining on the interior consisting of an amine cured novalac epoxy containing at least 20% by volume of ceramic quartz pigment. The lining material shall be Protecto 401 Ceramic Epoxy or approved equal. All other ductile iron pipe and fittings shall have interior cement mortar lining in accordance with AWWA C104.

B. All cut ends shall be immediately repaired with a field epoxy touch-up kit.

C. All buried ductile iron pipe and fittings shall be furnished with standard bitumastic coating on the exterior per AWWA standard.

D. Exposed ductile iron pipe and fittings shall be coated on the exterior with Tnemec 140-1211 primer, Series 66 HB Epoxoline at 4 to 6 mils, followed by Series 74 Endura Shield at 2 to 4 mils, or equal coating

2.02 DUCTILE IRON PIPE

A. Ductile Iron Pipe shall conform to the requirements of "Ductile-Iron Pipe, Centrifugally Cast" AWWA Standard C151/A21.51, latest revision.

B. Minimum Pressure Class shall be as follows:

1. 18-inch and smaller 350 psi
2. 24-inch 250 psi
3. 30-inch and greater 200 psi

C. Joint connections, pipe and fittings:

1. Push on and mechanical rubber gasket joints: ANSI/AWWA C111/A21.11.
2. Flanged: ANSI/AWWA C115/A21.15, ANSI B16.1.
3. Grooved and shouldered ANSI/AWWA C606.

D. Weights and Marking: Weights of pipe and fittings shall conform strictly to the requirements of ANSI Specifications. The class designations for the various classes of pipe and fittings shall be cast onto fittings in raised numerals, and cast or stamped on the outside of each joint of pipe. Weights shall be plainly and conspicuously painted in white on the outside of each joint of pipe and each fitting after the exterior coating has hardened.

F. Corrosion Control

1. Polyethylene wrap in tube or sheet form conforming to the requirements of ANSI/AWWA C105/A21.5. The pipe shall be double wrapped.

2. All buried ductile iron pipe and fittings shall be furnished with standard bitumastic coating on the exterior per AWWA standard.
3. Exposed ductile iron pipe and fittings shall be coated on the exterior with Tnemec 140-1211 primer, Series 66 HB Epoxoline at 4 to 6 mils, followed by Series 74 Endura Shield at 2 to 4 mils, or approved equal.

2.08 DUCTILE IRON FITTINGS

A. All ductile iron fittings shall conform to the requirements of ANSI/AWWA C153/A21.53, latest revision, for Ductile Iron Compact Fittings.

B. All ductile iron fittings located within a pump station site shall have a interior ceramic epoxy coating suitable for sewer service, Protecto 401, or equal. All other ductile iron fittings shall have interior cement mortar lining in accordance with AWWA C104.

C. Buried ductile iron fittings shall be furnished with standard bitumastic coating on the exterior per AWWA standard.

D. Exposed ductile iron pipe fittings shall be coated on the exterior with Tnemec 140-1211 primer, Series 66 HB Epoxoline at 4 to 6 mils, followed by Series 74 Endura Shield at 2 to 4 mils, or equal coating.

PART 3 EXECUTION

3.01 MEASUREMENT AND PAYMENT

A. Payment shall be in lump sum for work completed.

END OF SECTION

SECTION 33 31 23
SANITARY SEWERAGE FORCE MAIN PIPING

PART 1 GENERAL

1.1 SCOPE

A. The work covered by this section relates to sanitary sewer force mains including materials permitted, installation, and testing.

1.2 SUBMITTALS

A. Submit proposed methods, equipment, materials, and sequence of operations for force main construction. Plan operations to minimize disruption of utilities to occupied facilities or adjacent property.

B. Force mains 12 inches in diameter and larger: Submit shop drawings and design calculations for joint restraint systems using restrained joint pipe and fittings or reinforced concrete encasement of pressure pipe and fittings.

C. Submit qualifications, proposed methods, equipment, materials, and sequence for acceptance testing of pipeline.

D. Submit test reports as specified in Part 3 of this Section.

1.3 QUALITY ASSURANCE

A. Qualifications. Install sanitary sewer force main that is watertight both in pipe-to- pipe joints and in pipe-to-manhole connections. Perform testing in accordance with Section 33 01 10.13 – SEWER LINE TESTING.

B. Regulatory Requirements.

1. Install pressurized sewer lines to meet minimum State mandated separation distance from potable water line. Separation distance is defined as distance between outside of water pipe and outside of sewer pipe. Install new sanitary sewers no closer to water lines than 10 feet in all horizontal directions. Where water and pressurized sanitary sewer lines cross, a minimum vertical separation in accordance with state and/or local standards is required when the water line passes above the sanitary sewer main. Where separation distance cannot be achieved, sanitary sewers shall be constructed of ductile iron piping or encased in reinforced concrete encasement (as detailed on the Drawings) for a minimum distance of 10 feet either side of the crossing.

PART 2 PRODUCTS

2.1 PIPE AND FITTING MATERIAL SCHEDULE

A. A force main must be a minimum of 4 inches in diameter, unless it is used in conjunction with a grinder pump station.

2.2 THRUST RESTRAINT

A. Unless otherwise shown on Drawings, provide concrete thrust blocking for force mains up to 12-inches in diameter, to prevent movement of buried lines under pressure at bends, tees, caps, valves and hydrants. Blocking shall be Portland cement concrete. Place concrete in accordance with details on Drawings. Place thrust blocks between

undisturbed ground and fittings. Anchor fittings to thrust blocks so that pipe and fitting joints are accessible for repairs.

B. For force mains larger than 12 inches in diameter, and where indicated on Drawings, provide restrained joints conforming to requirements of force main pipe material specifications. Install restrained joints for length of pipe on both sides of each bend or fitting for full length where shown on Drawings.

C. Horizontal and vertical bends between zero degrees and the maximum allowable deflection angle will not require thrust blocks or harnessed or restrained joints.

D. Horizontal and vertical bends between the maximum allowable deflection angle and 90 degrees deflection angle shall have thrust restraint as shown on Drawings, or specified herein

E. Provide thrust restraint at tees, plugs, blowoff drains, valves, hydrants, and caps, as indicated.

F. Reinforced concrete encasement of force main pipe and fittings may be used in lieu of manufactured joint restraint systems. Alternate joint restraint systems using reinforced concrete encasement shall conform to following design requirements.

1. Design calculations shall be performed and sealed by Professional Engineer licensed in the State in which the project is being completed.
2. Base design calculations upon soil parameters quantified in geotechnical report for site where alternative thrust restraint system is to be installed. When data is not available for site, use parameters recommended by geotechnical engineer.
3. The design system pressure shall be specified test pressure.
4. The following safety factors shall be used in sizing restraint system:
   a. Apply factor of safety equal to 1.5 for passive soil resistance.
   b. Apply factor of safety equal to 2.0 for soil friction.
5. Contain concrete encasement entirely within standard trench width and terminate on both ends at pipe bell or coupling.
6. Concrete encasement reinforcing steel shall be designed for all loads, including internal pressure and longitudinal forces. Concrete design shall be in accordance with ACI 318.

PART 3 EXECUTION

3.1 PIPE INSTALLATION BY OPEN-CUT

A. Perform excavation, bedding, and backfill in accordance with Section 31 23 16 – TRENCH EXCAVATION, BACKFILL, AND COMPACTING

B. Wrap ductile-iron pipe and fittings with polyethylene wrap where soil conditions require installation. Do not install polyethylene wrap on ductile iron pipe protected by cathodic protection system or fusion bonded or polyurethane coated fittings.

C. Tracer wire shall be installed with pipe.

D. Install pipe in accordance with pipe manufacturer's recommendations and as specified in following paragraphs.

E. Install pipe only after excavation is completed, bottom of trench is fine graded, bedding material is installed, and trench has been approved by Owner.

F. Install pipe to line and grade indicated. Place pipe so that it has continuous bearing of barrel on bedding material and is laid in trench so interior surfaces of pipe follow grades and alignment indicated. Provide bell holes where necessary.

G. Install pipe with spigot ends toward direction of flow. Form concentric joint with each section of adjoining pipe so as to prevent offsets.

H. Keep interior of pipe clean as installation progresses. Where cleaning after laying pipe is difficult because of small pipe size, use suitable swab or drag in pipe and pull it forward past each joint immediately after joint has been completed. Remove foreign material and debris from pipe.

I. Provide lubricant, place and drive home newly-laid sections with come-a-long winches so as to eliminate damage to sections. Install pipe to "home" mark where provided. Use of back-hoes or similar powered equipment will not be allowed unless protective measures are provided and approved in advance by Owner.

J. Keep excavations free of water during construction and until final inspection.

K. When work is not in progress, cover exposed ends of pipes with approved plug to prevent foreign material from entering pipe.

L. A force main must terminate below a manhole invert with the top of the pipe matching the water level in the manhole at design flow.

M. Any high point must include a sewage type air release valve.

3.2 HYDROSTATIC TESTING

A. After pipe and appurtenance have been installed, test line and drain. Prevent damage to Work or adjacent areas. Use clean water to perform tests.

B. Owner may direct tests of relatively short sections of completed lines to minimize traffic problems or potential public hazards.

C. Test pipe in presence of Owner.

D. Test pipe at 150 psig or 1.5 times design pressure of pipe, whichever is greater. Design pressure of force main shall be rated total dynamic head of lift station pump, but never exceed the ultimate design pressure of the pipe.

E. Maximum allowable leakage shall be as calculated by following formula:

$$L = (S)\,(D)\,(P^{0.5}) / 133{,}200$$

Where:
- L = Leakage in gallons per hour.
- S = Length of pipe in feet.
- P = Inside diameter of pipe in inches.
- D = Pressure in pounds per square inch.

F. No leakage permitted on exposed pipes and fittings.

G. Correct defects, cracks, or leakage by replacement of defective items or by repairs as approved by MOAW.

H. Plug openings in force main after testing and flushing. Use cast iron plugs or blind flanges to prevent debris from entering tested pipeline.

END OF SECTION

SECTION 33 32 19
SEWER PUMP STATIONS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. This Section pertains to the requirements for the design and construction of submersible type lift stations, which are the primary type constructed as part of private development.

B. Pump stations meeting or exceeding the requirements set herein will be approved. Any proposed alteration of the pump station dimensions, equipment, controls, etc. from the standards set forth herein will be approved only upon the submittal of plans and specifications of the proposed changes to the Engineer, and upon the Engineer's written approval.

C. Pump Stations, in general, shall be submersible type including a minimum of two (2) pumps and motors of pumping capacity of 450 gpm at 32 feet total dynamic head, wet basin, separate valve pit, valves, piping, hatches, guide rails, pump removal components, control center, level controls, interconnecting electrical wiring, incoming power and telephone supply, and all other features regularly and normally required as a part of a complete and functional facility. All work shall be in accordance with site requirements, details in the Drawings, these Standards and the manufacturer's recommendations. Pump stations with check valves, isolation valves, etc. inside the wet well shall not be acceptable.

D. All Pump Stations shall be designed for and operate on 240 V, three (3) phase power. No deviation from this requirement shall be permitted without the express prior written approval of the Engineer; specifically, approval is required for operation from single-phase power.

E. The station shall be equipped with a pump control system capable of monitoring the status of the lift station.

F. All of the mechanical and electrical equipment shall be an integral package supplied by the pump manufacturer with local representation so as to provide undivided responsibility. The package shall be equal in construction and performance to Flygt Pump equipment and other specific requirements set forth herein and in the approved plans.

G. The Contractor shall submit to the Engineer for review and approval three (3) sets of shop drawings, detailed specifications, pump warranty, and performance characteristics for all of the equipment and fixtures to be furnished and installed. The Shop Drawings and equipment data shall be submitted with a cover letter, Contractor's stamp of approval, indicating that he has reviewed, checked, and approved the data submitted. Without prior written Engineer approval, the item of work may not be accepted.

H. Any exceptions to this Standard or associated approved Plans shall be submitted in writing and clearly stated. The exceptions must be approved by the Engineer prior to proceeding with the work.

I. All mounting and fastening hardware shall be stainless steel.

J. All components of the pump station that are exposed to weather shall be constructed of material that is resistant to corrosion and will not require surface protection throughout the expected life of the lift station. In general, these materials are stainless steel, aluminum, fiberglass reinforced polyester (FRP), and ultraviolet stabilized PVC.

1.02 PUMP STATION SITE

A. The wetwell shall be constructed so that there is only one pipe entry into the wetwell. Construct a manhole within the pump station site with all wastewater flowing through the manhole and outlet pipe to the wetwell. No other connections between the manhole and wetwell are permitted.

1.03 OPERATING CONDITIONS

A. Prior to installation the Contractor shall submit the following information for each pump to the Engineer for review and approval:
   1. Pump capacity in gallons per minute;
   2. Total dynamic head (TDH) and operating RPM; Use C=130
   3. Motor horsepower;
   4. Motor rpm;
   5. Motor voltage, phase and cycle;
   6. Make and model number; and
   7. Pump curves for the pumps to be provided.

B. Pump station acceptance will be based upon pump drawdown tests. The acceptable range is +10% and -5% of the reported pump capacity in GPM. Pump flows outside of this range will result in non-compliance of the standard and the pump station will not be accepted.

1.04 NOTES TO CONTRACTOR

A. The wetwell storage depth below the lowest inlet shall be a minimum of 4'-0" and shall also meet the following criteria:
   1. All pumps OFF shall be set at the pump manufacturer's recommended level but no less than 1'-6" from the bottom of the wetwell.
   2. The distance between all pumps OFF and the lead pump ON shall be set to provide storage capacity equal to:

$$\frac{10 \times \text{RATED PUMP GPM}}{4}$$

(i.e. 15 minute cycle minimum)

   c. The lag pump ON shall be set a minimum of 6" above the lead pump ON and a minimum of 12" below the lowest inlet invert.
   d. The high water alarm float shall be set a minimum of 6" above the lag pump ON and minimum of 6" below the lowest inlet invert.
   e. All level control elevations shall be set below the lowest inlet invert.

1.05 CONCRETE SLAB FOR CONTROL PANEL

A. Control panels shall be mounted on a concrete slab. Concrete slab shall be a minimum of 4 feet x 4 feet x 4 inches thick with reinforcement.

1.06 PUMP STATION WARRANTY

A. Pump station warranty shall be one (1) years from the date of acceptance.

PART 2 – PRODUCTS

2.01 PUMPING EQUIPMENT

A. Pumps shall be of the submersible type for handling raw unscreened sewage. Pump volute, motor and seal housing are to be high quality gray cast iron. Impeller shall be either cast iron or cast bronze of a non-clog design capable of handling minimum three (3) inch sphere solids, fibrous material, heavy sludge, and other matter found in normal sewage applications. Impeller shall have pump-out vanes on the back shroud of the impeller to keep pumped material away from the seal area and increase operating life. Impeller shall be either slip fit or taper fit with key to securely lock the impeller to the driving shaft. The pump volute shall be fit with a replaceable bronze wear ring to minimize wear on the impeller and help achieve longer balanced operating life. All fasteners shall be of stainless steel.

B. All mating surfaces where watertight sealing is required shall be machined and fitted with nitrile rubber O-rings. Sealing shall be accomplished when metal-to-metal contact is made, resulting in controlled compression of the rubber O-rings without requirement of a specific torque limit.

C. The pump shall be provided with a mechanical rotating shaft seal system running in an oil reservoir having separate, constantly lubricated lapped seal faces. The lower seal unit between the pump and oil chamber shall consist of one (1) stationary seat and one (1) rotating ring held in place by its own spring. The lower seal shall be removable without disassembling the seal chamber. The upper seal between the motor and the seal chamber shall be of the same design with its own separate spring system. The seals shall require neither maintenance nor adjustment, but shall be easily inspected and replaceable. The shaft sealing system shall be capable of operating submerged to pressures equivalent to two hundred (200) feet. No seal damage shall result from operating the pump unit out of its liquid environment. The seal system shall not rely upon the pumped media for lubrication.

D. The seal chamber shall also be equipped with a seal failure sensor probe which will sense water intrusion through the lower seal. This sensor is to be connected to an alarm in the control panel to indicate lower seal failure.

E. The stator winding, rotor and bearings are to be mounted in a sealed submersible type housing. Insulation utilized in the stator windings shall be Class F with maximum temperature capability of 155.C. Motor housing shall be filled with a high dielectric oil to give superior heat transfer and allow the bearing to run in a clean, well lubricated environment; or the housing shall be air filled with grease lubricated bearings. The pump and motor are to be specifically designed so that they may be operated partially or completely submerged in the liquid being pumped. The pump should not require cooling water jackets. Stator shall be securely held in place with a removable end ring and threaded fasteners so that it may be easily removed in the field without use of heat or press. Shaft shall be of stainless steel and supported by ball bearings. Motor shall be provided with heat sensing units attached to the motor windings which shall be connected to the control panel to shut down pump if overheating occurs.

F. Pump motor cable and heat sensor/seal failure sensor cable shall be suitable for submersible pump applications and this shall be indicated by a code or legend permanently embossed on the cable. Cable sizing shall conform to NEC specifications for pump motors and shall be of adequate size to allow motor voltage conversion (460V to 230V) without replacing the cable. Cable of the proper length shall be provided to

eliminate need for splices or junction boxes between pump and "control center". The cable shall enter the motor through a cord cap assembly which is double sealed allowing disassembly and disconnect of the wires and the motor and still not damage the sealed characteristics of the motor housing. Each individual conductor shall be color coded in accordance with generally accepted industry standards. The color coding shall designate the application of the conductor.

G. The pump mounting base shall include adjustable guide rail supports and a discharge connection with a one hundred twenty-five (125) pound standard flange. The base and the discharge piping shall be permanently mounted in place. The base plates shall be anchored in place utilizing epoxy type anchors with stainless steel studs and nuts as manufactured by HILTI Fasteners, Inc. or equal.

H. A rail system shall be provided for easy removal of the pump and motor assembly for inspection and service. The system shall not require a man to enter the wetwell to remove the pump and motor assembly. Two (2) rails of minimum two (2) inch stainless steel pipe shall be provided for each pump. The guide rails shall be positioned and supported by the pump mounting base. The guide rails shall be aligned vertically and supported at the top by attachment to the access hatch frame. One (1) intermediate guide rail support is required for each fifteen (15) feet of guide rail length for stainless steel pipe.

I. The pumps shall be equipped with sliding brackets or rail guides. To insure easy removal of the pumps, the rail guides attached to each pump shall not encircle the rails. A stainless steel lifting chain or manufacturer's pump removal system (similar to the Flygt Lift) of adequate length for the basin depth shall be provided for each pump. Each pump shall be equipped with a permanent, stationary lifting handle with a minimum clearance of 12" between the top of pump and bottom of handle.

J. The rails and the rail guides shall function to allow the complete weight of the pumping unit to be lifted on dead center without binding and stressing the pump housing. The rail system shall function to automatically align the pumping unit to the discharge connection by a simple downward movement of the pump. No twisting or angle approach will be considered acceptable. The actual sealing of the discharge interface may be of the metal-to-metal contact. No sealing gaskets will be permitted.

K. Pump warranty shall be provided by the pump manufacturer and shall warrant the units being supplied to the Owner against defects in workmanship and materials for a period of five (5) years under normal use, operation and service. The warranty shall be in printed form and apply to all similar units. A copy of the warranty statement shall be submitted with the approval drawings.

2.02 BASIN, VALVE PIT AND ACCESSORIES

A. The basin and separate valve pit are to be constructed of precast concrete meeting the requirements of ASTM C-478. Cast-in-place monolithic structures may be substituted with the prior written approval of the Owner. Minimum valve vault and wetwell diameter shall be 5'-0'. The actual arrangement of the structures are to be as shown in the approved Plans. The wetwell basin top shall be provided with a six (6) inch stainless steel vent having a downward pointing inlet and screen over the inlet opening. Under certain conditions and situations, fiberglass basins and valve vaults may be used. The use of fiberglass basins and vaults shall be at the discretion of the Engineer.

B. The basin, valve pit, flat tops, and base slabs are to be constructed of precast or cast-in-place reinforced concrete manhole sections conforming to ASTM C-478. All joints

between precast sections shall be made with an approved rubber O-Ring in accordance with ASTM C-443 and a 1/2 inch diameter non-asphaltic mastic conforming to AASHTO M-198 and Federal Specification SS-521-A. All manhole joints shall be sealed with an external joint wrap material. Material shall be equal to Bidco Butyl Wrap as manufactured by NPC or Infi-Shield® Gator Wrap by Sealing Systems, Inc. The top and bottom of the chambers shall be precast or may be poured in place concrete if approved by the Engineer.

C. The wetwell pump basin and the valve pit chamber shall be enclosed at grade level with a reinforced concrete pad rectangular in shape and extending a minimum of 1'-0' from the chambers outside dimension.

D. All concrete surfaces within the wetwell shall be coated with one of the products listed below. These products shall only be applied by personnel thoroughly familiar with handling of the coating material, and in accordance with the manufacturer's specifications, recommendations and requirements.

1. Quadex Structure Guard as manufactured by Quadex, Inc. with a minimum thickness of 80 to 100 mils.
2. Strong Seal Epoxy as manufactured by the Strong Company with a minimum thickness of 80 to 100 mils.
3. Raven Ultra High-Build Epoxy Coating, designated as Raven 405, with a minimum thickness of 80 to 100 mils.
4. All epoxies shall meet the following minimum requirements:

Flexural Strength	ASTM D790	6,000 psi
Compressive Strength	ASTM D695	8,000 psi
Tensile Strength	ASTM D638	4,000 psi
VOC	ASTM D2584	0%
Adhesion	ASTM D4541	Concrete Substrate Failure

E. The pump supplier shall provide an aluminum two (2) door access hatch frame and door assembly to be installed in the concrete basin top. This door assembly shall provide access for removal of the pumps and shall support the guide rails. The doors shall be provided with lifting handle, safety latch to hold door in the open position and a hasp suitable for padlock. The doors shall have a nonskid finish and be designed for light, medium, or heavy duty, depending on the location of the pumping station.

F. An aluminum single door access hatch frame and door assembly similar to the one described above shall be provided for use as entry to the valve pit. Minimum opening for the valve box entry shall be thirty-six (36) inch by thirty-six (36) inch.

G. A swing check valve with external swing arm and a full port (100% area) eccentric plug valve shall be installed in the valve pit in each pump's discharge piping. A minimum clearance of twelve (12) inches shall be allowed from the bottom of the valves to invert of the pit. A drain shall be provided from the valve vault to the wetwell. Drain shall have a minimum diameter of 4-inches. A duck-billed check valve shall be provided on the end of the 4-inch drain inside the wetwell. Check valve shall be model TF-1 manufactured by Tideflex, or approved equal. In addition, a 1/2” NPT tap and ball valve shall be provided on the discharge side of the pumps past the valves to facilitate pressure readings for the pump discharge.

H. All yard piping within the pump station site shall be centrifugally cast ductile iron and shall conform to ANSI Specifications A21.51 and AWWA C-151, latest revision and shall be Pressure Class 350, 300, 250, or 200 wall thickness dependent upon site conditions. All direct buried ductile iron pipe and fittings shall be poly-wrapped.

I. Force main and gravity pipe shall be DIP or PVC in accordance with Section 33 31 00.

J. All pipe and fittings inside the wetwell shall be as follows.

1. Pipe 4-inch in diameter and larger shall be ductile iron meeting the requirements of Section 33 31 00.
2. Pipe less than 4-inches in diameter shall be stainless steel.

K. Sewer line markers shall be in accordance with Section 33 31 00.

2.03 EMERGENCY BYPASS PUMP CONNECTION

A. An emergency bypass pump connection shall be provided on the force main within the pump station site. Emergency bypass pump connection shall be in accordance with the Cities Standard Sewer Details.

B. All piping for the emergency bypass pump connection shall be ductile iron meeting the requirements of Section 33 31 00 and shall conform to ANSI Specifications A21.51 and AWWA C-151, latest revision and shall be Pressure Class 350, 300, 250, or 200 wall thickness dependent upon site conditions. All direct buried ductile iron pipe and fittings shall be poly-wrapped.

2.04 GENERAL ELECTRICAL

A. A single main fusible or breaker disconnect switch of adequate size to provide power for the "control center" and its related components shall be provided by the Contractor. The disconnect switch shall be housed in a NEMA 4X stainless steel enclosure with an external operation handle capable of being locked in the ON position.

B. Provide a manual transfer switch rated for the station operating voltage and of an ampere rating equal to or larger than the main fuse or circuit breaker rating, with a NEMA 4X stainless steel enclosure with an external operation handle for On/Off/On capable of being locked in either ON position.

C. Provide a generator inlet connector wired to the manual transfer switch for Owner's connection of a portable generator. Coordinate with Owner personnel on type and size of inlet connector before ordering. Inlet shall be weather protected with cap or cover.

D. A minimum four (4) inch PVC schedule 40 wall conduit shall be provided from the wetwell basin to the control center which will allow the pump power cables, sensor cables and level controls to be pulled through without difficulty and allow the use of one (1) piece cables from the pumps and level controls to the control center. The conduit shall be sealed at the control center to avoid entrance of sewer gases into the control panel.

E. All vertical conduit and transitions from horizontal to vertical runs shall be rigid metallic conduit. Horizontal, below grade, conduit runs may be either Schedule 40 PVC or rigid metallic conduit.

2.05 CONTROL CENTER

A. The control center shall be built in a NEMA 4X white epoxy powder painted stainless steel enclosure and shall be suitable for the specified horsepower and voltage for the pumping equipment. The outer door of the panel shall be hinged dead front with provisions for locking with a padlock. Inside shall be a separate hinged panel to protect

all electrical components. H-O-A switches, run lights, circuit breakers, etc. shall be mounted such that only the faces protrude through the inside swing panel and no wiring is connected to the back side of the inside swing panel. The control center shall be located so as to provide safe access to the panel while wetwell hatch doors are opened, and shall be positioned so as not to be between the access drive and the wetwell.

B. Three-phase powered panels shall include a circuit breaker and magnetic starter with three (3) leg overload protection and manual reset for each pump. Single phase powered panels shall include Variable Frequency Drives, PWM type, for each pump, sized to operate 3-phase pumps from the single phase source.

C. Separate circuit breakers shall be supplied for:
   1. A control voltage transformer to reduce supply voltage to 120 volts.
   2. 24 volt DC power supply with battery backup, 4 hour capacity, for the float circuit and associated relays.
   3. Condensate heater.
   4. Transformer for external convenience receptacle, see Par. H. below.

D. A terminal strip shall be provided to make field connections of pump power leads, level control, seal sensor leads, heat sensor leads, and remote monitor panel interconnections.

E. The control center shall have a high water alarm built into the main enclosure. The high water alarm shall consist of a flashing alarm light with red Lexan plastic cover or red glass globe with metal guard mounted on top of the enclosure such that it is visible from all directions. An alarm horn shall be mounted on the side of the enclosure. A push to test horn and light button as well as a push to silence horn button shall be provided and mounted on the side of the enclosure.

F. The control center shall include a condensate heater to protect against condensation inside the enclosure. The heater shall be placed so as not to damage any other component or wiring in the control center.

G. The control center shall include lightning and surge protection.

H. The pump station site shall include a GFI convenience outlet with 20 amp breaker and suitable transformer, minimum 2 KVA, or power supply to provide 120 volt single phase power to the convenience outlet.

I. All component of the control center shall be available from local sources. In particular, items such as circuit breakers, overload protection, relays, starters, VFDs, etc. shall be available and in stock by local sources.

J. Pump control shall consist of a Multitrode brand “Multismart” Pump Station Manager & RTU. If the pump motors are 20 HP or larger, the Multismart shall include the Energy Monitoring & Motor Protection Module. Provide a serial cell modem compatible with the Multitrode “Pumpview” monitoring service.

K. Level sensor shall be a Multitrode probe rod, or a submersible level transducer, “LevelRat” by Keller America Inc. Contractor shall coordinate with Owner personnel for direction before ordering these items.

L. Provide three tilting float switches, to be suspended in the wetwell, with circuitry in the control center for backup level control and alarm.

M. In order to maintain unit responsibility and warranty on the pumping equipment and control center, the control center must be accepted in writing by the pump manufacturer as suitable for operation with the pumping equipment.

2.07 OPERATION AND MAINTENANCE MANUALS

A. Three (3) operation and maintenance manuals shall be submitted to the Engineer
B. Manuals shall include, at a minimum:
    1. Operation instructions;
    2. Maintenance instructions;
    3. Recommended spare parts list;
    4. Lubrication schedules;
    5. Structural diagrams;
    6. As-built wiring diagrams; and
    7. Bill of materials.

PART 3 – EXECUTION

3.01 SYSTEM OPERATION

A. On wet well level rise, the lead pump shall start at the lead pump ON elevation. With the lead pump operating, the wet well level shall lower to all pumps OFF and turn off the pump. The alternating function in the control center shall index on stopping of the pump so that the lag pump will start on the next operation.
B. If the wet well level continues to rise when lead pump is operating, the control system shall energize and start the lag pump. Both lead and lag pumps shall operate together until low level setting turns off both pumps. If level continues to rise when both pumps are operating, alarm level switch shall energize and signal the alarm.
C. If one pump should fail for any reason, the second pump shall operate. If the Multismart fails, the floats shall operate the pumps.
D. If the pumps fail to turn off for any reason after receiving the signal for all pumps OFF, a low level alarm shall signal.
E. All level controls shall be adjustable for level setting from the surface.

END OF SECTION

SECTION 40 71 00
MAGNETIC FLOW METER

PART 1 GENERAL

1.1 DESCRIPTION

A. Scope:

1. Provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish, install, calibrate, test, start-up, and place in satisfactory operation a magnetic flow meter.

1.2 REFERENCES

A. Standards referenced in this Section are:

1. ISA 5.1, Instrumentation Symbols and Identification.
2. ISA 5.4, Instrument Loop Diagrams.
3. ISA 20, Specification Forms for Process Measurement & Control Instruments, Primary Elements & Control Valves.
4. NEMA 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
5. UL 50, Safety Enclosures for Electrical Equipment, Non-Environmental Considerations.
6. UL 508A, Industrial Control Panels.
7. UL 698A, Standard for Industrial Control Panels Relating to Hazardous (Classified) Locations.
8. UL 2062, Enclosures for Use in Hazardous (Classified) Locations.

1.3 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer: Manufacturers of magnetic flow meters furnished under this Section shall be experienced producing similar equipment.
   a. Shall manufacture magnetic flow meters that are fully-developed, field-proven, and of standardized designs.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:

1. Shop Drawings:
   a. Manufacturer's product name and complete model number of devices proposed for use, including manufacturer's name and address.
   b. Data sheets and manufacturer's catalog literature.
   c. Description of construction features.
   d. Performance and operation data.
   e. Installation, mounting, and calibration details; instructions and recommendations.
   f. Service requirements.
   g. Dimensions of magnetic flow meter and details of mating flanges and upstream/downstream straight run pipe lengths required.
   h. Range of each device and calibration information.
   i. Descriptions of materials of construction and listing of NEMA ratings for equipment.
2. Product Data:

a. Manufacturer's literature, illustrations, specifications and engineering data including; dimensions, material size, weight and parts list for all components in sufficient detail to allow an item-by-item comparison with the Contract Documents.

B. Informational Submittals: Submit the following:
   1. Manufacturer's Instructions:
      a. Shipping, handling, storage, installation, and start-up instructions.
   2. Source Quality Control Submittals:
      a. Factory test reports and results.
   3. Special Procedure Submittals:
      a. Submit written procedure for system checkout to ENGINEER.
      b. Submit notification to OWNER and ENGINEER at least 14 days before readiness to begin system checkout, but not prior to CFPUA's approval of the checkout procedure. Schedule system checkout on dates agreed to by OWNER and ENGINEER.
   4. Field Quality Control Submittals:
      a. Submit the following prior to commencing system checkout and start-up.
         1) Completed calibration sheets for magnetic flow meter showing five-point calibration (0, 25, 50, 75, 100 percent of span), signed by factory- authorized serviceman.
      b. Field calibration reports
      c. Field testing reports.
   5. Supplier's Reports:
      a. Installation inspection and check-out report.
      b. Submit written report of results of each visit to Site by Supplier's service technician, including purpose and time of visit, tasks performed, and results obtained. Submit within two days of completion of visit to the Site.
   6. Qualifications Statements:
      a. Manufacturer, when required by ENGINEER.

C. Closeout Submittals: Submit the following:
   1. Operations and Maintenance Data:
      a. Include acceptable test reports, maintenance data and schedules, description of operation, wiring diagrams, and list of spare parts recommended for one year of operation with current price list.

D. Maintenance Materials Submittals: Submit the following:
   1. Spare Parts and Test Equipment:
      a. Provide replacement spool piece where bypass piping is not provided.
      b. Transmitter.
      c. Furnish a recommended list of additional spare parts and test equipment and itemized price.

1.5 STORAGE AND HANDLING

A. Prior to packaging, each manufacturer or Supplier shall securely attach tag number and instructions for proper field handling and installation to each instrument.

PART 2 PRODUCTS

2.1 MAGNETIC FLOW METERS

A. Manufacturers:

1. ABB Magmaster, plus MFF.
2. Emerson/Rosemount 8700 Series.
3. Toshiba LF 654 Series.
4. Or as approved.

B. Method of Operation: Produce a pulsed DC magnetic field that, when applied to a conductive liquid, generates an induced voltage as the liquid flows through the magnetic field. Generate voltage directly proportional to the flow of the metered liquid. Identify the ratio of flow velocity to voltage generated for all meter sizes, thereby permitting primary head and transmitter direct adaption and interchangeability without circuit modifications or system recalibration.

C. Performance Requirements:
   1. Range:
      a. Minimum Flow Rate: 180 GPM.
      b. Maximum Flow Rate: 550 GPM.
      c. Average Flow Rate: 430 GPM.
   2. Indication: Provide remote panel mounting for digital display of flowrate and totalized flow.
   3. Accuracy (with analog output):
      a. ±0.5 percent of flow rate, or better, over a range from 1 fps to 31 fps.
      b. ±0.005 fps, or better, at flows below 1 fps.
      c. Accuracy unaffected by changes in fluid velocity, density, pressure, temperature or conductivity (above minimum conductivity limits).
      d. System accuracy shall be proven by submittal of flow test curves of the actual meters being furnished.
         1) Test curves shall show a minimum of ten equally spaced flow points. Tests shall be performed using water and a weight or volume tank. A "master meter" used as a reference standard is not acceptable.
   4. Repeatability: ±0.15 percent of flow rate, or ±0.0015 fps, whichever is greater.
   5. Drift: Complete zero stability.
   6. Minimum Fluid Conductivity Limit: Five microsiemens per centimeter or less.
   7. Minimum Pre-amp Input Impedance: 1012 ohms.
   8. Power:
      a. 120 VAC ± 10 percent, 60 Hz, ±3 Hz power supply.
      b. Power Consumption shall not exceed 50 watts for flowtube and transmitter combined.
   9. Output:
      a. 4 to 20 mADC, direct acting and isolated, into 0 to 1000 ohms.
      b. High accuracy, field adjustable scaled pulse output (0.1 to 10 Hz or greater) to drive local totalizer.
   10. Operating Temperature: Suitable for operation with process fluid temperature from 0° to 140°F.
   11. Pressure Rating: Greater than or equal to 125 psi or test pressure specified in Section 33 05 05.31, Hydrostatic Testing, for appropriate piping system.

2.2 FLOW TUBE

A. Size: 6 inches.

B. Flow Tube Material: Type 304 stainless steel.

C. Housing:
   1. Material: Carbon steel with corrosion-resistant polyurethane paint finish.

2. Pressure Rating: 150 psi minimum.

D. Liner Material: Neoprene, Polyurethane, or Teflon (PTFE).

E. Electrodes Design and Material: Type 316L stainless steel or Hastelloy C.

F. Minimum Conductivity: 5 uS/cm (20 uS/cm for demineralized water).

G. Grounding Rings:

1. Provide each primary head with two grounding rings installed on each end of the primary head.

H. Accidental Submergence Ratings: IP67; accidental submergence to 30 feet for up to 48 hours.

I. Zero Stability: Provide a zero stability feature as an inherent characteristic of the flowmeter system to avoid zero drift.

2.3 FLOW TRANSMITTER

A. Description: Microprocessor-based transmitter unit requiring no calibration over its expected life, under normal use.

B. Power Supply: Operate meters from 120 VAC (±1 percent) at 60 Hz (±5 percent). Factory-wire and assembly primary head and transmitter components, ready for external field connections. Provide required lengths of shielded signal cable for connecting the primary head and transmitter for the raceway route as detailed.

C. Housing: NEMA 4X enclosure; remotely mounted as indicated in the Schedule at the end of this Section.

D. Accuracy:

1. ±1.0 percent of flow rate or better for flows above 1 foot/second.
2. ±0.5 percent of flow rate or better for flows above 2 foot/second.

E. Low Flow Cutoff: Adjustable low flow cutoff set point. Output shall be driven to zero (4 mAdc) when flow falls below low flow cutoff point.

F. Empty Pipe Detection: Drive output to zero (4 mAdc) when empty pipe is detected.

G. Totalization: Provide totalization of flow for direction of measured flow.

H. Temperature Range: -18 to 60 degrees C.

I. Outputs:

1. 4-20 mA 0 to 1000 ohms, providing 50 megohms of isolation from ground, and isolated from the transmitter's power supply. Minimum of 250 ohms is required for HART communicator.
2. Pulse output with minimum time duration of 0.5 seconds.

2.4 ACCESSORIES

A. Mounting:

1. Provide complete Type 316 stainless steel mounting hardware for all transmitter and driver electronics locally mounted and remotely mounted from the flow tubes.
2. Type of mounting (wall, support frame or pipe stand) as required inside vault and remote enclosure.

B. Shielded cable assemblies of sufficient length for connection between flowtube and transmitter electronics.

C. Type 316 stainless steel grounding rings for flowtubes.

D. Type 316 stainless steel grounding straps.

2.5 AC POWER ON-OFF SWITCH

A. Function: Local power on-off selector switch for magnetic flowmeters. All four-wire

transmitters shall be provided with a 120 VAC power on-off selector switch located at the instrument.

B. Construction Features:
   1. Selector Switch: NEMA 4X rated, SPDT.
   2. Enclosure: NEMA 4X rated, non-metallic.
   3. Products and Manufacturers: Provide one of the following:
      a. Allen Bradley 800H rosite glass polyester enclosure.
      b. Or Pre-Approved equal.

2.6 SOURCE QUALITY CONTROL

A. Provide shop inspection and testing of meters.
B. Certificate of Compliance:
   1. If manufacturer is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at manufacturer's facility conforms to Contract Documents.
   2. Specified shop tests are not required for Work performed by approved manufacturer.

PART 3 EXECUTION

3.1 INSTALLATION

A. To create optimum flow conditions, install meter with the manufacturer's recommended straight length of pipe on the inlet side and outlet side of meter. Consult with specific meter manufacturer for optimum installation instructions.
B. Installation in accordance with manufacturer's instructions.
C. Grounding:
   1. If the magnetic flowmeter does not provide a continuous flange-to-flange conductive path outside the area of the magnetic field, install ground rings and connect to each other with a No. 6 AWG ground wire.
   2. Ground magnetic flowmeter to the structure ground with a No. 6 AWG ground wire.
D. Electrical work for underground and potential flooding areas:
   1. Install drip leg in the conduit system and slope conduit downward away from magnetic flowmeter. Provide drain fitting in low part of conduit system to drain conduit system.
   2. Seal conduit entrance into magnetic flowmeter with RTV silicone sealant.
   3. Follow manufacturer's instruction as required to maintain IP67 or IP68 rating.
E. Support piping adjacent to meter such that no weight is carried on meter casings

3.2 CALIBRATION

A. Factory-set full-scale output to maximum flow rates.
B. Calibrate pulse output to provide a pulse every 1,000 gallons.

3.3 MANUFACTURER'S START-UP SERVICES

A. Manufacturer must certify that meter is properly designed and installed.
B. Provide a minimum of 8 hours of service.

END OF SECTION