

CONTRACT  
AND  
SPECIFICATION DOCUMENTS

**LAKE OUACHITA WATER SUPPLY PROJECT**

**CONTRACT 1**

**RAW WATER SUPPLY TRANSMISSION PIPELINE PROJECT  
BLAKELY MOUNTAIN DAM ROAD  
TO OUACHITA WATER TREATMENT PLANT**



**CITY OF HOT SPRINGS  
UTILITIES DEPARTMENT  
HOT SPRINGS, ARKANSAS**



June 2020

Crist Job 1926



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CRIST ENGINEERS, INC.

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# INVITATION TO BID (ITB)

## TERMS AND CONDITIONS OF BIDDING

*Bidders are responsible for reading and complying with the following Terms and Conditions of Bidding and preparing bid responses accordingly.*

**1.0 DEFINITIONS:** The following words, terms and phrases, when used in this document, shall have the following meaning.

*Bidder* means the individual, firm, partnership or corporation offering a bid in response to this invitation to bid. The terms vendor and seller are synonymous with vendor or seller.

*City* means the City of Hot Springs, Arkansas, a municipal corporation and its authorized agents. The terms owner or buyer are synonymous with City.

*Contractor* means the individual, firm, partnership or corporation to whom a contract or purchase order is awarded as a result of this invitation to bid.

*ITB* means invitation to bid and includes the entire bid packet issued by the City for this procurement.

**2.0 BID SUBMISSION REQUIREMENTS:** All bids must be received in the City Purchasing Office on or before the bid opening date and time, regardless of delivery method. Please advise us immediately if you wish to submit a quotation but are unable to meet this requirement. Requests for extensions to the closing date, although not encouraged, will be considered with the proper justification and, if requested, in writing at least one week prior to the established closing date. A NON-RESPONSE BY THE CITY OF HOT SPRINGS TO A REQUESTED BID EXTENSION WILL INDICATE THAT THE REQUEST HAS BEEN DENIED. In this regard, the City reserves the right to postpone bid opening for cause or convenience.

Bids shall be valid for a period of ninety (90) days after the bid opening date of this ITB.

In order to be considered responsive the Bidder must submit a base bid signed by an authorized official of the Bidder and consisting of the following properly executed forms:

- Bid Form
- Statement of Compliance
- Statement of Insurance Requirement Compliance

**3.0 SEALED BID INSTRUCTIONS:** Bids must be sealed in a bid container (envelope). It is mandatory that bidders identify the envelope containing the bid as such and show bid number and bid item. THIS APPLIES TO EXPRESS DELIVERY TYPE ENVELOPES, AS WELL. When Bidder's proposal consists of more than one envelope or box, Bidders must mark on the mailing label how many envelopes or boxes are contained in their bids. For example, box 1 of 6. Bidders shall also identify the other boxes by the number of boxes and the City's ITB number as found on the Invitation to Bid Cover Sheet. For example, box 2 of 6 for ITB XXXXX.

Sealed bids will be accepted until the stated time (Central Time) on the bid opening date. Late bids will not be considered. Facsimile, electronic, telegraphic or telephone bids are not acceptable.

**4.0 STATEMENT OF COMPLIANCE:** Bidder shall review all attachments and instructions with care. Failure to make complete review of all attachments and notes will not be deemed just cause for claims or errors.

Any EXCEPTIONS to specifications, individual data sheets, drawings, terms and conditions or any other documents forming part of this ITB must be clearly defined and set forth in Bidder's response. To be considered for an award, the Bidder must certify to either A or B below. Include one of the following certifications in the quotation (form provided):

- A. Our bid is in exact accordance with the specifications, drawings, terms and conditions and other requirements of this ITB with NO EXCEPTIONS.

\*\*\*OR\*\*\*

- B. Our bid is in exact accordance with the specifications, drawings, terms and conditions and other requirements of this ITB with the EXCEPTIONS listed below.

**5.0 GOVERNING TERMS AND CONDITIONS:** Bidder's quotation shall be submitted subject to the City's Terms and Conditions of Purchase (Contract Provisions). Bidder's terms and conditions of sale will not be considered. Bidder shall be deemed to have accepted the City's Terms and Conditions of Purchase unless Bidder has noted specific exceptions thereto in Bidder's proposal. Any exceptions not acceptable to the City shall be cause for rejection of the Bidder's proposal.

**6.0 COMMUNICATIONS:** Please direct your bid and all communications to:

Mary Burks, Purchasing Office  
City of Hot Springs  
517 Airport Road, Ste C  
Hot Springs, AR 71913

or P. O. Box 6300  
Hot Springs, AR 71902

Phone: (501) 321-6830

Fax: (501) 321-6833

**7.0 PRICING:** Prices must be submitted on a firm, fixed price basis. (Contracts for certain goods and services that may contain an escalation clause are noted on the Statement of Insurance Requirements.) Unit prices are to be extended and a total price shown on all bids. If unit prices and extensions thereof do not coincide, the City will assume the price most favorable to the City to be the correct price. Bids not prepared properly may not be considered for evaluation. If Bidder wishes to quote lower unit prices for the award of groups of items, Bidder may do so as an alternate to Bidder's base bid. If applicable, Bidder is to include impact to pricing for quantity additions and/or deletions.

**8.0 TAX INFORMATION:** Vendors in the State of Arkansas but outside Garland County must show the sales tax rate in the jurisdiction of their location. Vendors outside the State of Arkansas must show, if they have one, their Arkansas sales tax permit number. Vendors outside Arkansas without an Arkansas sales tax permit must so indicate.

**9.0 DELIVERY CHARGES:** Delivery to be FOB Hot Springs Freight Prepaid (unless indicated differently). Vendor to show freight charges (if not included in price) on bid form as part of bid. Freight cannot be added after the bid is opened. Earliest delivery time that can be accomplished should be shown as delivery time may be a factor in awarding bid.

**10.0 PRODUCTS** All products offered, unless otherwise specified, must be new and of the latest design and production. It must be complete, ready to use or operate with all the normal and usual features and capabilities.

If an equal is acceptable relative to a named brand and model, Bidders proposing an equal must provide documentation of support that their product is equal. Equality must be in design, size, appearance, capability, performance, endurance and lifetime.

The City shall consider the vendor to have not completed his obligations until all literature (operators manual, instructions, service manuals, parts manuals, owner manual) that is normally provided with the product or has been asked for in the ITB has been received.

**11.0 BID SPECIFICATIONS:** The specifications included hereinafter are to be interpreted as meaning the minimum acceptable by the City. The use of a manufacturer's or vendor's name, trade name, brand name, catalog number or other identifying reference or description is for the purpose of describing and establishing general quality levels only unless otherwise noted in the specifications. Such references are not intended to be restrictive. Bids will be considered for any product which meets or exceeds the quality described by the specifications.

**12.0 INSURANCE:** Insurance requirements of Bidders, if any, will be shown on the Statement of Insurance Requirements and Compliance. Certificates for those coverages checked must be provided with bid response.

**13.0 ALTERNATE BIDS:** The Bidder's base bid shall conform in all respects to applicable specifications, drawings, terms and conditions or any other documents forming part of this ITB and shall include all costs to Bidder for supply of material and/or equipment as specified.

The Bidder's base bid must be in accordance with all notes, terms and conditions and attachments to this ITB. At Bidder's option, the Bidder may supplement the basic quotation with an alternative quotation providing the following conditions are met:

- significant process, price or delivery advantage is indicated, or
- a superior product is offered at a justifiably higher price, or a product of equal quality at a lower price.

Alternative bids must state all deviations from the specifications. Alternative bids may or may not be considered by the City.

**14.0 INSPECTION & TESTING:** The City reserves the right to test or inspect proposed bid items in order to determine the lowest responsive bidder.

**15.0 WARRANTIES:** Guarantees and warranties (if any) should be attached as a part of the bid as they may be a consideration in determining the lowest responsible bidder and in awarding a bid or contract.

**16.0 QUESTIONS AND CLARIFICATIONS:** Any questions or requests for clarification concerning the bid or bid specifications may be made in person, by phone, by electronic mail, or in writing to the City of Hot Springs, Purchasing Department, P. O. Box 6300, 517 Airport Road, Ste C, Hot Springs, AR 71902, (501) 321-6830. Any such questions or requests must be submitted not less than 5 working days prior to the bid opening date. Should the question(s) pose substantial issues, the City may ask that they be submitted in writing. Any such inquiry that results in a change in the bid or the specifications, such change will be put in writing, time permitting, and provided to all those who have received the bid request. This procedure shall be followed in order to ensure competitive fairness by providing all prospective bidders with

the same information. Bidders should rely on written information (as opposed to verbal information) in preparing bids.

**17.0 IDENTICAL BIDS:** In the event of two or more identical low bids, the contract may be awarded arbitrarily or for any reason to any of such bidders or split in any proportion between the Bidders at the discretion of the City.

**18.0 AMBIGUITY IN BID:** Any ambiguity in any bid as the result of omission, error, lack of clarity or noncompliance by the Bidder with specifications, instructions and all conditions of bidding shall be construed in the light most favorable to the City. An error in the extension of unit prices (unit price times quantity) may be corrected by the City utilizing a Aunit prices govern@ standard.

**19.0 ADDITIONAL INFORMATION:** All Bidders must be prepared to, at the request of the City, furnish, within ten working days of the request, additional information as may be sought so that the City can determine responsiveness.

**20.0 TERMS OF PAYMENT:** Bidder shall clearly state the proposed terms of payment, if different from the City's preference. The City's preferred term of payment is Net 30 days. Discount terms will be accepted. Progress payments will be considered if tied to specific milestones.

**21.0 BID HANDLING PROCEDURE:** Bids will be opened and the dollar amount read at the stated time. Bidders are welcome to attend the bid opening but such attendance is not required. All bid openings are open to the public. Bid tabulations and bid documents are available for public viewing and inspection once the City has prepared such tabulations. A bid award decision will not be made at the bid opening. The City staff will take the bids under consideration and evaluation and prepare a recommendation for presentation to the Board of Directors, if required. In this regard, bid awards exceeding \$60,000 must be approved by the Board. Bids under \$60,000 may be awarded by the Purchasing Office. Once a bid award is approved, the City will issue a purchase order. The City may not formally notify unsuccessful bidders.

**22.0 BID AWARD AND PURCHASE ORDER:** The City will award a bid based on the lowest responsive, responsible bid considering any other pertinent factors such as freight, delivery, transportation, etc., that might affect overall City cost. Upon award of a bid, the City will issue its purchase order to the successful bidder. This ITB and the ATerms and Conditions of Purchase@ contained in this ITB (if included) will be considered a part of the purchase order. The purchase order shall be a binding agreement of supplier and buyer upon supplier signing and returning an acceptance copy of the purchase order without exception, or commencing performance of this purchase order, whichever occurs first.

**23.0 BIDDER INDEBTEDNESS:** Acceptance by the successful Bidder of an award from this bid request indicates that the successful Bidder is in no way currently indebted to the City, Garland County or State of Arkansas and is in compliance with any and all applicable laws and ordinances thereof. Indebtedness to any of the above may be basis for no award and/or cancellation of any award. The successful Bidder will be required to obtain a City of Hot Springs business license.

**24.0 PUBLIC INFORMATION:** All bids, documents, correspondence and material submitted to the City is considered public information and, as such, is subject to viewing and copying by the general public pursuant to the State of Arkansas Freedom of Information Act.

**25.0 PROTEST PROCEDURE:** Protest of bidding procedures, specifications or bid/contract awards shall be made in accordance with the following procedures. Such protests may only be initiated by an authorized representative of a person, firm or corporation who has a direct economic interest in the particular procurement in question.

1. **Protest Filing.** Any protest must be filed with the purchasing agent at the address specified in the bid specifications or quotation request for the receipt of bids or quotes. The protest must be in writing and describe in full detail the basis for the protest and the particular bid or quote in controversy. In order to meet the time frames enumerated hereinafter, a protest may be received in person, by U.S. mail, facsimile or electronic means; provided, however, that facsimile or electronic filing shall be followed with documents bearing original signatures as soon as practical thereafter.
2. **Bid Specifications (Pre-Award).** Protest of bid specifications or bidding procedures must be received by the purchasing office no later than five (5) business days prior to the scheduled bid opening or quotation closure period. Protests received the day of bid opening or quotation closure will not be considered.
3. **Award.** Protests of procurement decisions shall be filed by the protestant within five (5) business days of the award decision. Upon a determination of vendor selection from the bid process, a "Notice of Intent to Award" will be posted on the City's bid website. The purchasing agent, in consultation with the City Attorney and City Manager, shall have authority to settle and resolve the protest. If the protest is not resolved by mutual agreement, the City Manager or his designee shall issue a decision in writing to the protestant within ten (10) business days after receipt of the protest stating the reasons for the action taken.

4. **Post award protests and protest timelines.** All post award protests shall be referred to the City Manager for action. Furthermore, the City Manager, at his/her discretion, may extend the protest timelines.
5. **Stay of procurement award.** In the event of a timely protest pursuant to this section, the city shall not proceed with the solicitation or procurement until the protest is resolved by mutual agreement, the City Manager or his designee issues a final decision, the board of directors approves the procurement in controversy or a court decision is rendered if the controversy is filed in court. Provided, however, that the city may proceed with a procurement in controversy if a written determination is made by the purchasing agent, in consultation with the city attorney, that the items to be purchased are urgently required, the delivery or performance will be unduly delayed by failure to make the award promptly, or failure to make award will otherwise cause undue harm to the city.
6. **Award notification.** Notification of procurement decisions shall be available as soon as such decisions are final. Bid or contract award recommendations to be considered by the board of directors shall, whenever possible, also be available in the office of the city clerk seven (7) calendar days prior to the board of directors meeting at which the bid or contract award is scheduled for consideration. It is the responsibility of all bidders to make inquiry of the purchasing office regarding procurement decisions for the purpose of rendering protests.
7. **Federal grants.** Protest of any procurement funded in whole or in part with federal grant funds may also be filed subsequently with the funding agency. The Department with primary oversight responsible for a particular federal grant shall ensure that federal agency bid protest procedures, if any, are made available and shall provide assistance in the administration of such agency protest procedures.

**26.0 BIDDER TERMS:** Other terms or conditions prepared by Bidder may or may not be considered by the City in awarding the bid. The City reserves the right to accept or reject any Bidder's proposed terms and conditions or any part thereof.

**27.0 DISADVANTAGED BUSINESS ENTERPRISES:** The City of Hot Springs encourages the participation of Disadvantaged Business Enterprises, Minority Owned Business Enterprises, and Women Owned Business Enterprises (DBE/MBE/WBE) in its procurement process and seeks bids from such entities. Certification is necessary to be formally recognized as a DBE/MBE/WBE.

**28.0 COLLUSION:** Submission of a signed bid shall constitute certification by the Bidder that their bid is being submitted without collusion or agreement with any competitor.

**29.0 FEDERALLY REQUIRED CLAUSES AND CERTIFICATIONS:** Bids for goods and services to be purchased with federal funding may require the submission of additional federally required clauses and certifications. If required, such certifications will be included in the bid forms sections of this ITB and so noted on the Statement of Compliance.

**30.0 THE CITY'S RIGHTS:** The City reserves the right to reject any or all bids, to waive minor irregularities and/or formalities as determined by the City, to award the bid by item or groups of items or in total, and/or to award the bid in the manner most advantageous to the City. The City reserves the right to, at its discretion, purchase additional units, within a reasonable time, at the bid unit price, upon concurrence of the bidder.

**31.0 ANTI-DISCRIMINATION:** The contracting party shall not discriminate on the basis of race, sex, color, national origin, gender, sexual orientation, gender identity, or disability.



# STATEMENT OF COMPLIANCE

Bidder shall read all attachments and instructions carefully. Failure to completely become familiar with all attachments and notes will not be deemed just cause for claims or errors.

Any EXCEPTIONS to specifications, individual data sheets, drawings, terms and conditions or any other documents forming part of this Invitation to Bid must be clearly defined and set forth in Bidder's response on this form. To be considered for an award, the Bidder must certify to either A or B below and explain exceptions, if any, on this form (and attachments, if needed).

☐ A. "This bid is in exact accordance with the specifications, drawings, terms and conditions and other requirements of this Invitation to Bid with NO EXCEPTIONS."

\*\*\* OR \*\*\*

☐ B. "This bid is in exact accordance with the specifications, drawings terms and conditions and other requirements of this Invitation to Bid with the EXCEPTIONS listed below:" (List the number of or restate the specification excepted and in detail explain the exception. Add additional pages if necessary.)

Specification Number	DESCRIPTION (MARK EITHER "A" OR "B" ABOVE. IF "B" SHOW HERE AND/OR ATTACH A SHEET DETAILING EXCEPTIONS)

\_\_\_\_\_  
Bidder's Signature

\_\_\_\_\_  
Bidder's Trade Name (Company, Individual, etc.)

\_\_\_\_\_  
Date Signed

## STATEMENT OF INSURANCE REQUIREMENTS

Certificates for those coverages checked below must be submitted by the bidder with the bid forms. (If there are no checks in the left column, no insurance requirements apply.)

- ☒ General Liability (Minimum Amt. \$2,000,000)
- ☒ Product Liability (Minimum Amt. \$ Contract Amount)
- ☒ Vehicle Liability (Minimum Amt. per law)
- ☒ Workers Compensation
- ☒ Builders Risk (Minimum Amt. \$ Contract Amount)
- ☒ Personal Injury (Minimum Amt. \$1,000,000)

In addition to the above certification, bidders are hereby notified that the following additional items apply to this procurement as noted.

- ☐ This procurement is subject to an escalation clause.
- ☒ This procurement is **not** subject to an escalation clause.
- ☐ This procurement is subject to federally required certifications/contract clauses.
- ☒ This procurement is **not** subject to federally required certifications/contract clauses.
- ☒ Arkansas Business License: City \_\_\_\_\_ No. \_\_\_\_\_

\_\_\_\_\_  
Bidder's Signature

\_\_\_\_\_  
Bidder's Trade Name (Company, Individual, etc.)

\_\_\_\_\_  
Date Signed

ADVERTISEMENT FOR BIDS

**CITY OF HOT SPRINGS  
RAW WATER SUPPLY TRANSMISSION PIPELINE CONTRACT 1  
HOT SPRINGS, ARKANSAS**

Sealed Bids for **Raw Water Supply Transmission Pipeline, Contract 1: Blakely Mountain Dam Road To Ouachita Water Treatment Plant** will be received by the **City of Hot Springs** at the Hot Springs City Hall, 133 Convention Boulevard, Hot Springs, Arkansas 71901 until **2:00 PM CT, July 23rd, 2020**, at which time the Bids received will be publicly opened and read. Bids will be received prior to 1:00 PM, CT on July 23, 2020 at 517 Airport Road, Suite C, Hot Springs, Arkansas 71913. After 1:00 PM CT, July 23, 2020 they are to be hand delivered to Mary Burks at 133 Convention Blvd, Hot Springs, AR. The Project generally consists of constructing approximately 10,000 LF of 48-inch Raw Water Line and 1500 LF of 30-inch Raw Water Line, and appurtenances.

Bids may be delivered by any means available **except** electronically (fax or email). Fax/email bids will not be considered. It is the bidder's responsibility to see that their bid is in the City Purchasing Office by the time stated above. Those not received by that time will not be considered. A performance and payment bond written by a responsible surety company authorized to do business in Arkansas, in the amount of the contract, will be required on all contracts in excess of \$20,000. Bid security in the form of a **cashier's check only** (relative to other types of checks), drawn on a bank or trust company doing business in Arkansas, **or a corporate bid bond** in favor of the City of Hot Springs and in the amount of five percent (5%) of the bid amount is **required on bids exceeding \$20,000** and must be submitted with the bid. For bids over \$20,000, the contractor must be properly licensed for this activity prior to submitting a bid and provide proof thereof (show State contractor's license no.) with bid. Arkansas prevailing Wage Laws will apply as appropriate. Bids may not be withdrawn within 60 days of opening. Bidders must provide with their bid a certificate regarding *Equal Employment Opportunity*, as applicable. The City encourages the participation of disadvantaged, minority and woman owned business enterprises in the procurement of goods, services, and construction, either as contractor or subcontractor. The City reserves the right to reject any or all bids, to waive any formalities and to, in the opinion of the City, accept the bid that is in the City's best interest.

A mandatory pre-bid conference will be held at the Ouachita Water Treatment Plant, 860 Cozy Acres Road, Mountain Pine, AR 71956, on July 9th, 2020 at 2:00 p.m.

Bids will be received for a single prime Contract. Bids shall be on a unit price basis. The Issuing Office for the Bidding Documents is:

**Crist Engineers, Inc.  
205 Executive Court  
Little Rock, AR 72205  
(501) 664-1552**

Prospective Bidders may examine the Bidding Documents at 517 Airport Road, Suite C, Hot Springs, Arkansas 71913, on Mondays through Fridays between the hours of 8:00 a.m. and 4:30 p.m.; and the Issuing Office on Mondays through Fridays between the hours of 8:00 a.m. and 5:00 p.m.

Printed copies of the Bidding Documents may be obtained from the Issuing Office, during the hours indicated above, upon payment of \$200.00 for each set. The date that the Bidding Documents are transmitted by the Issuing Office will be considered the Bidder's date of receipt of the Bidding Documents. Partial sets of Bidding Documents will not be available from the Issuing Office. Neither Owner nor Engineer will be responsible for full or partial sets of Bidding Documents, including Addenda if any, obtained from sources other than the Issuing Office. Bid security shall be furnished in accordance with the Instructions to Bidders.

Owner:       **City of Hot Springs, Arkansas**

**DOCUMENT 002113**  
**INSTRUCTIONS TO BIDDERS**  
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## ARTICLE 1 – DEFINED TERMS

- 1.01 Terms used in these Instructions to Bidders have the meanings indicated in the General Conditions and Supplementary Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below:

A. *Issuing Office* – The office from which the Bidding Documents are to be issued.

## ARTICLE 2 – COPIES OF BIDDING DOCUMENTS

- 2.01 Complete sets of the Bidding Documents may be obtained from the Issuing Office in the number and format stated in the advertisement or invitation to bid.
- 2.02 Complete sets of Bidding Documents shall be used in preparing Bids; neither Owner nor Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.
- 2.03 Owner and Engineer, in making copies of Bidding Documents available on the above terms, do so only for the purpose of obtaining Bids for the Work and do not authorize or confer a license for any other use.

### 2.04 **ELECTRONIC MEDIA OF PLANS AND SPECIFICATIONS**

**Engineer will provide a digital version (PDF) of the bidding documents for your convenience and use in the preparation of the Bid.**

**Engineer makes no representation as to the compatibility of these files with your hardware or your software.**

**Data contained on these electronic files is part of Engineer's instruments of service and shall not be used by the Bidder or anyone receiving this data through or from the Bidder for any purpose other than as a convenience in the preparation of the Bid. Any other use or reuse by the Bidder or others, will be at the Bidder's sole risk and without liability or legal exposure to Engineer. The Bidder agrees upon execution and submission of the Bid Form to make no claim and hereby waive, to the fullest extent permitted by law, any claim or cause of action of any nature against Crist Engineers, Inc. (CEI), its officers, directors, employees, agents or subconsultants which may arise out of or in connection with your use of the electronic files.**

**Furthermore, you shall, to the fullest extent permitted by law, indemnify and hold harmless CEI from all claims, damages, losses and expenses, including attorney's fees arising out of or resulting from your use of these electronic files.**

**These electronic files will not be considered as contract documents. Hard copies distributed to the prospective bidder govern. Significant differences may exist between these electronic files and corresponding hard copy contract documents. Engineer makes no representation regarding the accuracy or completeness of the electronic files you receive. In the event that a conflict arises between the signed contract documents prepared by**

Engineers and electronic files, the signed hard copy contract documents shall govern. You are responsible for determining if any conflict exists. By the Bidder's use of these electronic files, the Bidder is not relieved of the duty to fully comply with the contract documents.

Because of the potential that the information presented on the electronic files can be modified, unintentionally or otherwise, Engineer reserves the right to remove all indicia of its ownership and/or involvement from each electronic display.

Under no circumstances shall delivery of the digital electronic files for use by the Bidder be deemed a sale by CEI and CEI makes no warranties, either express or implied, of merchantability and fitness for any particular purpose. In no event shall CEI be liable for any loss of profit or any consequential damages.

### ARTICLE 3 – QUALIFICATIONS OF BIDDERS

3.01 To demonstrate Bidder's qualifications to perform the Work, the Contractor is required to submit a statement of qualifications and supporting information along with the bid form. The Bidder should follow instructions included in Article 13 – Preparation of Bid. Bidders must include the following information in the Statement of Qualifications:

- A. Responsiveness – Only responsive applications will be considered and evaluated. A responsive application is that which is completed according to the instructions, includes all required attachments, and requested information, and contains complete information regarding the following:
  - Attachment A: General Bidder Information
  - Attachment B: Supplemental Bidder Information
  - Attachment C: Details of Past Projects
  - Attachment D: Bidder Affidavit
  - All Additional information as needed to provide a complete response.
- B. Debarment Status – By submitting a bid, the Bidder certifies that neither it nor any affiliated entity is currently debarred from submitting bids or has otherwise agreed not to submit bids on contracts with any government or business entity. If the Bidder experiences a material change in its debarment status after the bid is submitted and prior to the award of the contract for the project, the applicant shall notify the City of the change in writing at the time the change occurs or as soon thereafter as is reasonably practicable. If at any time during the evaluation process the Bidder is debarred as described above, it will be considered grounds for automatic disqualification.

- C. Contractor's License – The Bidder must provide a copy of their Arkansas Contractors License applicable for the contract for which it is seeking qualification, or provide documentation indicating that they are able to acquire one in a timely fashion consistent with the project schedule. Licensure requirements for bidder: Limitation: Unlimited, Classification: Municipal and Utility Construction (MU).
- D. Bonding Capacity/Statement – Bidders must provide a signed statement from its Surety stating that, based on present circumstances, the surety will be willing to provide bid, performance and payment bonds for the Bidder in connection with the Project. See attachment E for minimum requirements.
- E. Large Diameter Pressure Pipeline Experience – The minimum experience requirement for qualification is successful completion of at least \$15 million cumulative worth of large diameter pressure pipeline projects in the last ten (10) years. Large diameter pipeline being defined as 24-inch (or larger) diameter and materials of construction including welded steel or ductile iron pipe.
- F. Cathodic Protection – Prospective bidders shall include minimum of three cathodic protection installations for large diameter ferrous material pipe in the last ten (10) years as a requirement for qualification. If prospective bidder intends to utilize a subcontractor for cathodic protection installation, prospective bidder shall identify the proposed subcontractor and include subcontractor's experience for cathodic protection installation pursuant to the requirements identified in this paragraph.
- G. Steel Pipe Welding – For large diameter pipeline experience provided in Item E above, prospective bidders shall indicate if welding of steel pipe was self-performed or subcontracted as a requirement for qualification. If prospective bidder intends to utilize a subcontractor for steel pipe welding, prospective bidder shall identify the proposed subcontractor and include subcontractor's experience for steel pipe welding pursuant to the requirements identified in this paragraph.
- H. Quality Control Program – The Bidder must provide documentation regarding construction quality control program.
- I. Administration and Management Plan – The application must provide a description of their organization's administration and management plan.
- J. The Bidder shall provide a list of all owners, officers, partners, or individuals authorized to represent or conduct business for or sign legal documents for the firm.
- K. Subcontractor and Supplier qualification information; coordinate with provisions of Article 12 of these Instructions, "Subcontractors, Suppliers, and Others."



- 3.02 In addition to the requirements above, the Owner may request additional information from the Bidder. Within **ten (10)** days of Owner's request, Bidder shall submit the requested information.
- 3.03 A Bidder's failure to submit required qualification information within the times indicated may disqualify Bidder from receiving an award of the Contract.
- 3.04 No requirement in this Article 3 to submit information will prejudice the right of Owner to seek additional pertinent information regarding Bidder's qualifications.
- 3.05 Bidder is advised to carefully review those portions of the Bid Form requiring Bidder's representations and certifications.

#### **ARTICLE 4 – SITE AND OTHER AREAS; EXISTING SITE CONDITIONS; EXAMINATION OF SITE; OWNER'S SAFETY PROGRAM; OTHER WORK AT THE SITE**

##### **4.01 *Site and Other Areas***

- A. The Site is identified in the Bidding Documents. By definition, the Site includes rights-of-way, easements, and other lands furnished by Owner for the use of the Contractor. Any additional lands required for temporary construction facilities, construction equipment, or storage of materials and equipment, and any access needed for such additional lands, are to be obtained and paid for by Contractor.

##### **4.02 *Existing Site Conditions***

###### **A. Subsurface and Physical Conditions; Hazardous Environmental Conditions**

###### **1. The Supplementary Conditions identify:**

- a. those reports known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site.
- b. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities).
- c. reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site.
- d. Technical Data contained in such reports and drawings.

- 2. Owner will make copies of reports and drawings referenced above available to any Bidder on request. These reports and drawings are not part of the Contract Documents, but the Technical Data contained therein upon whose accuracy Bidder is entitled to rely, as provided in the General Conditions, has been identified and established in the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any Technical Data or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

3. If the Supplementary Conditions do not identify Technical Data, the default definition of Technical Data set forth in Article 1 of the General Conditions will apply.
- B. Underground Facilities: Information and data shown or indicated in the Bidding Documents with respect to existing Underground Facilities at or contiguous to the Site are set forth in the Contract Documents and are based upon information and data furnished to Owner and Engineer by owners of such Underground Facilities, including Owner, or others.
- C. Adequacy of Data: Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to subsurface conditions, other physical conditions, and Underground Facilities, and possible changes in the Bidding Documents due to differing or unanticipated subsurface or physical conditions appear in Paragraphs 5.03, 5.04, and 5.05 of the General Conditions. Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to a Hazardous Environmental Condition at the Site, if any, and possible changes in the Contract Documents due to any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work, appear in Paragraph 5.06 of the General Conditions.

#### 4.03 *Site Visit and Testing by Bidders*

- A. Bidder shall conduct the required Site visit during normal working hours and shall not disturb any ongoing operations at the Site.
- B. Bidder is not required to conduct any subsurface testing, or exhaustive investigations of Site conditions. Bidder is not to disturb any of the surface in the project limits.
- C. On request, and to the extent Owner has control over the Site, and schedule permitting, the Owner will provide Bidder access to the Site to conduct such additional examinations, investigations, explorations, tests, and studies as Bidder deems necessary for preparing and submitting a successful Bid. Owner will not have any obligation to grant such access if doing so is not practical because of existing operations, security or safety concerns, or restraints on Owner's authority regarding the Site.
- D. Bidder shall comply with all applicable Laws and Regulations regarding excavation and location of utilities, obtain all permits, and comply with all terms and conditions established by Owner or by property owners or other entities controlling the Site with respect to schedule, access, existing operations, security, liability insurance, and applicable safety programs.
- E. Bidder shall fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies.

#### 4.04 *Owner's Safety Program*

- A. Site visits and work at the Site may be governed by an Owner safety program. As the General Conditions indicate, if an Owner safety program exists, it will be noted in the Supplementary Conditions.

#### 4.05 *Other Work at the Site*

- A. Reference is made to Article 8 of the Supplementary Conditions for the identification of the general nature of other work of which Owner is aware (if any) that is to be performed at the Site by Owner or others (such as utilities and other prime contractors) and relates to the Work contemplated by these Bidding Documents. If Owner is party to a written contract for such other work, then on request, Owner will provide to each Bidder access to examine such contracts (other than portions thereof related to price and other confidential matters), if any.

### **ARTICLE 5 – BIDDER'S REPRESENTATIONS**

#### 5.01 It is the responsibility of each Bidder before submitting a Bid to:

- A. examine and carefully study the Bidding Documents, and any data and reference items identified in the Bidding Documents;
- B. visit the Site, conduct a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and satisfy itself as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work;
- C. become familiar with and satisfy itself as to all Laws and Regulations that may affect cost, progress, and performance of the Work;
- D. carefully study all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings, and (2) reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings;
- E. consider the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder; and (3) Bidder's safety precautions and programs;
- F. agree, based on the information and observations referred to in the preceding paragraph, that at the time of submitting its Bid no further

examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the Work at the price bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents;

- G. become aware of the general nature of the work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents;
- H. promptly give Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by Engineer is acceptable to Bidder;
- I. determine that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance and furnishing of the Work; and
- J. agree that the submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article, that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

## **ARTICLE 6 – PRE-BID CONFERENCE**

- 6.01 Attendance at the Pre-Bid Conference is mandatory. The pre-bid meeting date and time is as shown in the advertisement for bids, or as directed by the Owner.

## **ARTICLE 7 – INTERPRETATIONS AND ADDENDA**

- 7.01 All questions about the meaning or intent of the Bidding Documents are to be submitted to Engineer in writing. Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda delivered to all parties recorded as having received the Bidding Documents. Questions received less than seven days prior to the date for opening of Bids may not be answered. Only questions answered by Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.
- 7.02 Addenda may be issued to clarify, correct, supplement, or change the Bidding Documents.

## **ARTICLE 8 – BID SECURITY**

- 8.01 A Bid must be accompanied by Bid security made payable to Owner in an amount of **five percent (5%)** percent of Bidder's maximum Bid price (determined by adding the base bid and all alternates) and in the form of a certified check, bank money order, or a Bid bond (on the form included in the Bidding Documents) issued by a surety meeting the requirements of Paragraphs 6.01 and 6.02 of the General Conditions.

- 8.02 The Bid security of the apparent Successful Bidder will be retained until Owner awards the contract to such Bidder, and such Bidder has executed the Contract Documents, furnished the required contract security, and met the other conditions of the Notice of Award, whereupon the Bid security will be released. If the Successful Bidder fails to execute and deliver the Contract Documents and furnish the required contract security within 15 days after the Notice of Award, Owner may consider Bidder to be in default, annul the Notice of Award, and the Bid security of that Bidder will be forfeited. Such forfeiture shall be Owner's exclusive remedy if Bidder defaults.
- 8.03 The Bid security of other Bidders that Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of seven days after the Effective Date of the Contract or 61 days after the Bid opening, whereupon Bid security furnished by such Bidders will be released.
- 8.04 Bid security of other Bidders that Owner believes do not have a reasonable chance of receiving the award will be released within seven days after the Bid opening.

## **ARTICLE 9 – CONTRACT TIMES**

- 9.01 The number of days within which, or the dates by which, the Work is to be substantially completed and ready for final payment are set forth in the Agreement.

## **ARTICLE 10 – LIQUIDATED DAMAGES**

- 10.01 Provisions for liquidated damages, if any, for failure to timely attain a Milestone, Substantial Completion, or completion of the Work in readiness for final payment, are set forth in the Agreement.

## **ARTICLE 11 – SUBSTITUTE AND “OR-EQUAL” ITEMS**

- 11.01 The Contract for the Work, as awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents, and those “or-equal” or substitute or materials and equipment subsequently approved by Engineer prior to the submittal of Bids and identified by Addendum. No item of material or equipment will be considered by Engineer as an “or-equal” or substitute unless written request for approval has been submitted by Bidder and has been received by Engineer at least 15 days prior to the date for receipt of Bids. Each such request shall comply with the requirements of Paragraphs 7.04 and 7.05 of the General Conditions. The burden of proof of the merit of the proposed item is upon Bidder. Engineer's decision of approval or disapproval of a proposed item will be final. If Engineer approves any such proposed item, such approval will be set forth in an Addendum issued to all prospective Bidders. Bidders shall not rely upon approvals made in any other manner.
- 11.02 All prices that Bidder sets forth in its Bid shall be based on the presumption that the Contractor will furnish the materials and equipment specified or described in

the Bidding Documents, as supplemented by Addenda. Any assumptions regarding the possibility of post-Bid approvals of “or-equal” or substitution requests are made at Bidder’s sole risk.

## **ARTICLE 12 – SUBCONTRACTORS, SUPPLIERS, AND OTHERS**

- 12.01 A Bidder shall be prepared to retain specific Subcontractors, Suppliers, or other individuals or entities for the performance of the Work if required by the Bidding Documents (most commonly in the Specifications) to do so. If a prospective Bidder objects to retaining any such Subcontractor, Supplier, or other individual or entity, and the concern is not relieved by an Addendum, then the prospective Bidder should refrain from submitting a Bid.
- 12.02 Subsequent to the submittal of the Bid, Owner may not require the Successful Bidder or Contractor to retain any Subcontractor, Supplier, or other individual or entity against which Contractor has reasonable objection.
- 12.03 The apparent Successful Bidder, and any other Bidder so requested, shall within five days after Bid opening, submit to Owner a list of the Subcontractors or Suppliers proposed for the following portions of the Work: **Raw Water Supply Transmission Pipeline Contract 1: Blakely Mountain Dam Road to Ouachita Water Treatment Plant.**
- If requested by Owner, such list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, Supplier, or other individual or entity. If Owner or Engineer, after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, individual, or entity, Owner may, before the Notice of Award is given, request apparent Successful Bidder to submit an acceptable substitute, in which case apparent Successful Bidder shall submit a substitute, Bidder’s Bid price will be increased (or decreased) by the difference in cost occasioned by such substitution, and Owner may consider such price adjustment in evaluating Bids and making the Contract award.
- 12.04 If apparent Successful Bidder declines to make any such substitution, Owner may award the Contract to the next lowest Bidder that proposes to use acceptable Subcontractors, Suppliers, or other individuals or entities. Declining to make requested substitutions will constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor, Supplier, individual, or entity so listed and against which Owner or Engineer makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner and Engineer subject to subsequent revocation of such acceptance as provided in Paragraph 7.06 of the General Conditions.

## **ARTICLE 13 – PREPARATION OF BID**

- 13.01 The Bid Form is included with the Bidding Documents.
- A. All blanks on the Bid Form shall be completed in ink and the Bid Form signed in ink. Erasures or alterations shall be initialed in ink by the person signing

the Bid Form. A Bid price shall be indicated for each section, Bid item, alternate, adjustment unit price item, and unit price item listed therein.

- B. If the Bid Form expressly indicates that submitting pricing on a specific alternate item is optional, and Bidder elects to not furnish pricing for such optional alternate item, then Bidder may enter the words “No Bid” or “Not Applicable.”

13.02 **Bid Submittal.** Each bid must be submitted on the prescribed forms as well as accompanied by a Bid Bond. All blank spaces for bid prices must be filled in, with ink or typewritten, in both words and figures, and the foregoing certifications must be fully completed and executed when submitted. Each bid must be submitted in three sealed envelopes to be furnished by the Engineering firm and designated Envelopes “A”, “B”, and “C”.

- A. At the time of bid opening, Envelope “A”, containing the bid and bid bond, will be opened and read aloud for the purpose of acknowledging the low bidder. Envelope “B”, containing required statement of qualifications and supporting information will be opened and examined by the Owner at a later time for the purpose of qualifying the Bid. After all bids and required contract documents have been thoroughly checked by the Owner, the successful bidder will be announced and personally informed. Should a low bidder fail to execute all required documentation qualifying his bid, the bid may be rejected and the next lowest bidder awarded the work if he has qualified.

- B. Items to be included in each envelope are as follows:

1. **ENVELOPE “A”**

- a. Completed Bid Form
- b. Bid Bond
- c. Statement of Compliance
- d. Statement of Insurance Requirements Compliance

2. **ENVELOPE “B”**

- a. Statement of Qualifications (see Article 3).
- b. Attachment A – General Bidder Information
- c. Attachment B – Supplemental Bidder Information
- d. Attachment C – Details of Past Projects
- e. Attachment D – Bidder Affidavit
- f. Other Information supporting said Statement of Qualifications

3. **ENVELOPE “C”**

- a. Envelopes “A” and “B” to be enclosed in Envelope “C”
- b. Envelope “C” to be clearly marked on the outside as follows:

SUBMITTED BY: BIDDER NAME (NAME OF COMPANY)

ADDRESS (City, State Zip)

SUBMITTED TO: CITY OF HOT SPRINGS, ARKANSAS

PROJECT NAME: LAKE OUACHITA WATER SUPPLY IMPROVEMENTS –

CONTRACT 1 RAW WATER TRANSMISSION PIPELINE

BID NUMBER

- 13.03 A Bid by a corporation shall be executed in the corporate name by a corporate officer (whose title must appear under the signature), accompanied by evidence of authority to sign. The corporate address and state of incorporation shall be shown.
- 13.04 A Bid by a limited liability company shall be executed in the name of the firm by a member or other authorized person and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm shall be shown.
- 13.05 A Bid by an individual shall show the Bidder's name and official address.
- 13.06 A Bid by a joint venture shall be executed by an authorized representative of each joint venturer in the manner indicated on the Bid Form. The official address of the joint venture shall be shown.
- 13.07 All names shall be printed in ink below the signatures.
- 13.08 The Bid shall contain an acknowledgment of receipt of all Addenda, the numbers of which shall be filled in on the Bid Form.
- 13.09 Postal and e-mail addresses and telephone number for communications regarding the Bid shall be shown.
- 13.10 The Bid shall contain evidence of Bidder's authority and qualification to do business in the state where the Project is located, or Bidder shall covenant in writing to obtain such authority and qualification prior to award of the Contract and attach such covenant to the Bid. Bidder's state contractor license number, if any, shall also be shown on the Bid Form.

## **ARTICLE 14 – BASIS OF BID**

### **14.01 *Unit Price***

- A. Bidders shall submit a Bid on a unit price basis for each item of Work listed in the unit price section of the Bid Form.
- B. The "Bid Price" (sometimes referred to as the extended price) for each unit price Bid item will be the product of the "Estimated Quantity" (which Owner or its representative has set forth in the Bid Form) for the item and the corresponding "Bid Unit Price" offered by the Bidder. The total of all unit price Bid items will be the sum of these "Bid Prices"; such total will be used by



Owner for Bid comparison purposes. The final quantities and Contract Price will be determined in accordance with Paragraph 13.03 of the General Conditions.

- C. Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.

#### 14.02 *Lump Sum*

- A. Bidders shall submit a Bid on a lump sum basis **for the lump sum items** as set forth in the Bid Form.
- B. Lump sum item bids are to be complete-in-place prices for those items.

### **ARTICLE 15 – SUBMITTAL OF BID**

- 15.01 The Bid form and Bid Bond are to be included in Envelope “A” as noted in Article 13.
- 15.02 The Attachments containing qualifications and supporting information are to be included in Envelope “B”.
- 15.03 Envelopes “A” and “B” are to be included in Envelope “C” as stated in Article 13.
- 15.04 Envelope “C” is to be labeled as shown in Article 13.
- 15.05 With each copy of the Bidding Documents, a Bidder is furnished one separate unbound copy of the Bid Form, and, if required, the Bid Bond Form. The unbound copy of the Bid Form is to be completed and submitted with the Bid security and the other documents required to be submitted under the terms of Article 7 of the Bid Form.
- 15.06 A Bid shall be received no later than the date and time prescribed and at the place indicated in the advertisement or invitation to bid and shall be enclosed in a plainly marked package with the Project title (and, if applicable, the designated portion of the Project for which the Bid is submitted), the name and address of Bidder, and shall be accompanied by the Bid security and other required documents.
- 15.07 If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid shall be enclosed in a separate package plainly marked on the outside with the notation “**BID ENCLOSED**” or as noted in article 13. A mailed Bid shall be addressed to the **City of Hot Springs Purchasing Office, 517 Airport Road, Suite C, Hot Springs, Arkansas 71913.**
- 15.08 Bids received after the date and time prescribed for the opening of bids, or not submitted at the correct location or in the designated manner, will not be accepted and will be returned to the Bidder unopened.

## **ARTICLE 16 – MODIFICATION AND WITHDRAWAL OF BID**

- 16.01 A Bid may be withdrawn by an appropriate document duly executed in the same manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids. Upon receipt of such notice, the unopened Bid will be returned to the Bidder.
- 16.02 If a Bidder wishes to modify its Bid prior to Bid opening, Bidder must withdraw its initial Bid in the manner specified in Paragraph 16.01 and submit a new Bid prior to the date and time for the opening of Bids.
- 16.03 If within 24 hours after Bids are opened any Bidder files a duly signed written notice with Owner and promptly thereafter demonstrates to the reasonable satisfaction of Owner that there was a material and substantial mistake in the preparation of its Bid, that Bidder may withdraw its Bid, and the Bid security will be returned. Thereafter, if the Work is rebid, that Bidder will be disqualified from further bidding on the Work.

## **ARTICLE 17 – OPENING OF BIDS**

- 17.01 Bids will be opened at the time and place indicated in the advertisement or invitation to bid and, unless obviously non-responsive, read aloud publicly. An abstract of the amounts of the base Bids and major alternates, if any, will be made available to Bidders after the opening of Bids.

## **ARTICLE 18 – BIDS TO REMAIN SUBJECT TO ACCEPTANCE**

- 18.01 All Bids will remain subject to acceptance for the period of time stated in the Bid Form, but Owner may, in its sole discretion, release any Bid and return the Bid security prior to the end of this period.

## **ARTICLE 19 – EVALUATION OF BIDS AND AWARD OF CONTRACT**

- 19.01 Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Owner will reject the Bid of any Bidder that Owner finds, after reasonable inquiry and evaluation, to not be responsible. If Bidder purports to add terms or conditions to its Bid, takes exception to any provision of the Bidding Documents, or attempts to alter the contents of the Contract Documents for purposes of the Bid, then the Owner will reject the Bid as nonresponsive; provided that Owner also reserves the right to waive all minor informalities not involving price, time, or changes in the Work.
  - A. The Owner may select any of the alternate bids shown on the bid form.
- 19.02 If Owner awards the contract for the Work, such award shall be to the responsible qualified Bidder submitting the lowest responsive Bid for the Alternate Bid selected by the Owner.
- 19.03 Evaluation of Bids

- A. In evaluating Bids, Owner will consider whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices, and other data, as may be requested in the Bid Form or prior to the Notice of Award.
  - B. For the determination of the apparent low Bidder when unit price bids are submitted, Bids will be compared on the basis of the total of the products of the estimated quantity of each item and unit price Bid for that item, together with any lump sum items.
- 19.04 In evaluating whether a Bidder is qualified and responsible, Owner will consider the qualifications of the Bidder and may consider the qualifications and experience of Subcontractors and Suppliers proposed for those portions of the Work for which the identity of Subcontractors and Suppliers must be submitted as provided in the Bidding Documents. In considering a bidder for qualification, the City of Hot Springs shall be the sole judge of the firm's financial soundness, history of satisfactory project performance, whether or not the applicant possesses a sufficient number of experienced qualified personnel at its management and supervisory level and has demonstrated a commitment on its projects to accommodating changes and disruptions in the work, all of which indicate the ability to successfully complete the Project at the lowest possible cost to the City of Hot Springs in accordance with the Project schedule.
- A. Project Performance – During evaluation of project performance, emphasis will be placed on past performance on the City of Hot Springs projects and other recent projects of a similar size and nature to the Project, including applicant's ability to meet scheduled completion dates.
  - B. Personnel Qualifications/Experience – The designated Project Manager and Superintendent must have experience on projects of similar size and scope. The Bidder must dedicate the proposed personnel to the project and may not make changes without written approval from the City of Hot Springs. The qualifications of other personnel will also be considered in this evaluation.
  - C. References – The City of Hot Springs intends to contact references listed in the application and may contact other potential references if referred to them in the course of this evaluation. The City of Hot Springs reserves the right to contact any party it deems appropriate and by submitting a bid, the contractor releases the City of Hot Springs and any references from all liability concerning this exchange of information.
  - D. Financial Data – Financial data will be reviewed and compared to industry standards.
  - E. Safety Performance – Safety data will be reviewed and compared to industry standards.
  - F. Claims/Final Resolution/Judgments – Evaluation of this data will be based on the number of affirmative answers to the questions and the details provided in explanation for each occurrence.
  - G. Failure to Complete – Evaluation of the Bidder's failure to complete projects will primarily be based on the number of occurrences and the explanations

for the failure to complete in conjunction with the references on those projects.

- H. Other Relevant Criteria – Any other relevant criteria deemed to be in the best interest of the City of Hot Springs may be evaluated in determining whether or not to accept an Bidder's submission.

19.05 Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders and any proposed Subcontractors or Suppliers.

## **ARTICLE 20 – BONDS AND INSURANCE**

20.01 Article 6 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth Owner's requirements as to performance and payment bonds and insurance. When the Successful Bidder delivers the Agreement (executed by Successful Bidder) to Owner, it shall be accompanied by required bonds and insurance documentation.

## **ARTICLE 21 – SIGNING OF AGREEMENT**

21.01 When Owner issues a Notice of Award to the Successful Bidder, it shall be accompanied by the unexecuted counterparts of the Agreement along with the other Contract Documents as identified in the Agreement. Within 15 days thereafter, Successful Bidder shall execute and deliver the required number of counterparts of the Agreement (and any bonds and insurance documentation required to be delivered by the Contract Documents) to Owner. Within ten days thereafter, Owner shall deliver one fully executed counterpart of the Agreement to Successful Bidder, together with printed and electronic copies of the Contract Documents as stated in Paragraph 2.02 of the General Conditions.

# ATTACHMENT A

## GENERAL BIDDER INFORMATION

***A copy of this page shall be the cover page for each set. A set of attachments and any additional information should be included with each set.***

Bidder Name: \_\_\_\_\_

Provide all names under which the Bidder does business:

\_\_\_\_\_  
\_\_\_\_\_

Is the Bidder related to another firm as a parent, subsidiary, or affiliate? Yes\_\_\_ No\_\_\_

If yes, attach names and addresses for all affiliated, parent and/or subsidiary companies, and state the nature of each affiliation.

Address: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

Is Bidder a corporation? Yes\_\_\_\_\_, No\_\_\_\_\_

- If yes, what is the State of incorporation? \_\_\_\_\_
- If not incorporated, specify method and date of organization: \_\_\_\_\_
- If a partnership, attach partnership details (such as partner's names and individual contact information for each partner). If a Joint Venture (JV), attach the JV agreement and provide details of the intended role of each JV member, including appropriate additional attachments (at a minimum an Attachment C for each JV member).

Initial if: Minority Owned: \_\_\_\_\_, Women Owned: \_\_\_\_\_, Neither:\_\_\_\_\_.

If so, provide, as attachment, any governmental certifications thereof.

Specify the portions of the Work that the Bidder expects to subcontract:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Provide contact information including name, title, phone number and email address of the person who can respond authoritatively to any questions regarding this response:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Signed by: \_\_\_\_\_

Printed name and title: \_\_\_\_\_

**ATTACHMENT B  
SUPPLEMENTAL BIDDER INFORMATION**

**A. GENERAL INFORMATION**

1. **Responsiveness to Request for Bids** – Responsiveness is defined in Article 3.
2. **Debarment Status** – Has the Bidder, or any affiliate, ever been the subject of any of the following actions:
  - a. Debarment .....Yes\_\_\_ No\_\_\_
  - b. Deletion from a Prequalified Bidders List.....Yes\_\_\_ No\_\_\_
  - c. Other action which resembles debarment.....Yes\_\_\_ No\_\_\_If yes, provide details on a separate sheet for each instance.
3. **Contractor's License** – Attach copies of all Bidder's Arkansas Contractor's Licenses required to perform the work, or provide documentation indicating that they are able to acquire one in a timely fashion consistent with the project schedule.
4. **Bonding Capacity/Statement** – Attach a signed statement from Bidder's Surety stating that, based on present circumstances, the surety will be willing to provide bid, performance and payment bonds for the Bidder in connection with the Project.  
Total bonding capacity \$\_\_\_\_\_
- Available bonding capacity \$\_\_\_\_\_
5. **Minimum Large Diameter Pipeline Experience** – Provide on Attachment B.
6. **Minimum Trenchless Installation Experience** – Provide on Attachment B.
7. **Minimum Cathodic Protection Installation Experience** – Provide on Attachment B.
8. **Minimum Steel Pipe Welding Experience** – Provide on Attachment B.
9. **Minimum Installation in "Wet" Conditions Experience** – Provide on Attachment B.
10. **Quality Control Program**- Attach document(s) describing quality control program.
11. **Administration and Management Plan** - Attach document(s) describing plan.

**B. PROJECT SPECIFIC INFORMATION**

1. **Project Performance**

Using a separate copy of Attachment B for each project, provide details of five or more projects that are most similar in size and scope to the Project.

Attach a list of all projects with a contract value greater than five (5) million dollars over the last five (5) years. Include the following data: project name, owner, engineer and/or construction manager, contact information, completion date, percent of work performed by your own forces, original and final contract values.

2. **Personnel Qualifications/Experience** – Submit a copy of the Bidder's corporate organizational chart. Provide the quantity of employees identified by discipline and project with names and titles down through field superintendents. Provide proposed project organizational chart and attach resumes of key personnel. Emphasize years of construction experience, last employer, last position, and experience on similar projects.
3. **References** – Reference information is addressed on Attachment C.

4. **Financial Data** - Submit your organization's most recent audited financial statements for a three-year period. Complete balance sheets and income statements must be included in the application package. The statements shall be enclosed in a separate sealed envelope and it should be noted if the statements are for a parent company.

Has the Bidder, or any affiliate, ever been denied bonding or had bonding revoked? Yes\_\_\_ No\_\_\_

If yes, provide details on a separate sheet for each instance.

5. **Safety Performance** – On a separate sheet provide the following:
- a. Experience Modification Factor (EMF) with 3-year and 5-year trends
  - b. General Liability and Workers Compensation Insurance Loss Ratio with 3-year and 5-year trends
  - c. Accident Frequency Rate with 3-year and 5-year trends
  - d. A list of OSHA citations levied during the past five years. Describe the infractions and indicate whether there was a warning or fine imposed and the dollar amount of each.
  - e. Details from your organization's previous 5 years OSHA 300 log indicating:
    - Number of lost workday cases
    - Number of restricted workday cases
    - Number of cases with medical attention only
    - Number of fatalities
6. **Claims/Final Resolution/Judgments** – Have any of the following actions occurred on, or in conjunction with, any project performed by the Bidder, any affiliate, or their officers, partners or directors in the last five years?
- a. Legal Action Implemented by Contractor against Owner .....Yes\_\_\_ No\_\_\_
  - b. Legal Action Implemented by Contractor against Subcontractor .....Yes\_\_\_ No\_\_\_
  - c. Legal Action Implemented by Owner .....Yes\_\_\_ No\_\_\_
  - d. Legal Action Implemented by Subcontractor .....Yes\_\_\_ No\_\_\_
  - e. Settlement or Close Out Agreement in effect with Owner .....Yes\_\_\_ No\_\_\_
  - f. Judgments .....Yes\_\_\_ No\_\_\_
  - g. Arbitrations.....Yes\_\_\_ No\_\_\_

If the answer to any of items a. through g. above is yes, provide details on a separate sheet for each instance.

7. **Failure to Complete - Bidder** – Has your organization ever failed to complete any work awarded to it? This includes termination for the convenience of the Owner or any other reason for failing to complete a project. Yes\_\_\_ No\_\_\_

If yes, provide details on a separate sheet for each instance.

8. **Failure to Complete - Partner/Officer** – Has any officer or partner of your organization ever been an officer or partner of some other organization that failed to complete a construction contract or failed to complete a construction contract handled in his or her own name? This includes termination for the convenience of the Owner or any other reason for failing to complete a project. Yes\_\_\_ No\_\_\_

If yes, provide details on a separate sheet for each instance.

## ATTACHMENT C

### DETAILS OF PAST PROJECTS

*(Using a separate copy of this form for each project, provide details of five or more projects that are most similar in size and scope to the Project.)*

1. Contractor Name: \_\_\_\_\_  
If Contractor's Name is not the same as Bidder's name, state relationship (i.e. parent company, subsidiary, JV etc.): \_\_\_\_\_  
Project Manager: \_\_\_\_\_  
Superintendent: \_\_\_\_\_
2. Project Name: \_\_\_\_\_  
Facility Name: \_\_\_\_\_  
Project Location: \_\_\_\_\_  
\_\_\_\_\_  
Contract # \_\_\_\_\_ Project # \_\_\_\_\_
3. Owner: \_\_\_\_\_  
Address: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
Contact Person: \_\_\_\_\_  
Contact Title & Phone # \_\_\_\_\_ (   ) \_\_\_\_\_
4. Engineer: \_\_\_\_\_  
Address: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
Contact Person: \_\_\_\_\_  
Contact Title & Phone # \_\_\_\_\_ (   ) \_\_\_\_\_
5. Construction Manager (if any): \_\_\_\_\_  
Address: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
Contact Person: \_\_\_\_\_  
Contact Title & Phone # \_\_\_\_\_ (   ) \_\_\_\_\_
6. Contract Dates (completion dates should reflect substantial completion - if not indicate)  
Notice to Proceed: \_\_\_\_\_  
Contractual Completion: \_\_\_\_\_  
Actual Completion: \_\_\_\_\_



**ATTACHMENT C  
(Cont'd)**

7. Description of Project: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

8. Original Contract Value: \$ \_\_\_\_\_  
Final Contract Value: \$ \_\_\_\_\_  
Value of Change Orders to Date: \$ \_\_\_\_\_  
Outstanding Claims to Date: \$ \_\_\_\_\_

9. Bonding Company: \_\_\_\_\_  
Address: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
Contact Person: \_\_\_\_\_  
Contact Title & Phone # \_\_\_\_\_ ( ) \_\_\_\_\_

10. List the five largest subcontractors on this project in terms of percentage of participation.

Subcontractor: \_\_\_\_\_  
Trade: \_\_\_\_\_ Participation: \_\_\_\_\_ %  
Address: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
Contact Person: \_\_\_\_\_  
Contact Title & Phone # \_\_\_\_\_ ( ) \_\_\_\_\_

Subcontractor: \_\_\_\_\_  
Trade: \_\_\_\_\_ Participation: \_\_\_\_\_ %  
Address: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
Contact Person: \_\_\_\_\_  
Contact Title & Phone # \_\_\_\_\_ ( ) \_\_\_\_\_

**ATTACHMENT C**  
**(Cont'd)**

Subcontractor: \_\_\_\_\_  
Trade: \_\_\_\_\_ Participation: \_\_\_\_\_%  
Address: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
Contact Person: \_\_\_\_\_  
Contact Title & Phone # \_\_\_\_\_ (    ) \_\_\_\_\_

Subcontractor: \_\_\_\_\_  
Trade: \_\_\_\_\_ Participation: \_\_\_\_\_%  
Address: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
Contact Person: \_\_\_\_\_  
Contact Title & Phone # \_\_\_\_\_ (    ) \_\_\_\_\_

Subcontractor: \_\_\_\_\_  
Trade: \_\_\_\_\_ Participation: \_\_\_\_\_%  
Address: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
Contact Person: \_\_\_\_\_  
Contact Title & Phone # \_\_\_\_\_ (    ) \_\_\_\_\_

**ATTACHMENT D  
BIDDER AFFIDAVIT**

The undersigned hereby attests under penalty of perjury and by personal knowledge to the following:

1. The contents of the Application for Bidder Qualification (including all submitted attachments and other documentation) are true, correct and not misleading.
2. To the best of my knowledge neither the Bidder, nor its agents, affiliates, partners, employees, officers, directors or other associates of any kind, have colluded with any individual or entity on behalf of the Bidder, or themselves, to produce an unfair advantage over others or to gain favoritism in the award of any contract resulting from this bid process.
3. By responding to this bid and submitting the Application for Bidder Qualification (also referred to as the submittal), the Bidder agrees to indemnify and hold harmless all parties to this bid, including, but not limited to, the Owner and Engineers for any conceivable damages arising therefrom; and affirms that no compensation is expected as a result of the preparation of said response.
4. Bidder agrees to use the submitted personnel for the duration of this project. Any changes in the submitted personnel must be approved in writing by the City of Hot Springs.

Bidder Name: \_\_\_\_\_  
\_\_\_\_\_

Officer's Signature: \_\_\_\_\_

Printed name and title: \_\_\_\_\_  
\_\_\_\_\_

Telephone No: \_\_\_\_\_

Affix Corporate Seal

Witnessed by: \_\_\_\_\_

Witness printed name and title: \_\_\_\_\_  
\_\_\_\_\_

Date Signed: \_\_\_\_\_

**Bidder's Checklist of Required Items**

**CITY OF HOT SPRINGS UTILITIES DEPARTMENT  
HOT SPRINGS, ARKANSAS**

**Raw Water Supply Transmission Pipeline Contract 1:  
Blakely Mountain Dam Road to Ouachita Water Treatment Plant**

This Bidder's Checklist is provided to ensure all required forms are completed, signed and returned as a part of the bid submission. All forms must be included as indicated for a bid to be considered a complete and responsive bid. Appropriate signatures and date are required on each document. If an item is missing, the bid may be declared unresponsive and therefore rejected.

**This sheet will serve as the cover sheet for the bid submission.**

	Required	Submitted
Attended Mandatory Pre-Bid Meeting	X	
Acknowledgement of All Addenda	X	
Bid Form <b>SIGNED</b> (with Unit Price Schedule)	X	
List of Proposed Subcontractors	X	
Bid Bond	X	
Statement of Qualifications	X	
Copy of current Contractors License	X	
Statement of Compliance	X	
Statement of Insurance Requirements Compliance	X	

## **BID FORM**

### **CITY OF HOT SPRINGS UTILITIES DEPARTMENT HOT SPRINGS, ARKANSAS**

#### **Raw Water Supply Transmission Pipeline Contract 1: Blakely Mountain Dam Road to Ouachita Water Treatment Plant**

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## ARTICLE 1 – BID RECIPIENT

1.01 This Bid is submitted to:

**City of Hot Springs  
Purchasing Department  
517 Airport Road, Suite C  
Hot Springs, Arkansas 71913**

1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

## ARTICLE 2 – BIDDER’S ACKNOWLEDGEMENTS

2.01 Bidder accepts all the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 90 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

## ARTICLE 3 – BIDDER’S REPRESENTATIONS

3.01 In submitting this Bid, Bidder represents that:

- A. Bidder has examined and carefully studied the Bidding Documents, and any data and reference items identified in the Bidding Documents, and hereby acknowledges receipt of the following Addenda:

**Addendum No.**

**Addendum, Date**

_____	_____
_____	_____
_____	_____
_____	_____

- B. Bidder has visited the Site, conducted a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and satisfied itself as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
- C. Bidder is familiar with and has satisfied itself as to all Laws and Regulations that may affect cost, progress, and performance of the Work.
- D. Bidder has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings, and (2) reports and drawings relating to Hazardous Environmental Conditions, if any, at or

adjacent to the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings.

- E. Bidder has considered the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and any Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder; and (3) Bidder's safety precautions and programs.
- F. Bidder agrees, based on the information and observations referred to in the preceding paragraph, that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents.
- G. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.
- H. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and confirms that the written resolution thereof by Engineer is acceptable to Bidder.
- I. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance and furnishing of the Work.
- J. The submission of this Bid constitutes an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article, and that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

#### **ARTICLE 4 – BIDDER'S CERTIFICATION**

##### **4.01 Bidder certifies that:**

- A. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation;
- B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;
- C. Bidder has not solicited or induced any individual or entity to refrain from bidding; and

- D. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 4.01.D:
1. “corrupt practice” means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process;
  2. “fraudulent practice” means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;
  3. “collusive practice” means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels; and  
“coercive practice” means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.



## ARTICLE 5 – BASIS OF BID

- 5.01 Bidder will refer to Section 010250 Measurement and Payments prior to preparing the bid schedule.
- 5.02 Bidder will complete the Work in accordance with the Contract Documents for the following price(s):

<b>BID SCHEDULE – BASE BID – 48” WELDED STEEL PIPE</b> <b>Raw Water Supply Transmission Pipeline Contract 1:</b> <b>Blakely Mountain Dam Road to Ouachita Water Treatment Plant</b> <b>City of Hot Springs, Arkansas</b>					
<b>Item No.</b>	<b>Description</b>	<b>Units</b>	<b>QTY</b>	<b>Unit Price</b>	<b>Item Total</b>
1	48” Welded Steel Pipe, Class 200, Raw Water Transmission Line, Non-Roadway	LF	550	\$	\$
2	48” Welded Steel Pipe, Class 175, Raw Water Transmission Line, Non-Roadway	LF	7,600	\$	\$
3	48” Welded Steel Pipe, Class 200, Raw Water Transmission Line in Roadway	LF	300	\$	\$
4	48” Welded Steel Pipe, Class 175, Raw Water Transmission Line in Roadway	LF	1,600	\$	\$
5	48” Gate Valve (at Sta. 134+36 tee)	Each	1	\$	\$
<b>SUB-TOTAL BASE BID FOR ITEMS 1 THRU 5</b> <b>(TO BE USED FOR THE DEDUCTIVE ALTERNATE CALCULATIONS)</b>					<b>\$</b>
6	30” Ductile Iron Pipe, Class 200, Raw Water Branch Line to Ouachita WTP, Restrained	LF	700	\$	\$
7	30” Ductile Iron Pipe, Class 200, Raw Water Branch Line to Ouachita WTP, Non-Restrained	LF	850	\$	\$
8	42” Gate Valve (on branch of tee)	Each	1	\$	\$
9	30” Gate Valve	Each	1	\$	\$
10	Flushing Assembly	Each	3	\$	\$

11	2" Air Release Valve Assembly	Each	5	\$	\$
12	Rock Excavation	CY	2,000	\$	\$
13	Road Asphalt Pavement (2")	SY	4,700	\$	\$
14	Standpipe	LUMP SUM		\$	\$
15	Flow Control Valve Vault	LUMP SUM		\$	\$
16	Connection of 30" Pipe to Existing 8" Water for Filling (Includes Vault, RPZ, and Meter)	LUMP SUM		\$	\$
17	Bonds and Insurance	LUMP SUM		\$	\$
18	Mobilization & Demobilization	LUMP SUM		\$	\$
19	Clearing & Grubbing	LUMP SUM		\$	\$
20	Seeding, Mulching, Final Cleanup	LUMP SUM		\$	\$
21	Storm Water Permit & S.W.P.P.P.	LUMP SUM		\$	\$
22	Maintenance of Traffic	LUMP SUM		\$	\$
23	Excavation and Trench Safety System	LUMP SUM		\$	\$
24	Miscellaneous & Incidental Work	LUMP SUM		\$	\$
TOTAL BASE BID PRICE – 48" WELDED STEEL PIPE					\$
Dollars					

### DEDUCTIVE ALTERNATE # 1 – 42" WELDED STEEL PIPE

The purpose of this deductive alternate bid is to provide a price reduction to the Owner to install 42-inch welded steel pipe water line and appurtenances instead of 48-inch water line and appurtenances as shown on the Drawings and priced in the Base Bid. Bidder should provide the unit pricing below and total in "Line B". Bidder should translate the subtotal from the Base Bid for these items to 'Line A' below. The total for this deductive alternate is Line A minus Line B.

Item No.	Description	Units	QTY	Unit Price	Item Total
1	42" Steel Pipe, Class 200, Raw Water Transmission Line, Non-Roadway	LF	550	\$	\$
2	42" Steel Pipe, Class 175, Raw Water Transmission Line, Non-Roadway	LF	7,600	\$	\$
3	42" Steel Pipe, Class 200, Raw Water Transmission Line in Roadway	LF	300	\$	\$
4	42" Steel Pipe, Class 175, Raw Water Transmission Line in Roadway	LF	1,600	\$	\$
5	42" Gate Valve (at Sta. 134+36 tee)	Each	1	\$	\$
<b>B - TOTAL BID FOR THESE ITEMS FOR ALTERNATE BID #1</b>					\$
<b>A - TOTAL BASE BID FOR ITEMS 1 THRU 5 (From Base Bid)</b>					\$
<b>TOTAL DEDUCTION FOR ALTERNATE #1</b> <b>Line A (Base Bid Pricing) – Line B (Alternate Bid Pricing)</b>  _____ Dollars					\$
<b><u>BASE BID LESS DEDUCTIVE ALTERNATE #1:</u></b>  _____ Dollars					\$

## DEDUCTIVE ALTERNATE # 2 – 42” DUCTILE IRON PIPE

The purpose of this deductive alternate bid is to provide a price reduction to the Owner to install 42-inch ductile iron pipe water line and appurtenances instead of 48-inch water line and appurtenances as shown on the Drawings and priced in the Base Bid. Bidder should provide the unit pricing below and total in “Line B”. Bidder should translate the subtotal from the Base Bid for these items to ‘Line A’ below. The total for this deductive alternate is Line A minus Line B.

Item No.	Description	Units	QTY	Unit Price	Item Total
1	42” Ductile Iron Pipe, Class 200, Raw Water Transmission Line, Non-Roadway, <i>Restrained</i>	LF	1,600	\$	\$
2	42” Ductile Iron Pipe, Class 200, Raw Water Transmission Line, Non-Roadway, <i>Non-Restrained</i>	LF	6,550	\$	\$
3	42” Ductile Iron Pipe, Class 200, Raw Water Transmission Line in Roadway, <i>Restrained</i>	LF	250	\$	\$
4	42” Ductile Iron Pipe, Class 200, Raw Water Transmission Line in Roadway, <i>Non-Restrained</i>	LF	1,650	\$	\$
5	42” Gate Valve (at Sta. 134+36 tee)	Each	1	\$	\$
<b>B - TOTAL BID FOR THESE ITEMS FOR ALTERNATE BID #2</b>					\$
<b>A - TOTAL BASE BID FOR ITEMS 1 THRU 5 (From Base Bid)</b>					\$
<b>TOTAL DEDUCTION FOR ALTERNATE #2</b> <b>Line A (Base Bid Pricing) – Line B (Alternate Bid Pricing)</b>					\$
_____ Dollars					
<b><u>BASE BID LESS DEDUCTIVE ALTERNATE #2:</u></b>					\$
_____ Dollars					

5.03 The Owner reserves the right to select the alternate bid it so chooses.

5.04 The pipe supplier for **Steel pipe** that was used as the basis for this bid is

\_\_\_\_\_.

The pipe supplier for **Ductile Iron pipe** that was used as the basis for this bid is

\_\_\_\_\_.

Changes in supplier can only be made with Owner approval.

## **ARTICLE 6 – TIME OF COMPLETION**

6.01 Bidder agrees that the Work will be substantially complete within **270 consecutive calendar days** after the date when the Contract Times commence to run as provided in Paragraph 4.01 of the General Conditions and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions within **300 consecutive calendar days** after the date when the Contract Times commence to run.

6.02 Bidder accepts the provisions of the Agreement as to liquidated damages.

## **ARTICLE 7 – ATTACHMENTS TO THIS BID**

7.01 The following documents are submitted with and made a condition of this Bid:

- A. Bid Bond;
- B. Statement of Compliance;
- C. Statement of Insurance Requirements Compliance;
- D. Copy of current Contractor's License.

## **ARTICLE 8 – DEFINED TERMS**

8.01 The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

## ARTICLE 9 – BID SUBMITTAL

BIDDER: *[Indicate correct name of bidding entity]*

By: \_\_\_\_\_

*[Signature]* \_\_\_\_\_

*[Printed name]* \_\_\_\_\_

*(If Bidder is a corporation, a limited liability company, a partnership, or a joint venture, attach evidence of authority to sign.)*

Attest: *[Signature]* \_\_\_\_\_

*[Printed name]* \_\_\_\_\_

Title: \_\_\_\_\_

Submittal Date: \_\_\_\_\_

Address for giving notices: \_\_\_\_\_

Telephone Number: \_\_\_\_\_

Contact Name and e-mail address: \_\_\_\_\_

Bidder's License No.: \_\_\_\_\_

**DOCUMENT 004313**

**BID BOND**

Any singular reference to Bidder, Surety, Owner or other party shall be considered plural where applicable.

---

BIDDER (*Name and Address*):

SURETY (*Name, and Address of Principal Place of Business*):

OWNER:

**City of Hot Springs  
P.O. Box 700  
Hot Springs, AR 71902**

BID

Bid Due Date:

Description: **Raw Water Supply Transmission Pipeline Contract 1: Blakely  
Mountain Dam Road to Ouachita Water Treatment Plant  
Hot Springs, Arkansas**

BOND

Bond Number:

Date:

Penal sum

\$

(Words)

(Figures)

Surety and Bidder, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Bid Bond to be duly executed by an authorized officer, agent, or representative.

**BIDDER**

(Seal)

**SURETY**

(Seal)

---

Bidder's Name and Corporate Seal

---

Surety's Name and Corporate Seal

By:

Signature

By:

Signature (Attach Power of Attorney)

Print Name

Print Name

Title

Title

Attest: _____	Attest: _____
Signature	Signature
_____	_____
Title	Title

1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to pay to Owner upon default of Bidder the penal sum set forth on the face of this Bond. Payment of the penal sum is the extent of Bidder's and Surety's liability. Recovery of such penal sum under the terms of this Bond shall be Owner's sole and exclusive remedy upon default of Bidder.

2. Default of Bidder shall occur upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents.

3. This obligation shall be null and void if:

3.1 Owner accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents, or

3.2 All Bids are rejected by Owner, or

3.3 Owner fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by Paragraph 5 hereof).

4. Payment under this Bond will be due and payable upon default of Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.

5. Surety waives notice of any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by Owner and Bidder, provided that the total time for issuing Notice of Award including extensions shall not in the aggregate exceed 120 days from the Bid due date without Surety's written consent.

6. No suit or action shall be commenced under this Bond prior to 30 calendar days after the notice of default required in Paragraph 4 above is received by Bidder and Surety and in no case later than one year after the Bid due date.

7. Any suit or action under this Bond shall be commenced only in a court of competent jurisdiction located in the state in which the Project is located.



8. Notices required hereunder shall be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier, or by United States Registered or Certified Mail, return receipt requested, postage pre-paid, and shall be deemed to be effective upon receipt by the party concerned.

9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent, or representative who executed this Bond on behalf of Surety to execute, seal, and deliver such Bond and bind the Surety thereby.

10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond shall be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute shall govern and the remainder of this Bond that is not in conflict therewith shall continue in full force and effect.

11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.

**DOCUMENT 005100**  
**NOTICE OF AWARD**

Date of Issuance:

Owner's Contract No.:

Owner: **City of Hot Springs**

Engineer: **Crist Engineers, Inc.**

Engineer's Project No.: **1926**

Project: **Raw Water Supply  
Transmission Pipeline**

Contract Name: **Contract 1: Blakely  
Mountain Dam Road to  
Ouachita Water  
Treatment Plant**

Bidder

Bidder's Address

**TO BIDDER:**

You are notified that Owner has accepted your Bid dated [\_\_\_\_\_] for the above Contract, and that you are the Successful Bidder and are awarded a Contract for:  
**Contract 1 – Blakely Mountain Dam Road to Ouachita Water Treatment Plant**  
The Contract Price of the awarded Contract is: \$\_\_\_\_\_

Three (3) unexecuted counterparts of the Agreement accompany this Notice of Award, and one copy of the Contract Documents accompanies this Notice of Award.

☐ a set of the Drawings will be delivered separately from other Contract Documents.

You must comply with the following conditions precedent within 15 days of the date of receipt of this Notice of Award:

1. Deliver to Owner four (4) counterparts of the Agreement, fully executed by Bidder.
2. Deliver with the executed Agreement(s) the Contract security [e.g., *performance and payment bonds*] and insurance documentation as specified in the Instructions to Bidders and General Conditions, Articles 2 and 6.
3. Other conditions precedent (if any): None

Failure to comply with these conditions within the time specified will entitle Owner to consider you in default, annul this Notice of Award, and declare your Bid security forfeited.

Within ten days after you comply with the above conditions, Owner will return to you one fully executed counterpart of the Agreement, together with any additional copies of the Contract Documents as indicated in Paragraph 2.02 of the General Conditions.

---

Owner **City of Hot Springs, Arkansas**

\_\_\_\_\_  
Authorized Signature

By:

Title:

---

Copy: **Crist Engineers, Inc.**

## DOCUMENT 005213

### AGREEMENT BETWEEN OWNER AND CONTRACTOR FOR CONSTRUCTION CONTRACT

THIS AGREEMENT is by and between the **City of Hot Springs, Arkansas** ("Owner") and  

---

("Contractor").

Owner and Contractor hereby agree as follows:

#### ARTICLE 1 – WORK

- 1.01 Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows:

**Contract 1: Blakely Mountain Dam Road to Ouachita Water Treatment Plant**

#### ARTICLE 2 – THE PROJECT

- 2.01 The Project, of which the Work under the Contract Documents is a part, is generally described as follows: **Constructing approximately 10,000 LF of 48-inch Raw Water Transmission Line and 1500 LF of 30-inch Raw Water Transmission Line, and appurtenances.**

#### ARTICLE 3 – ENGINEER

- 3.01 The Project has been designed by **Crist Engineers, Inc.**
- 3.02 The Owner has retained **Crist Engineers, Inc.** ("Engineer") to act as Owner's representative, assume all duties and responsibilities, and have the rights and authority assigned to Engineer in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.

#### ARTICLE 4 – CONTRACT TIMES

##### 4.01 *Time of the Essence*

- A. All time limits for Milestones, if any, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

##### 4.02 *Contract Times: Days*

- A. The Work will be substantially completed within **270 consecutive calendar days** after the date when the Contract Times commence to run as provided in Paragraph 4.01 of the General Conditions, and completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions

within **300 consecutive calendar days** after the date when the Contract Times commence to run.

#### 4.03 *Liquidated Damages*

- A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above and that Owner will suffer financial and other losses if the Work is not completed and Milestones not achieved within the times specified in Paragraph 4.02 above, plus any extensions thereof allowed in accordance with the Contract. The parties also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty):
1. Substantial Completion: Contractor shall pay Owner **\$1,000** for each day that expires after the time (as duly adjusted pursuant to the Contract) specified in Paragraph 4.02.A above for Substantial Completion until the Work is substantially complete.
  2. Completion of Remaining Work: After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Time (as duly adjusted pursuant to the Contract) for completion and readiness for final payment, Contractor shall pay Owner **\$2,500** for each day that expires after such time until the Work is completed and ready for final payment.
  3. Liquidated damages for failing to timely attain Substantial Completion and final completion are not additive and will not be imposed concurrently.

---

## ARTICLE 5 – CONTRACT PRICE

- 5.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents the amounts that follow, subject to adjustment under the Contract:
- A. For all Work **other than** Unit Price Work, **at the prices stated in the Contractor's Bid, attached hereto as an exhibit.**
  - B. For all **Unit Price** Work, an amount equal to the sum of the extended prices (established for each separately identified item of Unit Price Work by multiplying the unit price times the actual quantity of that item, **at the prices stated in the Contractor's Bid**). The extended prices for Unit Price Work set forth as of the Effective Date of the Contract are based on estimated quantities. As provided in Paragraph 13.03 of the General Conditions, estimated quantities are not guaranteed, and determinations of actual quantities and classifications are to be made by Engineer.
  - C. Total of Lump Sum Amounts and Unit Price Work (subject to final Unit Price adjustment) \$                     .

## ARTICLE 6 – PAYMENT PROCEDURES

### 6.01 *Submittal and Processing of Payments*

- A. Contractor shall submit Applications for Payment in accordance with Article 15 of the General Conditions. Applications for Payment will be processed by Engineer as provided in the General Conditions.

### 6.02 *Progress Payments; Retainage*

- A. Owner shall make progress payments on account of the Contract Price on the basis of Contractor's Applications for Payment on or about the **25th** day of each month during performance of the Work as provided in Paragraph 6.02.A.1 below, provided that such Applications for Payment have been submitted in a timely manner and otherwise meet the requirements of the Contract. All such payments will be measured by the Schedule of Values established as provided in the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no Schedule of Values, as provided elsewhere in the Contract.
  - 1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Owner may withhold, including but not limited to liquidated damages, in accordance with the Contract
    - a. **95** percent of Work completed (with the balance being retainage). If the Work has been 50 percent completed as determined by Engineer, and if the character and progress of the Work have been satisfactory to Owner and Engineer, then as long as the character and progress of the Work remain satisfactory to Owner and Engineer, there will be no additional retainage; and
    - b. **95** percent of cost of materials and equipment not incorporated in the Work (with the balance being retainage).
- B. Upon Substantial Completion, Owner shall pay an amount sufficient to increase total payments to Contractor to **100** percent of the Work completed, less such amounts set off by Owner pursuant to Paragraph 15.01.E of the General Conditions, and less **200** percent of Engineer's estimate of the value of Work to be completed or corrected as shown on the punch list of items to be completed or corrected prior to final payment.

### 6.03 *Final Payment*

- A. Upon final completion and acceptance of the Work in accordance with Paragraph 15.06 of the General Conditions, Owner shall pay the remainder of the Contract Price as recommended by Engineer as provided in said Paragraph 15.06.

## ARTICLE 7 – INTEREST

7.01 All amounts not paid when due shall bear interest at the rate of 10 percent per annum.

## ARTICLE 8 – CONTRACTOR’S REPRESENTATIONS

8.01 In order to induce Owner to enter into this Contract, Contractor makes the following representations:

- A. Contractor has examined and carefully studied the Contract Documents, and any data and reference items identified in the Contract Documents.
- B. Contractor has visited the Site, conducted a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
- C. Contractor is familiar with and is satisfied as to all Laws and Regulations that may affect cost, progress, and performance of the Work.
- D. Contractor has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings, and (2) reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings.
- E. Contractor has considered the information known to Contractor itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and the Site-related reports and drawings identified in the Contract Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor; and (3) Contractor’s safety precautions and programs.
- F. Based on the information and observations referred to in the preceding paragraph, Contractor agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.
- G. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.
- H. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract

Documents, and the written resolution thereof by Engineer is acceptable to Contractor.

- I. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
- J. Contractor's entry into this Contract constitutes an incontrovertible representation by Contractor that without exception all prices in the Agreement are premised upon performing and furnishing the Work required by the Contract Documents.

## **ARTICLE 9 – CONTRACT DOCUMENTS**

### **9.01 *Contents***

- A. The Contract Documents consist of the following:
  - 1. This Agreement (pages 1 to 7, inclusive).
  - 2. Performance bond (pages 1 to 3, inclusive).
  - 3. Payment bond (pages 1 to 4, inclusive).
  - 4. General Conditions (pages 1 to 64, inclusive).
  - 5. Supplementary Conditions (pages 1 to 6, inclusive).
  - 6. Specifications as listed in the table of contents of the Project Manual.
  - 7. Drawings.
  - 8. Addenda (numbers      to     , inclusive).
  - 9. Exhibits to this Agreement (enumerated as follows):
    - a. Contractor's Bid (pages 1 to 5, inclusive).
  - 10. The following which may be delivered or issued on or after the Effective Date of the Contract and are not attached hereto:
    - a. Notice to Proceed.
    - b. Change Orders.
- B. The documents listed in Paragraph 9.01.A are attached to this Agreement (except as expressly noted otherwise above).
- C. There are no Contract Documents other than those listed above in this Article 9.
- D. The Contract Documents may only be amended, modified, or supplemented as provided in the General Conditions.

## **ARTICLE 10 – MISCELLANEOUS**

### **10.01 *Terms***

- A. Terms used in this Agreement will have the meanings stated in the General Conditions and the Supplementary Conditions.

#### 10.02 *Assignment of Contract*

- A. Unless expressly agreed to elsewhere in the Contract, no assignment by a party hereto of any rights under or interests in the Contract will be binding on another party hereto without the written consent of the party sought to be bound; and, specifically but without limitation, money that may become due and money that is due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

#### 10.03 *Successors and Assigns*

- A. Owner and Contractor each binds itself, its successors, assigns, and legal representatives to the other party hereto, its successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

#### 10.04 *Severability*

- A. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon Owner and Contractor, who agree that the Contract Documents shall be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

#### 10.05 *Contractor's Certifications*

- A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 10.05:
  - 1. "corrupt practice" means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the bidding process or in the Contract execution;
  - 2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of Owner, (b) to establish Bid or Contract prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;
  - 3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish Bid prices at artificial, non-competitive levels; and
  - 4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.



#### 10.06 Other Provisions

- A. Owner stipulates that if the General Conditions that are made a part of this Contract are based on EJCDC® C-700, Standard General Conditions for the Construction Contract, published by the Engineers Joint Contract Documents Committee®, and if Owner is the party that has furnished said General Conditions, then Owner has plainly shown all modifications to the standard wording of such published document to the Contractor, through a process such as highlighting or “track changes” (redline/strikeout), or in the Supplementary Conditions.

IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement.

This Agreement will be effective on \_\_\_\_\_ (which is the Effective Date of the Contract).

OWNER:

CONTRACTOR:

**City of Hot Springs, Arkansas**

By: \_\_\_\_\_

By: \_\_\_\_\_

Title: \_\_\_\_\_

Title: \_\_\_\_\_

*(If Contractor is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)*

Attest: \_\_\_\_\_

Attest: \_\_\_\_\_

Title: \_\_\_\_\_

Title: \_\_\_\_\_

Address for giving notices:

Address for giving notices:

**City of Hot Springs**

**P.O. Box 700**

**Hot Springs, AR 71902**

License

No.: \_\_\_\_\_

*(where applicable)*

*(If Owner is a corporation, attach evidence of authority to sign. If Owner is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of this Agreement.)*

**NOTE TO USER:** *Use in those states or other jurisdictions where applicable or required.*

**DOCUMENT 005500**

**NOTICE TO PROCEED**

Owner:	<b>City of Hot Springs, Arkansas</b>	Owner's Contract No.:	
Contractor:		Contractor's Project No.:	
Engineer:	<b>Crist Engineers, Inc.</b>	Engineer's Project No.:	<b>1926</b>
Project:	<b>Raw Water Supply Transmission Pipeline</b>	Contract Name:	<b>Contract 1 – Blakely Mountain Dam Road to Ouachita Water Treatment Plant</b>

Effective Date of  
Contract:

**TO CONTRACTOR:**

Owner hereby notifies Contractor that the Contract Times under the above Contract will commence to run on [\_\_\_\_\_, 2020]. *[see Paragraph 4.01 of the General Conditions]*

On that date, Contractor shall start performing its obligations under the Contract Documents. No Work shall be done at the Site prior to such date. In accordance with the Agreement, the number of days to achieve Substantial Completion is 21 consecutive calendar days, and the number of days to achieve readiness for final payment is 28 consecutive calendar days.

Before starting any Work at the Site, Contractor must comply with the following:

*[Note any access limitations, security procedures, or other restrictions]*

Temporary Access Permit from USACE

Section 404 Permit from USACE

Section 408 Permit from USACE

Special Use Permit from US Forest Service

Owner: **City of Hot Springs, Arkansas**

\_\_\_\_\_  
Authorized Signature

By: \_\_\_\_\_

Title: \_\_\_\_\_

Date Issued: \_\_\_\_\_

Copy: **Crist Engineers, Inc.**

DOCUMENT 006113

PERFORMANCE BOND

CONTRACTOR (*name and address*): SURETY (*name and address of principal place of business*):

OWNER (*name and address*):  
**City of Hot Springs, Arkansas**  
**P.O. Box 700**  
**Hot Springs, AR 71902**

CONSTRUCTION CONTRACT

Effective Date of the Agreement:

Amount:

Description (*name and location*): **Raw Water Supply Transmission Pipeline**  
**Contract 1: Blakely Mountain Dam Road to**  
**Ouachita Water Treatment Plant**  
**Hot Springs, Arkansas**

BOND

Bond Number:

Date (*not earlier than the Effective Date of the Agreement of the Construction Contract*):

Amount:

Modifications to this Bond Form: ☐ None ☐ See Paragraph 16

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL

SURETY

\_\_\_\_\_  
Contractor's Name and Corporate Seal

\_\_\_\_\_  
Surety's Name and Corporate Seal

By: \_\_\_\_\_  
Signature

By: \_\_\_\_\_  
Signature (*attach power of attorney*)

---

Print Name

---

Print Name

---

Title

---

Title

---

Attest:

Signature

---

Attest:

Signature

---

Title

---

Title

*Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.*

1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

2. If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Paragraph 3.

3. If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after:

3.1 The Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor, and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Paragraph 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor, and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;

3.2 The Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and

3.3 The Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

4. Failure on the part of the Owner to comply with the notice requirement in Paragraph 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

5. When the Owner has satisfied the conditions of Paragraph 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owners concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Paragraph 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and with reasonable promptness under the circumstances:

5.4.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or

5.4.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

6. If the Surety does not proceed as provided in Paragraph 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Paragraph 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

7. If the Surety elects to act under Paragraph 5.1, 5.2, or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication for:

7.1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;

7.2 additional legal, design professional, and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Paragraph 5; and

7.3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

8. If the Surety elects to act under Paragraph 5.1, 5.3, or 5.4, the Surety's liability is limited to the amount of this Bond.

9. The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors, and assigns.

10. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.

11. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the

minimum periods of limitations available to sureties as a defense in the jurisdiction of the suit shall be applicable.

12. Notice to the Surety, the Owner, or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

#### 14. Definitions

14.1 Balance of the Contract Price: The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made including allowance for the Contractor for any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

14.2 Construction Contract: The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

14.3 Contractor Default: Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

14.4 Owner Default: Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

14.5 Contract Documents: All the documents that comprise the agreement between the Owner and Contractor.

15. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

16. Modifications to this Bond are as follows:

DOCUMENT 006114

PAYMENT BOND

CONTRACTOR (*name and address*):

SURETY (*name and address of  
principal place of business*):

OWNER (*name and address*):

**City of Hot Springs, Arkansas  
P.O. Box 700  
Hot Springs, AR 71902**

CONSTRUCTION CONTRACT

Effective Date of the Agreement:

Amount:

Description (*name and location*): **Raw Water Supply Transmission Pipeline  
Contract 1: Blakely Mountain Dam Road to  
Ouachita Water Treatment Plant  
Hot Springs, Arkansas**

BOND

Bond Number:

Date (*not earlier than the Effective Date of the Agreement of the Construction  
Contract*):

Amount:

Modifications to this Bond Form: ☐ None ☐ See Paragraph 18

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL

SURETY

\_\_\_\_\_  
Contractor's Name and Corporate Seal

\_\_\_\_\_  
Surety's Name and Corporate Seal

By: \_\_\_\_\_  
Signature

By: \_\_\_\_\_  
Signature (*attach power of attorney*)

\_\_\_\_\_  
Print Name

\_\_\_\_\_  
Print Name

---

Title

**Attest:** \_\_\_\_\_

Signature

---

Title

**Attest:** \_\_\_\_\_

Signature

---

Title

---

Title

**Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.**

1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner to pay for labor, materials, and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
2. If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies, and holds harmless the Owner from claims, demands, liens, or suits by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.
  - 5.1.2 have sent a Claim to the Surety (at the address described in Paragraph 13).
3. If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Paragraph 13) of claims, demands, liens, or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, and tendered defense of such claims, demands, liens, or suits to the Contractor and the Surety.
  - 5.2 Claimants who are employed by or have a direct contract with the Contractor have sent a Claim to the Surety (at the address described in Paragraph 13).
4. When the Owner has satisfied the conditions in Paragraph 3, the Surety shall promptly and at the Surety's expense defend, indemnify, and hold harmless the Owner against a duly tendered claim, demand, lien, or suit.
5. The Surety's obligations to a Claimant under this Bond shall arise after the following:
  - 5.1 Claimants who do not have a direct contract with the Contractor,
    - 5.1.1 have furnished a written notice of non-payment to the Contractor, stating with
6. If a notice of non-payment required by Paragraph 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Paragraph 5.1.1.
7. When a Claimant has satisfied the conditions of Paragraph 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:
  - 7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and
  - 7.2 Pay or arrange for payment of any undisputed amounts.

- 7.3 The Surety's failure to discharge its obligations under Paragraph 7.1 or 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Paragraph 7.1 or 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.
8. The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Paragraph 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.
9. Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.
10. The Surety shall not be liable to the Owner, Claimants, or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to or give notice on behalf of Claimants, or otherwise have any obligations to Claimants under this Bond.
11. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.
12. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Paragraph 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.
13. Notice and Claims to the Surety, the Owner, or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.
- Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.
14. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.
15. Upon requests by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.
16. **Definitions**
- 16.1 **Claim:** A written statement by the Claimant including at a minimum:
1. The name of the Claimant;
  2. The name of the person for whom the labor was done, or materials or equipment furnished;
  3. A copy of the agreement or purchase order pursuant to which labor, materials, or equipment was furnished for use in the performance of the Construction Contract;
  4. A brief description of the labor, materials, or equipment furnished;
  5. The date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
  6. The total amount earned by the Claimant for labor, materials, or equipment furnished as of the date of the Claim;
  7. The total amount of previous payments received by the Claimant; and
  8. The total amount due and unpaid to the Claimant for labor, materials, or equipment furnished as of the date of the Claim.
- 16.2 **Claimant:** An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials, or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms of "labor, materials, or equipment" that part of the water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Construction Contract, architectural and



engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.

16.3 **Construction Contract:** The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

16.4 **Owner Default:** Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

16.5 **Contract Documents:** All the documents that comprise the agreement between the Owner and Contractor.

17. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

18. Modifications to this Bond are as follows:

**SECTION 006115**

**WARRANTY BOND**

Bond Number: \_\_\_\_\_

KNOW ALL MEN BY THESE PRESENTS, That

\_\_\_\_\_  
(Name of Contractor)

\_\_\_\_\_  
(Address of Contractor)

a \* \_\_\_\_\_, hereinafter called "Principal", and  
(\*Corporation, Partnership, or Individual)

\_\_\_\_\_  
(Name of Surety)

\_\_\_\_\_  
(Address of Surety)

hereinafter called "Surety", are hereby jointly and severally held and firmly bound unto

City of Hot Springs Utility Department  
acting by and through the  
City of Hot Springs  
P.O. Box 700  
Hot Springs, Arkansas 71902

as Obligee ("Owner"), for the payment of the total aggregate penal sum of  
\_\_\_\_\_ Dollars (\$\_\_\_\_\_)

subject to the terms and conditions provided herein.

WHEREAS, Principal executed and entered into that certain Agreement with Owner for:

**RAW WATER SUPPLY TRANSMISSION PIPELINE  
CONTRACT 1  
BLAKELY MOUNTAIN DAM ROAD TO OUACHITA WATER TREATMENT PLANT**

dated \_\_\_\_\_, 20\_\_\_\_ (the "Contract"), the provisions of which are  
incorporated herein by reference, and unless otherwise defined herein all defined terms

used or referred to herein shall have the meaning ascribed thereto in the Contract. In addition to other obligations and liabilities, the Contract required Principal to perform the Work for the Project and to furnish this Bond to Owner in compliance with Article 6 of the General Conditions and the Supplemental General Conditions.

NOW THEREFORE, the obligations of Principal and Surety herein shall remain in full force and effect as provided herein, subject to becoming null and void upon the occurrence of either or both of the conditions that (a) Principal shall fully perform and satisfy all obligations and liabilities of Principal under the warranty and guarantee provisions of Article 6 of the General Conditions, as modified or supplemented by the Supplemental General Conditions or any other applicable Contract Documents, at any time within two years after the date of Final Acceptance or such longer period of time as may be prescribed therein (the "Warranty Period"), all of which includes without limitation either correcting the defective Work, or removing and replacing it with nondefective Work, or paying all direct, indirect or consequential costs of such correction or removal and replacement, all as provided therein, or (b) Owner shall fail to institute a lawsuit, action or other proceeding under this Bond before the expiration of three (3) months following the end of the Warranty Period.

FURTHER PROVIDED, that (a) any changes, modifications, amendments, alterations or supplementations in or to the Contract, and Contract Documents or the Work, or the giving by Owner of any extension of time for the performance of the Contract, or any other forbearance on the part of either Owner or Principal to the other, shall not in any way release the Principal or Surety, or either of them, from their liability hereunder, notice to the Surety of any of the foregoing being hereby waived, (b) in no event shall the aggregate liability of Surety exceed the amount set out herein, and (c) the rights and obligations hereof shall be binding upon and shall inure to the benefit of Principal, Surety, Owner and their respective heirs, legal representatives, partners, privies, successors and assigns, provided that nothing herein shall authorize the assignment of any such rights and obligations except upon compliance with Article 6 of the General Conditions.

Date of project final completion is \_\_\_\_\_. The bond shall be effective for a period of two years.

IN WITNESS WHEREOF, this instrument is executed in five (5) counterparts, each one of which shall be deemed original, this the \_\_\_\_\_ day of \_\_\_\_\_ 20 \_\_\_\_.

**PRINCIPAL:**

\_\_\_\_\_  
(Company)

By: \_\_\_\_\_  
(Signature)

Name: \_\_\_\_\_

Title: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_

**ATTEST:**

By: \_\_\_\_\_  
(Signature)

Name: \_\_\_\_\_

Title: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_

**SURETY:**

\_\_\_\_\_  
(Surety)

Address: \_\_\_\_\_

\_\_\_\_\_

Phone No. \_\_\_\_\_

By: \_\_\_\_\_  
(Signature Attorney-in-Fact)

Address: \_\_\_\_\_

\_\_\_\_\_

Phone No. \_\_\_\_\_

**SEAL**

**ATTEST:**

By: \_\_\_\_\_

Name: \_\_\_\_\_

Title: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_

**IMPORTANT:** Surety Companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be in accordance with Article 6 of the RLF Supplemental General Conditions and be authorized to transact business in the State of Arkansas.

# STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

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## ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

### 1.01 *Defined Terms*

- A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
  2. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.
  3. *Application for Payment*—The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
  4. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
  5. *Bidder*—An individual or entity that submits a Bid to Owner.
  6. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.
  7. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.
  8. *Change Order*—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.
  9. *Change Proposal*—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.
  10. *Claim*—(a) A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein: seeking an adjustment of Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract; or (b) a demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision

regarding a Change Proposal; or seeking resolution of a contractual issue that Engineer has declined to address. A demand for money or services by a third party is not a Claim.

11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to (a) the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. §§9601 et seq. (“CERCLA”); (b) the Hazardous Materials Transportation Act, 49 U.S.C. §§5501 et seq.; (c) the Resource Conservation and Recovery Act, 42 U.S.C. §§6901 et seq. (“RCRA”); (d) the Toxic Substances Control Act, 15 U.S.C. §§2601 et seq.; (e) the Clean Water Act, 33 U.S.C. §§1251 et seq.; (f) the Clean Air Act, 42 U.S.C. §§7401 et seq.; or (g) any other federal, state, or local statute, law, rule, regulation, ordinance, resolution, code, order, or decree regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.
12. *Contract*—The entire and integrated written contract between the Owner and Contractor concerning the Work.
13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.
14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents. .
15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.
16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.
17. *Cost of the Work*—See Paragraph 13.01 for definition.
18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.
19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.
20. *Engineer*—The individual or entity named as such in the Agreement.
21. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.
22. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated in the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, does not establish a Hazardous Environmental Condition.
23. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
24. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.

25. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date or by a time prior to Substantial Completion of all the Work.
26. *Notice of Award*—The written notice by Owner to a Bidder of Owner's acceptance of the Bid.
27. *Notice to Proceed*—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.
28. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.
29. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.
30. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.
31. *Project Manual*—The written documents prepared for, or made available for, procuring and constructing the Work, including but not limited to the Bidding Documents or other construction procurement documents, geotechnical and existing conditions information, the Agreement, bond forms, General Conditions, Supplementary Conditions, and Specifications. The contents of the Project Manual may be bound in one or more volumes.
32. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative or "RPR" includes any assistants or field staff of Resident Project Representative.
33. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.
34. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer's review of the submittals and the performance of related construction activities.
35. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.
36. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.
37. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands furnished by Owner which are designated for the use of Contractor.

38. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.
39. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.
40. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the Work refer to Substantial Completion thereof.
41. *Successful Bidder*—The Bidder whose Bid the Owner accepts, and to which the Owner makes an award of contract, subject to stated conditions.
42. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.
43. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.
44. *Technical Data*—Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (a) subsurface conditions at the Site, or physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) or (b) Hazardous Environmental Conditions at the Site. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then the data contained in boring logs, recorded measurements of subsurface water levels, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical or environmental report prepared for the Project and made available to Contractor are hereby defined as Technical Data with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06.
45. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including but not limited to those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, fiber optic transmissions, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
46. *Unit Price Work*—Work to be paid for on the basis of unit prices.
47. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.
48. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

## 1.02 Terminology

- A. The words and terms discussed in the following paragraphs are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.
- B. *Intent of Certain Terms or Adjectives:*
1. The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.
- C. *Day:*
1. The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.
- D. *Defective:*
1. The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
    - a. does not conform to the Contract Documents; or
    - b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
    - c. has been damaged prior to Engineer’s recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 15.03 or 15.04).
- E. *Furnish, Install, Perform, Provide:*
1. The word “furnish,” when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
  2. The word “install,” when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
  3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.
  4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words

“furnish,” “install,” “perform,” or “provide,” then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.

- F. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

## **ARTICLE 2 – PRELIMINARY MATTERS**

### **2.01   *Delivery of Bonds and Evidence of Insurance***

- A. *Bonds*: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.
- B. *Evidence of Contractor’s Insurance*: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract), the certificates and other evidence of insurance required to be provided by Contractor in accordance with Article 6.
- C. *Evidence of Owner’s Insurance*: After receipt of the executed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or otherwise), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

### **2.02   *Copies of Documents***

- A. Owner shall furnish to Contractor four printed copies of the Contract (including one fully executed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.
- B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications signed and sealed by Engineer and other design professionals. Owner shall make such original printed record version of the Contract available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.

### **2.03   *Before Starting Construction***

- A. *Preliminary Schedules*: Within 10 days after the Effective Date of the Contract (or as otherwise specifically required by the Contract Documents), Contractor shall submit to Engineer for timely review:
  - 1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;
  - 2. a preliminary Schedule of Submittals; and
  - 3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.



#### 2.04 *Preconstruction Conference; Designation of Authorized Representatives*

- A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.03.A, procedures for handling Shop Drawings, Samples, and other submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.
- B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

#### 2.05 *Initial Acceptance of Schedules*

- A. At least 10 days before submission of the first Application for Payment, a conference, attended by Contractor, Engineer, and others as appropriate, will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.03.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.
  - 1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.
  - 2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
  - 3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.

#### 2.06 *Electronic Transmittals*

- A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may transmit, and shall accept, Project-related correspondence, text, data, documents, drawings, information, and graphics, including but not limited to Shop Drawings and other submittals, in electronic media or digital format, either directly, or through access to a secure Project website.
- B. If the Contract does not establish protocols for electronic or digital transmittals, then Owner, Engineer, and Contractor shall jointly develop such protocols.
- C. When transmitting items in electronic media or digital format, the transmitting party makes no representations as to long term compatibility, usability, or readability of the items resulting from the recipient's use of software application packages, operating systems, or computer hardware differing from those used in the drafting or transmittal of the items, or from those established in applicable transmittal protocols.

## ARTICLE 3 – DOCUMENTS: INTENT, REQUIREMENTS, REUSE

### 3.01 *Intent*

- A. The Contract Documents are complementary; what is required by one is as binding as if required by all.
- B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents.
- C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic or digital versions of the Contract Documents (including any printed copies derived from such electronic or digital versions) and the printed record version, the printed record version shall govern.
- D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.
- E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.

### 3.02 *Reference Standards*

- A. Standards Specifications, Codes, Laws and Regulations
  - 1. Reference in the Contract Documents to standard specifications, manuals, reference standards, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard specification, manual, reference standard, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Contract if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.
  - 2. No provision of any such standard specification, manual, reference standard, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the part of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the part of the Contract Documents prepared by or for Engineer.

### 3.03 *Reporting and Resolving Discrepancies*

- A. *Reporting Discrepancies:*
  - 1. *Contractor's Verification of Figures and Field Measurements:* Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.

2. *Contractor's Review of Contract Documents:* If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.
3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies:*

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

3.04 *Requirements of the Contract Documents*

- A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work thereunder.
- B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.
- C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly give written notice to Owner and Contractor that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

### 3.05 *Reuse of Documents*

- A. Contractor and its Subcontractors and Suppliers shall not:
  - 1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions, or reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer; or
  - 2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without Owner's express written consent, or violate any copyrights pertaining to such Contract Documents.
- B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

## **ARTICLE 4 – COMMENCEMENT AND PROGRESS OF THE WORK**

### 4.01 *Commencement of Contract Times; Notice to Proceed*

- A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Contract or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Contract. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Contract, whichever date is earlier.

### 4.02 *Starting the Work*

- A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to such date.

### 4.03 *Reference Points*

- A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

### 4.04 *Progress Schedule*

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 as it may be adjusted from time to time as provided below.
  - 1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.

2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 11.
- B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

#### 4.05 *Delays in Contractor's Progress*

- A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Times and Contract Price. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.
- C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:
  1. severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;
  2. abnormal weather conditions;
  3. acts or failures to act of utility owners (other than those performing other work at or adjacent to the Site by arrangement with the Owner, as contemplated in Article 8); and
  4. acts of war or terrorism.
- D. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5.
- E. Paragraph 8.03 governs delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.
- F. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor.
- G. Contractor must submit any Change Proposal seeking an adjustment in Contract Price or Contract Times under this paragraph within 30 days of the commencement of the delaying, disrupting, or interfering event.

## ARTICLE 5 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

### 5.01 *Availability of Lands*

- A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.
- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

### 5.02 *Use of Site and Other Areas*

- A. *Limitation on Use of Site and Other Areas:*
  - 1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.
  - 2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.12, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or at law; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.
- B. *Removal of Debris During Performance of the Work:* During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste

materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.

- C. *Cleaning*: Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.
- D. *Loading of Structures*: Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent structures or land to stresses or pressures that will endanger them.

#### 5.03 *Subsurface and Physical Conditions*

- A. *Reports and Drawings*: The Supplementary Conditions identify:
  - 1. those reports known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site;
  - 2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities); and
  - 3. Technical Data contained in such reports and drawings.
- B. *Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:
  - 1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or
  - 2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
  - 3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

#### 5.04 *Differing Subsurface or Physical Conditions*

- A. *Notice by Contractor*: If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site either:
  - 1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate; or
  - 2. is of such a nature as to require a change in the Drawings or Specifications; or
  - 3. differs materially from that shown or indicated in the Contract Documents; or

4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

- B. *Engineer's Review:* After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine the necessity of Owner's obtaining additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A above; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.
- C. *Owner's Statement to Contractor Regarding Site Condition:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.
- D. *Possible Price and Times Adjustments:*
  1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, or both, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
    - a. such condition must fall within any one or more of the categories described in Paragraph 5.04.A;
    - b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,
    - c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
  2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:
    - a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise; or
    - b. the existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site



and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or

- c. Contractor failed to give the written notice as required by Paragraph 5.04.A.
- 3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.
- 4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.

#### 5.05 *Underground Facilities*

- A. *Contractor's Responsibilities:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or adjacent to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:
  - 1. Owner and Engineer do not warrant or guarantee the accuracy or completeness of any such information or data provided by others; and
  - 2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
    - a. reviewing and checking all information and data regarding existing Underground Facilities at the Site;
    - b. locating all Underground Facilities shown or indicated in the Contract Documents as being at the Site;
    - c. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and
    - d. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.
- B. *Notice by Contractor:* If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, then Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer.
- C. *Engineer's Review:* Engineer will promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the Underground Facility in question; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and advise Owner in writing of Engineer's findings, conclusions, and

recommendations. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

- D. *Owner's Statement to Contractor Regarding Underground Facility:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question, addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.
- E. *Possible Price and Times Adjustments:*
  - 1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, or both, to the extent that any existing Underground Facility at the Site that was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
    - a. Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated the existence or actual location of the Underground Facility in question;
    - b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03;
    - c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times; and
    - d. Contractor gave the notice required in Paragraph 5.05.B.
  - 2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.
  - 3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.

#### 5.06 *Hazardous Environmental Conditions at Site*

- A. *Reports and Drawings:* The Supplementary Conditions identify:
  - 1. those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and
  - 2. Technical Data contained in such reports and drawings.
- B. *Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer,

or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or
  2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or
  3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.
- C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.
- D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.
- E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.
- F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.
- G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off.
- H. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special

conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.

- I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.H shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

## **ARTICLE 6 – BONDS AND INSURANCE**

### **6.01 *Performance, Payment, and Other Bonds***

- A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of all of Contractor's obligations under the Contract. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the Supplementary Conditions, or other specific provisions of the Contract. Contractor shall also furnish such other bonds as are required by the Supplementary Conditions or other specific provisions of the Contract.
- B. All bonds shall be in the form prescribed by the Contract except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (as amended and supplemented) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. A bond

signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.

- C. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds in the required amounts.
- D. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or its right to do business is terminated in any state or jurisdiction where any part of the Project is located, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the bond and surety requirements above.
- E. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner's termination rights under Article 16.
- F. Upon request, Owner shall provide a copy of the payment bond to any Subcontractor, Supplier, or other person or entity claiming to have furnished labor or materials used in the performance of the Work.

#### 6.02 *Insurance—General Provisions*

- A. Owner and Contractor shall obtain and maintain insurance as required in this Article and in the Supplementary Conditions.
- B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.
- C. Contractor shall deliver to Owner, with copies to each named insured and additional insured (as identified in this Article, in the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Contractor has obtained and is maintaining the policies, coverages, and endorsements required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Contractor may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.
- D. Owner shall deliver to Contractor, with copies to each named insured and additional insured (as identified in this Article, the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Owner has obtained and is maintaining the policies, coverages, and endorsements required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Owner may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.
- E. Failure of Owner or Contractor to demand such certificates or other evidence of the other party's full compliance with these insurance requirements, or failure of Owner or Contractor

to identify a deficiency in compliance from the evidence provided, shall not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.

- F. If either party does not purchase or maintain all of the insurance required of such party by the Contract, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage.
- G. If Contractor has failed to obtain and maintain required insurance, Owner may exclude the Contractor from the Site, impose an appropriate set-off against payment, and exercise Owner's termination rights under Article 16.
- H. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect to obtain equivalent insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and the Contract Price shall be adjusted accordingly.
- I. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests.
- J. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner and other individuals and entities in the Contract.

#### 6.03 *Contractor's Insurance*

- A. *Workers' Compensation:* Contractor shall purchase and maintain workers' compensation and employer's liability insurance for:
  - 1. claims under workers' compensation, disability benefits, and other similar employee benefit acts.
  - 2. United States Longshoreman and Harbor Workers' Compensation Act and Jones Act coverage (if applicable).
  - 3. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees (by stop-gap endorsement in monopolist worker's compensation states).
  - 4. Foreign voluntary worker compensation (if applicable).
- B. *Commercial General Liability—Claims Covered:* Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against:
  - 1. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees.
  - 2. claims for damages insured by reasonably available personal injury liability coverage.
  - 3. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.
- C. *Commercial General Liability—Form and Content:* Contractor's commercial liability policy shall be written on a 1996 (or later) ISO commercial general liability form (occurrence form) and include the following coverages and endorsements:
  - 1. Products and completed operations coverage:
    - a. Such insurance shall be maintained for three years after final payment.

- b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.
  2. Blanket contractual liability coverage, to the extent permitted by law, including but not limited to coverage of Contractor's contractual indemnity obligations in Paragraph 7.18.
  3. Broad form property damage coverage.
  4. Severability of interest.
  5. Underground, explosion, and collapse coverage.
  6. Personal injury coverage.
  7. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 10 01 and CG 20 37 10 01 (together); or CG 20 10 07 04 and CG 20 37 07 04 (together); or their equivalent.
  8. For design professional additional insureds, ISO Endorsement CG 20 32 07 04, "Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured" or its equivalent.
- D. *Automobile liability*: Contractor shall purchase and maintain automobile liability insurance against claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle. The automobile liability policy shall be written on an occurrence basis.
- E. *Umbrella or excess liability*: Contractor shall purchase and maintain umbrella or excess liability insurance written over the underlying employer's liability, commercial general liability, and automobile liability insurance described in the paragraphs above. Subject to industry-standard exclusions, the coverage afforded shall follow form as to each and every one of the underlying policies.
- F. *Contractor's pollution liability insurance*: Contractor shall purchase and maintain a policy covering third-party injury and property damage claims, including clean-up costs, as a result of pollution conditions arising from Contractor's operations and completed operations. This insurance shall be maintained for no less than three years after final completion.
- G. *Additional insureds*: The Contractor's commercial general liability, automobile liability, umbrella or excess, and pollution liability policies shall include and list as additional insureds Owner and Engineer, and any individuals or entities identified in the Supplementary Conditions; include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds; and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby (including as applicable those arising from both ongoing and completed operations) on a non-contributory basis. Contractor shall obtain all necessary endorsements to support these requirements.
- H. *Contractor's professional liability insurance*: If Contractor will provide or furnish professional services under this Contract, through a delegation of professional design services or otherwise, then Contractor shall be responsible for purchasing and maintaining applicable professional liability insurance. This insurance shall provide protection against claims arising out of performance of professional design or related services, and caused by a negligent error, omission, or act for which the insured party is legally liable. It shall be maintained throughout the duration of the Contract and for a minimum of two years after Substantial

Completion. If such professional design services are performed by a Subcontractor, and not by Contractor itself, then the requirements of this paragraph may be satisfied through the purchasing and maintenance of such insurance by such Subcontractor.

- I. *General provisions:* The policies of insurance required by this Paragraph 6.03 shall:
  1. include at least the specific coverages provided in this Article.
  2. be written for not less than the limits of liability provided in this Article and in the Supplementary Conditions, or required by Laws or Regulations, whichever is greater.
  3. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed, or renewal refused until at least 10 days prior written notice has been given to Contractor. Within three days of receipt of any such written notice, Contractor shall provide a copy of the notice to Owner, Engineer, and each other insured under the policy.
  4. remain in effect at least until final payment (and longer if expressly required in this Article) and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract Documents.
  5. be appropriate for the Work being performed and provide protection from claims that may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable.
- J. The coverage requirements for specific policies of insurance must be met by such policies, and not by reference to excess or umbrella insurance provided in other policies.

#### 6.04 *Owner's Liability Insurance*

- A. In addition to the insurance required to be provided by Contractor under Paragraph 6.03, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.
- B. Owner's liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner's liability policies for any of Contractor's obligations to the Owner, Engineer, or third parties.

#### 6.05 *Property Insurance*

- A. *Builder's Risk:* Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the full insurable replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:
  1. include the Owner and Contractor as named insureds, and all Subcontractors, and any individuals or entities required by the Supplementary Conditions to be insured under such builder's risk policy, as insureds or named insureds. For purposes of the remainder of this Paragraph 6.05, Paragraphs 6.06 and 6.07, and any corresponding Supplementary Conditions, the parties required to be insured shall collectively be referred to as "insureds."



2. be written on a builder's risk "all risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire; lightning; windstorm; riot; civil commotion; terrorism; vehicle impact; aircraft; smoke; theft; vandalism and malicious mischief; mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; flood; collapse; explosion; debris removal; demolition occasioned by enforcement of Laws and Regulations; water damage (other than that caused by flood); and such other perils or causes of loss as may be specifically required by the Supplementary Conditions. If insurance against mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; or flood, are not commercially available under builder's risk policies, by endorsement or otherwise, such insurance may be provided through other insurance policies acceptable to Owner and Contractor.
  3. cover, as insured property, at least the following: (a) the Work and all materials, supplies, machinery, apparatus, equipment, fixtures, and other property of a similar nature that are to be incorporated into or used in the preparation, fabrication, construction, erection, or completion of the Work, including Owner-furnished or assigned property; (b) spare parts inventory required within the scope of the Contract; and (c) temporary works which are not intended to form part of the permanent constructed Work but which are intended to provide working access to the Site, or to the Work under construction, or which are intended to provide temporary support for the Work under construction, including scaffolding, form work, fences, shoring, falsework, and temporary structures.
  4. cover expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects).
  5. extend to cover damage or loss to insured property while in temporary storage at the Site or in a storage location outside the Site (but not including property stored at the premises of a manufacturer or Supplier).
  6. extend to cover damage or loss to insured property while in transit.
  7. allow for partial occupation or use of the Work by Owner, such that those portions of the Work that are not yet occupied or used by Owner shall remain covered by the builder's risk insurance.
  8. allow for the waiver of the insurer's subrogation rights, as set forth below.
  9. provide primary coverage for all losses and damages caused by the perils or causes of loss covered.
  10. not include a co-insurance clause.
  11. include an exception for ensuing losses from physical damage or loss with respect to any defective workmanship, design, or materials exclusions.
  12. include performance/hot testing and start-up.
  13. be maintained in effect, subject to the provisions herein regarding Substantial Completion and partial occupancy or use of the Work by Owner, until the Work is complete.
- B. *Notice of Cancellation or Change:* All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this

Paragraph 6.05 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured.

- C. *Deductibles*: The purchaser of any required builder's risk or property insurance shall pay for costs not covered because of the application of a policy deductible.
- D. *Partial Occupancy or Use by Owner*: If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide notice of such occupancy or use to the builder's risk insurer. The builder's risk insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy; rather, those portions of the Work that are occupied or used by Owner may come off the builder's risk policy, while those portions of the Work not yet occupied or used by Owner shall remain covered by the builder's risk insurance.
- E. *Additional Insurance*: If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.05, it may do so at Contractor's expense.
- F. *Insurance of Other Property*: If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, such as tools, construction equipment, or other personal property owned by Contractor, a Subcontractor, or an employee of Contractor or a Subcontractor, then the entity or individual owning such property item will be responsible for deciding whether to insure it, and if so in what amount.

#### 6.06 *Waiver of Rights*

- A. All policies purchased in accordance with Paragraph 6.05, expressly including the builder's risk policy, shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any insureds thereunder, or against Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all Subcontractors, all individuals or entities identified in the Supplementary Conditions as insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.
- B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for:
  - 1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by,

arising out of, or resulting from fire or other perils whether or not insured by Owner; and

2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06.
- C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 6.06.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them.
- D. Contractor shall be responsible for assuring that the agreement under which a Subcontractor performs a portion of the Work contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by builder's risk insurance and any other property insurance applicable to the Work.

#### **6.07    *Receipt and Application of Property Insurance Proceeds***

- A. Any insured loss under the builder's risk and other policies of insurance required by Paragraph 6.05 will be adjusted and settled with the named insured that purchased the policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.
- B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.05 shall distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.
- C. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the money so received applied on account thereof, and the Work and the cost thereof covered by Change Order, if needed.

### **ARTICLE 7 – CONTRACTOR'S RESPONSIBILITIES**

#### **7.01    *Supervision and Superintendence***

- A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.

- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

#### 7.02 *Labor; Working Hours*

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.
- B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

#### 7.03 *Services, Materials, and Equipment*

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

#### 7.04 *"Or Equals"*

- A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or equal" item is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment, or items from other proposed suppliers under the circumstances described below.
  - 1. If Engineer in its sole discretion determines that an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer shall deem it an "or equal" item. For the purposes of this paragraph, a proposed item of material or equipment will be considered functionally equal to an item so named if:

- a. in the exercise of reasonable judgment Engineer determines that:
    - 1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;
    - 2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;
    - 3) it has a proven record of performance and availability of responsive service; and
    - 4) it is not objectionable to Owner.
  - b. Contractor certifies that, if approved and incorporated into the Work:
    - 1) there will be no increase in cost to the Owner or increase in Contract Times; and
    - 2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.
- B. *Contractor's Expense:* Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.
- C. *Engineer's Evaluation and Determination:* Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an "or-equal", which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.
- D. *Effect of Engineer's Determination:* Neither approval nor denial of an "or-equal" request shall result in any change in Contract Price. The Engineer's denial of an "or-equal" request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents.
- E. *Treatment as a Substitution Request:* If Engineer determines that an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer consider the proposed item as a substitute pursuant to Paragraph 7.05.

#### 7.05 Substitutes

- A. Unless the specification or description of an item of material or equipment required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment under the circumstances described below. To the extent possible such requests shall be made before commencement of related construction at the Site.
  - 1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of material or equipment from anyone other than Contractor.

2. The requirements for review by Engineer will be as set forth in Paragraph 7.05.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.
3. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:
  - a. shall certify that the proposed substitute item will:
    - 1) perform adequately the functions and achieve the results called for by the general design,
    - 2) be similar in substance to that specified, and
    - 3) be suited to the same use as that specified.
  - b. will state:
    - 1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times,
    - 2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and
    - 3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.
  - c. will identify:
    - 1) all variations of the proposed substitute item from that specified, and
    - 2) available engineering, sales, maintenance, repair, and replacement services.
  - d. shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.
- B. *Engineer's Evaluation and Determination:* Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.
- C. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- D. *Reimbursement of Engineer's Cost:* Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the

Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

- E. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute at Contractor's expense.
- F. *Effect of Engineer's Determination*: If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.05.D, by timely submittal of a Change Proposal.

7.06 *Concerning Subcontractors, Suppliers, and Others*

- A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner.
- B. Contractor shall retain specific Subcontractors, Suppliers, or other individuals or entities for the performance of designated parts of the Work if required by the Contract to do so.
- C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against which Contractor has reasonable objection.
- D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable, during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within five days.
- E. Owner may require the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors, Suppliers, or other individuals or entities for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor, Supplier, or other individual or entity so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity.
- F. If Owner requires the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, or both, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.
- G. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.

- H. On a monthly basis Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.
- I. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions.
- J. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors, Suppliers, and all other individuals or entities performing or furnishing any of the Work.
- K. Contractor shall restrict all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed herein.
- L. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.
- M. All Work performed for Contractor by a Subcontractor or Supplier shall be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer.
- N. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor on account of Work performed for Contractor by the particular Subcontractor or Supplier.
- O. Nothing in the Contract Documents:
  - 1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier, or other individual or entity; nor
  - 2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

#### **7.07 *Patent Fees and Royalties***

- A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.
- B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the



performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.

- C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

#### 7.08 *Permits*

- A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work

#### 7.09 *Taxes*

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

#### 7.10 *Laws and Regulations*

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.
- B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work or other action. It shall not be Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.
- C. Owner or Contractor may give notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if

any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

#### 7.11 *Record Documents*

- A. Contractor shall maintain in a safe place at the Site one printed record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, written interpretations and clarifications, and approved Shop Drawings. Contractor shall keep such record documents in good order and annotate them to show changes made during construction. These record documents, together with all approved Samples, will be available to Engineer for reference. Upon completion of the Work, Contractor shall deliver these record documents to Engineer.

#### 7.12 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:
  - 1. all persons on the Site or who may be affected by the Work;
  - 2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
  - 3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify Owner; the owners of adjacent property, Underground Facilities, and other utilities; and other contractors and utility owners performing work at or adjacent to the Site, when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.
- C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.
- D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.
- E. All damage, injury, or loss to any property referred to in Paragraph 7.12.A.2 or 7.12.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly

or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

- F. Contractor's duties and responsibilities for safety and protection shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 15.06.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).
- G. Contractor's duties and responsibilities for safety and protection shall resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

#### 7.13 *Safety Representative*

- A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

#### 7.14 *Hazard Communication Programs*

- A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

#### 7.15 *Emergencies*

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

#### 7.16 *Shop Drawings, Samples, and Other Submittals*

- A. *Shop Drawing and Sample Submittal Requirements:*
  - 1. Before submitting a Shop Drawing or Sample, Contractor shall have:
    - a. reviewed and coordinated the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
    - b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
    - c. determined and verified the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
    - d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.
  - 2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that submittal, and that Contractor approves the submittal.

3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be set forth in a written communication separate from the Shop Drawings or Sample submittal; and, in addition, in the case of Shop Drawings by a specific notation made on each Shop Drawing submitted to Engineer for review and approval of each such variation.
- B. *Submittal Procedures for Shop Drawings and Samples:* Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals. Each submittal will be identified as Engineer may require.
1. *Shop Drawings:*
    - a. Contractor shall submit the number of copies required in the Specifications.
    - b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 7.16.D.
  2. *Samples:*
    - a. Contractor shall submit the number of Samples required in the Specifications.
    - b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 7.16.D.
  3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.
- C. *Other Submittals:* Contractor shall submit other submittals to Engineer in accordance with the accepted Schedule of Submittals, and pursuant to the applicable terms of the Specifications.
- D. *Engineer's Review:*
1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
  2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction or to safety precautions or programs incident thereto.
  3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
  4. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.3 and

Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will document any such approved variation from the requirements of the Contract Documents in a Field Order.

5. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 7.16.A and B.
6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, shall not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.
7. Neither Engineer's receipt, review, acceptance or approval of a Shop Drawing, Sample, or other submittal shall result in such item becoming a Contract Document.
8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.D.4.

E. *Resubmittal Procedures:*

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.
2. Contractor shall furnish required submittals with sufficient information and accuracy to obtain required approval of an item with no more than three submittals. Engineer will record Engineer's time for reviewing a fourth or subsequent submittal of a Shop Drawings, sample, or other item requiring approval, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges.
3. If Contractor requests a change of a previously approved submittal item, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

7.17 *Contractor's General Warranty and Guarantee*

- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on Contractor's warranty and guarantee.
- B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
  1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
  2. normal wear and tear under normal usage.
- C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:

1. observations by Engineer;
  2. recommendation by Engineer or payment by Owner of any progress or final payment;
  3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
  4. use or occupancy of the Work or any part thereof by Owner;
  5. any review and approval of a Shop Drawing or Sample submittal;
  6. the issuance of a notice of acceptability by Engineer;
  7. any inspection, test, or approval by others; or
  8. any correction of defective Work by Owner.
- D. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract shall govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

#### 7.18 *Indemnification*

- A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable.
- B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.
- C. The indemnification obligations of Contractor under Paragraph 7.18.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:
1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or
  2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

#### 7.19 *Delegation of Professional Design Services*

- A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable Laws and Regulations.
- B. If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.
- C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.
- D. Pursuant to this paragraph, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 7.16.D.1.
- E. Contractor shall not be responsible for the adequacy of the performance or design criteria specified by Owner or Engineer.

### **ARTICLE 8 – OTHER WORK AT THE SITE**

#### 8.01 *Other Work*

- A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.
- B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any utility work at or adjacent to the Site, Owner shall provide such information to Contractor.
- C. Contractor shall afford each other contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or

alter others' work with the written consent of Engineer and the others whose work will be affected.

- D. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 8, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

#### 8.02 *Coordination*

- A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:
  - 1. the identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;
  - 2. an itemization of the specific matters to be covered by such authority and responsibility; and
  - 3. the extent of such authority and responsibilities.
- B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

#### 8.03 *Legal Relationships*

- A. If, in the course of performing other work at or adjacent to the Site for Owner, the Owner's employees, any other contractor working for Owner, or any utility owner causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment shall take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract. When applicable, any such equitable adjustment in Contract Price shall be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due to Contractor, and assign to such other contractor or utility owner the Owner's contractual



rights against Contractor with respect to the breach of the obligations set forth in this paragraph.

- C. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due to Contractor.
- D. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

## **ARTICLE 9 – OWNER'S RESPONSIBILITIES**

### **9.01    *Communications to Contractor***

- A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

### **9.02    *Replacement of Engineer***

- A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer's status under the Contract Documents shall be that of the former Engineer.

### **9.03    *Furnish Data***

- A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

### **9.04    *Pay When Due***

- A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

### **9.05    *Lands and Easements; Reports, Tests, and Drawings***

- A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.
- B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.
- C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

9.06 *Insurance*

- A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.

9.07 *Change Orders*

- A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.

9.08 *Inspections, Tests, and Approvals*

- A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.

9.09 *Limitations on Owner's Responsibilities*

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

9.10 *Undisclosed Hazardous Environmental Condition*

- A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.

9.11 *Evidence of Financial Arrangements*

- A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents (including obligations under proposed changes in the Work).

9.12 *Safety Programs*

- A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed.
- B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

**ARTICLE 10 – ENGINEER'S STATUS DURING CONSTRUCTION**

10.01 *Owner's Representative*

- A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract.

10.02 *Visits to Site*

- A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On

the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

- B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.08. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

#### 10.03 *Project Representative*

- A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 10.08. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent, or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

#### 10.04 *Rejecting Defective Work*

- A. Engineer has the authority to reject Work in accordance with Article 14.

#### 10.05 *Shop Drawings, Change Orders and Payments*

- A. Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, are set forth in Paragraph 7.16.
- B. Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, are set forth in Paragraph 7.19.
- C. Engineer's authority as to Change Orders is set forth in Article 11.
- D. Engineer's authority as to Applications for Payment is set forth in Article 15.

#### 10.06 *Determinations for Unit Price Work*

- A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.

#### 10.07 *Decisions on Requirements of Contract Documents and Acceptability of Work*

- A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Proposals, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.

#### 10.08 *Limitations on Engineer's Authority and Responsibilities*

- A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, shall create, impose, or give rise to any duty in

contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

- B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
- D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 15.06.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.
- E. The limitations upon authority and responsibility set forth in this Paragraph 10.08 shall also apply to the Resident Project Representative, if any.

#### 10.09 *Compliance with Safety Program*

- A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs (if any) of which Engineer has been informed.

### **ARTICLE 11 – AMENDING THE CONTRACT DOCUMENTS; CHANGES IN THE WORK**

#### 11.01 *Amending and Supplementing Contract Documents*

- A. The Contract Documents may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.
  - 1. *Change Orders:*
    - a. If an amendment or supplement to the Contract Documents includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order. A Change Order also may be used to establish amendments and supplements of the Contract Documents that do not affect the Contract Price or Contract Times.
    - b. Owner and Contractor may amend those terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, without the recommendation of the Engineer. Such an amendment shall be set forth in a Change Order.
  - 2. *Work Change Directives:* A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents

governing adjustments, expressly including Paragraph 11.04 regarding change of Contract Price. Contractor must submit any Change Proposal seeking an adjustment of the Contract Price or the Contract Times, or both, no later than 30 days after the completion of the Work set out in the Work Change Directive. Owner must submit any Claim seeking an adjustment of the Contract Price or the Contract Times, or both, no later than 60 days after issuance of the Work Change Directive.

3. *Field Orders*: Engineer may authorize minor changes in the Work if the changes do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

#### 11.02 *Owner-Authorized Changes in the Work*

- A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Such changes shall be supported by Engineer's recommendation, to the extent the change involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters. Such changes may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work shall be performed under the applicable conditions of the Contract Documents. Nothing in this paragraph shall obligate Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

#### 11.03 *Unauthorized Changes in the Work*

- A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.

#### 11.04 *Change of Contract Price*

- A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment of Contract Price shall comply with the provisions of Article 12.
- B. An adjustment in the Contract Price will be determined as follows:
  1. where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03); or
  2. where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.04.C.2); or

3. where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.04.C).
- C. *Contractor's Fee*: When applicable, the Contractor's fee for overhead and profit shall be determined as follows:
1. a mutually acceptable fixed fee; or
  2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
    - a. for costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor's fee shall be 15 percent;
    - b. for costs incurred under Paragraph 13.01.B.3, the Contractor's fee shall be five percent;
    - c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.01.C.2.a and 11.01.C.2.b is that the Contractor's fee shall be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.A.1 and 13.01.A.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of five percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted work the maximum total fee to be paid by Owner shall be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the work;
    - d. no fee shall be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;
    - e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and
    - f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 11.04.C.2.a through 11.04.C.2.e, inclusive.

#### 11.05 *Change of Contract Times*

- A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment in the Contract Times shall comply with the provisions of Article 12.
- B. An adjustment of the Contract Times shall be subject to the limitations set forth in Paragraph 4.05, concerning delays in Contractor's progress.

#### 11.06 *Change Proposals*

- A. Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; appeal an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; contest a set-off against payment due; or seek other relief under

the Contract. The Change Proposal shall specify any proposed change in Contract Times or Contract Price, or both, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents.

1. *Procedures:* Contractor shall submit each Change Proposal to Engineer promptly (but in no event later than 30 days) after the start of the event giving rise thereto, or after such initial decision. The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal. The supporting data shall be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event. Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal.
  2. *Engineer's Action:* Engineer will review each Change Proposal and, within 30 days after receipt of the Contractor's supporting data, either deny the Change Proposal in whole, approve it in whole, or deny it in part and approve it in part. Such actions shall be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.
  3. *Binding Decision:* Engineer's decision will be final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.
- B. *Resolution of Certain Change Proposals:* If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice shall be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.

#### 11.07 *Execution of Change Orders*

- A. Owner and Contractor shall execute appropriate Change Orders covering:
1. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive;
  2. changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;
  3. changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.02, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters; and
  4. changes in the Contract Price or Contract Times, or other changes, which embody the substance of any final and binding results under Paragraph 11.06, or Article 12.

- B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of this Paragraph 11.07, it shall be deemed to be of full force and effect, as if fully executed.

#### 11.08 *Notification to Surety*

- A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

### ARTICLE 12 – CLAIMS

#### 12.01 *Claims*

- A. *Claims Process:* The following disputes between Owner and Contractor shall be submitted to the Claims process set forth in this Article:
  - 1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;
  - 2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents; and
  - 3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters.
- B. *Submittal of Claim:* The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim shall rest with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, or both, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.
- C. *Review and Resolution:* The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim shall be stated in writing and submitted to the other party, with a copy to Engineer.
- D. *Mediation:*
  - 1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate shall stay the Claim submittal and response process.
  - 2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process shall resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim submittal



and decision process shall resume as of the date of the conclusion of the mediation, as determined by the mediator.

3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.
- E. *Partial Approval*: If the party receiving a Claim approves the Claim in part and denies it in part, such action shall be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.
- F. *Denial of Claim*: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim shall be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.
- G. *Final and Binding Results*: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim shall be incorporated in a Change Order to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

## **ARTICLE 13 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK**

### **13.01 Cost of the Work**

- A. *Purposes for Determination of Cost of the Work*: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:
  1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or
  2. To determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.
- B. *Costs Included*: Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 13.01.C, and shall include only the following items:
  1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, and vacation and holiday pay applicable thereto. The expenses of performing

Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.
3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01.
4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.
5. Supplemental costs including the following:
  - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
  - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.
  - c. Rentals of all construction equipment and machinery, and the parts thereof, whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.
  - d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
  - e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
  - f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 6.05), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or

indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.

- g. The cost of utilities, fuel, and sanitary facilities at the Site.
- h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.
- i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.

C. *Costs Excluded:* The term Cost of the Work shall not include any of the following items:

- 1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.
- 2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
- 3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
- 4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
- 5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.

D. *Contractor's Fee:* When the Work as a whole is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 11.04.C.

E. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

### 13.02 Allowances

- A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.

- B. *Cash Allowances*: Contractor agrees that:
  - 1. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and
  - 2. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.
- C. *Contingency Allowance*: Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.
- D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

### 13.03 *Unit Price Work*

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.
- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.
- D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of the following paragraph.
- E. Within 30 days of Engineer's written decision under the preceding paragraph, Contractor may submit a Change Proposal, or Owner may file a Claim, seeking an adjustment in the Contract Price if:
  - 1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement;
  - 2. there is no corresponding adjustment with respect to any other item of Work; and
  - 3. Contractor believes that it is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price, and the parties are unable to agree as to the amount of any such increase or decrease.

## ARTICLE 14 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

### 14.01 *Access to Work*

- A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction will have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply therewith as applicable.

### 14.02 *Tests, Inspections, and Approvals*

- A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.
- B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work shall be governed by the provisions of Paragraph 14.05.
- C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.
- D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:
  - 1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;
  - 2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;
  - 3. by manufacturers of equipment furnished under the Contract Documents;
  - 4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and
  - 5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

Such inspections and tests shall be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner and Engineer.

- E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.
- F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering shall be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to

cover the same and Engineer had not acted with reasonable promptness in response to such notice.

#### 14.03 *Defective Work*

- A. *Contractor's Obligation:* It is Contractor's obligation to assure that the Work is not defective.
- B. *Engineer's Authority:* Engineer has the authority to determine whether Work is defective, and to reject defective Work.
- C. *Notice of Defects:* Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.
- D. *Correction, or Removal and Replacement:* Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.
- E. *Preservation of Warranties:* When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.
- F. *Costs and Damages:* In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs, losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

#### 14.04 *Acceptance of Defective Work*

- A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work shall be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

#### 14.05 *Uncovering Work*

- A. Engineer has the authority to require special inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.
- B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.

- C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, and provide all necessary labor, material, and equipment.
  - 1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.
  - 2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

#### 14.06 *Owner May Stop the Work*

- A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

#### 14.07 *Owner May Correct Defective Work*

- A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, then Owner may, after seven days written notice to Contractor, correct or remedy any such deficiency.
- B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.
- C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

- D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

## **ARTICLE 15 – PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD**

### **15.01 *Progress Payments***

- A. *Basis for Progress Payments:* The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.
- B. *Applications for Payments:*
1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens, and evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.
  2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
  3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.
- C. *Review of Applications:*
1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
  2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:
    - a. the Work has progressed to the point indicated;
    - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon



Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and

- c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
- a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or
  - b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.
4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
- a. to supervise, direct, or control the Work, or
  - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or
  - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or
  - d. to make any examination to ascertain how or for what purposes Contractor has used the money paid on account of the Contract Price, or
  - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 15.01.C.2.
6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:
- a. the Work is defective, requiring correction or replacement;
  - b. the Contract Price has been reduced by Change Orders;
  - c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
  - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or
  - e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. *Payment Becomes Due:*

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended (subject to any Owner set-offs) will become due, and when due will be paid by Owner to Contractor.

E. *Reductions in Payment by Owner:*

1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:
  - a. claims have been made against Owner on account of Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages on account of Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;
  - b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;
  - c. Contractor has failed to provide and maintain required bonds or insurance;
  - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;
  - e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;
  - f. the Work is defective, requiring correction or replacement;
  - g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
  - h. the Contract Price has been reduced by Change Orders;
  - i. an event that would constitute a default by Contractor and therefore justify a termination for cause has occurred;
  - j. liquidated damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;
  - k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;
  - l. there are other items entitling Owner to a set off against the amount recommended.
2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed shall be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.

3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 15.01.C.1 and subject to interest as provided in the Agreement.

#### 15.02 *Contractor's Warranty of Title*

- A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than seven days after the time of payment by Owner.

#### 15.03 *Substantial Completion*

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.
- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which shall fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.
- D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.
- E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.

- F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

#### 15.04 *Partial Use or Occupancy*

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:
  - 1. At any time Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through E for that part of the Work.
  - 2. At any time Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
  - 3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.
  - 4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.05 regarding builder's risk or other property insurance.

#### 15.05 *Final Inspection*

- A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

#### 15.06 *Final Payment*

- A. *Application for Payment:*
  - 1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, annotated record documents (as provided in Paragraph 7.11), and other documents, Contractor may make application for final payment.

2. The final Application for Payment shall be accompanied (except as previously delivered) by:
  - a. all documentation called for in the Contract Documents;
  - b. consent of the surety, if any, to final payment;
  - c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.
  - d. a list of all disputes that Contractor believes are unsettled; and
  - e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.
3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.

**B. *Engineer's Review of Application and Acceptance:***

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the Application for Payment to Owner for payment. Such recommendation shall account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to the provisions of Paragraph 15.07. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.
- C. *Completion of Work:*** The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment.
- D. *Payment Becomes Due:*** Thirty days after the presentation to Owner of the final Application for Payment and accompanying documentation, the amount recommended by Engineer (less any further sum Owner is entitled to set off against Engineer's recommendation, including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions above with respect to progress payments) will become due and shall be paid by Owner to Contractor.

#### 15.07 *Waiver of Claims*

- A. The making of final payment will not constitute a waiver by Owner of claims or rights against Contractor. Owner expressly reserves claims and rights arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 15.05, from Contractor's failure to comply with the Contract Documents or the terms of any special guarantees specified therein, from outstanding Claims by Owner, or from Contractor's continuing obligations under the Contract Documents.
- B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted or appealed under the provisions of Article 17.

#### 15.08 *Correction Period*

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents, or by any specific provision of the Contract Documents), any Work is found to be defective, or if the repair of any damages to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas used by Contractor as permitted by Laws and Regulations, is found to be defective, then Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:
  - 1. correct the defective repairs to the Site or such other adjacent areas;
  - 2. correct such defective Work;
  - 3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and
  - 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting therefrom.
- B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others).
- C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
- D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.
- E. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

## ARTICLE 16 – SUSPENSION OF WORK AND TERMINATION

### 16.01 *Owner May Suspend Work*

- A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension. Any Change Proposal seeking such adjustments shall be submitted no later than 30 days after the date fixed for resumption of Work.

### 16.02 *Owner May Terminate for Cause*

- A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:
  - 1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule);
  - 2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;
  - 3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or
  - 4. Contractor's repeated disregard of the authority of Owner or Engineer.
- B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) ten days written notice that Owner is considering a declaration that Contractor is in default and termination of the contract, Owner may proceed to:
  - 1. declare Contractor to be in default, and give Contractor (and any surety) notice that the Contract is terminated; and
  - 2. enforce the rights available to Owner under any applicable performance bond.
- C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.
- D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within seven days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.
- E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses, and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When

exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

- F. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.
- G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond shall govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

#### 16.03 *Owner May Terminate For Convenience*

- A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
  - 1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
  - 2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and
  - 3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.
- B. Contractor shall not be paid on account of loss of anticipated overhead, profits, or revenue, or other economic loss arising out of or resulting from such termination.

#### 16.04 *Contractor May Stop Work or Terminate*

- A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.
- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.



## ARTICLE 17 – FINAL RESOLUTION OF DISPUTES

### 17.01 *Methods and Procedures*

- A. *Disputes Subject to Final Resolution:* The following disputed matters are subject to final resolution under the provisions of this Article:
  - 1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full; and
  - 2. Disputes between Owner and Contractor concerning the Work or obligations under the Contract Documents, and arising after final payment has been made.
- B. *Final Resolution of Disputes:* For any dispute subject to resolution under this Article, Owner or Contractor may:
  - 1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions; or
  - 2. agree with the other party to submit the dispute to another dispute resolution process; or
  - 3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

## ARTICLE 18 – MISCELLANEOUS

### 18.01 *Giving Notice*

- A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:
  - 1. delivered in person, by a commercial courier service or otherwise, to the individual or to a member of the firm or to an officer of the corporation for which it is intended; or
  - 2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the sender of the notice.

### 18.02 *Computation of Times*

- A. When any period of time is referred to in the Contract by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

### 18.03 *Cumulative Remedies*

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

18.04 *Limitation of Damages*

- A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

18.05 *No Waiver*

- A. A party's non-enforcement of any provision shall not constitute a waiver of that provision, nor shall it affect the enforceability of that provision or of the remainder of this Contract.

18.06 *Survival of Obligations*

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

18.07 *Controlling Law*

- A. This Contract is to be governed by **Arkansas State law**.

18.08 *Headings*

- A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

## Supplementary Conditions

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract, EJCDC® C-700 (2013 Edition). All provisions that are not so amended or supplemented remain in full force and effect.

The terms used in these Supplementary Conditions have the meanings stated in the General Conditions. Additional terms used in these Supplementary Conditions have the meanings stated below, which are applicable to both the singular and plural thereof.

The address system used in these Supplementary Conditions is the same as the address system used in the General Conditions, with the prefix "SC" added thereto.

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### ARTICLE 6 – BONDS AND INSURANCE

#### SC-6.03 Contractor's Liability Insurance

**SC 6.03** Add the following new paragraph immediately after Paragraph 6.03.J:

**K. The limits of liability for the insurance required by Paragraph 6.03 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations:**

- 1. Workers' Compensation, and related coverages under Paragraphs 6.03.A.1 and A.2 of the General Conditions:**

<b>State:</b>	<u><b>Statutory</b></u>
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<b>Federal, if applicable (e.g., Longshoreman's):</b>	<u><b>Statutory</b></u>
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**Jones Act coverage, if applicable:**

<b>Bodily injury by accident, each accident</b>	<b>\$ 500,000</b>
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<b>Bodily injury by disease, aggregate</b>	<b>\$ 500,000</b>
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**Employer's Liability:**

<b>Bodily injury, each accident</b>	<b>\$ 500,000</b>
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<b>Bodily injury by disease, each employee</b>	<b>\$ 500,000</b>
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<b>Bodily injury/disease aggregate</b>	<b>\$ 500,000</b>
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**For work performed in monopolistic states, stop-gap liability coverage shall be endorsed to either the worker's compensation or commercial general liability policy with a minimum limit of:**

<b>\$ 500,000</b>
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<b>Foreign voluntary worker compensation</b>	<u><b>Statutory</b></u>
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**2. Contractor's Commercial General Liability under Paragraphs 6.03.B and 6.03.C of the General Conditions:**

General Aggregate	\$ <u>2,000,000</u>
Products - Completed Operations Aggregate	\$ <u>1,000,000</u>
Personal and Advertising Injury	\$ <u>1,000,000</u>
Each Occurrence (Bodily Injury and Property Damage)	\$ <u>1,000,000</u>

**3. Automobile Liability under Paragraph 6.03.D. of the General Conditions:**

**Bodily Injury:**

Each person	\$ <u>1,000,000</u>
Each accident	\$ <u>1,000,000</u>

**Property Damage:**

Each accident	\$ <u>1,000,000</u>
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**4. Excess or Umbrella Liability:**

Per Occurrence	\$ <u>5,000,000</u>
General Aggregate	\$ <u>5,000,000</u>

**5. Contractor's Pollution Liability:**

Each Occurrence	\$ _____
General Aggregate	\$ _____



If box is checked, Contractor is not required to provide Contractor's Pollution Liability insurance under this Contract

**6. Additional Insureds: In addition to Owner and Engineer, include as additional insureds the following: None**

**7. Contractor's Professional Liability:**

Each Claim	\$ _____
Annual Aggregate	\$ _____

## ARTICLE 8 – OTHER WORK AT THE SITE

### SC-8.02 *Coordination*

**SC-8.02** Delete Paragraph 8.02.A in its entirety and replace with the following:

- A.** Owner intends to contract with others for the performance of other work at or adjacent to the Site.
  - 1.** The Engineer shall have authority and responsibility for coordination of the various contractors and work forces at the Site;
  - 2.** The following specific matters are to be covered by such authority and responsibility: None.
  - 3.** The extent of such authority and responsibilities is: Providing times and locations of work by others in relation to this Contract.

## ARTICLE 10 – ENGINEER’S STATUS DURING CONSTRUCTION

### SC-10.03 *Project Representative*

**SC-10.03** Add the following new paragraphs immediately after Paragraph 10.03.A:

- B.** The Resident Project Representative (RPR) will be Engineer’s representative at the Site, will act as directed by and under the supervision of Engineer, and will confer with Engineer regarding RPR’s actions.
  - 1.** General: RPR’s dealings in matters pertaining to the Work in general shall be with Engineer and Contractor. RPR’s dealings with Subcontractors shall only be through or with the full knowledge and approval of Contractor. RPR shall generally communicate with Owner only with the knowledge of and under the direction of Engineer.
  - 2.** Schedules: Review the progress schedule, schedule of Shop Drawing and Sample submittals, and Schedule of Values prepared by Contractor and consult with Engineer concerning acceptability.
  - 3.** Conferences and Meetings: Attend meetings with Contractor, such as preconstruction conferences, progress meetings, job conferences, and other Project-related meetings, and prepare and circulate copies of minutes thereof.
  - 4.** Liaison:
    - a.** Serve as Engineer’s liaison with Contractor. Working principally through Contractor’s authorized representative or designee, assist in providing information regarding the provisions and intent of the Contract Documents.
    - b.** Assist Engineer in serving as Owner’s liaison with Contractor when Contractor’s operations affect Owner’s on-Site operations.
    - c.** Assist in obtaining from Owner additional details or information, when required for proper execution of the Work.

5. **Interpretation of Contract Documents:** Report to Engineer when clarifications and interpretations of the Contract Documents are needed and transmit to Contractor clarifications and interpretations as issued by Engineer.
6. **Shop Drawings and Samples:**
  - a. Record date of receipt of Samples and Contractor-approved Shop Drawings.
  - b. Receive Samples which are furnished at the Site by Contractor, and notify Engineer of availability of Samples for examination.
  - c. Advise Engineer and Contractor of the commencement of any portion of the Work requiring a Shop Drawing or Sample submittal for which RPR believes that the submittal has not been approved by Engineer.
7. **Modifications:** Consider and evaluate Contractor's suggestions for modifications in Drawings or Specifications and report such suggestions, together with RPR's recommendations, if any, to Engineer. Transmit to Contractor in writing decisions as issued by Engineer.
8. **Review of Work and Rejection of Defective Work:**
  - a. Conduct on-Site observations of Contractor's work in progress to assist Engineer in determining if the Work is in general proceeding in accordance with the Contract Documents.
  - b. Report to Engineer whenever RPR believes that any part of Contractor's work in progress is defective, will not produce a completed Project that conforms generally to the Contract Documents, or will imperil the integrity of the design concept of the completed Project as a functioning whole as indicated in the Contract Documents, or has been damaged, or does not meet the requirements of any inspection, test or approval required to be made; and advise Engineer of that part of work in progress that RPR believes should be corrected or rejected or should be uncovered for observation, or requires special testing, inspection or approval.
9. **Inspections, Tests, and System Start-ups:**
  - a. Verify that tests, equipment, and systems start-ups and operating and maintenance training are conducted in the presence of appropriate Owner's personnel, and that Contractor maintains adequate records thereof.
  - b. Observe, record, and report to Engineer appropriate details relative to the test procedures and systems start-ups.
10. **Records:**
  - a. Prepare a daily report or keep a diary or log book, recording Contractor's hours on the Site, Subcontractors present at the Site, weather conditions, data relative to questions of Change Orders, Field Orders, Work Change Directives, or changed conditions, Site visitors, deliveries of equipment or materials, daily activities, decisions,

observations in general, and specific observations in more detail as in the case of observing test procedures; and send copies to Engineer.

- b. Record names, addresses, fax numbers, e-mail addresses, web site locations, and telephone numbers of all Contractors, Subcontractors, and major Suppliers of materials and equipment.
- c. Maintain records for use in preparing Project documentation.

**11. Reports:**

- a. Furnish to Engineer periodic reports as required of progress of the Work and of Contractor's compliance with the Progress Schedule and schedule of Shop Drawing and Sample submittals.
- b. Draft and recommend to Engineer proposed Change Orders, Work Change Directives, and Field Orders. Obtain backup material from Contractor.
- c. Immediately notify Engineer of the occurrence of any Site accidents, emergencies, acts of God endangering the Work, force majeure or delay events, damage to property by fire or other causes, or the discovery of any Constituent of Concern or Hazardous Environmental Condition.

**12. Payment Requests:** Review applications for payment with Contractor for compliance with the established procedure for their submission and forward with recommendations to Engineer, noting particularly the relationship of the payment requested to the Schedule of Values, Work completed, and materials and equipment delivered at the Site but not incorporated in the Work.

**13. Certificates, Operation and Maintenance Manuals:** During the course of the Work, verify that materials and equipment certificates, operation and maintenance manuals and other data required by the Contract Documents to be assembled and furnished by Contractor are applicable to the items actually installed and in accordance with the Contract Documents, and have these documents delivered to Engineer for review and forwarding to Owner prior to payment for that part of the Work.

**14. Completion:**

- a. Participate in Engineer's visits to the Site to determine Substantial Completion, assist in the determination of Substantial Completion and the preparation of a punch list of items to be completed or corrected.
- b. Participate in Engineer's final visit to the Site to determine completion of the Work, in the company of Owner and Contractor, and prepare a final punch list of items to be completed and deficiencies to be remedied.
- c. Observe whether all items on the final list have been completed or corrected and make recommendations to Engineer concerning acceptance and issuance of the notice of acceptability of the work.

**C. The RPR shall not:**

- 1. Authorize any deviation from the Contract Documents or substitution of materials or equipment (including “or-equal” items).**
- 2. Exceed limitations of Engineer’s authority as set forth in the Contract Documents.**
- 3. Undertake any of the responsibilities of Contractor, Subcontractors, or Suppliers.**
- 4. Advise on, issue directions relative to, or assume control over any aspect of the means, methods, techniques, sequences or procedures of Contractor’s work.**
- 5. Advise on, issue directions regarding, or assume control over security or safety practices, precautions, and programs in connection with the activities or operations of Owner or Contractor.**
- 6. Participate in specialized field or laboratory tests or inspections conducted off-site by others except as specifically authorized by Engineer.**
- 7. Accept Shop Drawing or Sample submittals from anyone other than Contractor.**
- 8. Authorize Owner to occupy the Project in whole or in part.**

**ARTICLE 15 – PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD**

*SC-15.03 Substantial Completion*

**SC 15.03.B Add the following new subparagraph to Paragraph 15.03.B:**

- 1. If some or all of the Work has been determined not to be at a point of Substantial Completion and will require re-inspection or re-testing by Engineer, the cost of such re-inspection or re-testing, including the cost of time, travel and living expenses, shall be paid by Contractor to Owner. If Contractor does not pay, or the parties are unable to agree as to the amount owed, then Owner may impose a reasonable set-off against payments due under Article 15.**



## **SECTION 010000**

### **GENERAL REQUIREMENTS**

#### **PART 1 - GENERAL**

##### **1.1 SCOPE OF WORK**

- A. The work embraced within these Contract Documents consists of furnishing all materials, labor, tools, supplies, and equipment to fully construct to the satisfaction of the Owner the following major elements of work for the Raw Water Supply Transmission Pipeline Contract 1: Blakely Mountain Dam Road to Ouachita Water Treatment Plant.
  - 1. Clearing access
  - 2. Trenching for Pipeline (widths will vary)
  - 3. Installation of Pipeline
  - 4. Backfilling of trenches and restoration of all altered objects.
- B. Location of the elements of Work is shown on the Drawings.
- C. Work or material not specifically mentioned in the Specifications, but designated on the Drawings, or forming an essential part of the Work mentioned or designated, shall be furnished and installed by the Contractor as though specifically mentioned.
- D. Construction of the work shall be by one General Contractor, utilizing Subcontractors for those specialties and portions of the Work that the General Contractor chooses to subcontract. All Subcontractors are subject to approval by the Owner in accordance with applicable sections of the General Conditions to these Specifications. The General Contractor shall maintain a responsible representative on-site whenever his subcontractors are on-site and engaged in the Work.

##### **1.2 COPIES OF DRAWINGS AND SPECIFICATIONS**

- A. To Contractor: The Owner will furnish the Contractor three sets of full-size Drawings and Specifications at no cost to the Contractor. Additional sets may be obtained from the Engineer at the cost of reproduction and delivery.
- B. To Subcontractors: Upon written request from the Contractor, the Owner will furnish any Subcontractor, bonafide and approved for work on the Project, one set of Drawings and Specifications at no cost to the Contractor or Subcontractor. Additional sets may be obtained by the Contractor (or Subcontractor) from the Engineer at the cost of reproduction and delivery.

##### **1.3 BUILDING PERMIT(S)**

- A. The Contractor shall be responsible for securing any required building permit(s) for the Project.

##### **1.4 SAFETY REQUIREMENTS**

- A. Contractor shall be totally responsible for all necessary safety measures and precautions as stipulated in the General Conditions to these Specifications, and in compliance with OSHA requirements applicable to the work of the various kinds as called for under this Contract. Particular attention is called to the APPENDIX of these Specifications pertinent to EXCAVATION AND TRENCH SAFETY.

- B. The Contractor shall be totally responsible for providing and maintaining any necessary and required barricades, signs, markers, shoring, bracing, etc. to provide for the protection of workmen and the Owner's personnel during the duration of the Work under this Contract.

#### 1.5 NORMAL PROJECT WORKING HOURS

- A. Normal project working hours for this project are Monday through Friday between the hours of 7:00 am and 6:00 pm. Work shall not be permitted on Saturday, Sunday, or any of the following holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day, unless written permission is requested by the Contractor and approved by the Engineer and Owner at least 72 hours prior to work taking place. The Owner will require that a representative of the Engineer or Owner be present or available for work which occurs outside of the normal project working hours. The Contractor shall compensate the Owner for salary costs and expenses incurred by the Owner and Engineer as a result of the Contractor choosing to work outside of the normal project working hours.
- B. The Contractor shall compensate the Owner for the salary costs and expenses incurred as a result of the Contractor choosing to work outside the normal project working hours as follows:
  - 1. Labor costs multiplied by 3 plus expenses such as lodging, mileage, materials, meals, etc.
- C. The Contractor may perform clean-up work outside of regular hours with the approval of the Engineer and Owner. Clean-up work shall be approved by the Engineer at least 48 hours prior to work taking place.

#### 1.6 ENVIRONMENTAL ASPECTS

- A. The work shall be planned and executed in full compliance with the requirements of the Federal Environmental Protection Agency (EPA), the Corps of Engineers 404 permit, the Arkansas Department of Environmental Quality (ADEQ), and all local authorities. The contractor shall secure a storm water permit and prepare a storm water pollution prevention plan in the name of the Owner.
- B. Siltation Control: The work shall be so planned and executed so as to prevent siltation of area streams and drainages. Reference Section 015713 Temporary Erosion and Sediment Control.
- C. Dust Control: During periods of dry, dusty conditions at the construction site, the work shall be planned and executed so as to minimize dust problems. Contractor shall provide for watering of the construction site, haul roads, and any other disturbed areas to prevent excessive dust problems within the vicinity. Water for such dust control shall be provided by the Contractor.
- D. Noise Control: The work shall be planned and executed to minimize noise on the construction site. All applicable measures for noise control as required by OSHA standards shall be used.
- E. Burning: Burning will not be permitted on the construction site.

## 1.7 PROTECTION OF EXISTING FACILITIES

- A. The construction work encompassed in this Contract will require excavation and related activity in close proximity to existing buried utility lines (and some aerial facilities). The approximate location of such utilities is shown on the Drawings, but all such utilities and individual service lines are not shown. The Contractor is to be aware of the potential for such buried utility lines conflicting with his intended construction efforts, and use proper precautionary measures to locate, verify, and protect such buried lines so as to avoid damage.
- B. The Contractor shall contact the owners of the various existing buried utility lines (or aerial facilities) as impacted by his construction activities, and obtain their assistance in identifying, locating, and marking affected facilities prior to beginning any excavation which might endanger the existing facilities. The Contractor will bear all costs in connection with the location, marking, temporary protection, or support of such utility facilities. If such utilities are damaged or impaired due to the actions or omissions of the Contractor, then the Contractor is responsible for the cost of repairs or replacement of the affected or damaged utility lines.
- C. The Contractor must comply with the ARKANSAS ONE-CALL (800-482-8998) system, and alert the Utility Systems accordingly.

## 1.8 STORAGE OF MATERIALS AND EQUIPMENT

- A. Protection of materials and equipment called for in Section 11 of the General Conditions to these Specifications shall extend to protection from exposure to the weather and damage from sun, rain, snow, water, wind, dust, vehicular traffic, or any other contaminants, during the process of unloading, handling, hauling, storage, and erection. Storage facilities shall be substantially constructed by the Contractor, and shall be fully weatherproof for the purpose intended. Any special requirements as called for by the manufacturer of equipment for short or long term storage shall be strictly followed by the Contractor; that is, including, but not limited to, provisions for special protection, lubrication, moisture control and removal, shaft and bearing rotation and movement, and such. The Contractor is advised that all critical materials and equipment must be properly stored and maintained as approved by the Engineer.
- B. Contractor may store materials and equipment at locations on the job site at locations which have been previously approved by the Engineer.

## 1.9 CONSTRUCTION CONTROL AND LAYOUT

- A. The Contractor is responsible for all construction layout and both horizontal and vertical control of construction operations at all construction sites. The Engineer will provide surveys to establish reference points and bench marks which are in the Engineer's judgment necessary to enable the Contractor to proceed with the Work. Contractor will report to the Engineer when any reference point is lost or destroyed. The Contractor shall furnish necessary assistant(s) to aid the Engineer in the establishment of all reference points and the undertaking of surveys. Assistant(s) to serve as rodman. Such Assistant(s) to be provided by the Contractor shall be at no additional cost to the Owner or the Engineer. Contractor will be responsible for all street, drainage, and pipeline grade control. Contractor will set all grade stakes, "blue tops", slope stakes, etc. as necessary for the proper control of construction effort; all in such manner as to complete the structures and facilities to such line and grade as established on the Drawings or as directed by the Engineer.

#### 1.10 CLEANING AND DISPOSAL

- A. Contractor shall clean up all construction sites, both inside buildings and exterior grounds, at least once per week. Contractor shall prevent trash and debris from blowing onto the grounds of the work area or adjacent property. All scrap, debris, and other trash resulting from the construction process shall be properly disposed by the Contractor. Contractor shall not dispose of construction debris by burying.

#### **PART 2 - PRODUCTS**

Not Used.

#### **PART 3 - EXECUTION**

Not Used.

END OF SECTION

## **SECTION 012900**

### **MEASUREMENT AND PAYMENT**

#### **PART 1 - GENERAL**

##### **1.1 SECTION INCLUDES**

- A. This Section stipulates the method of measurement and payment for items of Work for which Unit Prices and Lump Sum Prices are stated in the Bid Form.

##### **1.2 SCOPE OF PAYMENT**

- A. Units of measurement of items of Work for which Unit and/or Lump Sum Prices are stated will be as herein subsequently defined.
- B. The estimated quantities for items of Work for which Unit Prices are given in the Bid Form are subject to variation, and payment shall be based upon the final measurement of the items of work actually installed and approved by the Owner for payment.

##### **1.3 MEASUREMENT AND PAYMENT PROCEDURES**

###### **A. RAW WATER TRANSMISSION OR BRANCH LINE: NON-ROADWAY**

- 1. Unit of Measure: Linear feet.
- 2. Measurement determined by actual field measurement along the centerline of the pipe.
- 3. This item is for pipeline installed outside of the roadway.
- 4. Payment for this item shall be full compensation to the Contractor for all material, labor, tools, equipment, vehicles, all consumables, and all skills and workmanship required to install the raw water transmission or branch line using the material type, and at the size and pressure class shown outside of any roadways, complete in place. This includes, but isn't limited to, cost of the pipe, shipping, unloading of pipe, storage, exterior coatings or wraps and cement lining of pipe (where required), excavation of trenching, pipe laying and joining, granular bedding, backfilling, installation of utility markers, adjustment to existing water and sewer lines, pressure testing, bacteriological testing, and compaction effort associated with installing the pipe.
- 5. The cost for thrust blocking at fittings and anchor collars (where required) shall be included in this item.
- 6. The cost for all jointing, fittings, plugs, caps and Megalugs shall be included in this item.

###### **B. RAW WATER TRANSMISSION OR BRANCH LINE IN ROADWAY**

- 1. Unit of Measure: Linear feet.
- 2. Measurement determined by actual field measurement along the centerline of the pipe.
- 3. This item is for pipeline installed in the roadway.
- 4. Payment for this item shall be full compensation to the Contractor for all material, labor, tools, equipment, vehicles, all consumables, and all skills and workmanship required to install the raw water transmission or branch line using the material type, and at the size and pressure class shown in a roadway complete in place. This includes, but isn't limited to, cost of the pipe, shipping, unloading of pipe, storage, exterior coatings or wraps and cement lining of pipe (where required), excavation of trenching, pipe laying and joining, granular bedding, backfilling, installation of

- utility markers, adjustment to existing water and sewer lines, pressure testing, bacteriological testing, and compaction effort associated with installing the pipe.
5. The cost for hauling, placing and compaction of gravel backfilling of trenches under roadways is included in this pay item.
  6. The costs for all materials, labor, and equipment required for road or driveway base repair where installation of pipeline transects (crosses), or is within and along existing roadbeds (public or private), including but not limited to saw cut and removal of existing paving and base, preparation of subgrade, and compaction of base material shall be included in this pay item.
  7. The cost associated with replacing asphalt pavement that is cut and removed from the existing roadway is paid for separately as "Road Asphalt Pavement".
  8. The cost for thrust blocking at fittings and anchor collars (where required) shall be included in this item.
  9. The cost for all jointing, fittings, plugs, caps and Megalugs shall be included in this item.

C. GATE VALVE

1. Unit of Measure: Each.
2. Measure: Installed quantity.
3. Payment for this item shall be full compensation to the Contractor for all material, labor, tools, equipment, vehicles, all consumables, and all skills and workmanship required to install the gate valves complete in place. This includes, but isn't limited to, the gate valve, cast iron valve box, concrete collar and water valve sign, fittings, and all appertains required to completely install the valve.

D. FLUSHING ASSEMBLIES

1. Unit of Measure: Each.
2. Measure: Installed quantity.
3. Payment for this item shall be full compensation to the Contractor for all material, labor, tools, equipment, vehicles, all fittings, all consumables, and all skills and workmanship required to install flushing hydrant assemblies as shown on the plans.
4. This item includes hauling, delivery, and placement of dumped riprap downstream from the hydrant.

E. AIR RELEASE VALVE ASSEMBLY

1. Unit of Measure: Each.
2. Payment for this item shall be full compensation to the Contractor for all material, labor, tools, equipment, vehicles, all consumables, and all skills and workmanship required to install the air release valve assembly as specified in the plans and verified by the Engineer. This includes, but isn't limited to, the cost of the air release valve, piping, fittings, gate valves, gravel, vault, cover, accessories, water valve sign, installation, and all other work and materials incident thereto.

F. ROCK EXCAVATION (As Directed)

1. Unit of Measure: Cubic Yard.
2. Rock excavation will be measured on a unit basis in cubic yards (CY) based upon the maximum design trench width and actual depth of rock encountered, as approved by the Engineer or Owner. Unit Contract Price shall be inclusive of excavation, crushing, dynamite, blasting, equipment rental, etc., rock hauling, and all labor, materials, tools, equipment, and incidentals necessary to complete the work.

3. Rock excavation in bore pits will be measured by the actual (measured) quantity of rock that is encountered.

G. ROAD ASPHALT PAVEMENT (2")

1. Unit of Measure: Square Yard.
2. Measure: Installed quantity.
3. Payment for this item shall be full compensation to the Contractor for all materials, labor, tools, equipment, vehicles, all consumables, and all skills and workmanship required to haul, deliver, place, spread and compact asphalt pavement (2" thick) in all areas shown in the plans, and as required to completely repair the roadway or driveway that is cut during the installation of the new water line.
4. Repair or replacement of road base is included in the water pipeline items that are in roadways.

H. STANDPIPE

1. Unit of Measure: Lump Sum.
2. Standpipe shall be paid for at the stated lump sum amount for the complete installation of the length of standpipe shown in the plans and as stated in the Bid Form.
3. Payment for this item shall be full compensation to the Contractor for all labor, equipment, tools, skills, and materials including but not limited to pipe, fittings, blind flanges, bolts, gaskets, as necessary to excavate, place and compact backfill and connect the standpipe to the water pipeline and the air release valve to the standpipe, where located and detailed in the plans.
4. This lump sum amount shall be paid based upon the percentage of construction that is completed excluding materials stored.

I. FLOW CONTROL VALVE VAULT

1. Unit of Measure: Each.
2. Payment for this item shall be full compensation to the Contractor for all material, labor, tools, equipment, vehicles, all consumables, and all skills and workmanship required to install the flow control valve vault as specified in the plans and verified by the Engineer. This includes, but isn't limited to, the cost of the flow control valve vault, piping, fittings, gravel, vault, cover, accessories, water valve sign, discharge pipe, drain valve, dumped riprap and filter blanket, conduit from vault to control room, screen protector, traffic bollards, installation and all other work and materials incident thereto.

J. CONNECTION OF 30" TO EXISTING 8" BACKWASH LINE

1. Unit of Measure: Each.
2. Payment for this item shall be full compensation to the Contractor for all material, labor, tools, equipment, vehicles, all consumables, and all skills and workmanship required to connect and install a new 8" water main from an existing backwash line to the new 30" water main, install a new RPZ backflow preventor, and a new water meter, as well as construct a new vault as specified in the plans and verified by the Engineer. This includes, but isn't limited to, the purchase and installation costs of the tapping sleeve and valve, the RPZ backflow preventor, meter, piping, fittings, gravel, vault, cover, accessories, water valve sign, traffic bollards, installation and all other work and materials incident thereto.

K. BONDS AND INSURANCE

1. Unit of Measure: Lump Sum.
2. Payment of the lump sum amount shall be full compensation to the Contractor for all costs of bonds and insurance.

L. MOBILIZATION, DEMOBILIZATION

1. Unit of Measure: Lump Sum.
2. Payment of the lump sum amount shall be full compensation to the Contractor to include all labor, equipment, tools, skills, freight, and materials required to mobilize to, and demobilize from the site.

M. CLEARING AND GRUBBING

1. Unit of Measure: Lump Sum.
2. Payment for this item shall be full compensation for "Clearing and Grubbing".
3. Final cleanup shall be paid for at the stated lump sum amount for clearing and grubbing of the pipeline easement.
4. The lump sum amount shall include all labor, equipment, tools, skills, and materials including but not limited, removal of all trees and vegetation, including stumps, from the pipeline easements prior to installation of the pipeline.

N. SEEDING, MULCHING, AND FINAL CLEANUP

1. Unit of Measure: Lump Sum.
2. Final cleanup shall be paid for at the stated lump sum amount for the complete final cleanup and restoration of the site after installation of the pipe.
3. The lump sum amount shall include all labor, equipment, tools, skills, and materials including but not limited, removal of construction debris and waste, fine grading, preparation of seedbeds, delivery, placement, spreading of topsoil, mulching and seeding or sodding, and water in all areas disturbed by the construction activities.
4. This lump sum amount shall be paid based upon the percentage of construction that is completed excluding materials stored.

O. STORM WATER PERMIT AND S.W.P.P.P.

1. Unit of Measure: Lump Sum.
2. Preparation of the Storm Water Permit and Storm Water Pollution Prevention Plan and temporary erosion control shall be paid for at the stated lump sum amount for the job requirement as stated in the Bid Form.
3. The lump sum amount shall include all labor, equipment, tools, cost of storm water permit fees, preparation of the storm water permit and pollution prevention plan, water for vegetation, temporary erosion control, barriers and filters, silt fencing, maintenance, and compliance with all aspects of the storm water permit and pollution prevention plan.
4. The lump sum amount shall be paid based upon the percentage of construction that is completed excluding materials stored.

P. MAINTENANCE OF TRAFFIC

1. Unit of Measure: Lump Sum.
2. Payment for this item shall be full compensation for "Maintenance of Traffic".
3. The lump sum amount shall include all labor, equipment, tools, skills, and materials including but not limited, development of a traffic control plan, placement, relocation and removal of temporary signs, barricades, and other traffic control devices, as well as providing personnel to direct traffic around construction zones.
4. This lump sum amount shall be paid based upon the percentage of construction



that is completed excluding materials stored.

**Q EXCAVATION AND TRENCH SAFETY SYSTEM**

1. Unit of Measure: Lump Sum.
2. Excavation and trench safety systems shall be paid for at the stated lump sum amount for the job requirement as stated in the Bid Form.
3. The lump sum amount shall include all labor, equipment, tools, and materials necessary to comply with all safety standards in accordance with the Contract Documents.
4. This lump sum amount shall be paid based upon the percentage of construction that is completed excluding materials stored.

**R. MISCELLANEOUS AND INCIDENTAL ITEMS**

1. Unit of Measure: Lump Sum.
2. Payment for this item shall be full compensation to the Contractor for all material, labor, tools, equipment, vehicles, all consumables, and all skills and workmanship required for all miscellaneous and incidental items not included in the other items of the project, as is required in order to complete the work.
3. This item shall include removal of existing culverts and replacing with new culverts including, but not limited to, removal and disposal of existing culverts, cost of new culvert pipe and flared end sections, trenching, backfilling, and compaction effort associated with installing the culvert and the flared end section(s) as shown in the plans and approved by the Engineer.
3. This item shall include all other incidental items required to complete the construction activities, such as relocation of mail boxes, repair of driveways (except for asphalt pavement), fences, tree removal, repair or replacement of landscaping, etc.
4. This item shall include all special considerations required by property owners and agreed to by the Owner during the easement acquisition process.
5. This item shall include all demolition required on the plans for installation of the pipeline.

**PART 2 - PRODUCTS**

Not Used.

**PART 3 - EXECUTION**

Not Used.

END OF SECTION



## SECTION 013000

### ADMINISTRATIVE REQUIREMENTS

#### 1.1 SUMMARY

- A. This Section includes administrative provisions for coordinating construction operations on the Project including, but not limited to, the following:
1. General Project coordination procedures.
  2. Administrative and supervisory personnel.
  3. Project meetings.

#### 1.2 WRITTEN NOTICES

- A. Written notices, when required by the Contract Documents or for the purposes of project administration, shall be mailed by Certified Mail, return receipt requested, as follows:

1. If to the Owner: City of Hot Springs  
113 Convention Boulevard  
Hot Springs, AR 71901
2. If to the Engineer: Crist Engineers, Inc.  
205 Executive Court  
Little Rock, Arkansas 72205
3. If to the Contractor: As stated in the CONTRACT AGREEMENT

#### 1.3 COORDINATION

- A. Coordination: Coordinate construction operations included in various Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
- B. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other Contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preconstruction Meeting
  2. Delivery and processing of Submittals.
  3. Progress meetings.
  4. Project closeout activities.

#### 1.4 SUBMITTALS

- A. Staff Names: 15 days before starting construction operations, submit a list of principal staff assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1. Submit copies to Owner and Engineer.
2. Post copies of list in temporary field office, and by each temporary telephone.

#### 1.5 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

- A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.

#### 1.6 PROJECT MEETINGS

- A. General: Engineer will schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
- B. Preconstruction Conference: Engineer will schedule a preconstruction conference before starting construction, at a time convenient to Owner and Engineer.
  1. Attendees: Authorized representatives of Engineer, and their consultants; Owner; Contractor and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  2. The Preconstruction Conference will be held in a location to be determined by the Owner. The Engineer will issue notice of location, date and time.
  3. Agenda:
    - a. Safety
    - b. Tentative construction schedule.
    - c. Critical work sequencing.
    - d. Designation of responsible personnel.
    - e. Procedures for processing field decisions and Change Orders.
    - f. Procedures for processing Applications for Payment.
    - g. Distribution of the Contract Documents.
    - h. Submittal procedures.
    - i. Preparation of Record Documents.
    - j. Use of the premises.
    - k. Responsibility for temporary facilities and controls.
    - l. Parking availability.
    - m. Office, work, and storage areas.
    - n. Equipment deliveries and priorities.
    - o. First aid.
    - p. Security.
    - q. Progress cleaning.
    - r. Working hours.
- C. Progress Meetings: Engineer will conduct progress meetings at a time and location convenient to the Owner and Engineer.

### **PART 2 - PRODUCTS**

Not Used.

### **PART 3 - EXECUTION**

Not Used.

END OF SECTION

## **SECTION 013200**

### **CONSTRUCTION PROGRESS DOCUMENTATION**

#### **PART 1 - GENERAL**

##### **1.1 RELATED DOCUMENTS**

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

##### **1.2 SUMMARY**

- A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
  - 1. Preliminary Construction Schedule.
  - 2. Contractor's Construction Schedule.
  - 3. Submittals Schedule.
  - 4. Daily construction reports.
  - 5. Material location reports.
  - 6. Field condition reports.
  - 7. Special reports.

##### **1.3 RELATED SECTIONS**

- A. Section 013000: Administrative Requirements.
- B. Section 013300: Submittal Procedures

##### **1.4 SUBMITTALS**

- A. Submittals Schedule: Submit three (3) copies of schedule. Arrange the following information in a tabular format:
  - 1. Scheduled date for first submittal.
  - 2. Specification Section number and title.
  - 3. Submittal category (action or informational).
  - 4. Name of subcontractor.
  - 5. Description of the Work covered.
  - 6. Scheduled date for Engineer's final release or approval.
- B. Preliminary Construction Schedule: Submit two (2) printed copies; one (1) a single sheet of reproducible media, and one (1) a print.
- C. Contractor's Construction Schedule: Submit two (2) printed copies of initial schedule, one (1) a reproducible print and one (1) black-line print, large enough to show entire schedule for entire construction period.
- D. Daily Construction Reports: Submit two (2) copies at monthly intervals.
- E. Material Location Reports: Submit two (2) copies at monthly intervals.
- F. Field Condition Reports: Submit two (2) copies at time of discovery of differing conditions.

- G. Special Reports: Submit two (2) copies at time of unusual event.

## 1.5 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.
- B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.
  - 1. Secure time commitments for performing critical elements of the Work from parties involved.
  - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

## PART 2 - PRODUCTS

### 2.1 SUBMITTALS SCHEDULE

- A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, re-submittal, ordering, manufacturing, fabrication, and delivery when establishing dates.
  - 1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
  - 2. Initial Submittal: Submit concurrently with preliminary bar-chart schedule. Include submittals required during the first 60 days of construction. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
    - a. At Contractor's option, show submittals on the Preliminary Construction Schedule, instead of tabulating them separately.
  - 3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

### 2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."
- B. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Final Completion.
- C. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
  - 1. Submittal Review Time: Include review and resubmittal times indicated in Division 1 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
  - 2. Startup and Testing Time: Include time for startup and testing. Indicate date for making finished water.

3. Final Completion: Indicate completion in advance of date established for Final Completion, and allow time for Engineer's administrative procedures necessary for certification of Final Completion.
- D. Constraints: Include constraints and work restrictions indicated in the Contract Documents, and show how the sequence of the Work is affected.
- E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, and Final Completion.
- F. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragments to demonstrate the effect of the proposed change on the overall project schedule.

## 2.3 PRELIMINARY CONSTRUCTION SCHEDULE

- A. Bar-Chart Schedule: Submit preliminary horizontal bar-chart-type construction schedule within seven (7) days of date established for the Notice of Award.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first sixty (60) days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

## 2.4 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
  1. List of subcontractors at Project site.
  2. Approximate count of personnel at Project site.
  3. High and low temperatures and general weather conditions.
  4. Accidents.
  5. Meetings and significant decisions.
  6. Unusual events (refer to special reports).
  7. Stoppages, delays, shortages, and losses.
  8. Meter readings and similar recordings.
  9. Emergency procedures.
  10. Orders and requests of authorities having jurisdiction.
  11. Change Orders received and implemented.
  12. Construction Change Directives received.
  13. Services connected and disconnected.
  14. Equipment or system tests and startups.
- B. Material Location Reports: At monthly intervals, prepare a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.
- C. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare a detailed report. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

## 2.5 SPECIAL REPORTS

- A. General: Submit special reports directly to Owner or Engineer within one (1) day of an occurrence. Distribute copies of report to parties affected by the occurrence.
- B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

## PART 3 - EXECUTION

### 3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one (1) week before each regularly scheduled progress meeting.
  - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
  - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
  - 3. As the Work progresses, indicate actual completion percentage for each activity.
- B. Distribution: Distribute copies of approved schedule to Engineer, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
  - 1. Post copies in Project meeting rooms and temporary field offices.
  - 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION



**SECTION 013300**  
**SUBMITTAL PROCEDURES**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

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

**1.2 SUMMARY**

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

**1.3 RELATED SECTIONS**

- A. Section 013000: Administrative Requirements.
- B. Section 013200: Construction Progress Documentation.

**1.4 SUBMITTAL PROCEDURES**

- A. Identification: Place a permanent label or title block on each submittal for identification.
  - 1. Indicate name of firm or entity that prepared each submittal on label.
  - 2. Provide a space approximately 4 by 5 inches on label or beside title block to record Contractor's review and approval markings and action taken by Engineer.
  - 3. Include the following information on label for processing and recording action taken:
    - a. Project name,
    - b. Date,
    - c. Name and address of Engineer,
    - d. Name and address of Contractor,
    - e. Name and address of subcontractor,
    - f. Name and address of supplier,
    - g. Name of manufacturer,
    - h. Unique identifier, including revision number,
    - i. Number and title of appropriate Specification Section,
    - j. Drawing number and detail references, as appropriate,
    - k. Other necessary identification.
- B. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Engineer will discard submittals received from sources other than Contractor.

## 1.5 SUBMITTAL PROCEDURES

- A. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows:
  - 1. Initial Review: Allow fifteen (15) days for initial review of each submittal. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. Engineer will advise Contractor when a submittal being processed must be delayed for coordination.
  - 2. Time for review shall commence on Engineer's receipt of submittal.

## PART 2 - PRODUCTS

### 2.1 ACTION SUBMITTALS

- A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
  - 1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
  - 2. Mark each copy of each submittal to show which products and options are applicable.
  - 3. Include the following information, as applicable:
    - a. Manufacturer's written recommendations.
    - b. Manufacturer's product specifications.
    - c. Manufacturer's installation instructions.
    - d. Color charts.
    - e. Manufacturer's catalog cuts.
    - f. Wiring diagrams showing factory-installed wiring.
    - g. Printed performance curves.
    - h. Operational range diagrams.
    - i. Mill reports.
    - j. Standard product operating and maintenance manuals.
- B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
  - 1. Preparation: Include the following information, as applicable:
    - a. Dimensions.
    - b. Identification of products.
    - c. Fabrication and installation drawings.
    - d. Roughing-in and setting diagrams.
    - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
    - f. Shopwork manufacturing instructions.
    - g. Templates and patterns.
    - h. Schedules.
    - i. Design calculations.
    - j. Compliance with specified standards.
    - k. Notation of coordination requirements.
    - l. Notation of dimensions established by field measurement.
  - 2. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed

- wiring.
3. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 40 inches.
  4. Number of Copies: Submit four (4) minimum black-line prints of each submittal, unless prints are required for operation and maintenance manuals. Submit five (5) prints where prints are required for operation and maintenance manuals. Engineer will retain three (3) prints; remainder will be returned. Mark up and retain one (1) returned print as a Project Record.

## 2.2 INFORMATIONAL SUBMITTALS

- A. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements. Include evidence of manufacturing experience where required.
- B. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements.
- C. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements.
- D. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment.
- E. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer.
- F. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections.

## PART 3 - EXECUTION

### 3.1 CONTRACTOR'S REVIEW

- A. Review each submittal and check for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Engineer.
- B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

### 3.2 ENGINEER'S ACTION

- A. General: Engineer will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Engineer will review each submittal, make marks to indicate corrections or modifications required, and return it. Engineer will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken.

- C. Informational Submittals: Engineer will review each submittal and will not return it, or will reject and return it if it does not comply with requirements. Engineer will forward each submittal to appropriate party.
- D. Submittals not required by the Contract Documents will not be reviewed and may be discarded.

END OF SECTION

**SECTION 014000**  
**QUALITY REQUIREMENTS**

**PART 1 - GENERAL**

**1.1 GENERAL**

- A. SECTION INCLUDES:
1. Quality assurance - control of installation.
  2. Tolerances
  3. References.
  4. Testing laboratory services.
  5. Manufacturer field services and reports.

**1.2 QUALITY ASSURANCE - CONTROL OF INSTALLATION**

- A. Monitor quality control over suppliers, manufacturers, Products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturer's instructions, including each step in sequence.
- C. Should manufacturer's instructions conflict with Contract Documents, request clarification from Engineer before proceeding.
- D. 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.
- E. Perform Work by persons qualified to produce workmanship of specified quality.
- F. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

**1.3 TOLERANCES**

- A. Monitor tolerance control of installed products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturer's tolerances. Should manufacturer's tolerances conflict with Contract Documents, request clarification from Engineer before proceeding.
- C. Adjust products to appropriate dimensions; position before securing Products in place.

**1.4 REFERENCES**

- A. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard by date of issue current on date of Contract Documents, except where a specific date is established by governmental body.
- C. Obtain copies of standards where required by specification sections.

- D. The contractual relationship, duties, and responsibilities of the parties in the Contract nor those of the Engineer shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

#### 1.5 TESTING LABORATORY SERVICES

- A. Contractor will appoint and employ services of an independent firm to perform inspecting and testing.
- B. The independent firm will perform inspections, tests, and other services specified in individual Specification sections and as required by the Engineer and/or the Owner.
- C. Inspecting, testing, and source quality control may occur on or off the project site. Perform off-site inspecting or testing as required by the Engineer or the Owner.
- D. Reports will be submitted by the independent firm to the Owner, Engineer and Contractor indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.
- E. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.
  - 1. Contractor shall notify Engineer, Owner and independent firm 24 hours prior to expected time for operations requiring services.
  - 2. Make arrangements with independent firm and pay for additional samples and tests required for Contractor's use.
- F. Testing or inspecting does not relieve the Contractor of his responsibility to perform Work to Contract requirements.
- G. Retesting required because of non-conformance to specified requirements shall be performed by the same independent firm on instructions by the Engineer. Payment for retesting shall be the Contractor's responsibility.

#### 1.6 MANUFACTURER FIELD SERVICES AND REPORTS

- A. When specified, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, as applicable, and to initiate instructions when necessary.
- B. Report observations and site decisions or instructions that are supplemental or contrary to manufacturer's written instructions.
- C. Submit report in duplicate within 30 days of observation to Engineer for information.

### **PART 2 - PRODUCTS**

Not used.

### **PART 3 - EXECUTION**

Not used.

END OF SECTION

## SECTION 015713

### TEMPORARY EROSION PREVENTION AND SEDIMENT CONTROL

#### PART 1 – GENERAL

##### 1.1 SUMMARY

- A. Preparation of Storm Water Pollution Prevention Plan (SWPPP) for Owner.
- B. Temporary measures required to prevent erosion and control sediment during construction. This includes measures to meet the requirements of the National Pollution Discharge Elimination System (NPDES) administered by the Environmental Protection Agency (EPA).
- C. Submittal of the Notice of Intent (NOI) and Notice of Termination (NOT) in the name of the Owner to the Arkansas Department of Environmental Quality to comply with the requirements of NPDES Construction General Permit #ARR150000.
- D. Restoration of areas eroded due to insufficient preventive measures.
- E. Compensation of Owner for fines levied by authorities having jurisdiction due to non-compliance by Contractor.

##### 1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials (AASHTO), 444 N Capitol St. NW, Suite 249, Washington, DC 20001.
  - 1. AASHTO M288 – Geotextiles.
- B. Arkansas Department of Environmental Quality (ADEQ), 5301 Northshore Drive, North Little Rock, AR 72118-5317.
  - 1. ADEQ ePortal site – <https://eportal.adeq.state.ar.us/>
- C. ASTM International (ASTM), PO Box C700, West Conshohocken, PA, 19428-2959 USA.
  - 1. ASTM A116 – Standard Specification for Metallic-Coated, Steel Woven Wire Fence Fabric.
  - 2. ASTM D3786 – Standard Test Method for Bursting Strength of Textile Fabrics—Diaphragm Bursting Strength Tester Method.
  - 3. ASTM D4355 – Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus.
  - 4. ASTM D4491 – Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
  - 5. ASTM D4533 – Standard Test Method for Trapezoid Tearing Strength of Geotextiles.

6. ASTM D4632 – Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
7. ASTM D4751 – Standard Test Method for Determining Apparent Opening Size of a Geotextile.
8. ASTM D6241 – Standard Test Method for Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe.
9. ASTM D6461 – Standard Specification for Silt Fence Materials.

### 1.3 RELATED SECTIONS

- A. Section 013000 – Administrative Requirements.
- B. Section 013200 – Construction Progress Documentation.
- C. Section 311100 – Site Clearing and Grubbing.
- D. Section 312300 – Trench Excavation, Backfill, and Compacting.
- E. Section 312319 – Excavation Dewatering.
- F. Section 329219 – Seeding.

### 1.4 SUBMITTALS

- A. Submit in accordance with Section 013300 – Submittal Procedures.
- B. Submit SWPPP.
  1. Submit within two (2) weeks after Notice to Proceed.
  2. Include:
    - a. Site Map
    - b. Location of Best Management Practices.
    - c. Contractor and EPSC Inspector contact information and certifications.
    - d. Inspection Schedule.
    - e. BMP and SWPPP checklists.
    - f. Other information required by law.
  3. Obtain the approval of the Plan by Owner.
  4. Obtain the approval of the Plan by authorities having jurisdiction.

### 1.5 PERMITS

- A. ADEQ – Storm Water Construction General Permit #ARR1550000.
  1. The Contractor shall obtain Notice of Coverage (NOC) from ADEQ for the Storm Water Construction General Permit prior to the start of construction.
  2. The Contractor shall be responsible for and shall pay all costs associated with fines or penalties that may be imposed by the governmental authority for the failure of



the Contractor, the Contractor's Subcontractors, the Contractor's Suppliers, or the Contractor's Agents having access to the site to comply with the requirements of the Construction General Permit and/or comply with the SWPPP. The Owner shall be entitled to withhold such from Contract funds that may be due to the Contractor and/or claim through the appropriate court having jurisdiction.

3. Information regarding the NOI, SWPPP, and NOT and the pertinent regulation may be accessed at [www.adeq.state.ar.us](http://www.adeq.state.ar.us).

## 1.6 MAINTENANCE

- A. Maintain Best Management Practices as necessary to comply with NPDES. 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.

## PART 2 – PRODUCTS

### 2.1 GEOTEXTILE FABRIC

- A. Geotextile fabric shall conform to **AASHTO M288**. Geotextile fabric must be a non-woven polypropylene fabric designed specifically for use as a soil filtration media. Fabric shall meet the following specifications:

<u>Test Method</u>	<u>Property (Unit)</u>	<u>Value</u>	<u>Requirement</u>
ASTM D4632	Grab Strength (N)	MARV	1100/700
ASTM D4632	Sewn Seam Strength (N)	MARV	990/630
ASTM D4533	Tear Strength (N)	MARV	400/250
ASTM D6241	Puncture Strength (N)	MARV	2200/137
ASTM D4751	Apparent Opening Size (mm)	MaxARV	0.60
ASTM D4491	Permittivity (sec <sup>-1</sup> )	MRV	0.02
ASTM D4355	UV Resistance @ 500 hrs (% strength retained)	MTV	>50

- B. Approved Manufacturers:

1. Contech Engineered Solutions, North Little Rock, Arkansas,
2. or approved equal.

### 2.2 SILT FENCE

- A. Geotextile shall conform to **ASTM D6461** and meet the following material specifications:

<u>Test Method</u>	<u>Property (Unit)</u>	<u>Value</u>	<u>Requirement</u>
ASTM D4632	Grab Strength (lbs)	MARV	365/200
ASTM D4632	Grab Elongation (%)	MARV	24/10
ASTM D4533	Trapezoidal Tear Strength (lbs)	MARV	115/75
ASTM D6241	Puncture Strength (lbs)	MARV	675
ASTM D4751	Apparent Opening Size (mm)	MaxARV	0.425
ASTM D4491	Permittivity (sec <sup>-1</sup> )	MRV	2.0
ASTM D4491	Flow Rate (gal/min/ft <sup>2</sup> )	MRV	145
ASTM D4355	UV Resistance @ 500 hrs (% strength retained)	MTV	>70

- B. Fence posts shall be galvanized steel "T" posts of sufficient length to support the silt fence system.

- C. Woven wire support: W1.4, 4" x 4", zinc coated (galvanized) steel woven wire fabric conforming to **ASTM A116**.
- D. Approved manufacturers:
  - 1. TenCate Geosynthetics, Pendergrass, Georgia – Mirafi® FW402,
  - 2. or approved equal.

## 2.3 TEMPORARY SEEDING

- A. Seed shall be either rye/cereal grasses or brown top millet depending upon the planting time. Seed mix shall be free of invasive species and/or noxious weeds.
- B. Mulch cover shall consist of straw from threshed, rice, oats, wheat, barley, or rye; of wood excelsior, or of hay obtained from various legumes or grasses such as lespedeza, clover, vetch, soybeans, bermuda, carpet sedge, bahia, fescue, or other legumes or grasses; or a combination thereof. Mulch shall be dry and reasonably free from noxious weeds.

## 2.4 SEDIMENT LOG

- A. Sediment Log consist of a specific cut of naturally seed free Great Lakes Aspen wood excelsior with 80% of the fiber > six (6) inches in length inside a durable, flexible tubular netting with knotted ends. Sediment Log is designed to provide intimate contact with the soil, which prevents blowouts and undermining. Sediment Log allows water to flow through the 100% excelsior matrix, minimizing overtopping, slowing high flow water velocities, and intercepting and stopping silt movement. Sediment Logs may be installed over bare soil, over rolled erosion control products, on steep slopes, or around jobsites for perimeter control. Sediment Log shall be manufactured in the U.S.A. at company locations where QA/QC is implemented and managed by the manufacturer. Field fabricated products made by anyone other than the manufacturer (i.e. distributors, dealers, etc.) shall not be accepted.
- B. Sediment logs shall have the following nominal material characteristics:

Property	US customary units	SI units
Product Name	20 in	50.1 cm
Minimum Diameter	18 in	45.7 cm
Log Density <sup>1</sup> (+/- 10%)	1.38 lb/ft <sup>3</sup>	22.00 kg/m <sup>3</sup>
Fiber Length (80% min.)	> 6.0 in	> 15.2 cm
Log Dimensions (WxL) (+/- 10%)	20 in x 10.0 ft	0.508 m x 3.048 m

<sup>1</sup> Weight and density are based on a dry fiber weight basis at time of manufacture. Baseline moisture content of Great Lakes Aspen excelsior is 22%

- C. Stakes shall be wooden, 1 1/8 inch wide x 1 1/8 inch thick by a minimum of 48 inch long.
- D. Approved manufacturers:
  - 1. American Excelsior, Arlington, Texas – Curlex® Sediment Logs,
  - 2. Friendly Environment, Shelbyville, Tennessee – Erosion Eel,
  - 3. Tensar NORTH AMERICAN GREEN, Alpharetta, Georgia – Straw Wattle,
  - 4. or approved equal.

## 2.5 EROSION CONTROL BLANKET

- A. The Erosion Control Blanket shall meet Type 2.D specification requirements established by the Erosion Control Technology Council (ECTC) and Federal Highway Administration's (FHWA) **FP-03 Section 713.17**.
- B. The short-term double net erosion control blanket shall be a machine-produced mat of 100% agricultural straw with a functional longevity of up to 12 months. (NOTE: functional longevity may vary depending upon climatic conditions, soil, geographical location and elevation). The blanket shall be of consistent thickness with the straw evenly distributed over the entire area of the mat. The blanket shall be covered on the top and bottom sides with a 100% biodegradable woven natural fiber netting. The netting shall consist of machine directional strands formed from two intertwined yarns with cross directional strands interwoven through the twisted machine strands (commonly referred to as a Leno weave) to form an approximate 0.50 x 1.0 in. (1.27 x 2.54 cm) mesh. The blanket shall be sewn together on 1.50 inch (3.81 cm) centers with degradable thread. The blanket shall be manufactured with a colored thread stitched along both outer edges (approximately 2-5 inches [5-12.5 cm] from the edge) as an overlap guide for adjacent mats.
- C. Approved manufacturers:
  - 1. Tensar NORTH AMERICAN GREEN, Alpharetta, Georgia – BioNet ® S150BN ECB,
  - 2. or approved equal.

## 2.6 WATER

- A. All water used on the project shall be free of any substances harmful to plant germination and growth or to the environment in general. It shall be free of any impurities. Contractor shall be responsible for furnishing and applying water that meets these requirements. Engineer may, at Contractor's expense, submit samples of water used on the project for laboratory analysis (of a reasonable number and kind) to ensure the quality of the water. Onsite water shall not be used unless approved by Owner or Owners Representative.

## 2.7 ROCK DITCH CHECKS OR SEDIMENT DAMS

- A. All rock ditch checks to be constructed of materials as shown in the plans.
- B. All rock sediment dams are to be constructed of materials as shown in the plans.

# PART 2 – EXECUTION

## 2.1 EXAMINATION AND PREPARATION

- A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.
- B. Schedule work so that soil surfaces are left exposed for the minimum amount of time.
- C. Locate and protect survey horizontal and vertical control.

## 2.2 STORM WATER POLLUTION PREVENTION PLAN (SWPPP)

- A. Prepare SWPPP on behalf of the Owner.
- B. Contractors SWPPP shall conform to the requirements of the Arkansas Department of

Environmental Quality.

2.3 ADEQ CONSTRUCTION GENERAL PERMIT

- A. Submit Notice of Intent (NOI) at least a week prior to construction.
1. A completed ADEQ Electronic Signature Agreement form must be mailed to the Electronic Signature Agreement Committee, Arkansas Department of Environmental Quality, 5301 Northshore Drive, North Little Rock, AR 72118, prior to online submission. Most General NPDES Permits may be completed and submitted online through the ADEQ ePortal site at <https://eportal.adeq.state.ar.us/>
  2. A paper NOI may also be completed and mailed with the initial permit fee (if applicable) to:  
  
Arkansas Department of Environmental Quality  
Permit Branch, Water Division  
5301 Northshore Drive  
North Little Rock, AR 72118
- B. Submit a copy of the Notice of Coverage to the Engineer.
- C. Perform and document weekly inspections. Submit to Engineer with monthly Payment request.
- D. Submit Notice of Termination after date of Substantial Completion as required by NPDES regulations.

2.4 INSTALLATION

- A. Silt Fence
1. Silt fence shall 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.
  2. 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.
  3. 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.
- B. Check Dam
1. Rock
    - a. Dam shall consist of 2"-4" coarse aggregate rock with a #1 or #2 crushed gravel or stone face. Place rock either by hand or mechanically; do not simply dump into channel.
    - b. Check dam should be keyed into the swale bottom. Place geotextile fabric between earth and coarse aggregate. Provide a 6-inch deep by 24-inch wide sump immediately upstream of the dam to capture sediment.
  2. Sediment Log
    - a. Before placing sediment logs, the Contractor shall certify that the subgrade has been properly compacted, graded smooth, has no depressions, voids, soft or uncompacted areas, is free from obstructions such as tree roots, protruding stones or other foreign matter, and is seeded and fertilized

according to project specifications where applicable. The Contractor shall not proceed until all unsatisfactory conditions have been remedied. By beginning construction, Contractor signifies that the preceding work is in conformance with this specification.

- b. No vehicular traffic shall be permitted directly on the sediment log.
- c. Sediment log shall be installed as directed by the owner's representative in accordance to manufacturer's Installation Guidelines, Staking Pattern Guide, and details shown on drawings. The extent of sediment logs shall be as shown on the project drawings.
- d. Sediment log should be installed to intercept water flow and collect sediment on site. They may be placed over bare soil or on top of erosion control blankets. Sediment logs are typically installed laying on flat ground and not trenched.
- e. They shall be secured to the subgrade by wood stakes every two lineal feet across the length of the sediment log. The stakes shall be intertwined with the outer mesh of the sediment log only and drive into the ground a minimum of 16 inches on the downstream side of the sediment log.
- f. Sediment log installed in a swale or channel bottom shall allow the installation to continue up the slopes three feet above the anticipated high water mark and perpendicular to the flow of water.
- g. Spacing of sediment logs shall be such that the elevation of the bottom of the sediment log upstream will be equal to the elevation of the top of the log downstream.
- h. Sediment log shall remain in place until fully established vegetation and root systems are present.

C. Temporary Seeding

- 1. Rye or Cereal grasses shall be applied between August 15 and January 20 at a seeding rate of 2.3 lb/1,000 ft<sup>2</sup>. Brown top millet shall be applied between January 21 and August 14 at a seeding rate of 1.25 lb/1,000 ft<sup>2</sup>.
- 2. Mulch cover shall be applied at the rate of 92 lb/1,000 ft<sup>2</sup> immediately after seeding and shall be spread uniformly over the entire area.
- 3. From April 1 to December 31, either the day before the temporary seeding is placed or on the day of the temporary seeding operation (either before the seed is placed or after the application of the mulch cover), a minimum of 0.5 M gal/1,000 ft<sup>2</sup> of water should be applied.

D. Erosion Control Blanket

1. Channels

- a. Prepare soil before installing the erosion control blanket, including any necessary application of soil amendments such as lime or fertilizer.
- b. Installed erosion control blanket shall be seeded and soil-filled. After seeding, spread a layer of fine soil into the mat. Using the flat side of a rake, broom or other tool, completely fill the voids. Smooth soil-fill in order to just expose the top of the erosion control blanket. Do not place excessive soil above the mat. In the case of equipment use, no tracked equipment or sharp turns shall be allowed on the mat. Avoid any traffic over the mat if loose or wet soil conditions exist. Additional seed, hydraulic mulching or the use of a temporary erosion control blanket can be applied over the soil-filled mat for additional protection. Consult with a manufacturer's technical representative for installation assistance if unique conditions apply.
- c. Begin at the top of the channel by anchoring the blankets in a 6 in. (15 cm)

deep x 6 in. (15 cm) wide trench with approximately 12 in. (30 cm) of blankets extended beyond the upslope portion of the trench. Use outlet protection at the channel/culvert outlet as needed. Anchor the blankets with a row of staples/stakes approximately 12 in. (30 cm) apart in the bottom of the trench. Backfill and compact the trench after stapling. Apply seed to the compacted soil and fold the remaining 12 in. (30 cm) portion of blankets back over the seed and compacted soil. Secure blankets over compacted soil with a row of staples/stakes spaced approximately 12 in. (30 cm) apart across the width of the blankets.

- d. Roll center blankets in direction of water flow in bottom of channel. Blankets will unroll with appropriate side against the soil surface. All blankets must be securely fastened to soil surface by placing staples/stakes in appropriate locations as shown in the staple pattern guide. Place consecutive blankets end-over-end (shingle style) with a 4 in.-6 in. (10-15 cm) overlap. Use a double row of staples staggered 4 in. (10 cm) apart and 4 in. (10 cm) on center to secure blankets.
- e. Full-length edge of REC Ps at top of side slopes must be anchored with a row of staples/stakes approximately 12 in. (30 cm) apart in a 6 in. (15 cm) deep x 6 in. (15 cm) wide trench. Backfill and compact the trench after stapling.
- f. Adjacent blankets must be overlapped approximately 2 in.-5 in. (5-12.5 cm) (depending on blanket type) and stapled. Note: In adverse soil conditions longer staples/stakes or earth anchors may be necessary to properly secure the blankets.
- g. In high flow channel applications a staple check slot is recommended at 30 to 40 ft. (9-12 m) intervals. Use a double row of staples staggered 4 in. (10 cm) apart and 4 in. (10 cm) on center over entire width of the channel.
- h. The terminal end of the blankets must be anchored with a row of staples/stakes approximately 12 in. (30 cm) apart in a 6 in. (15 cm) deep x 6 in. (15 cm) wide trench. Backfill and compact the trench after stapling.

## 2. Slopes

- a. Prepare soil before installing the erosion control blanket, including any necessary application of soil amendments such as lime or fertilizer.
- b. Installed erosion control blanket shall be seeded and soil-filled. After seeding, spread a layer of fine soil into the mat. Using the flat side of a rake, broom or other tool, completely fill the voids. Smooth soil-fill in order to just expose the top of the erosion control blanket. Do not place excessive soil above the mat. In the case of equipment use, no tracked equipment or sharp turns shall be allowed on the mat. Avoid any traffic over the mat if loose or wet soil conditions exist. Additional seed, hydraulic mulching or the use of a temporary erosion control blanket can be applied over the soil-filled mat for additional protection. Consult with a manufacturer's technical representative for installation assistance if unique conditions apply.
- c. Begin at the top of the slope by anchoring the blankets in a 6 in. (15 cm) deep x 6 in. (15 cm) wide trench with approximately 12 in. (30 cm) of blankets extended beyond the upslope portion of the trench. Anchor the blankets with a row of staples/stakes approximately 12 in. (30 cm) apart in the bottom of the trench. Backfill and compact the trench after stapling. Apply seed to the compacted soil and fold the remaining 12 in. (30 cm) portion of blankets back over the seed and compacted soil. Secure blankets over compacted soil with a row of staples/stakes spaced approximately 12 in. (30 cm) apart across the width of the blankets.
- d. Roll the blankets down or horizontally across the slope. Blankets will unroll with appropriate side against the soil surface. All blankets must be

securely fastened to soil surface by placing staples/stakes in appropriate locations as shown in the staple pattern guide.

- e. The edges of parallel blankets must be stapled with approximately 2 in.-5 in. (5-12.5 cm) overlap depending on the blanket type.
- f. Consecutive blankets spliced down the slope must be end-over-end (shingle style) with an approximate 3 in. (7.5 cm) overlap. Staple through overlapped area, approximately 12 in. (30 cm) apart across entire blankets width. Note: In adverse soil conditions longer staples/stakes or earth anchors may be necessary to properly secure the blankets.

## 2.5 MAINTENANCE

### A. Silt Fence

- 1. Inspect weekly and after each rainfall.
- 2. Repair wherever fence is damaged.
- 3. Remove sediment when it reaches 1/3 the height of the fence.
- 4. Inspect silt fence when rain is forecast. Perform required maintenance before the storm event.
- 5. Remove silt fence when no longer needed. Fill and compact post holes and anchorage trench, remove sediment accumulation, and grade alignment to blend with adjacent ground

### B. Check Dam

- 1. Rock
  - a. Inspect for sediment buildup behind the check dam and signs of erosion around the check dam after each rain.
  - b. Remove accumulated sediment whenever it reaches one half the sump depth by hand shoveling or backhoeing the silt.
- 2. Sediment Log
  - a. Be aware that sediment control logs will eventually degrade. Remove accumulated sediment before the depth is one-half the height of the sediment log and repair damage to the sediment log, typically by replacing the damaged section
  - b. Once the upstream area is stabilized, remove and properly dispose of the logs. Areas disturbed beneath the logs may need to be seeded and mulched. Sediment control logs that are biodegradable may occasionally be left in place (e.g. when logs are used in conjunction with erosion control blankets as permanent slope breaks). However, removal of sediment control logs after final stabilization is typically appropriate when used in perimeter control, inlet protection and check dam applications. Compost from compost sediment logs may be spread over the area and seeded as long as this does not cover newly established vegetation.

### C. Temporary Seeding

- 1. Inspect frequently within the first six weeks of planting to see if stands are uniform and dense and to assure that appropriate moisture levels are maintained.
- 2. Make provisions to water as needed to penetrate to a depth of 6 inches (15.2 cm).
- 3. Check for damage caused by equipment or heavy rains.
- 4. Damaged areas should be repaired, fertilized, seeded, and mulched. Tack or tie down mulch as necessary.

D. Erosion Control Blanket

1. Inspect erosion control blankets after rainstorms to check for movement of topsoil, movement of the mulch, or erosion. Continue inspections until vegetation is firmly established.
2. In the cases of washout, breakage, or erosion occurring, repair surface, re-seed, re-sod, re-mulch and/or replace topsoil, and install new blanket.

**END OF SECTION**



**SECTION 016000**  
**MATERIAL AND EQUIPMENT**

**PART 1 - GENERAL**

**1.1 SECTION INCLUDES**

- A. Transportation and handling.
- B. Storage and protection.
- C. Product options.
- D. Substitutions.

**1.2 TRANSPORTATION AND HANDLING**

- A. Transport and handle products in accordance with manufacturer's instructions and contract documents.
- B. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.
- D. Pipe for potable water to be transported with exposed ends tarped or otherwise closed to prevent accumulation of airborne contaminants during transport.

**1.3 STORAGE AND PROTECTION**

- A. Store and protect products in accordance with manufacturer's instructions, with seals and labels intact and legible.
- B. Store sensitive products in weather tight, climate controlled enclosures.
- C. For exterior storage of fabricated products, place on sloped supports, above ground.
- D. Provide off-site storage and protection when site does not permit on-site storage or protection.
- E. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation or potential degradation of product.
- F. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- G. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- H. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

#### 1.4 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Any Product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Products of manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named in accordance with the following article. Where terms such as Aor equal,@ Aor equivalent@ are used in this Contract, they shall be taken to mean Aor approved equivalent.@ Proposed equivalents shall be offered as substitutions.

#### 1.5 SUBSTITUTIONS

- A. Engineer will consider requests for substitutions only within 90 days after date established in Notice to Proceed.
  - 1. Substitutions may be considered when a product becomes unavailable through no fault of the Contractor.
- B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.
- C. A request constitutes a representation that the Contractor:
  - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
  - 2. Will provide the same warranty for the substitution as for the specified product.
  - 3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
  - 4. Waives claims for additional costs or time extension which may subsequently become apparent.
- D. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.
- E. Substitution Submittal Procedure:
  - 1. Submit copies of Request for Substitution for consideration. Number of copies as specified in Section 013300. Limit each request to one proposed substitution.
  - 2. Submit shop drawings, product data, and certified test results attesting to the proposed Product equivalence. Burden of proof is on proposer.
  - 3. The Engineer will notify Contractor in writing of decision to accept or reject request.

### PART 2 - PRODUCTS

#### 2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
5. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in Part 2 "Comparable Products" to obtain approval for use of an unnamed product.

B. Product Selection Procedures:

1. Product: Where Specifications name a single product and manufacturer, provide the named product that complies with requirements.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.
3. Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
4. Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
5. Available Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed, or an unnamed product, that complies with requirements.
6. Available Manufacturers: Where Specifications include a list of manufacturers, provide a product by one of the manufacturers listed, or an unnamed manufacturer, that complies with requirements.
7. Product Options: Where Specifications indicate that sizes, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide the specified product or system.
8. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named.
9. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with other specified requirements.
  - a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Engineer will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
  - b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Engineer will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

## 2.2 PRODUCT SUBSTITUTIONS

- A. Conditions: Engineer will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Engineer will return requests without action, except to record noncompliance with these requirements:
1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Engineer for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
  2. Requested substitution does not require extensive revisions to the Contract Documents.
  3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
  4. Substitution request is fully documented and properly submitted.
  5. Requested substitution will not adversely affect the Construction Schedule.
  6. Requested substitution has received necessary approvals of authorities having jurisdiction.
  7. Requested substitution is compatible with other portions of the Work.
  8. Requested substitution has been coordinated with other portions of the Work.
  9. Requested substitution provides specified warranty.
  10. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

## 2.3 COMPARABLE PRODUCTS

- A. Conditions: Engineer will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Engineer will return requests without action, except to record noncompliance with these requirements:
1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
  2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
  3. Evidence that proposed product provides specified warranty.
  4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
  5. Samples, if requested.

## PART 3 - EXECUTION

Not used.

END OF SECTION

## **SECTION 017000**

### **MAINTENANCE OF TRAFFIC**

#### **PART 1 – GENERAL**

##### **1.1 SCOPE OF WORK**

- A. This item shall include the erection of signs and barricades, and the maintenance of, or nonintervention with, traffic in accordance with details shown on the Plans and with these Specifications, or as directed by the Engineer.
- B. This item shall also include the temporary relocation of traffic and street signs, the maintenance of the temporarily relocated signs through the construction of the project, and the permanent relocation of the signs after the construction is complete.
- C. Certain requirements with respect to maintenance of traffic are specified in Special Conditions of these Specifications.
- D. This item shall be accomplished according to the plans, this specification, and the MUTCD. It is also applicable to the furnishing, installing, maintaining, and removal of Temporary Culverts and to those traffic control devices and operations required to delineate temporary hazards that are a result of the Contractor's operations and which are not otherwise specified on the plans.
- E. The Contractor shall maintain the existing roads, including shoulders, bridges, and culverts, within the limits of the project from the date work is begun until the project has been completed and accepted. This maintenance of existing roads, including shoulder, bridges, and culverts, is the ordinary day to day maintenance, including minor repairs.
- F. The Contractor shall provide, under the item of Maintenance of Traffic, those traffic control devices and operations required to delineate temporary hazards that are a result of Contractor operations. Full compensation for this work will be considered including in the contract unit prices bid for the various items of the Contract. Speed limits through construction zones will be determined by the Engineer.

##### **1.2 RELATED WORK**

- A. Traffic Control Devices for Construction Zones are included in Arkansas Highway and Transportation Department Standard Specifications for Highway Construction – Section 604 and are to be used for this project except as modified or augmented herein.
- B. Maintenance of traffic as described above shall be accomplished in accordance with the applicable portions of Section 603, MAINTENANCE OF TRAFFIC AND TEMPORARY STRUCTURES - Arkansas Highway and Transportation Department Standard Specifications for Highway Construction, except as modified or augmented herein, or as directed by the Engineer.

##### **1.3 SUBMITTALS**

- A. A maintenance of traffic plan is not included in the plans. A submittal is not required to the Engineer. The Contractor will be responsible for notifying governing authorities such as the county sheriff or police chief and the fire chief of plans to alter traffic flow during construction of this project.

#### 1.4 REPETITIONS

- A. For emphasis, protective actions are noted in other parts of these Contract Documents. These repetitions here are called to the attention of each bidder to the end that he shall avoid any duplication of costs in compiling his bid.

### **PART 2 – PRODUCTS**

#### 2.1 MATERIALS

- A. Materials for maintenance of traffic shall be as required in Section 604 – Traffic Control Devices for Construction Zones, AHTD Standard Specifications for Highway Construction, current edition, except as directed by the Engineer in writing.

### **PART 3 – EXECUTION**

#### 3.1 RELOCATION AND REPLACEMENT OF TRAFFIC SIGNS

- A. During the construction of the project, the temporary relocation of street signs and traffic control signs will be performed by the Contractor. The Contractor shall maintain the signs at highly visible locations as near as practicable to the original locations. The latest edition of the Manual of Uniform Traffic Control Devices published by the Federal Highway Administration shall be used as guide to the placement of signs during construction.
- B. Immediately after the construction on any part of the project reaches a stage of completion such that the relocation of the street signs and traffic control signs is no longer necessary, the Contractor shall permanently relocate the street signs and traffic control signs at a site marked
- C. Street signs and traffic control signs shall be removed from such area of work as necessary to permit work on the project. Each sign shall be securely relocated by driving the sign into the ground with equipment approved by the Engineer.

#### 3.2 MAINTENANCE OF TRAFFIC

- A. Maintenance of Traffic shall be accomplished by the Contractor in an expeditious manner to preserve the integrity of the traveled way and shoulders and to protect traffic from temporary hazards created by Contractor operations.
- B. The delineation of temporary hazards shall include the placement of any traffic control devices that are necessary for the protection from, and /or delineation of, such objects as open trenches or holes, stationary objects, drop-offs, parked equipment, stockpiled materials, fresh oil, etc. These traffic control devices shall be placed at locations where they will provide adequate warning to the traffic, including side roads that enter the work limits. All traffic control devices used shall comply with the applicable requirements of Section 604 of the AHTD Specifications.
- C. Passageways for traffic shall be maintained dust free by the application of water or other approved material.

- D. The Contractor shall make judicious use of pilot vehicles or properly attired and trained flaggers or sentinels, as necessary, to safely and conveniently guide traffic through the work limits.
- E. On unpaved traveled ways or shoulders, the Contractor shall keep the surface smooth and stable by blading, ditching, etc.
- F. Shoulder material shall be maintained to closely match the grade of the existing pavement.

### 3.3 DETOUR OR STAGE CONSTRUCTION

- A. Where shown on the plans for the maintenance of traffic, the Contractor shall construct and maintain detours or stage roadway sections to provide for the construction of the roadway, culverts, bridges, or miscellaneous items.
- B. Any temporary culvert shall be of sufficient length to provide the specified roadway width, but in no case be less than that required to provide a minimum 20' (6M) traveled way, and shall have a minimum design capacity as required by Engineer.
- C. Except as provided therein, a layout and working drawings shall be submitted to the Engineer for informational and record purposes for all temporary bridges and drainage structures, except standard pipe culverts. The layout submitted shall show the length and type of spans, and the type of substructure. Working drawings shall show all dimensions and details necessary to construct the structure, and the type and condition of all materials that will be used. The Contractor shall construct the temporary structures according to these drawings, or shall submit revised drawings if changes become necessary.
- D. The materials and completed drainage structure shall be maintained in good serviceable conditions that will safely accommodate traffic using the facility for the durations of the work.
- E. Temporary pipes in detour or stage construction shall be as shown on the plans or approved before installation. No additional payment will be allowed if a bridge type structure is furnished in lieu of a temporary culvert at the Contractor's request.
- F. The detour or temporary roadway shall be maintained in a condition to allow the safe and convenient passage of vehicles. When the plans do not provide for a dust free surfacing, the passageway shall be maintained dust free by the application of water or other approved material to the roadway itself or to adjacent areas of construction activity that are the source of dust.
- G. Temporary culverts or bridges structures shall be removed when the new facility has been completed and opened to traffic.
- H. Materials from temporary culverts or temporary bridge structures shall remain the property of the Contractor. Materials used on the detours and in stage construction and not incorporated into the permanent work, shall be salvaged to the extent practicable and used for base on other detours, drives, approaches, islands or shoulders, or stockpiled as directed. Non-salvageable materials shall be disposed of by the Contractor according to these conditions and specifications.
- I. The Contractor shall provide the Engineer with a minimum of three calendar days advance notification of any non-emergency lane closure or lane width restriction.

- J. Where any operations result in a vertical differential at the centerline, land line, or edge of pavement, the Contractor shall immediately place traffic control devices or install a positive barrier according to the plans. Traffic control devices shall be maintained until the planned typical section is completed or until temporary shoulders are constructed.

END OF SECTION



**SECTION 018000**  
**WATER FOR DUST CONTROL**

**PART 1 GENERAL**

**1.1 DESCRIPTION**

- A. This item shall consist of the furnishing and placing of water for the purpose of dust control during period of dry weather.

**1.2 REFERENCE STANDARDS**

- A. Arkansas Highway and Transportation Department Standard Specifications for Highway Construction.

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

- A. Control of dust is of extreme importance to the health and welfare of the project residents and it is intent of the Specification that the contractor will, upon a 24-hour notice by the Engineer, furnish a water truck and adequate personnel to control dust on the project as directed by the Engineer and to maintain the availability of the equipment on the job during periods of dry weather. A supply of water is not available on-site.

**PART 3 - EXECUTION**

**3.1 CONSTRUCTION**

- A. Contractor is to apply water as is necessary to control dust in the area of construction traffic and other activities.

END OF SECTION



## SECTION 022710

### RIPRAP

#### PART 1 - GENERAL

##### 1.1 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and place riprap and appurtenances as shown on the Drawings and as specified herein.

#### PART 2 - PRODUCTS

##### 2.1 MATERIALS

- A. Stone for filter blanket and riprap shall be obtained from an approved source and shall consist of sandstone, limestone, or other hard and durable stone that will be resistant to the action of air and water. Riprap stone shall consist of field stone or quarry stone with angular or fractured faces, weighing not less than 140 pounds per solid cubic foot (2200 kg per solid cubic meter). Material for filter blanket and riprap shall be hard and durable and from a source with a percent of wear not greater than 45 by the Los Angeles Test (AASHTO T 96).
- B. Filter blanket material shall contain no organic matter or soft, friable particles in quantities considered objectionable by the Engineer, and shall consist of sand, gravel, or crushed stone reasonable well graded from coarse to fine according to the following requirements:

<b><u>SIEVE SIZE (mm)</u></b>	<b><u>PERCENT PASSING</u></b>
2" (50 mm)	100
#4 (4.75 mm)	25-65
#200 (0.075 mm)	0-12

In lieu of the material described above, material conforming to the grading requirements of AHTD Standard Specifications Section 303 for Aggregate Base Course, Class 7, may be used.

- C. Dumped riprap shall be reasonably free of fines and reasonably well graded between the maximum of voids. In general, the maximum piece size shall be not greater than 18" (0.5 m) in any dimension and approximately 50% of the material shall consist of pieces weighing 35 pounds (15 kg) or more. Broken concrete may not be used.
- D. A synthetic fiber geotextile fabric complying with the requirements of Section 022720 may be used as a filter blanket under dumped riprap in lieu of a granular filter blanket material.
- E. Stone for dumped riprap shall meet the requirements for Dumped Riprap in (c) above, except that the pieces shall range in size from approximately 12" (300 mm) and 24 (600 mm) in any dimension, with the interstices filled with stone spalls and grouted with cement grout. The grout filler shall be composed of mixture of one part portland cement and three parts sand, mixed with water to produce a workable consistency. The amount of water used shall be approved by the Engineer.
- F. Placing of riprap in layers or by dumping into chutes or by similar methods to cause segregation will not be permitted.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. The construction methods, compaction equipment, and appurtenances for bank-run gravel shall be in accordance with Section 816, filter Blanket and Riprap, Standard Specifications for Highway Construction, the Arkansas Highway and Transportation Department Current Edition, except as augmented and modified herein.
- B. Prior to placing filter blanket and riprap, the slopes shall be shaped as shown on the plans. When rock or hard shale is encountered at the toe of the slope, the riprap shall be keyed into this material at least the depth of the riprap.
- C. Granular filter blanket material shall be spread uniformly on the previously prepared and approved surface to the thickness and locations shown on the plans. Placement of the material by methods that will caused segregation or cause damage to the surface will not be required, but in shall be finished to present a reasonably even surface free from mounds or windrows.
  - 1. When fabric is used in lieu of granular material, it shall be placed directly on the prepared surface. Fabric sections may be placed vertically or horizontally on the slope. Adjacent fabric sections shall be joined by overlapping a minimum of 2' (0.6 m) at the edges and pinning the overlapped strip with U-shaped wire pins, single shaped steel pins with metal disc heads, or similar fasteners. The fasteners shall be 6" (150 mm) or more in length and shall hold the firmly in place. Fasteners shall be inserted through both strips of overlapped fabric at intervals of approximately 4' (1.2m) along the overlap. Additional pin shall be installed as necessary to prevent displacement of the fabric.
  - 2. Fabric shall be overlapped in the direction of water flow. The fabric shall be turned down and buried approximately 12" (0.3 m) deep at the exterior limits.
  - 3. No construction equipment will be permitted directly on the fabric.
- D. Stone, broken concrete, or steel slag for dumped riprap shall be placed in such a manner as to produce a reasonably well graded mass of rock with the minimum practicable percentage of voids and shall be constructed to the lines and grades shown on the plans or as directed by the Engineer. Material shall be placed in such a manner as to avoid displacing the underlying material. The larger pieces shall be well distributed throughout, the entire mass and the finished riprap shall be free from objectionable pockets of small or large pieces. Hand placing, to a limited extent, may be required, but only to the extent necessary to secure the results specified above. Placing riprap by dumping into chutes or by similar methods likely to cause segregation will not be permitted.
  - 1. Riprap stone or steel slag shall not be deposited in a manner that will cause damage to the filter blanket. Any damage to fabric during placement of riprap shall be corrected by the Contractor at no cost to the Department prior to proceeding with the work. Damaged fabric shall be repaired by placing a piece of fabric large enough to cover the damage area and overlapping and pinning according to Subsection 816.03(b).
  - 2. Dumped riprap for locations designated on the plans for detours shall be constructed to the lines and dimensions shown on the plans and in accordance with the provisions except that:
  - 3. Synthetic fiber fabric shall be used in lieu of granular filter blanket material.
  - 4. No toe excavation, as shown in the standard drawings, will be required.

5. Dumped riprap and synthetic fiber fabric shall be placed immediately after the detour embankment is constructed. The placement of any base material or pavement will not be permitted on the detour until the riprap has been placed on the detour slopes and approved by the Engineer.
- E. Dumped Riprap shall be placed in accordance with (c) above. The stones shall be thoroughly wetted immediately prior to applying the grout. The grout shall be thoroughly worked into the voids as the grout is deposited on the surface of the riprap. The stones shall then be brushed to expose the top surfaces. The grouted riprap shall then be cured in accordance with Subsection 501.05 (1).

END OF SECTION



**SECTION 022720**  
**GEOTEXTILE FABRICS**

**PART 1 - GENERAL**

**1.1 SCOPE OF WORK**

- A. Furnish and install geotextile fabrics for subsurface drainage. The work shall include the installation and all other related work as shown on the Drawings and as specified herein.

**1.2 QUALITY ASSURANCE**

- A. The materials supplied under this Section shall be first quality products designed and manufactured specifically for the purposes of this work and which have been satisfactorily demonstrated by prior use to be suitable and durable for such purposes. Supply the Engineer with the name of the fabric manufacturer and, later, a test report from the fabric producer certifying that the fabric meets this Section for fabric material.
- B. Technical Assistance
  - 1. A representative of the fabric manufacturer shall be present for a minimum of 1 day during the installation and shall provide technical assistance for the installation of the fabric.

**1.3 REFERENCE STANDARDS**

Arkansas Highway and Transportation Department Specifications for Highway Construction

- A. American Society for Testing and Materials (ASTM)
  - 1. ASTM D3776 - Standard Test Methods for Mass Per Unit Area (Weight) of Woven Fabric.
- B. Section 625 Geotextile Fabric, Arkansas Highway and Transportation Standard Specifications for Highway Construction, Current Edition.
- C. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

**1.4 PROJECT/SITE REQUIREMENTS**

- A. Fabric Protection
  - 1. The subgrade shall be inspected and approved by the Engineer prior to installation of the fabric. The subgrade shall be maintained in a smooth, uniform and compacted condition during the installation of the fabric.
  - 2. No mechanical equipment shall be driven directly on top of the fabric.
  - 3. The fabric shall be stored in such a way that it is protected from prolonged exposure to ultraviolet radiation.

## PART 2 - PRODUCTS

### 2.1 MATERIAL

#### A. Nonwoven Geotextile

1. The fabric shall be a nonwoven fabric consisting of synthetic polymers formed into a stable network. The fabric shall be nonbiodegradable, resistant to ultraviolet light exposure, insect and rodent resistant and conform to the minimum properties in the following table:

<u>Properties</u>	<u>Value</u>	<u>Test Method</u>
Fabric Weight - oz/sq yd	7	ASTM D3776
Size	No. 100	Equivalent Opening COE CW-02215-77 Average
Permeability (Transverse) - cm/sec		0.01

2. Nonwoven geotextile fabric shall be **Mirafi 180N**; Trevira 1127, or equal.

#### B. General

1. No fabric shall be covered until inspected and approved by the Engineer. Fabric surfaces shall be covered with soil materials shown on Drawings.
2. Soil cover materials shall be as specified in Section 02200.
3. Comply with the requirements of Paragraphs 1.05 and 3.05 of this Section for fabric protection during soil cover placement.

## PART 3 - EXECUTION

### 3.1 SUBGRADE PREPARATION

#### A. General

1. Preparation of the subgrade is specified in Section 022000.
2. Prior to ordering fabric material, submit, for the Engineer's approval, the manufacturer's name and fabric type, the engineering properties of the fabric as determined by manufacturer's tests, a sample of the proposed fabric type and the manufacturer's installation recommendations.
3. The earth subgrade shall be maintained in a smooth, uniform and compacted condition during installation of the fabric.

### 3.2 FILTER FABRIC INSTALLATION

- A. The fabric shall be installed as shown on the Drawings and in accordance with the manufacturer's recommendations. Overlaps shall be a minimum of 7 percent of the fabric roll width.

### 3.3 SOIL COVER

#### A. Placement of Soil Cover Over Fabric



1. The cover shall be placed with mechanical equipment; however, no mechanical equipment shall be allowed directly on top of the fabric material. Equipment shall be driven on pre-deposited material.
2. Soil cover shall be brought in with earth-carrying equipment, deposited on the previously spread soil cover, and then pushed onto the uncovered portion of the fabric with graders or bulldozers. This operation shall be repeated until the total area is covered.
3. Soil cover for the side slopes of the fabric shall be placed at the bottom and pushed up so as to reduce any tension on the fabric.
4. Damage to the fabric occurring during the placement of soil cover shall be repaired immediately at no additional expense.
5. Cover material shall be placed as soon as possible to protect materials from ultraviolet degradation and temperature fluctuations.

#### 3.4 DISPOSAL OF WASTE MATERIAL

- A. On completion of installation, dispose of all trash, waste fabric and equipment used in connection with the work herein and shall leave the premises in a neat and acceptable manner, as approved by the Engineer.

#### 3.5 FINAL INSPECTION

- A. Upon completion of the work, the fabric installation shall be subjected to a final inspection. All work in the system therein being inspected shall be complete, clean and ready for use. All work shall meet the requirements as to line, grade, cleanliness and workmanship, as determined by the Engineer.
- B. All discrepancies shall be noted and repaired at no additional expense. Final acceptance of the system shall be contingent upon the approval of the Engineer.

END OF SECTION



## **SECTION 031000**

### **CONCRETE FORMWORK**

#### **PART 1 - GENERAL**

##### **1.1 SCOPE OF WORK**

- A. Furnish all labor, materials, equipment and incidentals required and design, install and remove formwork for cast-in-place concrete as shown on the Drawings and as specified herein.
- B. Secure to forms as required or set for embedment as required, all miscellaneous metal items, sleeves, reglets, anchor bolts, inserts and other items furnished under other Sections and required to be cast into concrete.

##### **1.2 SUBMITTALS**

- A. Submit, in accordance with Section 01300, shop drawings and product data showing materials of construction and details of installation for:
  - 1. Form release agent
  - 2. Form ties
- B. Samples
  - 1. Demonstrate to the Engineer on a designated area of the concrete substructure exterior surface that the form release agent will not adversely affect concrete surfaces to be painted, coated or otherwise finished and will not affect the forming materials.
- C. Certificates
  - 1. Certify form release agent is suitable for use in contact with potable water after 30 days (non-toxic and free of taste and odor).

##### **1.3 REFERENCE STANDARDS**

- A. American Concrete Institute (ACI)
  - 1. ACI 301 - Standard Specification for Structural Concrete
  - 2. ACI 318 - Building Code Requirements for Structural Concrete
  - 3. ACI 347 - Formwork for Concrete
- B. American Plywood Association (APA)
  - 1. Material grades and designations as specified
- C. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.
- D. Arkansas Highway and Transportation Department Standard Specifications for Highway Construction.

##### **1.4 SYSTEM DESCRIPTION**

- A. General: Architectural Concrete is wall, slab, beam or column concrete which will have surfaces exposed to view in the finished work. It includes similar exposed surfaces in water containment structures from the top of walls to 2-ft below the normal water surface in open tanks and basins.
- B. Structural design responsibility: All forms and shoring shall be designed at the Contractor's expense by a professional engineer registered in the State of Arkansas. Formwork shall be designed and erected in accordance with the requirements of ACI 301 and ACI 318 and as recommended in ACI 347 and shall comply with all applicable regulations and codes. The design shall consider any special requirements due to the use of plasticized and/or retarded set concrete.

## **PART 2 - PRODUCTS**

### **2.1 GENERAL**

- A. The usage of a manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configurations desired.

### **2.2 MATERIALS**

- A. Forms for cast-in-place concrete shall be made of wood, metal, or other approved material. Construct wood forms of sound lumber or plywood of suitable dimensions and free from knotholes and loose knots. Where used for exposed surfaces, dress and match boards. Sand plywood smooth and fit adjacent panels with tight joints. Metal forms may be used when approved by the Engineer and shall be of an appropriate type for the class of work involved. All forms shall be designed and constructed to provide a flat, uniform concrete surface requiring minimal finishing or repairs.
- B. Wall Forms
  - 1. Forms for all exposed exterior and interior concrete walls shall be "Plyform" exterior grade plywood panels manufactured in compliance with the APA and bearing the trademark of that group, or equal acceptable to the Engineer. Provide B grade or better veneer on all faces to be placed against concrete during forming. The class of material and grades of interior plies shall be of sufficient strength and stiffness to provide a flat, uniform concrete surface requiring minimal finishing and grinding.
  - 2. All joints or gaps in forms shall be taped, gasketed, plugged, and/or caulked with an approved material so that the joint will remain watertight and will withstand placing pressures without bulging outward or creating surface patterns.
  - 3. Forms for circular structures shall conform to the circular shape of the structure. Straight panels may be substituted for circular panels if the straight panels do not exceed 2-ft in width nor deflect more than 3-1/2 degrees per joint, nor conflict with specific notes on the Drawings.
- C. Form Release Agent
  - 1. Coat all forming surfaces in contact with concrete using an effective, non-staining, non-residual, water based, bond-breaking form coating unless otherwise noted. Form release agents used in potable water containment structures shall be suitable for use in contact with potable water and shall be non-toxic and free of taste or odor.
  - 2. Concrete surfaces which are to be painted shall be formed with hard plastic finished plywood or a similar material which does not require a form release agent

unless the Contractor can substantiate to the satisfaction of the Engineer that the form release agent will not remain on the formed surface after it is stripped.

**D. Form Ties**

1. Form ties encased in concrete other than those specified in the following paragraphs shall be designed so that, after removal of the projecting part, no metal shall remain within 1-1/2-in of the face of the concrete. The part of the tie to be removed shall be provided with a removable cone at least 1-in diameter and 1-1/2-in deep. Form ties in concrete exposed to view shall be the cone-washer type.
2. Flat bar ties for panel forms shall have plastic or rubber inserts having a minimum depth of 1-1/2-in and sufficient dimensions to permit proper patching of the tie hole.
3. Ties for liquid containment structures shall have an integral waterstop that is tightly welded to the tie.
4. Common wire shall not be used for form ties.
5. Alternate form ties consisting of tapered through-bolts at least 1-in in diameter at smallest end or through-bolts that utilize a removable tapered sleeve of the same minimum size may be used at the Contractor's option. Obtain Engineer's acceptance of system and spacing of ties prior to ordering or purchase of forming. Clean, fill and seal form tie hole with non-shrink cement grout. The Contractor shall be responsible for watertightness of the form ties and any repairs needed.

**PART 3 - EXECUTION**

**3.1 GENERAL**

- A. Forms shall be used for all cast-in-place concrete including sides of footings. Forms shall be constructed and placed so that the resulting concrete will be of the shape, lines, dimensions and appearance indicated on the Drawings.
- B. Forms for walls shall have removable panels at the bottom for cleaning, inspection and joint surface preparation. Forms for walls of considerable height shall have closable intermediate inspection ports. Tremies and hoppers for placing concrete shall be used to allow concrete inspection, prevent segregation and prevent the accumulation of hardened concrete on the forms above the fresh concrete.
- C. Molding, bevels, or other types of chamfer strips shall be placed to produce blockouts, rustications, or chamfers as shown on the Drawings or as specified herein. Chamfer strips shall be provided at horizontal and vertical projecting corners to produce a 3/4-in chamfer. Rectangular or trapezoidal moldings shall be placed in locations requiring sealants where specified or shown on the Drawings. Sizes of moldings shall conform to the sealants manufacturer's recommendations.
- D. Forms shall be sufficiently rigid to withstand construction loads and vibration and to prevent displacement or sagging between supports. Construct forms so that the concrete will not be damaged by their removal. The Contractor shall be entirely responsible for the adequacy of the forming system.
- E. Before form material is re-used, all surfaces to be in contact with concrete shall be thoroughly cleaned, all damaged places repaired, all projecting nails withdrawn and all protrusions smoothed. Reuse of wooden forms for other than rough finish will be permitted only if a "like new" condition of the form is maintained.
- F. Accessories which remain embedded in the concrete after formwork removal shall be approved by the Engineer. Permanent embedments shall have sufficient concrete cover or be of suitable materials for the exposure condition as approved by the Engineer.

### 3.2 FORM TOLERANCES

- A. Forms shall be surfaced, designed and constructed in accordance with the recommendations of ACI 347 and shall meet the following additional requirements for the specified finishes.
- B. Formed Surface Exposed to View: Edges of all form panels in contact with concrete shall be flush within 1/32-in and forms for plane surfaces shall be such that the concrete will be plane within 1/16-in in 4-ft. Forms shall be tight to prevent the passage of mortar, water and grout. The maximum deviation of the finish wall surface at any point shall not exceed 1/4-in from the intended surface as shown on the Drawings. Form panels shall be arranged symmetrically and in an orderly manner to minimize the number of seams.
- C. Formed surfaces not exposed to view or buried shall meet requirements of Class "C" Surface in ACI 347.
- D. Formed rough surfaces including mass concrete, pipe encasement, electrical duct encasement and other similar installations shall have no minimum requirements for surface smoothness and surface deflections. The overall dimensions of the concrete shall be plus or minus 1-in.
- E. Formed concrete Surfaces to Receive Paint: Surface deflections shall be limited to 1/32-in at any point and the variation in wall deflection shall not exceed 1/16-in per 4-ft. The maximum deviation of the finish wall surface at any point shall not exceed 1/4-in from the intended surface as shown on the Drawings.

### 3.3 FORM PREPARATION

- A. Wood forms in contact with the concrete shall be coated with an effective release agent prior to form installation.
- B. Steel forms shall be thoroughly cleaned and mill scale and other ferrous deposits shall be sandblasted or otherwise removed from the contact surface for all forms, except those utilized for surfaces receiving a rough finish. All forms shall have the contact surfaces coated with a release agent.

### 3.4 REMOVAL OF FORMS

- A. The Contractor shall be responsible for all damage resulting from removal of forms. Forms and shoring for structural slabs or beams shall remain in place in accordance with ACI 301 and ACI 347. Form removal shall conform to the requirements specified in Section 03300.

### 3.5 INSPECTION

- A. The Engineer shall be notified when the forms are complete and ready for inspection at least 6 hours prior to the proposed concrete placement.
- B. Failure of the forms to comply with the requirements specified herein, or to produce concrete complying with requirements of this Section shall be grounds for rejection of that portion of the concrete work. Rejected work shall be repaired or replaced as directed by the Engineer at no additional cost to the Owner. Such repair or replacement shall be subject to the requirements of this Section and approval of the Engineer.

END OF SECTION

## SECTION 032000

### CONCRETE REINFORCEMENT

#### PART 1 - GENERAL

##### 1.1 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and install all concrete reinforcement complete as shown on the Drawings and as specified herein.
- B. Furnish only all deformed steel reinforcement required to be entirely built into concrete masonry unit construction.

##### 1.2 SUBMITTALS

- A. Submit to the Engineer, in accordance with Section 01300, shop drawings and product data showing materials of construction and details of installation, including the following:
  - 1. Reinforcing steel placing drawings. Placing drawings shall conform to the recommendations of ACI 315. Clearly identify the portion of the Work covered by each placing drawing. All bar splice locations and lap lengths shall be clearly shown. Clearly show the placement of all required additional reinforcement (around openings, at corners, etc.) as shown on the Drawings.
  - 2. Bill of materials (bar list). Clearly show the placement of each bar listed in the bill of materials on the placing drawings.
  - 3. Bar bending details. The bars shall be referenced to the same identification marks shown on the placing drawings. Include standard bending diagrams in the submittal, as applicable.
  - 4. Identify the grade of reinforcing steel in the submittal. Clearly identify any bars that are of a different grade or that have special coatings.
- B. Submit Test Reports, in accordance with Section 01300, of each of the following items.
  - 1. Certified copy of mill test on each steel proposed for use showing the physical properties of the steel and the chemical analysis.
  - 2. Welder's certification. The certification shall be in accordance with AWS D1.4 when welding of reinforcement required.

##### 1.3 REFERENCE STANDARDS

- A. Arkansas Highway and Transportation Department Standard Specifications for Highway Construction
- B. American Society for Testing and Materials (ASTM)
  - 1. ASTM A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
  - 2. ASTM A184 - Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
  - 3. ASTM A185 - Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
  - 4. ASTM A496 - Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement

5. ASTM A497 - Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement
  6. ASTM A615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
  7. ASTM A706 - Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
- C. American Concrete Institute (ACI)
1. ACI 301 - Standard Specification for Structural Concrete
  2. ACI 315 - Details and Detailing of Concrete Reinforcement.
  3. ACI 318 - Building Code Requirements for Structural Concrete
  4. ACI SP-66 - ACI Detailing Manual
- D. Concrete Reinforcing Steel Institute (CRSI)
1. Manual of Standard Practice
- E. American Welding Society (AWS)
1. AWS D1.4 - Structural Welding Code - Reinforcing Steel
- F. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

#### 1.4 DELIVERY, HANDLING AND STORAGE

- A. Reinforcing steel shall be substantially free from mill scale, rust, dirt, grease, or other foreign matter.
- B. Reinforcing steel shall be shipped and stored with bars of the same size and shape fastened in bundles with durable tags, marked in a legible manner with waterproof markings showing the same "mark" designations as those shown on the submitted Placing Drawings.
- C. Reinforcing steel shall be stored off the ground, protected from moisture and kept free from dirt, oil, or other injurious contaminants.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Materials shall be new, of domestic manufacture and shall comply with the following material specifications.
- B. Deformed Concrete Reinforcing Bars: ASTM A615, Grade 60 deformed bars.
- C. Concrete Reinforcing Bars required on the Drawings to be Welded: ASTM A706.
- D. Spiral Reinforcement
1. ASTM A615, Grade 60 for hot-rolled plain or deformed bars.
  2. ASTM A82 for cold-drawn wire.
  3. Welded Steel Wire Fabric: ASTM A185. Provide in flat sheets.



- F. Welded Deformed Steel Wire Fabric: ASTM A497.
- G. Welded Plain Bar Mats: ASTM A704 and ASTM A615 Grade 60 plain bars.
- H. Fabricated Deformed Steel Bar Mats: ASTM A184 and ASTM A615 Grade 60 deformed bars.
- I. The following alternate materials are allowed:
  - 1. ASTM A615 Grade 60 may be used for ASTM A706 provided the following requirements are satisfied:
    - a. The actual yield strength of the reinforcing steel based on mill tests shall not exceed the specified yield strength by more than 18,000 psi. Retests shall not exceed this value by more than an additional 3000 psi.
    - b. The ratio of the actual ultimate tensile strength to the actual tensile yield strength of the reinforcement shall not be less than 1.25.
    - c. The carbon equivalency (CE) of bars shall be 0.55 or less.
- J. Reinforcing Steel Accessories
  - 1. Plastic Protected Bar Supports: CRSI Bar Support Specifications, Class 1 - Maximum Protection.
  - 2. Stainless Steel Protected Bar Supports: CRSI Bar Support Specifications, Class 2 - Moderate Protection.
  - 3. Precast Concrete Block Bar Supports: CRSI Bar Support Specifications, Precast Blocks. Blocks shall have equal or greater strength than the surrounding concrete.
- K. Tie Wire
  - 1. Tie Wires for Reinforcement shall be 16-gauge or heavier, black annealed wire.

## 2.2 FABRICATION

- A. Fabrication of reinforcement shall be in compliance with the CRSI Manual of Standard Practice and ACI 315.
- B. Bars shall be cold bent. Bars shall not be straightened or rebent.
- C. Bars shall be bent around a revolving collar having a diameter of not less than that recommended by the ACI 318.
- D. Bar ends that are to be butt spliced, placed through limited diameter holes in metal, or threaded, shall have the applicable end(s) saw-cut. Such ends shall terminate in flat surfaces within 1-1/2 degrees of a right angle to the axis of the bar.
- E. Spirals
  - 1. Provide a minimum of 1-1/2 finishing turns at the top and bottom.
  - 2. Splices shall be tension lap splices at least 48 bar diameters, but not less than 12-in in length. Welded splices shall only be used where specifically approved by the Engineer.
  - 3. Provide spacers as recommended by the CRSI.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Surface condition, bending, spacing and tolerances of placement of reinforcement shall comply with the CRSI Manual of Standard Practice and ACI 301. The Contractor shall be solely responsible for providing an adequate number of bars and maintaining the spacing and clearances shown on the Drawings.
- B. Except as otherwise indicated on the Drawings, the minimum concrete cover of reinforcement shall be as follows:
  - 1. Concrete cast against and permanently exposed to earth: 3-in
  - 2. Concrete exposed to soil, water, sewage, sludge and/or weather: 2-in (Including bottom cover of slabs over water or sewage)
  - 3. Concrete not exposed to soil, water, sewage, sludge and/or weather:
    - a. Slabs (top and bottom cover), walls, joists, shells and folded plate members - 1-in
    - b. Beams and columns (principal reinforcement, ties, spirals and stirrups) - 1-1/2-in
- C. Reinforcement which will be exposed for a considerable length of time after being placed shall be coated with a heavy coat of neat cement slurry.
- D. No reinforcing steel bars shall be welded either during fabrication or erection unless specifically shown on the Drawings or specified herein, or unless prior written approval has been obtained from the Engineer. All bars that have been welded, including tack welds, without such approval shall be immediately removed from the work. When welding of reinforcement is approved or called for, it shall comply with AWS D1.4.
- E. Reinforcing steel interfering with the location of other reinforcing steel, conduits or embedded items may be moved within the specified tolerances or one bar diameter, whichever is greater. Greater displacement of bars to avoid interference shall only be made with the approval of the Engineer. Do not cut reinforcement to install inserts, conduits, mechanical openings or other items without the prior approval of the Engineer.
- F. Securely support and tie reinforcing steel to prevent movement during concrete placement. Secure dowels in place before placing concrete.
- G. Reinforcing steel bars shall not be field bent except where shown on the Drawings or specifically authorized in writing by the Engineer. If authorized, bars shall be cold-bent around the standard diameter spool specified in the CRSI. Do not heat bars. Closely inspect the reinforcing steel for breaks. If the reinforcing steel is damaged, replace, Cadweld or otherwise repair as directed by the Engineer. Do not bend reinforcement after it is embedded in concrete.

### 3.02 REINFORCEMENT AROUND OPENINGS

- A. Unless specific additional reinforcement around openings is shown on the Drawings, provide additional reinforcing steel on each side of the opening equivalent to one half of the cross-sectional area of the reinforcing steel interrupted by an opening. The bars shall have sufficient length to develop bond at each end beyond the opening or penetration.

### 3.03 SPLICING OF REINFORCEMENT

- A. Lap splices shall be provided as shown on the Drawings. For lap splices not shown, request clarification from the Engineer. (In general, lap splices will be required to be Class B tension lap splices in accordance with ACI 318.
- B. Install wire fabric in as long lengths as practicable. Splices in welded wire fabric shall be lapped in accordance with the requirements of ACI 318 but not less than 12-in. The spliced fabrics shall be tied together with wire ties spaced not more than 24-in on center and laced with wire of the same diameter as the welded wire fabric. Do not position laps midway between supporting beams, or directly over beams of continuous structures. Offset splices in adjacent widths to prevent continuous splices.

#### 3.04 ACCESSORIES

- A. Determine, provide and install accessories such as chairs, chair bars and the like in sufficient quantities and strength to adequately support the reinforcement and prevent its displacement during the erection of the reinforcement and the placement of concrete.
- B. Use precast concrete blocks where the reinforcing steel is to be supported over soil.
- C. Stainless steel bar supports or steel chairs with stainless steel tips shall be used where the chairs are set on forms for a concrete surface that will be exposed to weather, high humidity, or liquid (including bottom of slabs over liquid containing areas). Use of galvanized or plastic tipped metal chairs is permissible in all other locations unless otherwise noted on the Drawings or specified herein.
- D. Alternate methods of supporting top steel in slabs, such as steel channels supported on the bottom steel or vertical reinforcing steel fastened to the bottom and top mats, may be used if approved by the Engineer.

#### 3.05 INSPECTION

- A. In no case shall any reinforcing steel be covered with concrete until the installation of the reinforcement, including the size, spacing and position of the reinforcement has been observed by the Engineer and the Engineer's release to proceed with the concreting has been obtained. The Engineer shall be given ample prior notice of the readiness of placed reinforcement for observation. The forms shall be kept open until the Engineer has finished his/her observations of the reinforcing steel.

END OF SECTION



## SECTION 032500

### CONCRETE JOINTS AND JOINT ACCESSORIES

#### PART 1 - GENERAL

##### 1.1 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and install accessories for concrete joints as shown on the Drawings and as specified herein.

##### 1.2 SUBMITTALS

- A. Submit, in accordance with Section 01300, shop drawings and product data. Submittals shall include the following:
  - 1. Standard Waterstops: Product data including catalogue cut, technical data, storage requirements, splicing methods and conformity to ASTM standards.
  - 2. Special Waterstops: Product data including catalogue cut, technical data, location of use, storage requirements, splicing methods, installation instructions and conformity to ASTM standards.
  - 3. Premolded joint fillers: Product data including catalogue cut, technical data, storage requirements, installation requirements, location of use and conformity to ASTM standards.
  - 4. Bond breaker: Product data including catalogue cut, technical data, storage requirements, installation requirements, location of use and conformity to ASTM standards.
  - 5. Expansion joint dowels: Product data on the complete assembly including dowels, coatings, lubricants, spacers, sleeves, expansion caps, installation requirements and conformity to ASTM standards.
  - 6. Compressible joint filler: Product data including catalogue cut, technical data, storage requirements, installation requirements, location of use and conformity to ASTM standards.
  - 7. Bonding agents: Product data including catalogue cut, technical data, storage requirements, product life, application requirements and conformity to ASTM standards.
- B. Certifications
  - 1. Certification that all materials used within the joint system are compatible with each other.
  - 2. Certification that materials used in the construction of joints are suitable for use in contact with potable water 30 days after installation.

##### 1.3 REFERENCE STANDARDS

- A. Arkansas Highway and Transportation Department Standard Specifications for Highway Construction
- B. American Society for Testing and Materials (ASTM)
  - 1. ASTM A675 - Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality, Mechanical Properties.
  - 2. ASTM C881 - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.

3. ASTM C1059 - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete.
  4. ASTM D1751 - Standard Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction. (Nonextruding and Resilient Bituminous Types).
  5. ASTM D1752 - Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
- C. U.S. Army Corps of Engineers (CRD).
1. CRD C572 - Specification for Polyvinylchloride Waterstops.
- D. Federal Specifications
1. FS SS-S-210A - Sealing Compound for Expansion Joints.
- E. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply unless otherwise noted.

## **PART 2 - PRODUCTS**

### **2.1 GENERAL**

- A. The use of manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired.
- B. All materials used together in a given joint (bond breakers, backer rods, joint fillers, sealants, etc) shall be compatible with one another. Coordinate selection of suppliers and products to ensure compatibility. Under no circumstances shall asphaltic or bituminous bond breakers or joint fillers be used in joints receiving sealant.
- C. All chemical sealant type waterstops shall be products specifically manufactured for the purpose for which they will be used and the products shall have been successfully used on similar structures for more than five years.

### **2.2 MATERIALS**

- A. Standard Waterstops
  1. PVC Waterstops - The PVC waterstops shall be made by extruding elastomeric plastic compound with virgin polyvinylchloride as the basic resins. The compound shall contain no reprocessed materials. Minimum tensile strength of waterstop shall be 1750 psi. The waterstop shall conform to CRD-C572. Waterstops for expansion joints shall be 9-in wide and be the ribbed type with a center bulb. Expansion joint waterstops shall be style 696 by Greenstreak Plastic Products, St. Louis, MO; style RLB9-38 by Vinylex Corp., Knoxville, TN, or equal. Waterstops for non-expansion joints shall be 6-in wide and be the flat ribbed type. Non-expansion joint waterstops shall be style 679 by Greenstreak Plastic Products, St. Louis, MO; style R6-38 by Vinylex Corp., Knoxville, TN, or equal. Equal waterstops may have an integral fastening system.
- B. Special Waterstops
  1. PVC Special Waterstop – The special type waterstop shall be made by extruding elastomeric plastic compound with virgin polyvinylchloride as the basic resins. The

compound shall contain no reprocessed materials. Minimum tensile strength of waterstop shall be 1750 psi. The waterstop shall conform to CRD-C572. Waterstop shall be Style 792, by Greenstreak Plastic Products, St. Louis, MO or equal.

2. Expansive Waterstops - Non-expansion joint. The waterstops shall be gun applied hydrophilic rubber sealant. Installation adhesives used with the expansive waterstops shall be as recommended by the waterstop manufacturer. The waterstop shall be Adeka Ultraseal P201 as distributed by Mitsubishi of Houston, TX; Leakmaster by Greenstreak Plastic Products, St. Louis, MO, or equal.

C. Premolded Joint Filler

1. Premolded joint filler - structures. Self-expanding cork, premolded joint filler shall conform to ASTM D1752, Type III. The thickness shall be 3/4-in unless shown otherwise on the Drawings.

D. Bond Breaker

1. Bond breaker tape shall be an adhesive-backed glazed butyl or polyethylene tape which will satisfactorily adhere to the premolded joint filler or concrete surface as required. The tape shall be the same width as the joint unless otherwise noted.
2. Except where tape is specifically called for on the drawings, bond breaker for concrete shall be either bond breaker tape or a non-staining type bond prevention coating such as Williams Tilt-up Compound by Williams Distributors Inc.; Silcoseal 2000F, by SCA Construction Supply Division, Superior Concrete Accessories or equal.

E. Expansion Joint Dowels

1. Dowels shall be smooth steel conforming to ASTM A675, Grade 60. Dowels must be straight and clean, free of loose flaky rust and loose scale. Dowels may be sheared to length provided deformation from true shape caused by shearing does not exceed 0.04-in on the diameter of the dowel and extends no more than 0.04-in from the end. Bars shall be coated with a bond breaker on the expansion end of the dowel. Expansion caps shall be provided on the expansion end. Caps shall allow for at least 1-1/2-in of expansion.

F. Bonding Agent

1. Epoxy bonding agent shall be a two-component, solvent-free, moisture insensitive, epoxy resin material conforming to ASTM C881 (2002), Type V. The bonding agent shall be Sikadur 32 Hi-Mod by Sika Corporation of Lyndhurst, N.J.; Concessive Liquid (LPL) by Master Builders of Cleveland, OH or equal.
2. Latex bonding agent shall be a non-reemulsifiable acrylic-polymer latex conforming to ASTM C1059, Type II.

G. Joint Sealant

1. Joint sealants shall be two-part urethane sealant as specified in Section 07920. Minimum sealant thickness at concrete joints shall be 3/8-in.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

A. PVC Waterstops

1. Install PVC waterstops for all joints where waterstops are indicated on the Drawings, unless specifically noted otherwise. Waterstops shall be continuous around all corners and intersections so that a continuous seal is provided. Splices shall be made by welding.
2. PVC splices shall be made by welding in accordance with the manufacturer's recommendations, subject to acceptance of the Engineer. Only manufacturer's special approved tools shall be used for welding. The finished splices shall provide a cross-section that is dense and free of porosity.
3. To properly secure PVC waterstops in wall joints before concrete is placed, drill holes in waterstops approximately 1-in from each edge or between the outermost ribs at each edge and center the waterstop in the joint. Tie both edges of the waterstop and fasten to reinforcing steel with black annealed steel tie wire as specified for tying reinforcing steel and secure in place so that the waterstop will be perpendicular to the joint and remain in the required position during concrete placement. The spacing of the waterstop ties shall match the spacing of the adjacent reinforcing, but need not be spaced closer than 12-in on center.
4. Horizontal PVC waterstops in slabs shall have the edge of the waterstop lifted while placing concrete below the waterstop. Then the waterstop shall be manually forced against and into the placed concrete and covered with fresh concrete, to ensure adequate encasement of the waterstop in concrete.
5. Waterstops shall be installed so that half of the width will be embedded on each side of the joint. Care shall be exercised to ensure that the waterstop is completely embedded in void-free concrete.
6. Waterstops shall be terminated 3-in below the exposed top of walls. Expansion joint waterstop center bulbs shall be plugged with foam rubber, 1-in deep, at point of termination.

B. Special Waterstops

1. Install special waterstops at joints where specifically noted on the Drawings. Waterstops shall be continuous around all corners and intersections so that a continuous seal is provided.
2. Each piece of the waterstop shall be of maximum practicable length to provide a minimum number of connections or splices. Connections and splices shall conform to the manufacturer's recommendations and as specified herein.
3. Waterstops shall be terminated 3-in below the exposed top of walls.
4. Prepare the joint surfaces, install primers or adhesives, and install expansive waterstops in accordance with the manufacturer's instructions.

C. Construction Joints

1. Make construction joints only at locations shown on the Drawings or as approved by the Engineer. Any additional or relocation of construction joints proposed by the Contractor, must be submitted to the Engineer for written approval.
2. Additional or relocated joints should be located where they least impair strength of the member. In general, locate joints within the middle third of spans of slabs, beams and girders. However, if a beam intersects a girder at the joint, offset the joint a distance equal to twice the width of the member being connected. Locate joints in walls and columns at the underside of floors, slabs, beams or girders and at tops of footings or floor slabs. Do not locate joints between beams, girders, column capitals, or drop panels and the slabs above them. Do not locate joints between brackets or haunches and walls or columns supporting them.



3. All joints shall be perpendicular to main reinforcement. Continue reinforcing steel through the joint as indicated on the Drawings. When joints in beams are allowed, provide a shear key and inclined dowels as approved by the Engineer.
4. Provide sealant grooves for joint sealant where indicated on the Drawings.
5. At all construction joints and at concrete joints designated on the Drawings to be "roughened", uniformly roughen the surface of the concrete to a full amplitude (distance between high and low points or side to side) of approximately 1/4-in to expose a fresh face. Thoroughly clean joint surfaces of loose or weakened materials [by waterblasting or sandblasting] and prepare for bonding. At least 2 hours before and again shortly before the new concrete is deposited, the joints and adjacent concrete surfaces to at least 12-in past the joint shall be saturated with water. After glistening water disappears, horizontal construction joints shall be given a thorough coating of neat cement slurry mixed to the consistency of very heavy paste. The surfaces shall receive a coating at least 1/8-in thick, well scrubbed-in by means of stiff bristle brushes whenever possible. Horizontal wall joints with no access to the earlier concrete placement surface shall have the roughened surface thoroughly coated with a neat, cement slurry of pouring consistency. New concrete shall be deposited before the neat cement dries.
6. In lieu of the above method for bonding plastic concrete to hardened concrete, the following optional method may be used. Concrete must be allowed to set a minimum of 28 days. Use an epoxy bonding agent applied to roughened and cleaned surfaces of set concrete in strict accordance with manufacturer's recommendations and as specified in Section 03740 with respect to preparation of surfaces and applications of bonding agent.
7. Provide waterstops in all wall and slab construction joints in liquid containment structures and at other locations shown on the Drawings.
8. Keyways shall not be used in construction joints unless specifically shown on the Drawings or approved by the Engineer.

D. Expansion Joints

1. Do not extend through expansion joints, reinforcement or other embedded metal items that are continuously bonded to concrete on each side of joint.
2. Position premolded joint filler material accurately. Secure the joint filler against displacement during concrete placement and compaction. Place joint filler over the face of the joint, allowing for sealant grooves as detailed on the Drawings. Tape all joint filler splices to prevent intrusion of mortar. Seal expansion joints as shown on the Drawings.
3. Expansion joints shall be 3/4-in in width unless otherwise noted on the Drawings.
4. Where indicated on Drawings, install dowels at right angles to expansion joints. Align dowels accurately with finished surface. Rigidly hold in place and support during concrete placement. Unless otherwise shown on the Drawings, apply an approved bond breaker to one end of all dowels through expansion joints. Provide plastic expansion caps on the unbonded ends of expansion dowels.
5. Provide center bulb type waterstops in all wall and slab expansion joints in liquid containment structures and at other locations shown on the Drawings.

E. Control Joints

1. Provide sealant grooves, sealants and waterstops at control joints in slabs on grade or walls as detailed. Provide waterstops at all wall and slab control joints in water containment structures and at other locations shown on the Drawings.
2. Control joints at slabs on grade 6-in thick or less and without waterstops, may be sawed, if approved by the Engineer. If control joint grooves are sawed, properly time the saw cutting with the time of the concrete set. Start cutting as soon as concrete has hardened sufficiently to prevent aggregates from being dislodged by

- the saw. Complete cutting before shrinkage stresses have developed sufficiently to induce cracking. No reinforcing shall be cut during sawcutting.
3. Extend every other bar of reinforcing steel through control joints or as indicated on the Drawings. Where specifically noted on the Drawings, coat the concrete surface with a bond breaker prior to placing new concrete against it. Avoid coating reinforcement or waterstops with bond breaker at these locations.

END OF SECTION

## SECTION 033000

### CAST-IN-PLACE CONCRETE

#### PART 1 - GENERAL

##### 1.1 SCOPE OF WORK

- A. Furnish all labor and materials required and install cast-in-place concrete complete as shown on the Drawings and as specified herein.
- B. Furnish all sampling and testing as required for qualification of proposed materials and establishment of design mixtures by a qualified testing laboratory acceptable to the Engineer and engaged by and at the expense of the Contractor.

##### 1.2 SUBMITTALS

- A. Submit, in accordance with Section 01300, shop drawings and product data including the following:
  - 1. Sources of cement, pozzolan, and aggregates.
  - 2. Material Safety Data Sheets (MSDS) for all concrete components and admixtures.
  - 3. Air-entraining admixture. Product data including catalogue cut, technical data, storage requirements, product life, recommended dosage, temperature considerations, field testing methods and conformity to ASTM standards.
  - 4. Water-reducing admixture. Product data including catalogue cut, technical data, storage requirements, product life, recommended dosage, temperature considerations and conformity to ASTM standards.
  - 5. High-range water-reducing admixture (plasticizer). Product data including catalogue cut, technical data, storage requirements, product life, recommended dosage, temperature considerations, retarding effect, slump range and conformity to ASTM standards. Identify proposed locations of use.
  - 6. Concrete mix for each formulation of concrete proposed for use including constituent quantities per cubic yard, water-cementitious materials ratio, concrete slump, type and manufacturer of cement. Provide either a. or b. below for each mix proposed.
    - a. Compression test results for proposed mixes. Include standard deviation data for each proposed concrete mix based on statistical records where applicable.
    - b. Curve of water-cementitious materials ratio versus concrete cylinder strength for each formulation of concrete proposed based on laboratory tests. The cylinder strength shall be the average of the 28 day cylinder strength test results for each mix. Provide results of 7 and 14 day tests if available.
  - 7. Sheet curing material. Product data including catalogue cut, technical data and conformity to ASTM standard.
  - 8. Liquid curing compound. Product data including catalogue cut, technical data, storage requirements, product life, application rate and conformity to ASTM standards. Identify proposed locations of use.
- B. Samples
  - 1. Fine and coarse aggregates if requested by the Engineer.

C. Test Reports

1. Fine aggregates - Conformity with ASTM standards, including sieve analysis, physical properties, and deleterious substance.
2. Coarse aggregates - Conformity with ASTM standards, including sieve analysis, physical properties, and deleterious substances.
3. Cements - Conformity with ASTM standards, including chemical analysis and physical properties for each type.
4. Pozzolans - Conformity with ASTM standards, including chemical analysis and physical properties.
5. Proposed concrete mixes - compressive strength, slump and air content.

D. Certifications

1. Certify admixtures used in the same concrete mix are compatible with each other and the aggregates.
2. Certify admixtures are suitable for use in contact with potable water after 30 days of concrete curing.
3. Certify curing compound is suitable for use in contact with potable water after 30 days (non-toxic and free of taste or odor).

1.3 REFERENCE STANDARDS

A. Arkansas Highway and Transportation Department Standard Specifications for Highway Construction

B. American Society for Testing and Materials (ASTM)

1. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
2. ASTM C33 - Standard Specification for Concrete Aggregates.
3. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
4. ASTM C42 - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
5. ASTM C94 - Standard Specification for Ready-Mixed Concrete.
6. ASTM C143 - Standard Test Method for Slump of Hydraulic Cement Concrete
7. ASTM C150 - Standard Specification for Portland Cement
8. ASTM C156 - Standard Test Method for Water Retention by Concrete Curing Materials
9. ASTM C157 – Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar.
10. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete
11. ASTM C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
12. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
13. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
14. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
15. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.
16. ASTM C596 – Standard Test Method for Drying Shrinkage of Mortar Containing Hydraulic Cement.
17. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.

- B. American Concrete Institute (ACI).
  - 1. ACI 304R - Guide for Measuring, Mixing, Transporting and Placing Concrete.
  - 2. ACI 305R - Hot Weather Concreting.
  - 3. ACI 306.1 - Standard Specification for Cold Weather Concreting.
  - 4. ACI 350 - Code Requirements for Environmental Engineering Concrete Structures.
- C. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

#### 1.4 QUALITY ASSURANCE

- A. Reinforced concrete shall comply with ACI 350 and other stated requirements, codes and standards. The most stringent requirement of the codes, standards and this Section shall apply when conflicts exist.
- B. Only one source of cement and aggregates shall be used on any one structure. Concrete shall be uniform in color and appearance.
- C. Concrete meeting: A meeting will be held between the Engineer and the Contractor to review the detailed requirements of the Contractor's proposed concrete design mixes and to determine the procedures for producing proper concrete construction. The meeting shall be held no later than 30 days prior to the first concrete placement. All parties involved in concrete work shall attend the conference including the following:
  - 1. Contractor's superintendent and/or project manager;
  - 2. Contractor's concrete supplier testing laboratory representative (optional as determined by the Engineer);
  - 3. Concrete subcontractor;
  - 4. Reinforcing steel subcontractor and detailer;
  - 5. Concrete supplier;
  - 6. Admixture manufacturer's representative(s).
- D. Meeting discussion topics will include, but not be limited to: methods of hot and cold weather concrete placement, concrete placement during rainy weather, cleanliness of rebar before placement of concrete, concrete mix design(s) and source of concrete materials, concrete shrinkage for key structures, waterstop placement, use of admixtures, concrete curing methods, concrete finishes (Section 03350), grouts (Section 03600), and rebar submittals.
- E. If, during the progress of the work, it is impossible to secure concrete of the required workability and strength with the materials being furnished, the Engineer may order such changes in proportions or materials, or both, as may be necessary to secure the desired properties. All changes so ordered shall be made at the Contractor's expense.
- F. If, during the progress of the work, the materials from the sources originally accepted change in characteristics, the Contractor shall, at his/her expense, make new acceptance tests of aggregates and establish new design mixes.
- G. Testing of the following materials shall be furnished by Contractor to verify conformity with this Specification Section and the stated ASTM Standards.
  - 1. Fine aggregates for conformity with ASTM C33 - sieve analysis, physical properties, and deleterious substances.

2. Coarse aggregates for conformity with ASTM C33 - sieve analysis, physical properties, and deleterious substances.
  3. Cements for conformity with ASTM C150 - chemical analysis and physical properties.
  4. Pozzolans for conformity with ASTM C618 - chemical analysis and physical properties.
  5. Proposed concrete mix designs - compressive strength, slump, and air content.
- H. Field testing and inspection services will be provided by the Owner. The cost of such work, except as specifically stated otherwise, will be paid by the Owner. Testing of the following items will be by the Owner to verify conformity with this Section.
1. Concrete placements - compressive strength (cylinders), compressive strength (cores), slump, air content and shrinkage. Samples shall be taken at the point of placement of the Concrete.
  2. Other materials or products that may come under question.
- I. All materials incorporated in the work shall conform to accepted samples.

## 1.5 DELIVERY, STORAGE AND HANDLING

- A. Cement: Store in weathertight buildings, bins or silos to provide protection from dampness and contamination and to minimize warehouse set.
- B. Aggregate: Arrange and use stockpiles to avoid excessive segregation or contamination with other materials or with other sizes of like aggregates. Build stockpiles in successive horizontal layers not exceeding 3-ft in thickness. Complete each layer before the next is started. Do not use frozen or partially frozen aggregate.
- C. Sand: Arrange and use stockpiles to avoid contamination. Allow sand to drain to a uniform moisture content before using. Do not use frozen or partially frozen aggregates.
- D. Admixtures: Store in closed containers to avoid contamination, evaporation or damage. Provide suitable agitating equipment to assure uniform dispersion of ingredients in admixture solutions which tend to separate. Protect liquid admixtures from freezing and other temperature changes which could adversely affect their characteristics.
- E. Pozzolan: Store in weathertight buildings, bins or silos to provide protection from dampness and contamination.
- F. Sheet Curing Materials: Store in weathertight buildings or off the ground and under cover.
- G. Liquid Curing Compounds: Store in closed containers.

## PART 2 - PRODUCTS

### 2.1 GENERAL

- A. The use of manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired.
- B. Like items of materials shall be the end products of one manufacturer in order to provide standardization for appearance, maintenance and manufacturer's service.

### 2.2 MATERIALS

- A. Materials shall comply with this Section and applicable State or local requirements.
- B. Cement: Domestic portland cement complying with ASTM C150. Cement shall be low alkali cement. Air entraining cements shall not be used. Cement brand shall be subject to approval by the Engineer and one brand shall be used throughout the Work. Cement type(s) shall be one of the following:
  - 1. Sanitary Sewer Structures - Type II
  - 2. Structures exposed to freezing conditions – Type I A or II A
  - 3. Paving – Type I A or II A
  - 4. Cold weather – Type III or III A
- C. Fine Aggregate: Washed inert natural sand conforming to the requirements of ASTM C33.
- D. Coarse Aggregate: Well-graded crushed stone or washed gravel conforming to the requirements of ASTM C33. Size numbers for the concrete mixes shall be as shown in Table 1 herein. Grading requirements shall be as listed in ASTM C33 for the specified coarse aggregate size number. Limits of Deleterious Substances and Physical Property Requirements shall be as listed in ASTM C33 for severe weathering regions. Coarse aggregates known to be deleteriously reactive with alkalis in cement shall not be used.
- E. Water: Potable water free from injurious amounts of oils, acids, alkalis, salts, organic matter, or other deleterious substances.
- F. Admixtures: Admixtures shall be free of chlorides and alkalis (except for those attributable to water). Each admixture shall be compatible with all of the components in the concrete mix and shall be suitable when it is required to use more than one admixture in a concrete mix, the admixtures shall be from the same manufacturer. Admixtures shall be compatible with the concrete mix including other admixtures and shall be suitable for use in contact with potable water after 30 days of concrete curing.
  - 1. Air-Entraining Admixture: The admixture shall comply with ASTM C260. Proportioning and mixing shall be in accordance with manufacturer's recommendations.
  - 2. Water-Reducing Agent: The admixture shall comply with ASTM C494, Type A. Proportioning and mixing shall be in accordance with manufacturer's recommendations.
  - 3. High-Range Water-Reducer (Plasticizer): The admixture shall comply with ASTM C494, Type F and shall result in non-segregating plasticized concrete with little bleeding and with the physical properties of low water/cement ratio concrete. The treated concrete shall be capable of maintaining its plastic state in excess of 2 hours. Proportioning and mixing shall be in accordance with manufacturer's recommendations.
  - 4. Admixtures causing retarded or accelerated setting of concrete shall not be used without written approval from the Engineer. When allowed, the admixtures shall be retarding or accelerating water reducing or high range water reducing admixtures.
- G. Pozzolan (Fly Ash) Pozzolan shall be Class F fly ash complying with ASTM C618 except the Loss on Ignition (LOI) shall be limited to 3 percent maximum.
- H. Sheet Curing Materials. Waterproof paper, polyethylene film or white burlap-polyethylene sheeting all complying with ASTM C171.

- I. Liquid Curing Compound. Liquid membrane-forming curing compound shall comply with the requirements of ASTM C309, Type 1-D (clear or translucent with fugitive dye) and shall contain no wax, paraffin, or oil. Curing compounds shall have a minimum of 18 percent solids, be non-yellowing and have a unit moisture loss no greater than 0.039 gm/cm<sup>2</sup> at 72 hours as measured by ASTM C156. Curing compound shall be approved for use in contact with potable water after 30 days (non-toxic and free of taste or odor).

## 2.3 MIXES

- A. Development of mix designs and testing shall be by a qualified testing laboratory acceptable to the Engineer engaged by and at the expense of the Contractor.
- B. Select proportions of ingredients to meet the design strength and materials limits specified in Table 1 and to produce concrete having proper placement, durability, strength, appearance and other required properties. Proportion ingredients to produce a homogenous mixture which will readily work into corners and angles of forms and around reinforcement without permitting materials to segregate or allowing excessive free water to collect on the surface.
- C. The design mix shall be based on one of the following:
  1. Standard deviation data of prior mixes with essentially the same proportions of the same constituents in accordance with ACI 350. Acceptance of mixes based on standard deviation shall be based on the modification factors for standard deviation tests contained in ACI 350.
  2. Trial mixtures developed by the design mix shall be based on standard deviation data of prior mixes with essentially the same proportions of the same constituents or, if such data is not available, be developed by a testing laboratory, acceptable to the Engineer, engaged by and at the expense of the Contractor. The water content of the concrete mix, determined by laboratory testing, shall be based on a curve showing the relation between water cementitious ratio and 7 and 28 day compressive strengths of concrete made using the proposed materials. The curves shall be determined by four or more points, each representing an average value of at least three test specimens at each age. The curves shall have a range of values sufficient to yield the desired data, including the specified design strengths as modified below, without extrapolation. The water content of the concrete mixes to be used, as determined from the curve, shall correspond to strengths 16 percent greater than the specified design strengths. The resulting mix shall not conflict with the limiting values for maximum water cementitious ratio and net minimum cementitious content as specified in Table 1.
- D. Compression Tests: Provide testing of the proposed concrete mix or mixes to demonstrate compliance with the specified design strength requirements in conformity with the above paragraph.
- E. Entrained air, as measured by ASTM C231, shall be as shown in Table 1.
  1. If the air-entraining agent proposed for use in the mix requires testing methods other than ASTM C231 to accurately determine air content, make special note of this requirement in the admixture submittal.
- F. Slump of the concrete as measured by ASTM C143, shall be as shown in Table 1. If a high-range water-reducer (plasticizer) is used, the slump indicated shall be that measured before plasticizer is added. Plasticized concrete shall have a slump ranging from 7 to 10-in.



- G. Proportion admixtures according to the manufacturer's recommendations. Two or more admixtures specified may be used in the same mix provided that the admixtures in combination retain full efficiency and have no deleterious effect on the concrete or on the properties of each other.
- H. Where fly ash is included in the mix, the fly ash content shall be no less than 15 percent nor more than 25 percent of the total cement plus pozzolan content, by weight

TABLE 1  
CONCRETE MIX REQUIREMENTS

Class	Design Strength (1)	Coarse Aggregate (2)	Cementitious Content (3)
A	2500	57	440 min.
C	4000	67	560 min.

Class	W/C Ratio (4)	Fly Ash	AE Range (5)	WR (6)	HRWR (7)	Slump Range Inches
A	0.62 max	--	4.5 to 7.5	Yes	No	1.4
C	0.44 max	--	4.5 to 7	Yes	No	3.5

NOTES:

- (1) Minimum compressive strength in psi at 28 days
- (2) Size Number in ASTM C33
- (3) Cementitious content in lbs/cu yd
- (4) W/C is Water-Cementitious ratio by weight
- (5) AE is percent air-entrainment
- (6) WR is water-reducer admixture
- (7) HRWR is high-range water-reducer admixture

### PART 3 - EXECUTION

#### 3.1 GENERAL

- A. It is the intent of this Section to require quality work including adequate forming, proper mixture and placement of concrete and curing so completed concrete surfaces will require no patching.
- B. Position embedded anchor bolts using templates.
- C. Unless otherwise shown or approved, conduits and pipes embedded within a slab, wall, or beam (other than those merely passing thru) shall satisfy the following:
  - 1. Maximum outside dimension shall be no greater than one third the overall thickness of slab, wall, or beam.
  - 2. Spacing shall be greater than or equal to three diameters or widths on center.
- D. Ensure that all aluminum embedments are effectively coated or isolated to prevent aluminum-concrete reaction or electrolytic action between aluminum and steel.

### 3.2 MEASURING MATERIALS

- A. Concrete shall be composed of portland cement, pozzolan (where applicable) fine aggregate, coarse aggregate, water and admixtures as specified and shall be produced by a concrete mixing plant acceptable to the Engineer. All constituents, including admixtures, shall be batched at the plant.
- B. Measure materials for batching concrete by weighing in conformity with and within the tolerances given in ASTM C94 except as otherwise specified. Scales shall have been certified by the local Sealer of Weights and Measures within 1 year of use.
- C. Measure the amount of free water in fine aggregates within 0.3 percent with a moisture meter. Compensate for varying moisture contents of fine aggregates. Record the number of gallons of water as-batched on printed batching tickets.
- D. Admixtures shall be dispensed either manually using calibrated containers or measuring tanks, or by means of an automatic dispenser approved by the manufacturer of the specific admixture.
  - 1. Charge air-entraining and chemical admixtures into the mixer as a solution using an automatic dispenser or similar metering device.
  - 2. Inject multiple admixtures separately during the batching sequence.

### 3.03 MIXING AND TRANSPORTING

- A. Concrete shall be ready-mixed concrete produced by equipment acceptable to the Engineer. No hand-mixing will be permitted. Clean each transit mix truck drum and reverse drum rotation before the truck proceeds under the batching plant. Equip each transit-mix truck with a continuous, nonreversible, revolution counter showing the number of revolutions at mixing speeds.
- B. Ready-mix concrete shall be transported to the site in watertight agitator or mixer trucks loaded not in excess of their rated capacities as stated on the name plate.
- C. Keep the water tank valve on each transit truck locked at all times. Any addition of water must be directed by the Engineer. Added water shall be incorporated by additional mixing of at least 35 revolutions. All added water shall be metered and the amount of water added shall be shown on each delivery ticket.
- D. All central plant and rolling stock equipment and methods shall comply with ACI 318 and ASTM C94.
- E. Select equipment of size and design to ensure continuous flow of concrete at the delivery end. Metal or metal-lined non-aluminum discharge chutes shall be used and shall have slopes not exceeding 1 vertical to 2 horizontal and not less than 1 vertical to 3 horizontal. Chutes more than 20-ft long and chutes not meeting slope requirements may be used if concrete is discharged into a hopper before distribution.
- F. Retempering (mixing with or without additional cement, aggregate, or water) of concrete or mortar which has reached initial set will not be permitted.
- G. Handle concrete from mixer to placement as quickly as practicable while providing concrete of required quality in the placement area. Dispatch trucks from the batching plant so they arrive at the work site just before the concrete is required, thus avoiding excessive mixing of concrete while waiting or delays in placing successive layers of concrete in the forms.

- H. Furnish a delivery ticket for ready mixed concrete to the Engineer as each truck arrives. Each ticket shall provide a printed record of the weight of cement and each aggregate as batched individually. Use the type of indicator that returns for zero punch or returns to zero after a batch is discharged. Clearly indicate the weight of fine and coarse aggregate, cement and water in each batch, the quantity delivered, the time any water is added, and the numerical sequence of the delivery. Show the time of day batched and time of discharge from the truck. Indicate the number of revolutions of the truck mixer.
- I. Temperature and Mixing Time Control
1. In cold weather, do not allow the as-mixed temperature of the concrete and concrete temperatures at the time of placement in the forms to drop below 40 degrees F.
  2. If water or aggregate has been heated, combine water with aggregate in the mixer before cement is added. Do not add cement to mixtures of water and aggregate when the temperature of the mixture is greater than 90 degrees F.
  3. In hot weather, cool ingredients before mixing to maintain temperature of the concrete below the maximum placing temperature of 90 degrees F. If necessary, substitute well-crushed ice for all or part of the mixing water.
  4. The maximum time interval between the addition of mixing water and/or cement to the batch and the placing of concrete in the forms with concrete agitated shall not exceed the values shown in Table 2.

TABLE 2

MAXIMUM TIME TO DISCHARGE OF CONCRETE

<u>Air or Concrete Temperature (whichever is higher)</u>	<u>Maximum Time</u>
80 to 90 Degree F (27 to 32 Degree C)	45 minutes
70 to 79 Degree F (21 to 26 Degree C)	60 minutes
40 to 69 Degree F (5 to 20 Degree C)	90 minutes

5. If an approved high-range water-reducer (plasticizer) is used to produce plasticized concrete, the maximum time interval shall not exceed 90 minutes.

### 3.4 PLACING AND COMPACTING

#### A. Placing

1. Verify that all formwork completely encloses concrete to be placed and is securely braced prior to concrete placement. Remove ice, excess water, dirt and other foreign materials from forms and exposed concrete joints. Voids in sleeves, inserts, etc, shall be filled temporarily with readily removable material to prevent entry of concrete. Confirm that reinforcement and other embedded items are securely in place. Have a competent workman at the location of the placement who can assure that reinforcing steel and embedded items remain in designated locations while concrete is being placed. Sprinkle semi-porous subgrades or forms to eliminate suction of water from the mix. Seal extremely porous subgrades in an approved manner.
2. Deposit concrete as near its final position as possible to avoid segregation due to rehandling or flowing. Place concrete continuously at a rate which ensures the concrete is being integrated with fresh plastic concrete. Do not deposit concrete which has partially hardened or has been contaminated by foreign materials or on concrete which has hardened sufficiently to cause formation of seams or planes of

weakness within the section. If the section cannot be placed continuously, place construction joints as specified or as approved.

3 Placement Size

- a. When not otherwise shown or specified, concrete slabs shall be constructed in segments not larger than 40 feet by 40 feet unless otherwise approved by the Engineer.
- b. The long dimension of the slab panel shall not exceed 1.5 times the short dimension unless otherwise approved by the Engineer.
- c. Walls shall be constructed in segments no longer than 40 feet unless otherwise shown or approved by the Engineer.

4. Pumping of concrete will be permitted. Use a mix design and aggregate sizes suitable for pumping and submit for approval.

5. Remove temporary spreaders from forms when the spreader is no longer useful. Temporary spreaders may remain embedded in concrete only when made of galvanized metal or concrete and if prior approval has been obtained.

6. Do not place concrete for supported elements until concrete previously placed in the supporting element (columns, slabs and/or walls) has reached adequate strength.

7. Where surface mortar is to form the base of a finish, especially surfaces designated to be painted, work coarse aggregate back from forms with a suitable tool to bring the full surface of the mortar against the form. Prevent the formation of excessive surface voids.

8. Slabs

a. After suitable bulkheads, screeds and jointing materials have been positioned, the concrete shall be placed continuously between construction joints beginning at a bulkhead, edge form, or corner. Each batch shall be placed into the edge of the previously placed concrete to avoid stone pockets and segregation.

b. Avoid delays in casting. If there is a delay in casting, the concrete placed after the delay shall be thoroughly spaded and consolidated at the edge of that previously placed to avoid cold joints. Concrete shall then be brought to correct level and struck off with a straightedge. Bullfloats or darbies shall be used to smooth the surface, leaving it free of humps or hollows.

c. Where slabs are to be placed integrally with the walls below them, place the walls and compact as specified. Allow 1 hour to pass between placement of the wall and the overlying slab to permit consolidation of the wall concrete. Keep the top surface of the wall moist so as to prevent cold joints.

9. Formed Concrete

a. Place concrete in forms using tremie tubes and taking care to prevent segregation. Bottom of tremie tubes shall preferably be in contact with the concrete already placed. Do not permit concrete to drop freely more than 4-ft. Place concrete for walls in 12 to

b. 24-in lifts, keeping the surface horizontal. If plasticized concrete is used, the maximum lift thickness may be increased to 5-ft and the maximum free fall of concrete shall not exceed 10-ft.

c. A minimum of 48 hours shall have elapsed between placement of adjacent wall sections at a vertical construction joint

10. Concrete shall not be placed underwater unless approved in writing by the Engineer.

**B. Compacting**

1. Consolidate concrete by vibration, puddling, spading, rodding or forking so that concrete is thoroughly worked around reinforcement, embedded items and openings and into corners of forms. Puddling, spading, etc, shall be continuously performed along with vibration of the placement to eliminate air or stone pockets which may cause honeycombing, pitting or planes of weakness.
2. All concrete shall be placed and compacted with mechanical vibrators. The number, type and size of the units shall be approved by the Engineer in advance of placing operations. No concrete shall be ordered until sufficient approved vibrators (including standby units in working order) are on the job.
3. A minimum frequency of 8000 rpm is required for mechanical vibrators. Insert vibrators and withdraw at points from 18 to 30-in apart. At each insertion, vibrate sufficiently to consolidate concrete, generally from 5 to 15 seconds. Do not over vibrate so as to segregate. Keep a spare vibrator on the site during concrete placing operations.
4. Concrete Slabs: Concrete for slabs less than 8-in thick shall be consolidated with vibrating screeds; slabs greater than 8-in thick shall be compacted with internal vibrators and (optionally) with vibrating screeds. Vibrators shall always be placed into concrete vertically and shall not be laid horizontally or laid over.
5. Walls and Columns: Internal vibrators (rather than form vibrators) shall be used unless otherwise approved by the Engineer. In general, for each vibrator needed to melt down the batch at the point of discharge, one or more additional vibrators must be used to densify, homogenize and perfect the surface. The vibrators shall be inserted vertically at regular intervals, through the fresh concrete and slightly into the previous lift, if any.
6. Amount of Vibration: Vibrators are to be used to consolidate properly placed concrete but shall not be used to move or transport concrete in the forms. Vibration shall continue until:
  - a. Frequency returns to normal.
  - b. Surface appears liquefied, flattened and glistening.
  - c. Trapped air ceases to rise.
  - d. Coarse aggregate has blended into surface, but has not disappeared.

**3.0 CURING AND PROTECTION**

- A.** Protect all concrete work against injury from the elements and defacements of any nature during construction operations.

**B. Curing Methods**

1. Curing Methods for Concrete Surfaces: Cure concrete to retain moisture and maintain specified temperature at the surface for a minimum of 7 days after placement. Curing methods to be used are as follows:
  - a. Water Curing: Keep entire concrete surface wet by ponding, continuous sprinkling or covered with saturated burlap. Begin wet cure as soon as concrete attains an initial set and maintain wet cure 24 hours a day.
  - b. Sheet Material Curing: Cover entire surface with sheet material. Securely anchor sheeting to prevent wind and air from lifting the sheeting or entrapping air under the sheet. Place and secure sheet as soon as initial concrete set occurs.

- c. Liquid Membrane Curing: Apply over the entire concrete surface except for surfaces to receive additional concrete. Curing compound shall NOT be placed on any concrete surface where additional concrete is to be placed, where concrete sealers or surface coatings are to be used, or where the concrete finish requires an integral floor product. Curing compound shall be applied as soon as the free water on the surface has disappeared and no water sheen is visible, but not after the concrete is dry or when the curing compound can be absorbed into the concrete. Application shall be in compliance with the manufacturer's recommendations.
  - 2. Specified applications of curing methods.
    - a. Slabs for Water Containment Structures and Chemical Spill Basins: Water curing only.
    - b. Slabs on Grade and Footings (not used to contain water): Water curing, sheet material curing or liquid membrane curing.
    - c. Structural Slabs (other than water containment): Water curing or liquid membrane curing.
    - d. Horizontal Surfaces which will Receive Additional Concrete, Coatings, Grout or Other Material that Requires Bond to the substrate: Water curing.
    - e. Formed Surfaces: None if nonabsorbent forms are left in place 7 days. Water cure if absorbent forms are used. Sheet cure or liquid membrane cure if forms are removed prior to 7 days. Exposed horizontal surfaces of formed walls or columns shall be water cured for 7 days or until next placement of concrete is made.
    - f. Concrete Joints: Water cured or sheet material cured.
- C. Finished surfaces and slabs shall be protected from the direct rays of the sun to prevent checking and crazing.
- D. Cold Weather Concreting:
  - 1. "Cold weather" is defined as a period when for more than 3 successive days, the average daily outdoor temperature drops below 40 degrees F. The average daily temperature shall be calculated as the average of the highest and the lowest temperature during the period from midnight to midnight.
  - 2. Cold weather concreting shall conform to ACI 306.1 and the additional requirements specified herein. Temperatures at the concrete placement shall be recorded at 12 hour intervals (minimum).
  - 3. Discuss a cold weather work plan with the Engineer. The discussion shall encompass the methods and procedures proposed for use during cold weather including the production, transportation, placement, protection, curing and temperature monitoring of the concrete. The procedures to be implemented upon abrupt changes in weather conditions or equipment failures shall also be discussed. Cold weather concreting shall not begin until the work plan is acceptable to the Engineer.
  - 4. During periods of cold weather, concrete shall be protected to provide continuous warm, moist curing (with supplementary heat when required) for a total of at least 350 degree-days of curing.
    - a. Degree-days are defined as the total number of 24 hour periods multiplied by the weighted average daily air temperature at the surface of the concrete (eg: 5 days at an average 70 degrees F = 350 degree-days).
    - b. To calculate the weighted average daily air temperature, sum hourly measurements of the air temperature in the shade at the surface of the

concrete taking any measurement less than 50 degrees F as 0 degrees F. Divide the sum thus calculated by 24 to obtain the weighted average temperature for that day.

5. Salt, manure or other chemicals shall not be used for protection.
6. The protection period for concrete being water cured shall not be terminated during cold weather until at least 24 hours after water curing has been terminated.

E. Hot Weather Concreting

1. "Hot weather" is defined as any combination of high air temperatures, low relative humidity and wind velocity which produces a rate of evaporation estimated in accordance with ACI 305R, approaching or exceeding 0.2 lbs/sqft/hr.
2. Concrete placed during hot weather, shall be batched, delivered, placed, cured and protected in compliance with the recommendations of ACI 305R and the additional requirements specified herein.
  - a. Temperature of concrete being placed shall not exceed 90 degrees F and every effort shall be made to maintain a uniform concrete mix temperature below this level. The temperature of the concrete shall be such that it will cause no difficulties from loss of slump, flash set or cold joints.
  - b. All necessary precautions shall be taken to promptly deliver, to promptly place the concrete upon its arrival at the site and to provide vibration immediately after placement.
  - c. The Engineer may direct the Contractor to immediately cover plastic concrete with sheet material.
3. Discuss with the Engineer a work plan describing the methods and procedures proposed to use for concrete placement and curing during hot weather periods. Hot weather concreting shall not begin until the work plan is acceptable to the Engineer.

- F. Do not apply unbalanced loads, such as hydrostatic pressure, or backfill against structural components until the concrete has attained its design strength.

3.6 REMOVAL OF FORMS

- A. Except as otherwise specifically authorized by the Engineer, forms shall not be removed before the concrete has attained a strength of at least 30 percent of its specified design strength, nor before reaching the following number of day-degrees of curing (whichever is the longer):

TABLE 3	
MINIMUM TIME TO FORM REMOVAL	
<u>Forms for</u>	<u>Degree Days</u>
Beams and slabs	500
Walls and vertical surfaces	100

(See definition of degree-days in Paragraph 3.05D above).

- B. Shores shall not be removed until the concrete has attained at least 60 percent of its specified design strength and also sufficient strength to support safely its own weight and construction live loads.

3.7 INSPECTION AND FIELD TESTING

- A. The batching, mixing, transporting, placing and curing of concrete shall be subject to the inspection by the Engineer at all times. The Contractor shall advise the Engineer of his/her readiness to proceed at least 24 hours prior to each concrete placement. The Engineer will inspect the preparations for concreting including the preparation of previously placed concrete, the reinforcing steel and the alignment, cleanliness and tightness of formwork. No placement shall be made without the inspection and acceptance of the Engineer.
- B. Sets of field control cylinder specimens will be taken, at the point of placement, by the Engineer (or inspector) during the progress of the work, in compliance with ASTM C31. The number of sets of concrete test cylinders taken of each class of concrete placed each day shall not be less than one set per day, nor less than one set for each 150 cu yds of concrete nor less than one set for each 5,000 sq ft of surface area for slabs or walls.
  - 1. A "set" of test cylinders consists of four cylinders: one to be tested at 7 days and two to be tested and their strengths averaged at 28 days. The fourth may be used for a special test at 3 days or to verify strength after 28 days if 28 day test results are low.
  - 2. When the average 28 day compressive strength of the cylinders in any set falls below the specified design strength or below proportional minimum 7 day strengths (where proper relation between seven and 28 day strengths have been established by tests), proportions, water content, or temperature conditions shall be changed to achieve the required strengths.
- C. Cooperate in the making of tests by allowing free access to the work for the selection of samples, providing an insulated closed curing box for specimens, affording protection to the specimens against injury or loss through the operations and furnish material and labor required for the purpose of taking concrete cylinder samples. All shipping of specimens will be paid for by the Owner. Curing boxes shall be acceptable to the Engineer.
- D. Slump tests will be made in the field immediately prior to placing the concrete. Such tests will be made in accordance with ASTM C143. If the slump is outside the specified range, the concrete will be rejected.
- E. Air Content: Test for air content will be made on fresh concrete samples taken at the point of placement. Air content for concrete made of ordinary aggregates having low absorption will be made in compliance with either the pressure method complying with ASTM C231 or by the volumetric method complying with ASTM C173. If lightweight aggregates or aggregates with high absorptions are used, the latter test method will be used.
- F. The Engineer may have cores taken from any questionable area in the concrete work such as construction joints and other locations as required for determination of concrete quality. The results of tests on such cores shall be the basis for acceptance, rejection or determining the continuation of concrete work.
- G. Cooperate in obtaining cores by allowing free access to the work and permitting the use of ladders, scaffolding and such incidental equipment as may be required. Repair all core holes. The work of cutting and testing the cores will be at the expense of the Owner.



### 3.8 FAILURE TO MEET REQUIREMENTS

- A. Should the strengths shown by the test specimens made and tested in compliance with the previous provisions fall below the values given in Table 1, the Engineer shall have the right to require changes in proportions outlined to apply to the remainder of the work. Furthermore, the Engineer shall have the right to require additional curing on those portions of the structure represented by the test specimens which failed. The cost of such additional curing shall be at the Contractor's expense. In the event that such additional curing does not give the strength required, as evidenced by core and/or load tests, the Engineer shall have the right to require strengthening or replacement of those portions of the structure which fail to develop the required strength. The cost of all such core borings and/or load tests and any strengthening or concrete replacement required because strengths of test specimens are below that specified, shall be entirely at the expense of the Contractor. In such cases of failure to meet strength requirements the Contractor and Engineer shall confer to determine what adjustment, if any, can be made in compliance with Sections titled "Strength" and "Failure to Meet Strength Requirements" of ASTM C94. The "purchaser" referred to in ASTM C94 is the Contractor in this Section.
- B. When the tests on control specimens of concrete fall below the specified strength, the Engineer will permit check tests for strengths to be made by means of typical cores drilled from the structure in compliance with ASTM C42 and C39. In the case of cores not indicating adequate strength, the Engineer, in addition to other recourses, may require, at the Contractor's expense, load tests on any one of the slabs, beams, piles, caps, and columns in which such concrete was used. Tests need not be made until concrete has aged 60 days.
- C. Should the strength of test cylinders fall below 60 percent of the required minimum 28 day strength, the concrete shall be rejected and shall be removed and replaced.

### 3.09 PATCHING AND REPAIRS

- A. Surface defects which do not impair the structural integrity shall be repaired as approved by the Engineer. Defective concrete and honeycombed areas as determined by the Engineer shall be replaced or repaired using methods required by the Engineer.
- B. As soon as the forms have been stripped and the concrete surfaces exposed, fins and other projections shall be removed; recesses left by the removal of form ties shall be filled; and surface defects which do not impair structural strength shall be repaired. Clean all exposed concrete surfaces and adjoining work stained by leakage of concrete, to approval of the Engineer.
- C. Immediately after the forms have been stripped and before the concrete has changed color, carefully remove all fins and projections. Promptly fill holes upon stripping as follows: Moisten the hole with water, followed by a 1/16-in brush coat of neat cement slurry mixed to the consistency of a heavy paste. Immediately plug the hole with a 1 to 1.5 mixture of cement and concrete sand mixed slightly damp to the touch (just short of "balling"). Hammer the grout into the hole until dense, and an excess of paste appears on the surface in the form of a spiderweb. Trowel smooth with heavy pressure. Avoid burnishing.
- D. When patching defects in exposed surfaces the same source of cement and sand as used in the parent concrete shall be employed. Adjust color if necessary by addition of proper amounts of white cement. Rub lightly with a fine Carborundum stone at an age of 1 to 5 days if necessary to bring the surface down with the parent concrete. Exercise care to avoid damaging or staining the virgin skin of the surrounding parent concrete. Wash thoroughly to remove all rubbed matter.

3.10 CONCRETE SCHEDULE

- A. Concrete class and design strength shall be as shown on the Drawings and in accordance with the specifications.
- B. The following (Table 4) are the general applications for the various concrete classes and design strengths:

TABLE 4  
CONCRETE SCHEDULE

Design Strength		
Class	(psi)	Description
A	2,500	Concrete electrical raceway encasement, duct encasement
C	4,000	Walls, slabs on grade, suspended slab and beam systems, columns, grade beams and all other structural concrete

END OF SECTION

**SECTION 033500**  
**CONCRETE FINISHES**

**PART 1 - GENERAL**

**1.1 SCOPE OF WORK**

- A. Furnish all labor, materials, equipment and incidentals required and finish cast-in-place concrete surfaces as shown on the Drawings and as specified herein.

**1.2 SUBMITTALS**

- A. Submit, in accordance with Section 013300, shop drawings and product data showing materials of construction and details of installation for:
  - 1. Concrete sealer. Confirmation that the sealer is compatible with additionally applied coatings shall also be submitted.
  - 2. Chemical hardener. Confirmation that the hardener is compatible with sealer shall also be submitted.

**1.3 REFERENCE STANDARDS**

- A. Arkansas Highway and Transportation Department Standard Specifications for Highway Construction
- B. American Society for Testing and Materials (ASTM)
  - 1. ASTM C33 - Standard Specification for Concrete Aggregates.
- C. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

**1.4 QUALITY ASSURANCE**

- A. Finishes
  - 1. For concrete which will receive additional applied finishes or materials, the surface finish specified is required for the proper application of the specified manufacturer's products. Where alternate products are approved for use, determine if changes in finishes are required and provide the proper finishes to receive these products.
  - 2. Changes in finishes made to accommodate products different from those specified shall be performed at no additional cost to the Owner. Submit the proposed new finishes and their construction methods to the Engineer for approval.
- B. Services of Manufacturer's Representative
  - 1. Make available at no additional cost to the Owner, upon 72 hours notification, the services of a qualified field representative of the manufacturer of sealer or hardener to instruct the user on the proper application of the product under prevailing job conditions.

**PART 2 - PRODUCTS**

NOT USED

## **PART 3 - EXECUTION**

### **3.1 FORMED SURFACES**

- A. Forms shall not be removed before the requirements of Section 031000, have been satisfied.
- B. Exercise care to prevent damaging edges or obliterating the lines of chamfers, rustications or corners when removing the forms or performing any other work adjacent thereto.
- C. Prepare the exposed surface as specified in Section 031000.
- D. Rough-Form Finish
  - 1. No additional finishing is required.
- E. Rubbed Finish
  - 1. While the wall is still damp apply a thin coat of medium consistency neat cement slurry by means of bristle brushes to provide a bonding coat within all pits, air holes or blemishes in the parent concrete. Avoid coating large areas with the slurry at one time.
  - 2. Before the slurry has dried or changed color, apply a dry (almost crumbly) grout proportioned by volume and consisting of 1 part cement to 1-1/2 parts of clean masonry sand having a fineness modulus of approximately 2.3 and complying with the gradation requirements of ASTM C33 for such a material. Grout shall be uniformly applied by means of damp pads of coarse burlap approximately 6-in square used as a float. Scrub grout into the pits and air holes to provide a dense mortar in all imperfections.
  - 3. Allow the mortar to partially harden for 1 or 2 hours depending upon the weather. If the air is hot and dry, keep the wall damp during this period using a fine, fog spray. When the grout has hardened sufficiently so it can be scraped from the surface with the edge of a steel trowel without damaging the grout in the small pits or holes, cut off all that can be removed with a trowel. (Note: Grout allowed to remain on the wall too long will harden and will be difficult to remove.)
  - 4. Allow the surface to dry thoroughly and rub it vigorously with clean dry burlap to completely remove any dried grout. No visible film of grout shall remain after this rubbing. The entire cleaning operation for any area must be completed the day it is started. Do not leave grout on surfaces overnight. Allow sufficient time for grout to dry after it has been cutoff with the trowel so it can be wiped off clean with the burlap.
  - 5. On the day following the repair of pits, air holes and blemishes, the walls shall again be wiped off clean with dry, used pieces of burlap containing old hardened mortar which will act as a mild abrasive. After this treatment, there shall be no built-up film remaining on the parent surface. If, however, such a film is present, a fine abrasive stone shall be used to remove all such material without breaking through the surface film of the original concrete. Such scrubbing shall be light and sufficient only to remove excess material without changing the texture of the concrete.
  - 6. A thorough wash-down with stiff bristle brushes shall follow the final bagging or stoning operation. No extraneous materials shall remain on the surface of the wall. The wall shall be sprayed with a fine fog spray periodically to maintain a continually damp condition for at least 3 days after the application of the repair grout.

### **3.2 FLOORS AND SLABS**

A. Floated Finish

1. Machine Floating

- a. Screed floors and slabs with straightedges to the established grades shown on the Drawings. Immediately after final screeding, a dry cement/sand shake in the proportion of two sacks of portland cement to 350 lbs of coarse natural concrete sand shall be sprinkled evenly over the surface at the rate of approximately 500 lbs /1,000 sq ft of floor. Do not sprinkle neat, dry cement on the surface.
- b. The application of the cement/sand shake may be eliminated at the discretion of the Engineer if the base slab concrete exhibits adequate fattiness and homogeneity and the need is not indicated. When the concrete has hardened sufficiently to support the weight of a power float without its digging into or disrupting the level surface, thoroughly float the shake into the surface with a heavy revolving disc type power compacting machine capable of providing a 200 lb compaction force distributed over a 24-in diameter disc.
- c. Start floating along walls and around columns and then move systematically across the surface leaving a matte finish.
- d. The compacting machine shall be the "Kelly Power Float with Compaction Control" as manufactured by Kelley Industries of SSP Construction Equipment Inc., Pomona, CA or equal. Troweling machines equipped with float (shoe) blades that are slipped over the trowel blades may be used for floating. Floating with a troweling machine equipped with normal trowel blades will not be permitted. The use of any floating or troweling machine which has a water attachment for wetting the concrete surface during finishing will not be permitted.

2. Hand Floating

- a. In lieu of power floating, small areas may be compacted by hand floating. The dry cement/sand shake previously specified shall be used unless specifically eliminated by the Engineer. Screed the floors and slabs with straightedges to the established grades shown on the Drawings. While the concrete is still green, but sufficiently hardened to support a finisher and kneeboards with no more than 1/4-in indentation, wood float to a true, even plane with no coarse aggregate visible. Use sufficient pressure on the wood floats to bring moisture to the surface.

3. Finishing Tolerances

- a. Level floors and slabs to a tolerance of plus or minus 1/8-in when checked with a 10-ft straightedge placed anywhere on the slab in any direction. Where drains occur, pitch floors to drains such that there are no low spots left undrained. Failure to meet either of the above requirements shall be cause for removal, grinding, or other correction as directed by the Engineer.

B. Broom Finish

1. Screed slabs with straightedges to the established grades indicated on the Drawings. When the concrete has stiffened sufficiently to maintain small surface indentations, draw a stiff bristle broom lightly across the surface in the direction of drainage, or, in the case of walks and stairs, perpendicular to the direction of traffic to provide a non-slip surface.

C. Steel Trowel Finish

1. Finish concrete as specified in Paragraph 3.02A. Then, hand steel trowel to a perfectly smooth hard even finish free from high or low spots or other defects.

3.3 APPROVAL OF FINISHES

- A. All concrete surfaces, when finished, will be inspected by the Engineer.
- B. Surfaces which, in the opinion of the Engineer, are unsatisfactory shall be refinished or reworked.
- C. After finishing horizontal surfaces, regardless of the finishing procedure specified, the concrete shall be cured in compliance with Section 03300 unless otherwise directed by the Engineer.

3.4 SCHEDULE OF FINISHES

- A. Concrete shall be finished as specified either to remain as natural concrete to receive an additional applied finish or material under another section.
- B. Concrete for the following conditions shall be finished as noted on the Drawings and as further specified herein:
  1. Concrete to receive dampproofing or waterproofing: Rough-form finish. See Paragraph 3.01D above.
  2. Concrete not exposed to view and not scheduled to receive an additional applied finish or material: Rough-form finish. See Paragraph 3.01D above.
  3. Exterior vertical concrete above grade exposed to view: Rubbed finish. See Paragraph 3.01E above.
  4. Interior vertical concrete exposed to view except in water containment areas: Rubbed finish. See Paragraph 3.01E above.
  5. Vertical concrete in water containment areas. Rubbed finish on exposed surfaces and extending to two feet below normal operating water level: Rough-form finish on remainder of submerged areas. See Paragraphs 3.01E and 3.01D above.
  6. Interior and exterior underside of concrete exposed to view: Rubbed finish. See Paragraph 3.01E above.
  7. Interior or exterior horizontal concrete not requiring floor hardener or sealer: Floated finish. See Paragraph 3.02A above.

END OF SECTION

## **SECTION 036000**

### **GROUT**

#### **PART 1 - GENERAL**

##### **1.1 SCOPE OF WORK**

- A. Furnish all labor, materials, equipment and incidentals required and install grout complete as shown on the Drawings and as specified herein.

##### **1.2 SUBMITTALS**

- A. Submit, in accordance with Section 013300, shop drawings and product data showing materials of construction and details of installation for:
  - 1. Commercially manufactured nonshrink cementitious grout. The submittal shall include catalog cuts, technical data, storage requirements, product life, working time after mixing, temperature considerations, conformity to required ASTM standards and Material Safety Data Sheet.
  - 2. Commercially manufactured nonshrink epoxy grout. The submittal shall include catalog cuts, technical data, storage requirements, product life, working time after mixing, temperature considerations, conformity to required ASTM standards and Material Safety Data Sheet.
  - 3. Cement grout. The submittal shall include the type and brand of the cement, the gradation of the fine aggregate, product data on any proposed admixtures and the proposed mix of the grout.
  - 4. Concrete grout. The submittal shall include data as required for concrete as delineated in Section 03300 and for fiber reinforcement as delineated in Section 03200. This includes the mix design, constituent quantities per cubic yard and the water/cement ratio.
- B. Samples
  - 1. Samples of commercially manufactured grout products when requested by the Engineer.
  - 2. Aggregates for use in concrete grout when requested by the Engineer.
- C. Laboratory Test Reports
  - 1. Submit laboratory test data as required under Section 033000 for concrete to be used as concrete grout.
- D. Certifications
  - 1. Certify that commercially manufactured grout products and concrete grout admixtures are suitable for use in contact with potable water after 30 days curing.
- E. Qualifications
  - 1. Submit documentation that manufacturers of commercially manufactured grout products have at least 10 years experience in the production and use of the proposed grouts which they will supply.

### 1.3 REFERENCE STANDARDS

- A. Arkansas Highway and Transportation Department Standard Specifications for Highway Construction
- B. American Society for Testing and Materials (ASTM)
  - 1. ASTM C531 - Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical Resistant Mortars, Grouts and Monolithic Surfacing and Polymer Concretes
  - 2. ASTM C579 - Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts and Monolithic Surfacing and Polymer Concretes
  - 3. ASTM C827 - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures
  - 4. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
- C. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

### 1.4 QUALITY ASSURANCE

- A. Qualifications
  - 1. Manufacturers of commercially manufactured grout products shall have a minimum of 10 years experience in the production and use of the type of grout proposed for the work.
- B. Field Testing
  - 1. All field testing and inspection services required will be provided by the Owner. The Contractor shall assist in the sampling of materials and shall provide any ladders, platforms, etc, for access to the work. The methods of testing will comply with the applicable ASTM Standards.
  - 2. The field testing of Concrete Grout will be as specified for concrete in Section 033000.

### 1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the jobsite in original, unopened packages, clearly labeled with the manufacturer's name, product identification, batch numbers and printed instructions.
- B. Store materials in full compliance with the manufacturer's recommendations. Total storage time from date of manufacture to date of installation shall be limited to 6 months or the manufacturer's recommended storage time, whichever is less.
- C. Material which becomes damp or otherwise unacceptable shall be immediately removed from the site and replaced with acceptable material at no additional expense to the Owner.
- D. Nonshrink cement-based grouts shall be delivered as preblended, prepackaged mixes requiring only the addition of water.
- E. Nonshrink epoxy grouts shall be delivered as premeasured, prepackaged, three component systems requiring only blending as directed by the manufacturer.



## 1.6 DEFINITIONS

- A. Nonshrink Grout: A commercially manufactured product that does not shrink in either the plastic or hardened state, is dimensionally stable in the hardened state and bonds to a clean base plate.

## PART 2 - PRODUCTS

### 2.1 GENERAL

- A. The use of a manufacturer's name and product or catalog number is for the purpose of establishing the standard of quality desired.
- B. Like materials shall be the products of one manufacturer or supplier in order to provide standardization of appearance.

### 2.2 MATERIALS

#### A. Nonshrink Cementitious Grout

- 1. Nonshrink cementitious grouts shall meet or exceed the requirements of ASTM C1107, Grades B or C. Grouts shall be portland cement based, contain a pre-proportioned blend of selected aggregates and shrinkage compensating agents and shall require only the addition of water. Nonshrink cementitious grouts shall not contain expansive cement or metallic particles. The grouts shall exhibit no shrinkage when tested in conformity with ASTM C827.
  - a. General purpose nonshrink cementitious grout shall conform to the standards stated above and shall be SikaGrout 212 by Sika Corp.; Set Grout by Degussa Building Systems; NS Grout by The Euclid Chemical Co.; Five Star Grout by Five Star Products, Inc or equal.
  - b. Flowable (Precision) nonshrink cementitious grout shall conform to the standards stated above and shall be Masterflow 928 by Degussa Building Systems; Hi-Flow Grout by the Euclid Chemical Co.; SikaGrout 212 by Sika Corp.; Five Star Grout or Five Star Fluid Grout 100 by Five Stars Products, Inc or equal.

#### B. Nonshrink Epoxy Grout

- 1. Nonshrink epoxy-based grout shall be a pre-proportioned, three components, 100 percent solids system consisting of epoxy resin, hardener, and blended aggregate. It shall have a compressive strength of 10,000 psi in 7 days when tested in conformity with ASTM C579 and have a maximum thermal expansion of  $30 \times 10^{-6}$  when tested in conformity with ASTM C531. The grout shall be Masterflow 648 CP by DeGussa Building Systems; Five Star HP Epoxy Grout by Five Stars Products, Inc; Sikadur 42 Grout-Pak by Sika Corp.; High Strength Epoxy Grout E3-G by the Euclid Chemical Co. or equal.

#### C. Cement Grout

- 1. Cement grouts shall be a mixture of one part portland cement conforming to ASTM C150, Types I, II, or III and 1 to 2 parts sand conforming to ASTM C33 with sufficient water to place the grout. The water content shall be sufficient to impart workability to the grout but not to the degree that it will allow the grout to flow.

#### D. Concrete Grout

1. Concrete grout shall conform to the requirements of Section 03300 except as specified herein. It shall be proportioned with cement, pozzolan, coarse and fine aggregates, water, water reducer and air entraining agent to produce a mix having an average strength of 2900 psi at 28 days, or 2500 psi nominal strength. Coarse aggregate size shall be 3/8-in maximum. Slump should not exceed 5-in and should be as low as practical yet still retain sufficient workability.
  2. Synthetic reinforcing fibers as specified in Section 03200 shall be added to the concrete grout mix at the rate of 1.5 lbs of fibers per cubic yard of grout. Fibers shall be added from the manufacturer's premeasured bags and according to the manufacturer's recommendations in a manner which will ensure complete dispersion of the fiber bundles as single monofilaments within the concrete grout.
- E. Water
1. Potable water, free from injurious amounts of oil, acid, alkali, organic matter, or other deleterious substances.

### **PART 3 - EXECUTION**

#### **3.1 PREPARATION**

- A. Grout shall be placed over cured concrete that has attained its full design strength unless otherwise approved by the Engineer.
- B. Concrete surfaces to receive grout shall be clean and sound, free of ice, frost, dirt, grease, oil, curing compounds, laitance and paints and free of all loose material or foreign matter which may effect the bond or performance of the grout.
- C. Roughen concrete surfaces by chipping, sandblasting, or other mechanical means to ensure bond of the grout to the concrete. Remove loose or broken concrete. Irregular voids or projecting coarse aggregate need not be removed if they are sound, free of laitance and firmly embedded into the parent concrete.
  1. Air compressors used to clean surfaces in contact with grout shall be the oilless type or equipped with an oil trap in the airline to prevent oil from being blown onto the surface.
- D. Remove all loose rust, oil or other deleterious substances from metal embedments or bottom of baseplates prior to the installation of the grout.
- E. Concrete surfaces shall be washed clean and then kept moist for at least 24 hours prior to the placement of cementitious or cement grout. Saturation may be achieved by covering the concrete with saturated burlap bags, use of a soaker hose, flooding the surface, or other method acceptable to the Engineer. Upon completion of the 24 hour period, visible water shall be removed from the surface prior to grouting. The use of an adhesive bonding agent in lieu of surface saturation shall only be used when approved by the Engineer for each specific location of grout installation.
- F. Epoxy-based grouts do not require the saturation of the concrete substrate. Surfaces in contact with epoxy grout shall be completely dry before grouting.
- G. Construct grout forms or other leakproof containment as required. Forms shall be lined or coated with release agents recommended by the grout manufacturer. Forms shall be of

adequate strength, securely anchored in place and shored to resist the forces imposed by the grout and its placement.

1. Forms for epoxy grout shall be designed to allow the formation of a hydraulic head and shall have chamfer strips built into forms.
- H. Level and align the structural or equipment bearing plates in accordance with the structural requirements and the recommendations of the equipment manufacturer.
- I. Equipment shall be supported during alignment and installation of grout by shims, wedges, blocks or other approved means. The shims, wedges and blocking devices shall be prevented from bonding to the grout by appropriate bond breaking coatings and removed after grouting unless otherwise approved by the Engineer.

### 3.2 INSTALLATION - GENERAL

- A. Mix, apply and cure products in strict compliance with the manufacturer's recommendations and this Section.
- B. Have sufficient manpower and equipment available for rapid and continuous mixing and placing. Keep all necessary tools and materials ready and close at hand.
- C. Maintain temperatures of the foundation plate, supporting concrete, and grout between 40 and 90 degrees F during grouting and until grout compressive strength reaches 1000 psi or as recommended by the grout manufacturer, whichever is longer. Take precautions to minimize differential heating or cooling of baseplates and grout during the curing period.
- D. Take special precautions for hot weather or cold weather grouting as recommended by the manufacturer when ambient temperatures and/or the temperature of the materials in contact with the grout are outside of the 60 and 90 degrees F range.
- E. Install grout in a manner which will preserve the isolation between the elements on either side of the joint where grout is placed in the vicinity of an expansion or control joint.
- F. Reflect all existing underlying expansion, control and construction joints through the grout.

### 3.3 INSTALLATION - CEMENT GROUTS AND NONSHRINK CEMENTITIOUS GROUTS

- A. Mix in accordance with manufacturer's recommendations. Do not add cement, sand, pea gravel or admixtures without prior approval by the Engineer.
- B. Avoid mixing by hand. Mixing in a mortar mixer (with moving blades) is recommended. Pre-wet the mixer and empty excess water. Add premeasured amount of water for mixing, followed by the grout. Begin with the minimum amount of water recommended by the manufacturer and then add the minimum additional water required to obtain workability. Do not exceed the manufacturer's maximum recommended water content.
- C. Placements greater than 3-in in depth shall include the addition of clean, washed pea gravel to the grout mix when approved by the manufacturer. Comply with the manufacturer's recommendations for the size and amount of aggregate to be added.
- D. Place grout into the designated areas in a manner which will avoid segregation or entrapment of air. Do not vibrate grout to release air or to consolidate the material. Placement should proceed in a manner which will ensure the filling of all spaces and provide full contact between the grout and adjoining surfaces. Provide grout holes as necessary.

- E. Place grout rapidly and continuously to avoid cold joints. Do not place cement grouts in layers. Do not add additional water to the mix (retemper) after initial stiffening.
- F. Just before the grout reaches its final set, cut back the grout to the substrate at a 45 degree angle from the lower edge of bearing plate unless otherwise approved by the Engineer. Finish this surface with a wood float (brush) finish.
- G. Begin curing immediately after form removal, cutback, and finishing. Keep grout moist and within its recommended placement temperature range for at least 24 hours after placement or longer if recommended by the manufacturer. Saturate the grout surface by use of wet burlap, soaker hoses, ponding or other approved means. Provide sunshades as necessary. If drying winds inhibit the ability of a given curing method to keep grout moist, erect wind breaks until wind is no longer a problem or curing is finished.

### 3.4 INSTALLATION - NONSHRINK EPOXY GROUTS

- A. Mix in accordance with the procedures recommended by the manufacturer. Do not vary the ratio of components or add solvent to change the consistency of the grout mix. Do not overmix. Mix full batches only to maintain proper proportions of resin, hardener and aggregate.
- B. Monitor ambient weather conditions and contact the grout manufacturer for special placement procedures to be used for temperatures below 60 or above 90 degrees F.
- C. Place grout into the designated areas in a manner which will avoid trapping air. Placement methods shall ensure the filling of all spaces and provide full contact between the grout and adjoining surfaces. Provide grout holes as necessary.
- D. Minimize "shoulder" length (extension of grout horizontally beyond base plate). In no case shall the shoulder length of the grout be greater than the grout thickness.
- E. Finish grout by puddling to cover all aggregate and provide a smooth finish. Break bubbles and smooth the top surface of the grout in conformity with the manufacturer's recommendations.
- F. Epoxy grouts are self curing and do not require the application of water. Maintain the formed grout within its recommended placement temperature range for at least 24 hours after placing, or longer if recommended by the manufacturer.

### 3.5 INSTALLATION - CONCRETE GROUT

- A. Screed underlying concrete to the grade shown on the Drawings. Provide the surface with a broomed finish, aligned to drain. Protect and keep the surface clean until placement of concrete grout.
- B. Remove the debris and clean the surface by sweeping and vacuuming of all dirt and other foreign materials. Wash the surface using a strong jet of water. Flushing of debris into drain lines will not be permitted.
- C. Saturate the concrete surface for at least 24 hours prior to placement of the concrete grout. Saturation may be maintained by ponding, by the use of soaker hoses, or by other methods acceptable to the Engineer. Remove excess water just prior to placement of the concrete grout. Place a cement slurry immediately ahead of the concrete grout so that the slurry is moist when the grout is placed. Work the slurry over the surface with a broom until it is coated with approximately 1/16 to 1/8-in thick cement paste. (A bonding grout composed

of 1 part portland cement, 1.5 parts fine sand, an approved bonding admixture and water, mixed to achieve the consistency of thick paint, may be substituted for the cement slurry.)

- D. Place concrete grout to slopes and final grade.
- E. Provide grout control joints as indicated on the Drawings.
- F. Finish and cure the concrete grout as specified for cast-in-place concrete.

### 3.6 GROUT SCHEDULE

- A. The following list indicates where the particular types of grout are to be used:
  - 1. General purpose nonshrink cementitious grout: Use at all locations where non shrink grout is called for on the plans except for base plates greater in area than 3-ft wide by 3-ft long and except for the setting of anchor rods, anchor bolts or reinforcing steel in concrete.
  - 2. Flowable nonshrink cementitious grout: Use under all base plates greater in area than 3-ft by 3-ft. Use at all locations indicated to receive flowable nonshrink grout by the Drawings. The Contractor, at his/her option and convenience, may also substitute flowable nonshrink grout for general purpose nonshrink cementitious grout.
  - 3. Nonshrink epoxy grout: Use for the setting of anchor rods, anchor bolts and reinforcing steel in concrete and for all locations specifically indicated to receive epoxy grout.
  - 4. Cement grout: Cement grout may be used for grouting of incidental base plates for structural and miscellaneous steel such as post base plates for platforms, base plates for beams, etc. It shall not be used when nonshrink grout is specifically called for on the Drawings or for grouting of primary structural steel members such as columns and girders.
  - 5. Concrete grout: Use for overlaying the base concrete to allow more control in placing the surface grade. Use for concrete grout fill within liquid-containment structures and other locations where specifically indicated on the Drawings.

END OF SECTION



## **SECTION 311100**

### **SITE CLEARING AND GRUBBING**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. Clear, grub, and prepare site as required by the Contract Documents and as necessary for access, stringing of pipeline materials, and construction of pipelines and appurtenant structures. The Contractor shall not remove or disturb any vegetation except that required for the execution of the work.
- B. Remove and dispose of all debris.
- C. Remove interfering or objectionable material from designated areas of Work.
- D. In areas of maintained lawns, Contractor shall import topsoil or strip the top 6 inches of surface material from areas which will be disturbed by construction activities and stockpile for finish grading and revegetation.
- E. Preserve vegetation and existing objects designated to remain from injury or defacement.
- F. Unless specified otherwise, the Contractor shall replace all vegetation, shrubs, bushes, trees (excluding woods), and flowers disturbed or removed that are located upon public or private property. At the Owner's direction and approval, bushes, trees, etc. that intrude upon the Owner's ability to access the water line shall not be replaced.

##### **1.2 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.
- 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.

##### **1.3 SUBMITTALS**

- A. All agreements between the Contractor and Land Owners shall be in writing and shall be submitted to the Owner.

##### **1.4 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. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.
- C. Contractor to be responsible for providing access to Owner and others as required to travel along easement for reviewing construction progress.
- D. Do not commence site clearing until the easement boundaries are clearly established and verified.

## **PART 2 - MATERIALS**

### **2.1 GENERAL**

- A. Provide materials, suitable and in adequate quantity, required to accomplish Work of this Section.
- B. The Contractor shall replant vegetation and re-landscape or cause such to be performed throughout the work area as soon as possible after the pipe and appurtenances have been installed. All vegetation damaged by construction activities shall be replaced with healthy vegetation of the same kind or type. All plants shall be replanted in the original location.
- C. The Contractor shall maintain all such replanted vegetation by the application of water, fertilizers and topsoil. The vegetation shall be cultivated to prohibit the growth of foreign vegetation until a well-developed root system has been established and transplanted vegetation has overcome the "shock" resulting from transplanting. All vegetation which dies or becomes unhealthy shall be replaced by the Contractor. The contour of the ground shall be left as near the original contour as possible.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Review with Owner's representative the location, limits, and methods to be used prior to commencing Work under this Section.
- B. Protect and maintain benchmarks and survey control points from disturbance during construction.
- 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.



### 3.2 TEMPORARY EROSION PREVENTION AND SEDIMENTATION CONTROL

- A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.
- B. All areas impacted by site preparation activities shall be immediately seeded if trenching activities do not occur within 30 days.
- C. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- D. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

### 3.3 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.
  - 2. Remove stumps, roots, obstructions, and debris extending to a minimum depth of 18 inches below exposed subgrade.

### 3.4 PRESERVATION OF TREES, SHRUBS, AND OTHER VEGETATION

- A. Refer to Section 311300 - Tree Protection and Trimming.

### 3.5 CLEARING AND GRUBBING LIMITS

- A. The limits of clearing and grubbing shall be those actually required by the contractor to accomplish the work in accordance with these specifications. Leave undisturbed all remaining portion of the easement whether permanent or temporary. Remove all trees damaged or killed during construction.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
- C. Clear and grub in stages. Avoid advancing clearing and grubbing unnecessarily too far in advance of pipe laying to reduce potential for erosion.

### 3.6 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.
- 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 landowners agreement, such agreements shall be in writing and submitted to Owner.
- C. Burning of clearing and grubbing debris shall not be permitted.

### 3.7 TOPSOIL AND SURFACE MATERIAL

- A. Imported topsoil may be substituted for stockpiling and replacing of surface material.

- B. In areas of maintained lawns, remove surface material to a depth of 6 inches for full width of the disturbed area and stockpile for finish grading.
- C. Stockpile surface material to one side and do not mix with other excavated material. Seed stockpiled material to prevent erosion, if stockpile not utilized within 30 days.
- D. Locate stockpiles so that material of one ownership is not transported and stockpiled on property of another ownership.
- E. Use equipment capable of removing a uniform depth of material.
- F. Use topsoil or stockpiled material for finish grading for minimum depth of 6 inches.

END OF SECTION

## **SECTION 311300**

### **TREE PROTECTION AND TRIMMING**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. This Section includes the protection and trimming of existing trees, shrubbery, and other vegetation that interferes with, or are affected by, execution of the Work, whether temporary or permanent construction.
- 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 effect the Work to provide a balanced appearance of any tree, as approved prior to removal.
- D. Treat scars resulting from the removal of branches with an approved tree sealant.

##### **1.2 SUBMITTALS**

- A. All agreements between the Contractor and Land Owners shall be in writing and shall be submitted to the Owner and Engineer. Refer to Specifications Section 013300.

##### **1.3 DEFINITIONS**

- A. Tree Protection Zone: Area surrounding individual trees or groups of trees to remain during construction, and defined by the drip line of individual trees or the perimeter drip line of groups of trees, unless otherwise indicated.

##### **1.4 QUALITY ASSURANCE**

- A. Tree Pruning Standard: Comply with ANSI A300 (Part 1), "Tree, Shrub, and Other Woody Plant Maintenance--Standard Practices (Pruning)."
- B. Before tree protection and trimming operations begin, meet with representatives of Owner and Engineer to review tree protection and trimming procedures and responsibilities.

#### **PART 2 - PRODUCTS**

Not used.

#### **PART 3 - EXECUTION**

##### **3.1 PREPARATION**

- A. Contractor shall take extra measures to protect trees, shrubbery, and other vegetation designated to be preserved, such as erecting barricades, trimming to prevent damage from construction equipment, and installing pipe and other work by means of hand excavation.

- B. Temporary Barrier: Install temporary barriers around tree protection zones if required to protect remaining trees and vegetation from construction damage. Maintain temporary barrier and remove when construction is complete.
- C. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.
- D. Do not store construction materials, debris, or excavated material inside tree protection zones. Do not permit vehicles or foot traffic within tree protection zones; prevent soil compaction over root systems.
- E. Maintain tree protection zones free of weeds and trash.
- F. Do not allow fires within tree protection zones.
- G. Do not allow fires from the site preparation activities to damage trees which are to remain.

### 3.2 EXCAVATION

- A. Do not excavate within tree protection zones, unless otherwise indicated.
- B. Where excavation for new construction is required within tree protection zones, minimize damage to root systems. Use hand digging, slick bore, or other method approved by Engineer.

### 3.3 REGRADING

- A. Maintain original grade around remaining trees.

### 3.4 TREE PRUNING

- A. Prune trees to allow for operation of construction equipment.
- B. Pruning Standards: Prune trees according to ANSI A300 (Part 1).
- C. Cut branches with sharp pruning instruments; do not break or chop.
- D. Remove branches and dispose of off-site.
- E. Treat scars resulting from the removal of branches with an approved tree sealant.

### 3.5 TREE REPAIR AND REMOVAL

- A. Downed trees and limbs will be the property of the Contractor unless removed from the easement by the property owner for his own purposes.
- B. Promptly repair trees damaged by construction operations within 24 hours.
- C. Repair damaged tree bark with an approved tree sealant.
- D. Remove trees to remain that die during construction operations and guarantee period, as a result of construction, when instructed by Engineer.

END OF SECTION

## SECTION 312300

### TRENCH EXCAVATION, BACKFILL, AND COMPACTING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. This Section includes:
  - 1. Excavating trenches for water line.
  - 2. Crushed granular stone backfill required by over-excavation or for trench stabilization.
  - 3. Pipe zone embedment material.
  - 4. Trench settlement repair, including roadway surfacing, sidewalks, or other structures.
  - 5. Replacing damaged culverts.
  - 6. Trench excavation and safety requirements
- B. Pipe zone includes full width of excavated trench from 6 inches below bottom of pipe to a point 6 inches above top outside surface of pipe barrel.
- C. 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 Arkansas Act 291 of 1993.
- D. The right is reserved to modify the use, location, and quantities of the various types of backfill during construction as Engineer considers being in the best interest of Owner.
- E. The Contractor is responsible for excess excavated material disposal off-site.

##### 1.2 RELATED SECTIONS

- A. Section 312333 - Trench and Excavation Safety System.

##### 1.3 REFERENCES

- A. Arkansas Highway and Transportation Department, P.O. Box 2261, Little Rock, Arkansas 72203.
  - 1. AHTD 303 - Aggregate Base Course.
- B. American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, Pennsylvania 19428.
  - 1. ASTM D448 - Standard Classification for Sizes of Aggregate for Road and Bridge Construction.
  - 2. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft.- $lbf/m^3$  (600 kN-m/m<sup>3</sup>)).
  - 3. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>)).
  - 4. ASTM D2487- Standard Classification of Soils for Engineering Purposes.
  - 5. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

- C. American Water Works Association, 6666 West Quincy Avenue, Denver, CO 80235.
  - 1. M41 - Ductile Iron Pipe and Fittings; Laying Conditions Type 2 and Type 3
  - 2. M11 – Steel Pipe – A guide for Design and Installation.
- D. Occupational Safety and Health Administration (OSHA) Standard for Excavation and Trenches Safety System, 29 CFR 1926, Subpart P - Excavations.
- E. The Contractor shall be solely responsible for trench and excavation safety systems in accordance with Act 291 of 1993.

## **PART 2 - PRODUCTS**

### **2.1 FOUNDATION STABILIZATION MATERIAL**

- A. Coarse natural gravel or crushed quarry rock (sandstone or granite), angular or rounded.
- B. Foundation stabilization material will be free from dirt, clay balls, or organic material.
- C. Uniformly graded from 6 inches to approximately 1 inch 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) or Stone Backfill as defined by the AHTD in Section 207.02 of the 2014 Standard Specifications.
- 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.

### **2.2 PIPE ZONE MATERIAL FOR WATER LINES**

- A. Bedding and pipe zone material shall be in full accordance with details on the Drawings.
- B. Pipe zone embedment material shall be in accordance with ASTM D 2487, latest edition and shall conform to class 1A embedment materials in accordance with ASTM D 2321, latest edition. Material shall meet the grading requirements of ASTM C 33, gradation 67, commonly referred to as ASTM #67 (3/4" concrete aggregate or 5/8" aggregate) or ASTM C 33, gradation 7, commonly referred to as ASTM #7 (1/2" aggregate). Maximum aggregate size shall be 3/4 inch. This includes materials such as crushed stone or rock.

### **2.3 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 8 inches in diameter.
- C. Excluded material includes roots, tree branches, refuse, trash, concrete, scrap metal, plastics, paper and any other deleterious material deemed unacceptable by the Engineer.

### **2.4 TRENCH BACKFILL UNDER PAVEMENT AND GRAVEL ROADS**

- A. For trenches crossing gravel roads, paved streets, parking lots, and driveways, backfill shall consist of compacted crushed stone material throughout the depth of the trench and as shown on the Drawings. Crushed stone material shall be in accordance with AHTD

Section 303 Class 7.

2.5 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.

2.6 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 quackgrass, 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**

3.1 PREPARATION

- A. Where clearing or partial clearing of right-of-way is necessary, complete clearing in accordance with Section 311100 - Clearing and Grubbing.
- B. Do not permit excavated materials to cover brush or trees prior to disposal.

3.2 STRIPPING AND STOCKPILING OF SURFACE MATERIAL

- A. In areas of maintained lawns, remove surface material to a depth of 6 inches for full width of disturbed areas and stockpile or finish grading. Imported topsoil may be substituted for stockpiling and replacing of surface material.

3.3 TRENCH WIDTH

- A. Width of trench shall be adequate for the installation of the pipe and make-up joints, but in no case shall the width of the trench at the top of the pipe be wider than the outside diameter of the pipe plus two (2) feet. The minimum clear width of an unsupported or supported trench measured at the centerline of the pipe shall be at least 18-inches or the pipe outside diameter plus 12-inches, whichever is greater. Where embedment compaction is required, the trench shall be wide enough to accommodate the compaction equipment.
- 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.

### 3.4 EXCAVATION

- A. All pipe shall be laid in trenches of such depth as to provide 36 inches of minimum cover over the top of the pipe barrel unless otherwise shown on the Drawings.
- B. Classification:
  - 1. Rock excavation is defined as all solid rock formation that, in the opinion of the Engineer, cannot be excavated by using power shovels or other power excavators which are of recognized manufacturer and design, of adequate size and operated by qualified operations without continuous and systematic blasting or breaking up with a power-operated tool. No soft or disintegrated rock or slag which can be removed with a power-operated excavator or shovel equipped with bucket mounted rippers; no loose, shaken, or previously blasted rock or broken stone in rock fillings or elsewhere; and no rock exterior to the maximum limits of measurement allowed, which may fall into the excavation, will be measured or allowed. It shall include boulders or pieces of detached rock exceeding one (1) cubic yard in volume or solid rock formations which are interspersed with strata of clay or other material, provided that the solid rock constitutes at least seventy five (75) percent of the total volume of the particular formation. The Contractor is reminded that blasting before an attempt to excavate is made does not necessarily qualify the material to be excavated as "rock excavation" and no payment for "rock excavation" will be made unless the material excavated can conform to the above definition.
  - 2. All other excavation shall be unclassified regardless of the nature of materials encountered.
- C. Depth shall be increased as necessary for crossing other pipe lines, to provide for proper connection to existing lines and structures, and to provide required cover for valves and valve boxes. Depth shall be increased so as not to exceed the maximum permissible deflection joint as recommended by the pipe manufacturer.
- D. Excavate trench to lines and grades shown on the Drawings, or as established by Engineer, with proper allowance for pipe bells. The bottom of the trench shall be graded so that the pipe will be in continuous and uniform contact with and have a uniform bearing for the full length of the pipe.
- E. Trench preparation should proceed in advance of the pipe installation only as far as can be backfilled in the same day. The excavation of trenches shall not advance more than 100 feet ahead of the completed pipe work and backfill. All trenches and areas disturbed by construction activity shall be backfilled, settled, and the ground restored to its original condition as soon as possible after the pipe is installed. Any unnecessary delay in restoring trenches to their original condition shall constitute just cause for stopping all other work until the trenches are so restored.
- F. If trench is excavated below required grade whether due to instability of soils or other reason, the Contractor shall excavate below the lower extremity of the pipe as directed by the Engineer, and place a foundation stabilization material thoroughly in place to receive the pipe.
- G. Remove hard spots that would prevent a uniform thickness of bedding.
- H. 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.



- I. Any excavation which remains open overnight shall be properly barricaded and lighted in accordance with OSHA standards to avoid injury to persons and property.

### 3.5 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. Refer to the guidance provided in the Appendix.

### 3.6 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.

### 3.7 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.
- 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.

### 3.8 FOUNDATION STABILIZATION

- A. If trench is excavated below required grade whether due to instability of soils or other reason, the Contractor shall excavate below the lower extremity of the pipe as directed by the Engineer, and place foundation stabilization material thoroughly in place to receive the pipe.
- B. Backfill trench to subgrade of pipe base with foundation stabilization material.
- 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 pipe zone material on top to cushion the pipe and to

prevent point bearing of the pipe on the trench stabilization material which may have sharp points.

### 3.9 ROCK IN TRENCH

- A. Do not allow pipe to be subjected to point bearing on rock anywhere along its length.
- B. No part of any bell or coupling shall be in contact with the trench bottom or trench walls when the pipe is jointed.
- C. Minimum Bedding Thickness: 6 inches.

### 3.10 PIPE ZONE BACKFILL

- A. Pipe zone backfill shall be in full accordance with details 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 (springline) 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 as 70 to 80 percent of standard proctor density).
- E. Backfill from horizontal centerline (springline) to 6 inches above crown of pipe with pipe zone material. Lightly compact.
- F. Pipe zone material shall be approved by the Engineer, and shall be free of trash, lumber, or other debris deemed unacceptable by the Engineer.
- G. Special attention shall be given to compactive efforts near ponds to prevent leakage from ponds.

### 3.11 TRENCH BACKFILL ABOVE PIPE ZONE

- A. From a plane 6-inches above the crown of the pipe to the ground surface as shown on the Drawings.
- B. Backfill shall be placed in a manner to avoid pipe damage. 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.
- C. Under no circumstances allow sharp, heavy pieces of material to drop directly onto pipe or tamped material around pipe.
- D. Do not use backfill material of consolidated masses larger than 2 cubic foot.
- E. Use compaction equipment to obtain approximately 80 percent of standard proctor density on the backfill above the pipe zone up to the ground surface.
- F. Backfill of trenches shall be uniformly graded, conforming to adjacent natural ground or to required finished grade. 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. In lawn or garden areas, backfill trench

and maintain it level with existing adjacent grade.

- G. Replace surface soil in top 6 inches.
- H. 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.
- I. Remove rocks larger than 2 inches from upper 6 inches of backfill.
- J. Remove trash, construction debris, materials, brush, and other foreign objects.
- K. For trenches crossing paved streets, parking lots, and driveways:
  - 1. Backfill trench above pipe zone with granular backfill material as specified in lifts not exceeding 8 inches loose depth.
  - 2. Compact each lift with mechanical vibrating or impact tampers.
  - 3. Maintain surface of backfilled trench level with existing grade with granular backfill material until entire Project is accepted by Owner.
  - 4. Subsequent settlement of finished surfacing during warranty period shall be considered to be a result of improper or insufficient compaction and shall be promptly repaired.
- L. Special attention shall be given to compactive efforts near ponds to prevent leakage from ponds.

### 3.12 EXCESS EXCAVATED MATERIAL

- A. Dispose of excess or unsuitable 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.

### 3.13 TEMPORARY CLEAN UP

- A. Contractor shall not leave trenches open overnight without approval of the Engineer. Contractor shall install temporary fencing around excavation at pipe end, at end of workday.
- B. Backfilling shall be a continuous operation. Contractor shall not have more than 100 feet of trench open at any given time.
- 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.

#### 3.14 DRAINAGE MAINTENANCE AND RESTORATION

- A. Bridges and other temporary structures required to maintain traffic across such unfilled trenches shall be constructed and maintained by the Contractor.
- B. 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.
- C. Where indicated on Drawings, provide rip rap on ditch banks.

#### 3.15 SETTLEMENT

- A. The Contractor shall be responsible for all settlement of backfills, fills, and embankments which may occur during the warranty period stipulated in the General Conditions or on the Warranty Bond.
- B. The Contractor shall refill trenches as often as necessary to bring them back to original grade.
- C. Where settlement occurs in streets, driveways, roads, parking areas, or other paved surfaces, the Contractor shall refill them frequently enough to maintain traffic without hazard at all times.
- D. 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 312303

### EXCAVATING, BACKFILLING, AND COMPACTING FOR PAVEMENT

#### PART 1 - GENERAL

##### 1.1 SECTION INCLUDES

- A. Excavating, backfilling and compacting for establishing pavement subgrade elevations. Installation of flexible base material as a subgrade material for paving.

##### 1.2 REFERENCES

- A. Arkansas Highway and Transportation Department (AHTD), P.O. Box 2261, Little Rock, Arkansas 72203
  - 1. AHTD Standards - Standard Specifications for Highway Construction, latest edition as published by the Arkansas State Highway and Transportation Department.
- B. American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, Pennsylvania 19428.
  - 1. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)).
  - 2. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>)).
  - 3. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
  - 4. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

##### 1.3 SUBMITTALS

- A. In accordance with Section 013000 - Submittal Procedures.

##### 1.4 DEFINITIONS

- A. Classification: Earthwork materials are classified in accordance with definitions in this Section.
- B. Topsoil: Natural surface soil possessing the characteristics of representative soils on the site that produce growths of grass or other vegetation. Topsoil includes roots and other vegetation.
- C. Pavement Fill: Material excavated on-site or approved borrow material.
- D. Natural Subgrade: Consists of that portion of the surface on which a compacted embankment or pavement is constructed, after removal of topsoil layer.
- E. Compacted Fill: A subgrade under pavement consisting of fill placed and compacted between the top of compacted natural subgrade and underside of pavement and including fill areas adjacent to paving within limits shown on Typical Cross Sections.
- F. Borrow: Material taken from approved areas to make up any deficit of excavated material.

- G. Finish Grading: Operations required for smoothing disturbed areas that are not overlaid with pavement.
- H. Excavation: Excavation of every description and of whatever substance encountered within the grading limits of the project to the lines and grades indicated on the Drawings.
- I. Compaction: Compaction of soil materials shall be measured as a percent of Standard Proctor Density at the specified moisture content as determined by ASTM D698.

## **PART 2 - PRODUCTS**

### **2.1 FILL MATERIALS**

- A. "Select Fill" shall be an approved, low-plasticity sandy clay (CL), clayey sand (SC), or clayey gravel (CG) with a liquid limit (LL) less than 45 and a maximum plasticity index (PI) of 20, with a maximum rock size of 2 inches or an alternate accepted by the Engineer.
- B. In the event that compaction of subgrade cannot be achieved through traditional methods, the Contractor can use a synthetic geogrid which has been approved by the Engineer for stabilizing road subgrades.

## **PART 3 - EXECUTION**

### **3.1 HANDLING OF TOPSOIL**

- A. Remove topsoil within limits of the paving section, and area adjacent to paving section as required, and stockpile. Protect stockpiles of topsoil from other excavated materials, dumping of unwanted material, and dumping by the public.

### **3.2 STRIPPING OF GROUND SURFACE**

- A. All vegetation, all decayed vegetable matter, rubbish, and other unsuitable material within the areas to be graded, not removed by clearing, shall be stripped or otherwise removed to ground level before grading or other earthwork is started. In no case will such material be allowed to remain in or on the areas to be graded.

### **3.3 EXCAVATION**

- A. Objective: Excavate to lines, grades, and elevations required for subsequent construction of pavement fill, flexible base, and pavement. Remove materials within the indicated limits and legally dispose.
- B. Drainage: During excavation, maintain grades for complete drainage. When directed, install temporary drains or drainage ditches to intercept or divert surface water and prevent interference or delay of the work.
- C. Stockpiling: If at time of excavation, it is not possible to place material in the proper section of permanent construction, stockpile the material in Owner or Engineer approved areas for later use.
- D. Stone or Rock: Stones or rock fragments larger than 2 inches in their greatest dimension will not be permitted in top 6 inches of subgrade.
- E. Dressing: Uniformly dress-cut and fill slope, cross section, and alignment.

### 3.4 NATURAL SUBGRADE UNDER PAVEMENTS

- A. Remove existing earth as required for placement of pavement section. Proof-roll excavated surface with a 20-ton or larger roller to identify soft or undesirable material and remove such soft or undesirable material to suitable material beneath. Break down sides of holes or depressions to flatten the slopes.
- B. Fill any such hole or depression with appropriate soil with similar classification, moistened and compacted as specified in this Section.
- C. Grade adjustments within pavement construction limits shall be accomplished with pavement fill, placed in maximum 8-inch lifts moistened and compacted as specified in this Section.
- D. After depressions have been filled, grade adjustments made, and immediately before placement of pavement section, thoroughly loosen the foundation material to a depth of 6 inches. Remove roots and debris turned up while loosening the soil. Adjust moisture and recompact the subgrade in accordance with this Section.
- E. Unstable subgrades can be stabilized with approved geosynthetics. The Contractor is to place the approved synthetic material on the unstable subgrade, then place granular base material on top such as aggregate base course.

### 3.5 PLACING PAVEMENT FILL FOR GRADE ADJUSTMENTS

- A. Inspection of Natural Subgrade: Do not place pavement fill for grade adjustments to the natural subgrade until the surface has been examined by the Engineer.
- B. Prior to placing pavement fill, scarify the natural subgrade to a depth of 6 inches. As needed, adjust the moisture content to between optimum and optimum + 2 percent. Recompact the subgrade to a density of 98 percent of the maximum Standard Proctor Density, as determined by ASTM D698.
- C. Removing Debris: During the dumping and spreading process, remove all roots, stones, and debris that are uncovered in the fill material.
- D. Spreading Fill: After dumping, spread the pavement fill in horizontal layers over the entire fill area. The thickness of each layer before compaction shall not exceed 8 inches. Place fill adjacent to pavement section to elevations indicated.
- E. Attaining Proper Bond: If the compacted surface of a layer is too smooth to bond with succeeding layers, loosen the surface by harrowing or other approved method before continuing the work.

### 3.6 MOISTURE CONTROL

- A. Intent: Developing the maximum density obtainable with the natural moisture of the material is preferred. However, the moisture content of the pavement fill shall vary from the optimum, as determined by ASTM D698, by ranging between 0 and +2 percent of optimum. The moisture content of the natural subgrade under pavement sections, including grade adjustments with pavement fill, as determined by ASTM D698 shall range from optimum to +2 percent of optimum.
- B. Adjustment: If the moisture content is too high, adjust to within the specified limits by spreading the material and permitting it to dry. Assist the drying process by discing or

harrowing if necessary. When the material is too dry, sprinkle each layer with water. Work the moisture into the soil by harrowing or other approved method.

### 3.7 COMPACTION

- A. Compact each layer of pavement select fill with suitable rollers as necessary to obtain a dry density of 95 percent to 98 percent maximum dry density within the specified range of the moisture content, according to ASTM D698.

END OF SECTION



## SECTION 312319

### EXCAVATION DEWATERING

#### PART 1 - GENERAL

##### 1.1 DESCRIPTION

- A. This section specifies performance of dewatering required to lower and control ground water table levels and hydrostatic pressures to permit excavation, backfill, and construction to be performed in dry conditions. Control of surface water shall be considered as part of the work under this specification.
- B. All water pumped from the construction excavation shall be forced through a silt control system as approved by the Engineer before it is released.
- C. Surface water included in this work shall include water that appears on the surface as rainfall or snowmelt runoff, or ground water conditions below grade that appear at the surface in the form of weeps or springs.

##### 1.2 REQUIREMENT

- A. Dewatering system shall be of sufficient size and capacity necessary to lower and maintain ground water table to an elevation at least 1 foot below lowest foundation subgrade or bottom of pipe trench and to allow material to be excavated in a reasonably dry condition. Materials to be removed shall be sufficiently dry to permit excavation to grades shown and to stabilize excavation slopes where sheeting is not required. Operate dewatering system continuously until backfill work has been completed.
- B. Reduce hydrostatic head below any excavation to extent that water level in the construction area is a minimum of 1 foot below prevailing excavation surface.
- C. Prevent loss of fines, seepage, boils, quick conditions or softening of foundation strata.
- D. Maintain stability of sides and bottom of excavation.
- E. Control of surface and subsurface water are part of dewatering requirements. Maintain adequate control so that the stability of excavated and constructed slopes are not adversely affected by saturated soil, that erosion is controlled and that flooding of excavations or damage to structures does not occur. Drain surface water away from excavations. Protect excavations from becoming wet from surface water, or insure excavations are dry before additional work is undertaken.

##### 1.3 SUBMITTALS

- A. In accordance with Section 013300 - Submittal Procedures.
- B. Drawings and Design Data:
  - 1. Submit drawings and data showing the method to be employed in dewatering excavated areas 30 days before commencement of excavation.
  - 2. Material shall include location, depth and size of well points, headers, sumps, ditches, size and location of discharge lines, capacities of pumps and standby units, and detailed description of dewatering methods to be employed to convey the water from site to adequate disposal.

- C. Provide details of silt control system.

## **PART 2 - PRODUCTS**

### **2.1 FILTRATION DEWATERING PRODUCTS**

- A. A polypropylene nonwoven geotextile material sewn into a bag with a double needle matching using a high strength thread. The Adirt bag® shall be designed to accept the discharge from dewatering pumps and filter the solids from the water before it is released to discharge.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Install a dewatering system to lower and control ground water in order to permit excavation, construction of structure and placement of backfill materials, to be performed under dry conditions. Make the dewatering system adequate to pre-drain the water-bearing strata above and below the bottom of structure foundations, utilities and other excavations.

### **3.2 WATER DISPOSAL**

- A. Dispose water removed from the excavations in such a manner as will not endanger portions of work under construction or completed. Dispose water in such manner as will cause no inconvenience to Owner or to others working near site.
- B. All water pumped from the construction excavation shall be forced through a silt control system as approved by the Engineer before it is released.

END OF SECTION

## **SECTION 312333**

### **TRENCH AND EXCAVATION SAFETY SYSTEM**

#### **PART 1 - GENERAL**

##### **1.1 SECTION INCLUDES**

- A. Requirements for a Trench and Excavation Safety System (System) to be designed and furnished by the Contractor for the safety and health of personnel.
- B. Submission of a written Plan describing the System in detail.

##### **1.2 RELATED SECTIONS**

- A. Section 312300 - Trench Excavating, Backfill, and Compacting for Pavement.

##### **1.3 REFERENCES**

- A. 29 CFR 1926 - Occupational Safety and Health Standards - Excavations, United States Department of Labor, latest edition.
- B. Others - Other applicable Federal, State, and local rules for Trench Construction or excavations.

##### **1.4 REQUIREMENTS**

- A. The Contractor shall develop, design, and implement a System. The Contractor shall bear the sole responsibility for the adequacy of the System.
- B. The requirements of 29 CFR 1926 shall be the minimum requirements for this specification and is adopted as a part of this specification. Other regulations relating to trench and excavation safety shall also be considered a part of this specification as if referenced directly.
- C. Should the System require wider trenches than shown, the Contractor shall be responsible for the costs associated with determining adequacy of pipe bedding and class, as well as, purchase and installation of alternate materials.

##### **1.5 SUBMITTALS**

- A. Submit copies of the System Plan for information only. The Engineer will not review the System Plan for sufficiency, adequacy, or other engineering aspects. Submission is only to record the presence or absence of the System Plan.

#### **PART 2 - PRODUCTS**

Not Used.

## **PART 3 - EXECUTION**

### **3.1 GENERAL**

- A. Implement the system in accordance with the written System Plan and conduct affected work in accordance with the same.

END OF SECTION

## **SECTION 320117**

### **ASPHALT PAVEMENT REPAIR**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. Repair asphaltic concrete pavement disturbed during construction in accordance with this Section and details shown on the Drawings.
- B. Contractor shall comply with all requirements of county or city in which the work is being done and the Arkansas State Highway and Transportation Department.
- C. Contractor shall secure permits and inspections, post necessary bonds, and pay necessary fees.
- D. Where asphalt streets, driveways, or parking areas are disturbed during trench excavation, the surface shall be replaced as soon as practical after completion of backfilling so as to restore it to the original condition.

##### **1.2 REFERENCES**

- A. American Association of State Highway and Transportation Officials, 444 North Capitol Street North West, Suite 249, Washington, DC 20001.
  - 1. AASHTO M82 - Standard Specification for Cut-Back Asphalt (Medium-Curing Type).
- B. American Society of Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, Pennsylvania 19428.
  - 1. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>))
- C. Arkansas State Highway and Transportation Department, P.O. Box 2261, Little Rock, AR 72203.
  - 1. AHTD - Standard Specifications for Highway Construction, Latest Edition.
  - 2. AHTD 303 - Aggregate Base Course.
  - 3. AHTD Division 400 - Asphalt Pavements
    - a. AHTD 407 - Asphalt Concrete Hot Mix Surface Course

#### **PART 2 - PRODUCTS**

##### **2.1 ASPHALTIC PAVING MATERIALS**

- A. Base Coarse: Crushed stone conforming to AHTD Standard Specifications for Highway Construction Section 303, Class 7.
- B. Prime Coat: Medium curing cut-back asphalt; MC-30 or MC-70; AASHTO M82; heated and applied within the temperature range 80 degrees F. - 150 degrees F.

- C. Hot-mix surfacing material shall meet the following requirements: Asphaltic Cement Hot Mix Surface Course (½") in accordance with Section 407 of the AHTD Standard Specifications for Highway Construction.

## 2.2 REINFORCEMENT STEEL

- A. Reinforcement steel shall be in accordance with Specification Section 320129 "Concrete Pavement Repair".

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. Asphalt surfaces for pavements, streets, roads, driveways, parking lots and walks shall be repaired with hot mix asphalt. Minimum thickness of asphalt surface replacement shall be 2-inches. The finished surface shall match and shall be level with surrounding pavement.
- B. Before replacing paved surfacing, the existing pavement shall be cut, sawed, or trimmed along straight and vertical lines along each side of the trench.
- C. Temporary repairs (if required) to paved surfaces shall be made with cold mix asphalt to allow access. Final repairs shall be made within 60 days weather permitting. Driveways shall be maintained to allow access during all weather conditions.

### 3.2 EXCAVATION AND BACKFILL

- A. Excavate and backfill in accordance with Specifications Section 312300 Trench Excavation, Backfill, and Compacting.

### 3.3 SUBGRADE PREPARATION

- A. Subgrade for asphalt paving improvements shall have organic silty and clayey topsoils and other unsuitable material removed and replaced with approved material.
- B. Fill and tamp traces of utility trenches.
- C. Replace soft spots as needed.
- D. Subgrade preparation must meet requirements of Section 312303.

### 3.4 BASE COURSE FOR ASPHALTIC PAVING

- A. A concrete slab 6 inches in thickness and reinforced with #4 reinforcement bars placed at 12 inches on center each way shall be poured with the finished top of the slab extending to a point 2 inches below the finished surface. A bituminous tack coat shall then be applied to the concrete surface at a rate of 0.03 to 0.10 gallons per square yard. After proper curing of the tack coat, asphalt concrete hot mix surface course shall be placed with a compacted thickness of 2 inches and rolled with a steel wheeled roller to a minimum density of 92% of maximum density by Modified Proctor method.
- B. Place material on prepared subgrade in accordance with details shown on the Drawings.
  - 1. Spread base course the same day the material is hauled. It shall be thoroughly mixed, either by repeated handling with a blade grader or by harrowing sufficiently to secure a uniform mixture of coarse and fine particles.

2. Compact base course by systematically rolling and watering as required to obtain a firm, uniform, smooth surface as specified in Division 300 of AHTD Standard Specifications for Highway Construction. Base course shall be compacted in 8-inch lifts.

- C. Minimum density shall be 95 Percent Standard Proctor (ASTM D698).

### 3.5 HOT-MIX SURFACING FOR ASPHALTIC PAVING

- A. Plant Mixing and Transporting: Mixing, transportation, and temperature limitations for hot-mix surface course materials shall be in accordance with the requirements of Division 400, Asphalt Pavements of the AHTD Standard Specifications for Highway Construction.
- B. Placing, compacting, and acceptance shall be in accordance with Division 400, Asphalt Pavements of the AHTD Standard Specifications for Highway Construction.
- C. Surface shall be uniform and shall match adjacent surfaces.

### 3.6 TEMPORARY REPAIRS TO PAVED SURFACES

- A. The surface shall match the surfaces on each side of the trench and shall be in accordance with applicable state, county, or local requirements.
- B. The Contractor shall maintain all temporary surfaces in good condition until permanent repairs are complete.

END OF SECTION





## SECTION 320129

### CONCRETE PAVEMENT REPAIR

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Repair concrete pavement disturbed during construction in accordance with this Section and details shown on the Drawings.
- B. Contractor shall comply with all requirements of state, county, city, or local authority having jurisdiction for the paved surface in which the work is being done.
- C. Contractor shall secure permits and inspections, post necessary bonds, and pay necessary fees.
- D. Where concrete streets, driveways, or parking areas are disturbed during trench excavation, the surface shall be replaced as soon as practical after completion of backfilling so as to restore it to the original condition. The Contractor shall refer to Part 3.10, Temporary Repairs to Paved Surfaces.

##### 1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials, 444 North Capitol Street North West, Suite 249, Washington, DC 20001
  - 1. AASHTO M33 - Standard Specifications for Transportation Materials and Methods of Sampling and Testing.
- B. American Concrete Institute, 38800 Country Club Drive, Farmington Hills, Michigan 48331.
  - 1. ACI 614 - Recommended Practice for Mixing, Measuring and Placing Concrete.
- C. American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, Pennsylvania 19428.
  - 1. ASTM A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
  - 2. ASTM A996 - Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement.
  - 3. ASTM A1064 - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
  - 4. ASTM C33 - Standard Specification for Concrete Aggregates.
  - 5. ASTM C94 - Standard Specification for Ready-Mixed Concrete.
  - 6. ASTM C131 - Standard Specification for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
  - 7. ASTM C150 - Standard Specification for Portland Cement.
  - 8. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
  - 9. ASTM D698 - Standard Test Methods for Laboratory Compaction of Soil Standard Effort.
  - 10. ASTM D1557 - Standard Test Methods for Laboratory Compaction of Soil Modified Effort.

11. ASTM D994 - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
  - D. Arkansas State Highway and Transportation Department, P.O. Box 2261, Little Rock, AR 72203.
    1. AHTD - Standard Specifications for Highway Construction, 2014.
    2. AHTD 303 - Aggregate Base Course.
- 1.3 SUBMITTALS
- A. Submit complete information regarding concrete mix to Engineer for review in accordance with the requirements of ASTM C94 and in accordance with Specifications Section 013300 - Submittal Procedures.

## **PART 2 - PRODUCTS**

### **2.1 FORMS**

- A. Forms shall be constructed prior to placement of any concrete unless otherwise authorized by Engineer.
- B. Forms shall conform to shapes, lines, and dimensions as required to conform to the original shape and dimensions of the structure to be repaired.
- C. Forms shall be sufficiently tight to prevent leakage of mortar. Forms shall be properly braced or tied together so as to maintain position and shape.
- D. Forms shall be constructed of any material with sufficient strength which shall provide the finished work a satisfactory surface; however, metal forms shall not be permitted for concrete which will be exposed on any of the completed work, except upon the specific approval of the Engineer.
- E. Forms shall be constructed in such manner that a smooth concrete surface is produced which matches the existing surfaces on each side.
- F. Forms shall be removed in such a manner as to ensure the complete safety and integrity of the structure. When the structure is supported on shores, the removable floor forms, beams, and girder sides, and column and similar vertical forms may be removed after 96 hours, providing the concrete will not be damaged. Supporting forms or shoring shall not be removed until members have achieved sufficient strength to support their weight and imposed loads safely.
- G. Forms shall be coated with oil before placement of reinforcing steel or concrete. Excessive coating material shall not be permitted to form or stand in puddles in the forms nor allowed in contact with adjacent existing concrete against which fresh concrete will be placed.

### **2.2 CRUSHED STONE BASE**

- A. Crushed stone conforming to Section 303, Class 7 of the AHTD Standard Specifications for Highway Construction.

## 2.3 EXPANSION JOINTS AND JOINT FILLER

- A. Joint Filler - Joint filler shall be pre-molded joint filler of the non-extruding type, 3/4 inch to 1 inch thick conforming to AASHTO M33, or rubber based compound conforming to Federal Specification SS-F-336. Joint filler shall be of sufficient dimension to extend through the full depth of the paved surface.
- B. Expansion and contraction joints for sidewalks, streets, driveways, curb and gutter, ditch paving, and protective slabs shall be spaced every 12 feet maximum and shall be placed to match the original joint system for the pavement.

## 2.4 CONCRETE

- A. Concrete shall be ready mixed concrete conforming to ASTM C94. Concrete shall not contain more than 6 gallons of water per sack of cement, including the water in aggregates, and not less than 6 sacks of cement per cubic yard of concrete.
- B. Cement: Portland Cement conforming to ASTM C150, Type 1
- C. Water used shall be clean and free from injurious amounts of oil, acids, alkalis, salt, organic matter, or other deleterious substances.
- D. Compressive Strength: 4,000 psi at 28 days.
- E. Fine Aggregate: Fine aggregate shall consist of clean, sound, properly graded sand conforming to ASTM Standard C33 uniformly graded. Fine aggregate shall be graded within the following requirements:
  - 1. Total passing the No. 4 Sieve - 95-100% by weight
  - 2. Total passing the No. 16 Sieve - 35-75% by weight
  - 3. Total passing the No. 50 Sieve - 10-25% by weight
  - 4. Total passing the No.100 Sieve - 2-8% by weight
- F. Coarse Aggregate: Coarse aggregate shall consist of crushed stone or gravel having clean, hard, strong, durable non-coated particles with not more than 5% by weight of soft fragments, 1/4% by weight of clay lumps, and 1% by weight of material removed by decantation, except that when the material removed by decantation consists essentially of crushed dirt the maximum amount permitted may be increased to one and one-half percent by weight. Rocks shall conform to ASTM Standard C131.
  - 1. Coarse aggregate may be either of two sizes, 1-1/2 inch and smaller or 3/4 inch and smaller, and shall be graded within the following requirements:
    - a. Maximum size mesh screen (sq. mesh) 0-3% retained by weight
    - b. Half maximum size mesh screen (sq. mesh) 30-65% retained by weight
    - c. No. 4 sieve 94-100% retained by weight
  - 2. Coarse aggregate for exposed aggregate surfaces shall be as follows:
    - a. Total retained on the 1 1/2 inch sieve 0%
    - b. Total retained on the 3/4 inch sieve 25 - 60%
    - c. Total retained on the 3/8 inch sieve 70 - 90%
    - d. Total retained on the No. 4 inch sieve 95 - 100%

- G. Slump: 3 to 4 inches.
- H. Air Content: Severe Condition. 5.5 percent for 1-½ inch aggregate.
- I. The concrete shall be delivered and placed within 45 minutes after all materials including mixing water have been placed in the mixing drum.

## 2.5 CURING COMPOUND

- A. Liquid membrane-forming, clear or translucent, suitable for spray application.
- B. Conform to ASTM C309, Type 1.

## 2.6 REINFORCEMENT

- A. Reinforcement shall be free from rust scale or other coatings that will destroy or reduce the bond.
- B. Reinforcing steel shall be steel of 60,000 psi minimum yield strength, conforming to the following ASTM Standards:
  - 1. A615 - Standard Specification for Deformed Billet-Steel Bars for Concrete Reinforcement
  - 2. A996 - Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement.
  - 3. A1064 - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
- C. All reinforcing steel bars #3 (3/8" diameter) or larger shall be deformed bars conforming to these specifications. Plain (non-deformed) bars larger than 1/4" diameter shall not be used for reinforcing.
- D. The supplier of reinforcing steel shall furnish certification of compliance with these specifications.
- E. Reinforcement shall be shop bent, unless otherwise permitted by the Engineer. Reinforcement partially embedded in concrete shall not be bent.
- F. Reinforcement shall be accurately placed according to the Drawings or as specified herein and adequately secured in position by concrete, metal, or other approved chairs, spacers, or ties.
- G. Reinforcement shall not be welded unless specifically permitted by the Engineer.
- H. Reinforcement shall be protected by the thickness of concrete as shown on the Drawings. Where dimension are not shown, the thickness of concrete over the reinforcement shall be as follows:
  - 1. Where concrete is deposited against the ground without the use of forms, not less than 3 inches, except wire mesh reinforcement for concrete slabs which may be within 1 1/2 inches of the ground.
  - 2. Where concrete is to be exposed to the weather or to the ground but placed in forms, in slabs and wall not exposed to the ground or to the weather not less than 2 inches.
  - 3. In all other cases not less than 2 inches.

- I. Reinforcement for concrete streets, driveways, and parking lots shall be #6 bars placed at 6 inches on center perpendicular to the trench and #4 bars placed at 6 inches on center parallel to the trench.
- J. Reinforcement for sidewalks, ditch paving, and slope protection shall consist of 6 inch x 6 inch mesh, #6 for driveways and #9 for ditch paving, slope protection and sidewalks.

## 2.8 ACCEPTANCE OF MATERIALS

- A. Materials shall be subject to inspection for suitability by the Engineer prior to or during incorporation into the work.

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. Concrete surfaces for streets, roads, driveways, and parking lots that are removed and/or damaged by construction operations shall be repaired with concrete with a minimum thickness of 6-inches or as shown on the Drawings.
- B. Concrete surfaces for sidewalks, slope protection, and ditch paving that are removed and/or damaged by construction operations shall be repaired with concrete with a minimum thickness of 4-inches or as shown on the Drawings.
- C. Before replacing surfacing, the existing pavement shall be cut, sawed, or trimmed along straight and vertical lines using a concrete saw or other suitable tool.
- D. Temporary repairs to paved surfaces shall be made with cold mix asphalt to allow access. Final repairs shall be made within 60 days weather permitting. Driveways shall be maintained to allow access during all weather conditions.
- E. After removal of forms and finishing, backfill shall be placed around the structures and thoroughly compacted.

### 3.2 EXCAVATION AND BACKFILL

- A. Excavate and backfill in accordance with Specifications Section 312300 Trench Excavation, Backfill, and Compacting.

### 3.3 PREPARATION OF SUBGRADE

- A. Bring the areas where pavement, curbs, and sidewalks are to be constructed to required grade on undisturbed ground and compact by sprinkling and rolling or mechanical tamping.
- B. As depressions occur, refill with crushed stone base course material and recompact until the surface is at the proper grade.
- C. Compact subgrade on fill to 95 percent of maximum density at optimum moisture content as determined by ASTM D698 Standard Proctor Density.

### 3.4 PLACING CRUSHED STONE BASE

- A. After subgrade for sidewalks and curbs is compacted and at proper grade, spread at least 4 inches of crushed stone base course material and compact to at least 95 percent of maximum density as determined by ASTM D698 Standard Proctor Density.

- B. Sprinkle with water and compact by rolling or other method.
- C. Top of compact granular fill shall be at proper level to receive concrete after taking slab thickness and desired finished grade into account.

### 3.5 SETTING FORMS

- A. Construct forms to the shape, lines, grades, and dimensions called for on the Drawings, or match shape, lines, grades, and dimensions of cut curbs.
- B. Stake wood or metal forms securely in place, true to line and grade.
- C. Brace forms to prevent change of shape or movement in any direction resulting from the weight of the concrete during placement.
- D. Construct short-radius curved forms to exact radius.
- E. Tops of forms shall not depart from grade line more than 1/8 inch when checked with a 10 foot straightedge.
- F. Alignment of straight sections shall not vary more than 1/8 inch in 10 feet.
- G. Forms shall be cleaned and oiled thoroughly after each use and before concrete is placed.

### 3.6 PLACING CONCRETE

- A. All placement of concrete shall be in the presence of the Engineer or his representative. The Contractor may be required to remove, without compensation, any concrete placed in the absence of the Engineer or his representative.
- B. Equipment for chuting, pumping and pneumatically conveying concrete shall be of such size and design as to ensure a practically continuous flow of concrete at the delivery end without separation of materials. All concrete in walls and columns shall be poured through tremies unless otherwise permitted by the Engineer. The free fall of concrete shall be held to a minimum.
- C. Concrete shall be deposited as nearly as practicable in its final position to avoid segregation due to rehandling or flowing. The placing of concrete shall be carried on at such a rate that concrete is at all times plastic and flows readily into the spaces between the bars. No concrete that has been contaminated by foreign material shall be used.
- D. Once placement has started, it shall be carried on as a continuous operation until placement of the panel or section is complete. When construction joints are necessary, they shall be constructed in accordance with these specifications.
- E. Concrete shall be placed and vibrated in such a manner as to prevent coarse aggregate to separate from mortar, that no rock pockets are left, that the concrete flows readily around the steel reinforcement and into the extremities of the forms. Free water shall not be present on the surface of the concrete. All concrete paving shall be poured and vibrated with mechanical vibration equipment.
- F. Water shall be removed from the place of deposit before concrete is placed. Before depositing concrete on or against concrete which has taken its initial set, the surface of the hardened concrete shall be broken off down to coarse aggregate and wire brushed to remove foreign matter and laitance. A layer of grout of the same cement-sand ratio as the

concrete without coarse aggregate shall be placed to a thickness of one to two inches on the brushed surface after which the new concrete shall be placed immediately.

### 3.7 FLAT SURFACES

- A. Concrete shall be deposited and leveled so that the surface conforms to the line, grade and finish required to match adjacent surfaces.
- B. Exposed aggregate finish - Scrubbed finish shall be produced on green concrete. The surface shall be thoroughly wetted and scrubbed with stiff fiber or wire brushed, using water freely, until the surface film of mortar is removed and the aggregate is uniformly exposed. The surface shall then be rinsed with clean water. If portions of the surface have become too hard to scrub in equal relief, dilute hydrochloric acid (commercial muriatic acid diluted with 4 to 10 parts water) shall be used after the concrete is at least two weeks old to facilitate the scrubbing. The acid shall be removed within 15 minutes from the finished surface with clean water. This operation may be facilitated by casting the concrete against form faces which have been coated with a chemical retarder to keep the mortar adjacent to the form from setting. Every effort shall be exerted to assure that the new surface matches any existing adjacent surfaces.
- C. Protect flat surfaces from damage for period of 10 days.

### 3.8 COLD WEATHER REQUIREMENTS

- A. Concrete shall not be placed when the ambient temperature is below 40 degrees F, or when the concrete is likely to be subjected to freezing temperatures before final set has occurred. Concrete footings or slabs shall not be placed over frozen ground. The temperature of the concrete when placed shall not be less than 45 degrees F. Suitable means shall be provided for maintaining the concrete at a temperature of 45 degrees F for not less than 96 hours after placing.
- B. Any concrete damaged by freezing shall be removed and replaced at the expense of the Contractor.

### 3.9 HOT WEATHER REQUIREMENTS

- A. Suitable precautions shall be taken in hot weather to avoid drying of the concrete prior to finishing operations.
- B. Concrete deposited in hot weather shall not have a placing temperature that will cause difficulty from loss of slump, flash set, or cold joints. Concrete temperatures shall be less than 90 degrees F.

### 3.10 TEMPORARY REPAIRS TO PAVED SURFACES

- A. Unless permanent repairs to paved surfaces will be repaired within two (2) days after backfilling the trench, the Contractor shall place suitable asphalt material in the trench. This shall apply to driveways, sidewalks, parking lots, or other paved surface whenever the backfill will not adequately support vehicular traffic, whenever dust from the trench creates a nuisance, or whenever the trench is a hazard.
- B. The surface shall match the surfaces on each side of the trench and shall be in accordance with applicable state, county, or local requirements.
- C. The Contractor shall maintain all temporary surfaces in good condition until permanent repairs are complete.

- D. Detours shall have a gravel, crushed stone, or asphalt surface. Dust shall be controlled by the application of asphalt or water.

END OF SECTION



**SECTION 321123**  
**AGGREGATE BASE COURSE**

**PART 1 - GENERAL**

1.1 SECTION INCLUDES

- A. Aggregate base course, consisting of crushed or uncrushed coarse and fine aggregate material, as necessary to meet the requirements herein and in conformity with lines, grades, compacted thickness and typical sections shown.

1.2 REFERENCES

- A. ODOT Standards - Standard Specifications for Highway Construction.
- B. ASTM D698--Test Methods for Moisture-Density Relations of Soils (Standard).

1.3 SUBMITTALS

- A. In accordance with Section 013300.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Aggregate Base Course shall be hauled in tight trucks previously cleaned of all dirt and foreign material.
- B. Place aggregate base course the same day as delivered to the job site unless otherwise approved by the Engineer.

**PART 2 - PRODUCTS**

2.1 MATERIALS

- A. Aggregate Base Course shall meet the requirements ODOT Section 303, Type A or C.
- B. Do not use additives unless approved by the Engineer.

**PART 3 - EXECUTION**

3.1 EXAMINATION

- A. Place material only after the underlying material has been properly constructed and inspected.

3.2 PREPARATION

- A. Shape subgrade to conform to the typical sections shown before placing Aggregate Base Course.
- B. Do not place fill or base on soft, muddy, or frozen subgrades.

- C. Subgrade preparation must meet requirements of Section 312303.

### 3.3 AGGREGATE PLACEMENT

- A. Place aggregate in maximum eight (8) inch layers and compact to specified density. For thicknesses over eight (8) inches, construct in multiple courses of equal thickness. The minimum thickness of a lift is four (4) inches.
- B. Upon completion, the material shall be smooth and in conformity with the typical sections as shown.
- C. Use mechanical tamping equipment in areas inaccessible to compaction equipment.
- D. Compact to a density between 95 and 100 percent of the maximum standard Proctor Density (ASTM 0698) at 0 to 2% above optimum moisture.

### 3.4 TOLERANCES

- A. Correct any deviation in excess of 1/4 inch in a length of sixteen (16) feet by loosening, adding or removing material, reshaping and recompacting at the Contractor's expense.
- B. Correct any deficiency of 1/2 inch or more in thickness by scarifying, adding material as required, reshaping, recompacting and refinishing at the Contractor's expense.
- C. For compaction tests, the material will be acceptable providing not more than one out of the most recent five consecutive density tests performed is below the specified density. The failing test must not be more than three pounds per cubic foot below the specified density.

### 3.5 FIELD QUALITY CONTROL

- A. Field Inspection and Testing will be performed under provisions of Section 014000.
- B. If the Aggregate Base Course should lose the required density or finish before surfacing is complete, it shall be reworked, recompacted, refinished and retested at the Contractor's expense.

END OF SECTION

## **SECTION 321216**

### **ASPHALT CONCRETE HOT MIX PAVING**

#### **PART 1 - GENERAL**

##### **1.1 SECTION INCLUDES**

- A. Surface course, consisting of compacted mixture of coarse and fine aggregates and asphaltic material, placed on stabilized base in conformity with lines, grades, compacted thickness and typical cross sections shown.

##### **1.2 REFERENCES**

- A. ARDOT Standards - Standard Specifications for Highway Construction Section.
- B. AASHTO--American Association of State Highway and Transportation Officials.

##### **1.3 SUBMITTALS**

- A. Procedures for Submittals: Section 013300.
- B. Contractor shall certify the mixing plant will conform to the requirements of the ADOT.
- C. Certified weight tickets shall be submitted with each delivery of Asphaltic Concrete to the Work Site.
- D. Contractor shall submit Design Mixtures, including additive modifiers, for review and approval at least 30 days before any asphaltic pavement is placed. The design mixes shall be prepared by a certified independent testing laboratory employed and paid by the Contractor.

##### **1.4 DELIVERY, STORAGE AND HANDLING**

- A. Asphaltic Concrete Material shall be hauled in tight trucks previously cleaned of all dirt and foreign material with the load completely covered by canvas.
- B. All material shall be delivered so that material can be placed and rolled during daylight hours.

##### **1.5 ENVIRONMENTAL REQUIREMENTS**

- A. Asphaltic Concrete shall not be placed when the ambient temperature is below 60° F and is falling.
- B. Asphaltic Concrete may be mixed and placed when the ambient temperature is above 50° F and rising.

## **PART 2 - PRODUCTS**

### **2.1 PRIME COAT**

- A. Asphaltic Materials: AASHTO M82, Cut-Back Asphalt Concrete."
- B. Provide grade MC-30.

### **2.2. HOT MIX ASPHALTIC CONCRETE SURFACE COURSE**

- A. The asphaltic concrete surface course shall be plant mixed, hot laid meeting requirements in ARDOT Division 400.
- B. The mix shall be designed for stability of at least 35 and shall be compacted to between 95 and 99 percent of the maximum theoretical density.
- C. The asphalt cement content by percent of total mixture weight shall fall within a tolerance of 0.3 percent asphalt cement from the specific mix. In addition, the mix shall be designed so that 75 to 85 percent of the voids in the mineral aggregate (VMA) are filled with asphalt cement.

## **PART 3 - EXECUTION**

### **3.1 PRIME COAT**

- A. Prime coat is only applied to the surface of the base course, if approved by the Owner.
- B. Apply with a sprayer. Prime coat shall be applied at a rate of 0.25 to 0.35 gallons per square yard over compacted flexible base and shall be cured for 24 hours minimum.

### **3.2 LAYING**

- A. Placement: Haul the asphaltic concrete mixture, which has been heated and prepared as specified, to the project in tight vehicles previously cleaned of foreign material. The mixture shall be at a temperature between 200° F and 350° F when laid. The Engineer will determine the lowest acceptable temperature; a variance of 30° F upward will be allowed. Spread the material into place with approved mechanical finishing machine of screening or tamping type. Use a tire or track-mounted finish machine capable of maintaining uniform grade WITHIN SPECIFIED TOLERANCES while placing directly on the flexible base subgrade. When placing on existing pavement, Contractor is to clean the existing surface with a sweeper to remove all loose material prior to the overlay
- B. Surface Course Material: A surface course two (2) inches or less in thickness may be spread in one lift. Spread all lifts in such a manner that when compacted, the finished course will be smooth, of uniform density, and to section, line and grade shown.

### **3.3 LAYERING IN RESTRICTED AREAS**

- A. If use of a paver is impractical, asphalt surface courses may be spread and finished by hand. Use wood or steel forms, rigidly supported to assure correct grade and cross section. Carefully place materials to avoid segregation of the mix. Broadcasting the material will not be permitted. Any lumps that do not break down readily shall be removed. Place asphalt courses in the same sequence as if placed by machine.

### 3.4 ROLLING

- A. Begin rolling while pavement is still hot and as soon as it will bear the roller without undue displacement or hair cracking. To prevent adhesion of surface mixture to the roller, keep wheels properly moistened with water. Excessive use of water will not be permitted.
- B. Compress the surface thoroughly and uniformly, first with power-driven, 3-wheel, or tandem rollers weighing 10 tons. Obtain subsequent compression by starting at the side and rolling longitudinally toward the center of the pavement, overlapping on successive trips by at least one-half width of rear wheels. Make alternate trips slightly different in length. Continue rolling until further compression cannot be obtained and all rolling marks are eliminated.
- C. Use a tandem roller for the final rolling. Double coverage with an approved pneumatic roller on asphaltic concrete surface is acceptable after flat wheel and tandem rolling has been completed.

### 3.5 HAND TAMPING

- A. Along walls, curbs, headers and similar structures, and in all locations not accessible to rollers, compact the mixture thoroughly with a vibrating plate compactor.

### 3.6 DENSITY

- A. Compact in accordance with ARDOT Division 400. If, during the construction, the results of density tests show that the surface has a density less than specified, an additional rolling with a 3-wheel or pneumatic roller will be required. Such a rolling shall be done before the mix cools if it is to be successful.

### 3.7 SURFACE TESTS

- A. The completed surface, when tested with a 16-foot straightedge laid parallel to the center line of the pavement, shall show no deviation in excess of 1/16 inch per foot from the nearest point of contact. The maximum ordinate measured from the face of the straightedge shall not exceed 1/4 inch at any point. Furnish approved templates for checking subgrade in finished sections. The strength and rigidity of templates shall be such that if a support is transferred to center, no deflection in excess of 1/8 inch will be observed.

### 3.8 CONSTRUCTION JOINTS

- A. Place courses as nearly continuously as possible. Pass the roller over unprotected ends of the freshly laid mixture only when the mixture has become chilled. When work is resumed, cut back the laid material to produce a slightly beveled edge for the full thickness of the course. Remove old material which has been cut away and lay the new mix against the fresh cut.
- B. When new asphalt is laid against existing or old asphalt, the existing or old asphalt shall be cut to provide a straight smooth joint.

### 3.9 DEFECTIVE PAVEMENT

- A. Re-compact pavement sections not meeting specified densities or replace them with new asphaltic concrete material. Replace with new material section of surface course pavement not meeting surface test requirements or having an unacceptable surface texture. Patch asphalt pavement sections in accordance with procedures established by the Asphalt Institute. Replace asphalt which did not meet the Specifications.

### 3.10 FIELD QUALITY CONTROL

- A. Laboratory Testing and Inspection Services: As specified in Section 014000.

### 3.11 DEFICIENT SURFACE THICKNESS

- A. Any area of asphalt surface found deficient in thickness by more than 0.25 inches shall be removed and replaced, at the Contractor's expense, with asphalt surface of the thickness shown. Care should be taken not to damage or remove the pavement below the asphalt surface. Should damage to the pavement below the asphalt surface occur, it shall also be removed and replaced at the Contractor's expense.
- B. No additional payment over the contract price will be made for any asphalt surface of a thickness exceeding that required by the Contract Documents.

END OF SECTION

**SECTION 321540**  
**GRAVEL DRIVEWAY REPAIR**

**PART 1 - GENERAL**

1.1 SECTION INCLUDES

- A. New gravel surfaces.
- B. Preparing gravel subgrade for paved areas disturbed by construction.

1.2 RELATED SECTIONS

- A. Section 320117 - Asphalt Pavement Repair.
- B. Section 320129 - Concrete Pavement Repair.

1.3 REFERENCES

- A. Arkansas Highway and Transportation Department, P.O. Box 2261, Little Rock, Arkansas 72203.
  - 1. AHTD Standard Specification Section 303 - Aggregate Base Course, latest edition.
- B. American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, Pennsylvania 19428.
  - 1. ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.

1.4 TESTS

- A. Gradation of stone materials will be performed in accordance with ASTM C136.

**PART 2 - PRODUCTS**

2.1 MATERIALS

- A. Natural and artificial mixture of gravel and soil mortar.
- B. Gravel:
  - 1. Crushed or uncrushed stone.
  - 2. Free from objectionable, deleterious, or other injurious matter.
  - 3. Graded to AHTD designation Class 7.

### **PART 3 - EXECUTION**

#### **3.1 PLACING GRAVEL**

- A. The Contractor shall prepare and compact subgrade prior to placement of gravel surfacing. The subgrade must meet requirements of Section 312303.
- B. For compacted depths exceeding eight (8) inches, place material in multiple courses of equal depth which do not exceed eight (8) inches. The minimum thickness is to be four (4) inches.
- C. Compact each course with mechanical compaction equipment approved by the Engineer. Compaction with wheel of backhoe or track of trackhoe is not acceptable.
- D. Finish grade to provide smooth transition with surrounding gravel. Avoid leaving any humps or ruts.
- E. Repair settling as required.

END OF SECTION



## **SECTION 329219**

### **SEEDING**

#### **PART 1 - GENERAL**

##### **1.1 GENERAL**

- A. This section shall consist of furnishing and applying lime, fertilizer, seed, mulch cover, and water to all disturbed areas of construction that do not receive a final cover of sod, gravel, concrete, or asphalt paving.
- B. The work under this Section shall be accomplished as soon as practicable after the grading in order to deter erosion.

##### **1.2 RELATED SECTIONS**

- A. Section 311100 - Site Clearing and Grubbing
- B. Section 312300 - Trench Excavation, Backfill, and Compacting
- C. Section 329223 - Sodding

##### **1.3 QUALITY ASSURANCE**

- A. Furnish seed labeled in accordance with current rules and regulations of Arkansas State Plant Board.

##### **1.4 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver grass seed in original containers showing analysis of seed mixture, percentage of pure seed, year of production, net weight, date of packaging, and location of packaging. Damaged packages are not acceptable.
- B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

#### **PART 2 - PRODUCTS**

##### **2.1 TOPSOIL**

- A. If imported topsoil is required for germination and sustained growth of grass, it shall be natural, fertile, agricultural soil capable of sustaining vigorous plant growth, not in frozen or muddy condition, containing not less than 3 percent organic matter, and corrected to pH value of 5.9 to 7.0. Free from subsoil, slag, clay, stones, live plants, roots, sticks, crabgrass, crabgrass, noxious weeds, and foreign matter. Very fine sandy loams and silt loams are not allowed.

##### **2.2 SEED**

- A. Shall have a minimum of 98% pure seed and 85% germination by weight.
- B. Labeled in accordance with current rules and regulations of Arkansas State Plant Board.

- C. A combined total of 50 noxious weed seeds shall be the maximum amount allowed per pound of seed with the following exceptions: Johnson grass, wild onion, wild garlic, field bindweed, nut grass, sickle pod, sesbania, indigo , morning glory, and cocklebur will not be allowed in any amount.

## 2.3 SEED MIXING

- A. Seed shall be composed of the varieties and amounts by weight as follows:

SEED VARIETY:	LBS. PER ACRE
<b>March 1 - June 15</b>	
Bermuda Grass (Common) Unhulled	10
Bermuda Grass (Common) Hulled	5
Lespedeza (Kobe)	35
<b>June 16 - August 31</b>	
Bermuda Grass (Common) Unhulled	10
Bermuda Grass (Common) Hulled	5
Weeping Love Grass (Eragrostis Curvula)	10
<b>September 1 - February 28</b>	
Wheat	30
Crimson Clover (Dixie)	20
Bermuda Grass (Common) Unhulled	20
Lespedeza (Kobe)	35

## 2.4 FERTILIZER

- A. Commercial Grade
- B. Proportions 10N-20P-10K

## 2.5 LIME

- A. Agricultural grade ground limestone ground to pass an 8-mesh sieve with 25 percent passing a 100-mesh sieve.

## 2.6 MULCHING MATERIAL

- A. Straw from threshed rice, oats, wheat, barley, or rye; wood excelsior; hay obtained from various legumes or grasses. Material shall be free of debris and seed heads from Johnson grass or other noxious grasses and not be excessively brittle or in advanced state of decomposition. All material will be inspected and approved prior to use.

## 2.7 WATER

- A. All water used on the project shall be free of any substances harmful to plant germination and growth or to the environment in general. It shall be free of any impurities. Contractor shall be responsible for furnishing and applying water that meets these requirements. Engineer may, at Contractor's expense, submit samples of water used on the project for laboratory analysis (of a reasonable number and kind) to ensure the quality of the water. Onsite water shall not be used unless approved by Owner or Owners Representative.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Fine grade subgrade for seedbed, eliminating uneven areas and low spots. Maintain lines, levels, profiles and contours, allowing for thickness or topsoil. Make changes in grade gradual. Blend slopes into level areas.
- B. Remove foreign materials, undesirable plants and their roots, stones, and debris. Remove subsoil which has been contaminated with petroleum products.

### 3.2 TILLAGE

- A. After spreading fertilizer and lime, areas to be seeded shall be tilled in order to incorporate the lime and fertilizer, break up soils compacted by construction, and promote rooting. The finished operation should result in a well-aggregated soil to retain moisture and protect the seed against temperature fluctuations. The soil shall be tilled to a depth of not less than 3 inches. Repeat cultivation in areas where equipment used for hauling and spreading topsoil has compacted subsoil. After tilling, the seedbed shall be smoothed by harrowing or dragging methods to eliminate clods or voids. All areas shall be brought to finished grade within a tolerance of  $\nabla$  0.1 foot according to the grading plan, as indicated on the Drawings, or to match existing ground surface. If the surface is not acceptable to the Engineer, the Contractor shall recultivate the site at his own expense.

### 3.3 PLACING TOPSOIL

- A. Spread topsoil to minimum depth of 3 inches over entire area to be seeded.
- B. Place topsoil during dry weather on dry, unfrozen subgrade.
- C. Grade to eliminate rough and low areas, ensuring positive drainage. Maintain levels, profiles and contours of subgrade. Rake surface.

### 3.4 LIME APPLICATION

- A. Apply lime at rate of 2,000 pounds per acre.
- B. Mix lime into top 3 inches of soil

### 3.5 FERTILIZER APPLICATION

- A. Apply fertilizer at rate of 800 pounds per acre.
- B. Uniformly incorporate fertilizer into soil to depth of at least 3 inches.

3.6 SEEDING APPLICATION

- A. Apply grass seed mixture at a rate specified in this Section for time of year of application.
- B. Lightly firm seeded areas with cultipacker.
- C. Apply fine spray of water to seeded area immediately after sowing and rolling.

3.7 MULCH COVER APPLICATION

- A. Apply mulch at rate of 4,000 pounds per acre immediately after seeding.
- B. Spread uniformly over entire area using approved power mulching equipment.

3.8 MAINTENANCE

- A. Maintain seeded areas by watering, mowing, and repairing until Contract Time ends or for a period of 90 days after germination occurs, if germination occurs less than 90 days before that time, by which time a stand of growing grass completely and uniformly covering entire area shall have been established.

END OF SECTION

## **SECTION 329220**

### **PIPE CULVERTS AND STORM DRAINAGE PIPING**

#### **PART 1 - GENERAL**

##### **1.1 DESCRIPTION**

- A. This section covers all types of reinforced concrete pipe and corrugated metal pipe at the locations shown on the Plan or as described by the Engineer.
- B. All work shall be in accordance with details shown on the Plans, or as directed by the Engineer and with these Specifications.

##### **1.2 STANDARD SPECIFICATIONS**

- A. Arkansas Highway and Transportation Department Specifications for Highway Construction
- B. Materials and work shall be in accordance with SECTION 606- PIPE CULVERTS, AHTD Standard Specifications, except as herein modified or augmented.

##### **1.3 RELATED SECTIONS**

- A. Excavation, backfilling and compaction (Structure and Piping) is included in Section 022200.
- B. Pipe Embedment is included in Section 022350.
- C. Granular Fill Material is included in Section 022300.

#### **PART 2 - PRODUCTS**

##### **2.1 MATERIALS**

- A. Concrete pipes shall be of the bell and spigot type and shall conform to the specifications of ASTM Designation C76 and C 506, latest editions, for the sizes and classes of pipes shown on the Plans and listed in the Unit Price Schedule. The class of pipe and ate of manufacture shall be marked on each joint of pipe. Pipe shall be at least ten (10) days old before it is delivered to the project.
- B. The manufacture and furnishing of precoated galvanized steel pipe culverts shall be in accordance with AASHTO M 245, as amended below, and AASHTO M 246. AASHTO M 245 amended as follows:
  - 1. A field inspection will be made by the Engineer. The Contractor shall furnish the Engineer and itemized statement of the sizes and lengths of culvert pipe in each shipment. This inspection will include an examination of the culvert pipe for deficiencies in lengths of sheets use, nominal specified diameter, net length of finished culvert pipe and any evidence of poor workmanship as outlined above. The inspection may include the taking of samples for chemical analysis and shelter and polymeric coating measurements. The pipe making up the shipment shall meet the requirements of these specifications, and if 25 percent of the pipe in any shipment fails to meet these requirements, the entire shipment may be rejected.

2. The Contractor shall arrange, if the Engineer so requests, to have the material inspected and sampled in the rolling mill or in the shop where fabricated. The Engineer may require from the mill the chemical analysis of any heat. The inspection, either in the mill or in the shop, shall be made under the direction of the Engineer. The Engineer will have free access to the mill or shop for inspection, and every reasonable facility shall be extended to him for is purpose. The inclusion of any material or pipe which has been rejected at the mill or shop will be considered sufficient cause for rejection on the entire lot.
3. No precoated steel will be accepted until after the sheet manufacturer's certified analysis and manufacturer's guarantee have been passed by the Engineer of material and accepted.
4. The identifications brands shall be placed on the sheets by the manufacturer of the sheets in such a manner that when the sheets are rolled into culverts, such identification shall appear on the outside of each section of pipe. Pipe having any sections not so stamped will be rejected.
5. The sheets shall have a polymeric coating of 0.010 inch thickness minimum on both sides.

C. Alternates will be shown on the Plans.

D. Jointing material for reinforced concrete pipe, at the Contractor's option, shall be bituminous plastic cement or compression type rubber conforming to the requirements that follow:

1. Bituminous plastic cement shall be made for use without heating.
  - (a) It shall be composed either of steam refined petroleum asphalt or of a refined coal tar dissolved in a suitable solvent and stiffened with a mineral filler consisting essentially of short fiber asbestos.
  - (b) The cement shall be smooth, non-thickened, uniformed mixture and shall show no separation which cannot be overcome easily by stirring. The material shall be in such consistency and properties that it can be applied readily with a trowel, a putty knife or with a caulking gun without pulling or drawing. The cement, when applied to concrete surfaces shall exhibit good adhesive and cohesive properties, and shall have only slight shrinkage after curing. The cement shall be capable of being exposed to temperatures below freezing without sustaining any damage or losing its characteristic.
  - (c) When applied in a layer 1/16 inch to 1/8 inch thick on a tinned metal panel, and cured at room temperature for 24 hours, the cement shall set to a tough plastic coating, free from blisters. The cement shall conform to specifications tabulated as follows:

	<u>Min.</u>	<u>Max.</u>
Grease Cone Penetration (Unworked) 150 grams, 25 degrees C., 5 Sec., ASTM D 217, Min/10	175	250
Weight, pounds per gallon	9.75	XX
	<u>Min.</u>	<u>Max.</u>
Nonvolatile, 19 grams 105 degrees C. – 110 degrees C., 24 hours	75	XX

Ash, by ignition, %

24

45

Backfill shall not be undertaken until the cement joint is at least 24- hours old.

2. With pipe manufactured for such joints, an approved rubber compression –type may be used. In case of such use, backfilling may proceed immediately after the pipe is laid and inspected.
- E. When storm piping is to be trenched under paved areas, piping is to be bedded on a minimum of 4 inches of pipe embedment material, then the trench backfilled to the top pipe with a crushed stone, or granular materials as approved by the Engineer, and then backfilled with Class 7 Aggregate Base Course or other granular material approved by the Engineer.
- F. When not under paved areas the pipe is to be properly bedded as according to the Plans backfilled to the top of pipe with crushed stone as approved by the Engineer, then backfilled with select backfill material as specified in Section 022200 of these specifications.

## 2.2 JOINTING OF PIPE

- A. Jointing of concrete pipe shall be in accordance with one (1) of the two (2) methods specified as follows:
  1. Bituminous Cement Joint - The tongue and groove shall be wiped clean and dry. The plastic compound shall be applied to the entire surface of both the tongue and groove. The joints shall be forced together with excess compound extruding both inside the joint. Excess compound shall be removed from the interior surface and the exterior shall be leveled reasonably flush with the surface of the pipe.
  2. Rubber Compression- Type Joint - The tongue and groove shall be cleaned and maintained clean. The joint shall be constructed as recommended by the manufacturer if the pipe.
- B. Jointing of corrugated metal pipe and corrugated metal arch pipe shall be in accordance with SECTION 606- PIPE CULVERTS, AHTD Standard Specifications.

## PART 3 - EXECUTION

### 3.1 TRENCHING AND BACKFILLING

- A. Trench width at the horizontal centerline of a pipe shall not exceed inside the diameter of the pipe plus two (2) feet.
- B. Where unsuitable material is encountered, excavation shall continue until a firm material is reached and the over-excavation filled to grade with special bedding material conforming to Section 022350 of these Specification, or C- Ballast, or as directed by the Engineer.

### 3.2 INSTALLATION OF PIPE

- A. The provisions of this Section shall apply to circular pipes and to arch pipes.

- B. Each section of pipe shall be examined carefully before being laid, and the defective or damaged sections shall not be used. Pipelines shall be laid in the grades and alignment indicated, or as directed by the Engineer. Pipe laying shall proceed upgrade. The groove ends of concrete pipe shall point upgrade.
- C. Proper facilities shall be provided for lowering sections of pipe into trenches. Under no circumstances shall pipe be laid in water, and no pipe shall be laid when trench conditions or weather are unsuitable for work. Full responsibility for the diversion of drainage and for dewatering of trenches during construction shall be borne by the Contractor.
- D. All pipe in place shall have been approved before being backfilled. In all backfilling operations, the Contractor shall be responsible for preventing damage to or misalignment of the pipe.

END OF SECTION



## **SECTION 329300**

### **PRECAST CONCRETE MANHOLES AND STRUCTURES**

#### **PART 1 - GENERAL**

##### **1.1 SCOPE OF WORK**

- A. Furnish all labor, materials and equipment required and install precast concrete manholes, structures, frames and covers, access hatches, manhole rungs, ladders and appurtenances as shown on the Drawings and as specified herein.

##### **1.2 SUBMITTALS**

- A. Submit to the Engineer, in accordance with Section 01300, shop drawings, product data, materials of construction, and details of installation. Submittals shall include at least the following:

- 1. Base sections, riser sections, eccentric and concentric conical top sections, flat slab tops, grade rings with notarized certificate indicating compliance with ASTM C478.
- 2. Pipe connection to manhole.
- 3. Manhole rungs or ladders, including method of installation and notarized certificate indicating compliance with pull-out resistance test specified herein.
- 4. Manhole frame and cover with notarized certificate indicating compliance with ASTM A48, Class 30.
- 5. Method of repair for minor damage to precast concrete sections.
- 6. Sewer brick with notarized certificate indicating compliance with ASTM C32, Grade 55.

- B. Design Data

- 1. Precast concrete structures:
  - a. Sectional plan(s) and elevations showing dimensions and reinforcing steel placement.
  - b. Structural calculations including assumptions.
  - c. Concrete design mix.

- C. Test Reports

- 1. Precast concrete structures:
  - a. Concrete test cylinder reports from an approved testing laboratory certifying conformance with this Section.

##### **1.3 REFERENCE STANDARDS**

- A. American Society for Testing and Materials (ASTM)
  - 1. ASTM A48 - Standard Specification for Gray Iron Castings.
  - 2. ASTM A615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
  - 3. ASTM C32 - Standard Specification for Sewer and Manhole Brick (Made from Clay or Shale).

4. ASTM C33 - Standard Specification for Concrete Aggregates.
  5. ASTM C62 - Standard Specification for Building Brick (Solid Masonry Units Made from Clay or Shale)
  6. ASTM C150 - Standard Specification for Portland Cement
  7. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes
  8. ASTM C443 - Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
  9. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections
  10. ASTM D4101 - Standard Specification for Polypropylene Plastic Injection and Extrusion Materials.
- B. American Concrete Institute (ACI)
1. ACI 318 - Building Code Requirements for Structural Concrete
  2. ACI 350R - Environmental Engineering Concrete Structures
- C. American Association of State Highway and Transportation Officials (AASHTO)
1. Standard Specifications for Highway Bridges
- D. Occupational Safety and Health Administration (OSHA)
- E. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

#### 1.4 QUALITY ASSURANCE

- A. All material shall be new and unused.
- B. Materials' quality, manufacturing process and finished sections are subject to inspection and approval by Engineer or other Owner representative. Inspection may be made at place of manufacture, at work site following delivery, or both.
- C. Materials will be examined for compliance with ASTM standards, this Section and approved manufacturer's drawings. Additional inspection criteria shall include appearance, dimensions(s), blisters, cracks and soundness.
- D. Materials shall be rejected for failure to meet any requirements specified herein. Rejection may occur at place of manufacture, at work site, or following installation. Mark for identification rejected materials and remove from work site immediately. Rejected materials shall be replaced at no cost to Owner.
- E. Repair minor damage to precast concrete sections by approved method, if repair is authorized by Engineer.

## PART 2 - PRODUCTS

### 2.1 GENERAL

- A. Reference to a manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired.
- B. Like items of materials/equipment shall be the end products of one manufacturer in order to provide standardization for appearance, operation, maintenance, spare parts and

manufacturer's service.

- C. Provide lifting lugs or holes in each precast section for proper handling.

## 2.2 PRECAST CONCRETE MANHOLE SECTIONS AND VAULTS

- A. Precast concrete base sections, riser sections, transition top sections, flat slab tops and grade rings shall conform to ASTM C478 and meet the following requirements:
  - 1. Bottom slab thickness shall equal the riser wall thickness or flat slab top thickness, whichever is greater.
  - 2. Top section shall be eccentric cone where cover over pipe exceeds 4-ft. Top section shall be a flat slab where cover over top of pipe is 4-ft or less. Top section shall be a plastic lined flat slab where manhole riser sections are to be plastic lined.
  - 3. Base, riser and transition top sections shall have tongue and groove joints.
  - 4. Sections shall be cured by an approved method.
  - 5. Precast concrete sections shall be shipped after concrete has attained 3,000 psi compressive strength.
  - 6. Design precast concrete base, riser, transition top, flat slab top and grade ring for a minimum H-20 loading plus earth load. Calculate earth load with a unit weight of 130 pcf.
  - 7. Mark date of manufacture, name and trademark of manufacturer on the inside of each precast section.
  - 8. Construct and install precast concrete base as shown on the Drawings.
  - 9. Provide integrally cast knock-out panels in precast concrete manhole sections at locations, and with sizes shown on Drawings. Knock-out panels shall have no steel reinforcing.

## 2.3 BRICK MASONRY

- A. Bricks shall be sound, hard, uniformly burned, regular and uniform in shape and size. Underburned or salmon brick shall not be acceptable. Only whole brick shall be used.
  - 1. Bricks for channels and shelves shall conform to ASTM C32, Grade SS except that the mean of five tests for absorption shall not exceed 8 percent and no individual brick exceed 11 percent.
  - 2. Bricks for raising manhole frames to finished grade shall conform to ASTM C62.
- B. Mortar shall be composed of 1 part portland cement, 2 parts sand, and hydrated lime not to exceed 10-lbs to each bag of cement. Portland cement shall be ASTM C150, Type II; hydrated lime shall conform to ASTM C207.
- C. Sand shall be washed, cleaned, screened, well graded with all particles passing a No. 4 sieve and conform to ASTM C33.

## 2.4 MANHOLE FRAME AND COVER

- A. Manhole frames and covers shall be of good quality, strong, tough, even grained cast iron, smooth, free from scale, lumps, blisters, sand holes and defects of any kind which render them unfit for the service for which they are intended. Manhole covers and frame seats shall be machined to a true surface. Castings shall be thoroughly cleaned and subject to hammer inspection. Cast iron shall conform to ASTM A48, Class 30.
- B. Manhole covers shall have a diamond pattern, pickholes and the words SEWER cast in 3-in letters. Manhole frame and covers shall be Neenah Foundry or equal.

## 2.5 JOINTING PRECAST MANHOLE SECTIONS AND STRUCTURES

- A. Seal tongue and groove joints of precast manhole and structure sections with either rubber O-ring gasket or preformed flexible joint sealant. O-ring gasket shall conform to ASTM C443. Preformed flexible joint sealant shall be Kent Seal No. 2 by Hamilton-Kent; Ram-Nek by K.T. Snyder Company or equal.
- B. Completed joint shall withstand 15 psi internal water pressure without leakage or displacement of gasket or sealant.

## 2.6 MANHOLE RUNGS

- A. Manhole rungs shall be either of the following types:
  - 1. Cast aluminum alloy 6061-T6, drop front design, 12-in wide with an abrasive step surface conforming to OSHA requirements.
  - 2. Steel reinforced, copolymer polypropylene, 14-in wide, M.A. Industries Inc, PF Series or equal. Copolymer polypropylene shall conform to ASTM D4101 Classification PP0344 B33534 Z02. Steel reinforcing shall be 1/2-in diameter, conforming to ASTM A615, Grade 60 and shall be continuous throughout rung. The portion of the legs to be embedded in the precast section shall have fins and be tapered to insure a secure bond.

## 2.7 PIPE CONNECTIONS TO MANHOLE

- A. Connect pipe to manhole in the following ways:
  - 1. Grout in place - Precast manhole section shall have a formed, tapered circular opening larger than the pipe outside diameter. Grout shall be non-shrink and waterproof equal to Hallemite, Waterplug or Embeco. Plastic pipe shall have a waterstop gasket secured to pipe with a stainless steel clamp.
  - 2. Flexible sleeve - Integrally cast sleeve in precast manhole section or install sleeve in a formed or cored opening. Fasten pipe in sleeve with stainless steel clamp(s). Coat stainless steel clamp(s) with bituminous material to protect from corrosion. Flexible sleeve shall be Lock Joint Flexible Manhole Sleeve; Kor-N-Seal connector; PSX Press-Seal Gasket or equal.
  - 3. Compression gasket - Integrally cast compression gasket in precast manhole section. Insert pipe into compression gasket. Compression gasket shall be A-Lok or equal.

## 2.8 DAMPPROOFING

- A. Dampproofing shall be Hydrocide 648 by Sonneborn Building Products; Dehydratine 4 by A.C. Horn Inc; RIW Marine Liquid by Toch Brothers or equal.

# PART 3 - EXECUTION

## 3.1 INSTALLATION

- A. Manhole Installation.
  - 1. Manhole shall be constructed to the dimensions shown on the Drawings and as specified herein. Protect all work against flooding and flotation.
  - 2. Place manhole base on a bed of 12-in screened gravel as shown on the Drawings. Set manhole base grade so that a maximum grade adjustment of 8-in is required to bring the manhole frame and cover to final grade.

- a. Use precast concrete grade rings or brick and non-shrink mortar to adjust manhole frame and cover to final grade.
  3. Set precast concrete barrel sections plumb with a 1/4-in maximum out of plumb tolerance allowed. Seal joints of precast barrel sections with either a rubber O-ring set in a recess or preformed flexible joint sealant in sufficient quantity to fill 75 percent of the joint cavity. Fill the outside and inside joint with non-shrink mortar and finished flush with the adjoining surfaces. Caulk the inside of any leaking barrel section joint with lead wool or non-shrink grout to the satisfaction of the Engineer.
  4. Allow joints to set for 14 hours before backfilling unless a shorter period is specifically approved by the Engineer.
  5. Plug holes in the concrete barrel sections required for handling with a non-shrinking grout or non-shrinking grout in combination with concrete plugs. Finish flush on the inside.
  6. Cut holes in precast sections to accommodate pipes prior to setting manhole sections in place to prevent jarring which may loosen the mortar joints.
  7. Backfill carefully and evenly around manhole sections.
- B. Manhole Pipe Connections
1. Construct manhole pipe connections, including pipe stubs, as specified above. Close or seal pipe stubs for future connections with a gasketed watertight plug.
- C. Manhole Rung Installation
1. Aluminum Manhole Rungs
    - a. Grout aluminum manhole rungs into precast sections, on 12-in centers. Preform holes in riser and cone sections for rungs during casting. Holes for rungs shall be 1-1/8-in in diameter and a minimum of 3-1/2-in deep.
    - b. Grout rungs into precast sections immediately after casting and placing in the curing area, or immediately after coring holes for manhole rungs into base section. Fill holes with grout consisting of Portland Type II cement and mortar sand in a 1 to 1/2 ratio mixed to a putty consistency.
    - c. Paint those parts of the rungs which are embedded with a heavy coating of zinc chromate or other approved paint.
  2. Steel Reinforced Polypropylene Plastic Manhole Rungs
    - a. Preform holes for manhole rungs during casting of the riser and cone sections, using tapered form pins specifically made for preforming manhole rung holes.
    - b. Drive manhole rungs into preformed holes after concrete has developed a compressive strength of 3,000 psi.
    - c. Alternatively, cast manhole rungs into riser and cone sections when concrete is placed.
    - d. Drilling holes for manhole rungs may be used to accommodate field conditions when approved by the Engineer. Drill holes of diameter, spacing and depth required by manhole rung manufacturer.
  3. Pull-out resistance test
    - a. All manhole rung installation methods shall withstand a pull-out resistance test of 1,500 pounds.

4. Plastic Lined Manholes

- a. Install only steel reinforced polypropylene plastic manhole rungs in lined manholes.
- b. Seal the joint between the copolymer polypropylene and the PVC plastic with MC-100 Mono-Caulk by Grove International, San Marcos, CA (619-591-0025 or 345-4815) or equal. Note that copolymer polypropylene and PVC can not be thermally welded due to different melting temperatures.
- c. Install only plastic lined, flat slab tops on plastic lined manholes.

D. Setting Manhole Frame and Cover

1. Set manhole covers and frames in a full mortar bed. Utilize bricks or precast concrete grade rings, a maximum of 8-in thick, to assure frame and cover are set to the finished grade. Set manhole frame and cover to final grade prior to placement of permanent paving.

E. Dampproofing

1. Paint outer surfaces of precast and cast-in-place manholes with two coats of bituminous dampproofing at the rate of 30 to 60 sq ft per gallon, in accordance with manufacturer's instructions.

3.2 LEAKAGE TESTS

- A. Test each manhole for leakage. Engineer shall observe each test. Perform exfiltration test as described below:
- B. Assemble manhole in place; fill and point all lifting holes and exterior joints within 6-ft of the ground surface with an approved non-shrinking mortar. Test prior to placing the shelf and invert and before filling and pointing the horizontal joints below 6-ft of depth. Lower ground water table below bottom of the manhole for the duration of the test. Plug all pipes and other openings into the manhole and brace to prevent blow out.
- C. Fill manhole with water to the top of the cone section. If the excavation has not been backfilled and no water is observed moving down the surface of the manhole, the manhole is satisfactorily water-tight. If the test, as described above is unsatisfactory as determined by the Engineer, or if the manhole excavation has been backfilled, continue the test. A period of time may be permitted to allow for absorption. Following this period, refill manhole to the top of the cone, if necessary and allow at least 8 hours to pass. At the end of the test period, refill the manhole to the top of the cone again, measuring the volume of water added. Extrapolate the refill amount to a 24-hour leakage rate. The leakage for each manhole shall not exceed one gallon per vertical foot for a 24-hour period. If the manhole fails this requirement, but the leakage does not exceed three gallons per vertical foot per day, repairs by approved methods may be made as directed by the Engineer. If leakage due to a defective section of joint exceeds three gallons per vertical foot per day, the manhole shall be rejected. Uncover the rejected manhole as necessary and to disassemble, reconstruct or replace it as directed by the Engineer. Retest the manhole and, if satisfactory, fill and paint the interior joints.
- D. No adjustment in the leakage allowance will be made for unknown causes such as leaking plugs, absorptions, etc. It will be assumed that all loss of water during the test is a result of leaks through the joints or through the concrete.
- E. An infiltration test may be substituted for an exfiltration test if the ground water table is

above the highest joint in the manhole. If there is no leakage into the manhole as determined by the Engineer, the manhole will be considered water-tight. If the Engineer is not satisfied, testing shall be performed as described hereinbefore.

F. Leakage Tests for Structures

1. The Engineer will visually inspect structure(s) for possible leaks before backfilling of structures is allowed. Seal all joints to the satisfaction of the Engineer.
2. The Engineer may require an exfiltration test as described for manholes on any structure for which he/she deems the test appropriate.

3.3 CLEANING

- A. Thoroughly clean all new manholes of all silt, debris and foreign matter of any kind, prior to final inspections.

END OF SECTION





## **SECTION 329400**

### **MISCELLANEOUS WORK AND CLEANUP**

#### **PART 1 GENERAL**

##### **1.1 SCOPE OF WORK**

- A. Furnish all labor, materials, equipment and incidentals required and perform the miscellaneous work not specified in other sections but obviously necessary for the proper completion of the work as shown on the Drawings.
- B. When applicable, perform the work in accordance with other related Sections. When no applicable specification exists, perform the work in accordance with the best modern practice and/or as directed by the Engineer.
- C. The work of this Section includes, but is not limited to, the following:
  - 1. Crossing and relocating existing utilities.
  - 2. Incidental work.
  - 3. Job photographs.
  - 4. Protection and bracing of utility poles.
  - 5. Relocation of street signs
  - 6. Relocation of mail boxes
  - 7. Relocation of guard rails or barriers
- D. Submit to the Engineer a breakdown of the miscellaneous work and cleanup including the above items as a minimum.
- E. Payment for these items is subsidiary to all other items in the project, and not paid for separately.

#### **PART 2 PRODUCTS**

##### **2.1 MATERIALS**

- A. Materials required for this Section shall be the same quality of materials that are to be restored. Where possible, re-use existing materials that are removed.
- B. New Mail Boxes shall meet the requirements in AHTD Section 637.
- C. New Guard Rails shall meet the requirements in AHTD Section 639.
- D. New street signs shall meet the requirements in AHTD Section 723 and 726, as well as the Garland County, Arkansas Road Department.

#### **PART 3 EXECUTION**

##### **3.1 CROSSING AND RELOCATING EXISTING UTILITIES**

- A. Perform any extra work required in crossing culverts; water courses including drainage ditches; storm drains; gas mains; water mains; electric, telephone, gas and water services; and other utilities. This work shall include: bracing, hand excavation, backfill and any other work required for crossing the utility or obstruction. Notification of utility companies shall be as specified in Section 01047.

- B. In locations where existing utilities cannot be crossed without interfering with the construction of the work as shown on the Drawings, remove and relocate the utility as directed by the Engineer or cooperate with the utility companies concerned if they relocate their own utility.
- C. At pipe crossings and where designated by the Engineer, furnish and place screened gravel bedding so that the existing utility or pipe is firmly supported for its entire exposed length. The bedding shall extend to the mid-diameter of the pipe crossed.

### 3.3 INCIDENTAL WORK

- A. Do all incidentals work not otherwise specified, but obviously necessary to the proper completion of the work as shown on the Drawings and as specified herein.

### 3.4 PHOTOGRAPHS OF PROJECT

- A. Prior to excavation, document existing conditions using construction photographs.
- B. The photographs shall be retained in a secure location throughout the duration of the project and shall then be turned over to the Owner.

### 3.5 PROTECTION AND BRACING OF UTILITY POLES

- A. Make all arrangements with the proper utility companies for bracing and protection of all utility poles that may be damaged or endangered by the operations. Work under this item shall include the related removal and reinstallation of guy wires or support poles whether shown on the Drawings or not.

### 3.6 RELOCATION OF STREET SIGNS

- A. Temporarily remove and re-install existing street signs that interfere with the construction for this project.
- B. If the existing sign is damaged by the contractor during removal, the contractor shall replace the sign with a new sign that matches the existing sign in quality and detail, and meets local road department requirements.

### 3.7 RELOCATION OF MAIL BOXES

- A. Temporarily remove and re-install existing mail boxes that interfere with the construction for this project.
- B. Provide a temporary installation of the mail box in a location where mail can continue to be delivered during construction.
- C. If the existing mail box is damaged by the contractor during removal, the contractor shall replace the mail box with a new mail box that meets U.S. Postal Service requirements. Installation shall meet the requirements in AHTD Section 637.

### 3.8 RELOCATION OF GUARD RAILS OR BARRIERS

- A. Remove and re-install existing guard rails or traffic barriers that interfere with the construction for this project.
- B. If the existing guard rail or barrier is damaged by the contractor during removal, the contractor shall replace with a new guard rail or barrier matching the quality and construction methods used in the existing guard rail or barrier and meet requirements in AHTD Section 639.

END OF SECTION

## **SECTION 330526**

### **UTILITY MARKERS**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. This section includes requirements for furnishing and installing utility markers along the route of the existing and proposed water transmission mains to enable the Owner to easily identify the location of the water line and appurtenances after construction.

##### **1.2 SUBMITTALS**

- A. Submit in accordance with Specifications Section 013300 - Submittal Procedures.

##### **1.3 REFERENCES**

- A. American Society for Testing and Materials (ASTM), 100 Barr Harbor Drive, West Conshohocken, Pennsylvania 19428.
  - 1. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

#### **PART 2 - MATERIALS**

##### **2.1 WATER LINE LOCATION MARKERS**

- A. Utility markers for marking the water line location shall be installed at certain locations as determined by the Owner and/or the Engineer.
- B. Signs shall be fiberglass reinforced composite, 3.75-inches wide, 66-inches long, and blue in color. Signs shall have standard decals for visible identification of buried water line day or night.
- C. Utility markers shall be by Carsonite International, or approved equal.

##### **2.2 WATER VALVE SIGNS**

- A. Water valve signs shall consist of a aluminum sign panel mounted to a steel post:
  - 1. Panel size: 16-inch x 16-inch
  - 2. Panel material: ASTM B209, Alloy 5052 - H38 aluminum.
  - 3. Panel thickness: 0.080 inches.
  - 4. Engineering grade reflective sheeting.
  - 5. Lettering: "HOT SPRINGS WATER VALVE".
  - 6. Lettering size: 3-inches.
  - 7. Colors: Blue lettering on white background.
  - 8. Mounting post: 12 feet long, U-section channel, 2 pounds per foot, green enamel paint, all in accordance with AHTD Specifications.
  - 9. Mounting height: 7 feet to bottom of sign.

## 2.3 WATER LINE CROSSING SIGNS

- A. Water line crossing signs shall consist of a aluminum sign panel mounted to a steel post:
  - 1. Panel size: 16-inch x 16-inch
  - 2. Panel material: ASTM B 209, Alloy 5052 - H38 aluminum.
  - 3. Panel thickness: 0.080 inches.
  - 4. Engineering grade reflective sheeting.
  - 5. Lettering: "BWRPWA WATER LINE CROSSING".
  - 6. Lettering size: 3-inches.
  - 7. Colors: Blue lettering on white background.
  - 8. Mounting post: 12 feet long, U-section channel, 2 pounds per foot, green enamel paint, all in accordance with AHTD Specifications.
  - 9. Mounting height: 7 feet to bottom of sign.

## 2.3 INSTALLATION LOCATIONS

- A. Water Line Location Markers:
  - 1. One (1) marker installed every 1,000 linear feet along the water line route.
  - 2. Final location to be determined by the Engineer during construction.
- B. Water Valve Signs:
  - 1. One (1) sign installed at each existing gate valve.
  - 2. One (1) sign installed at each proposed gate valve.
  - 3. One (1) sign installed at each air release valve.
- C. Water Line Crossing Signs:
  - 1. One (1) sign installed on each side of roadway crossing.
    - a. Cozy Acres Road in 3 places
  - 2. One (1) sign installed on each side of encased highway crossings:
    - a. Not applicable

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install markers in accordance with manufacturer's recommendations.
- B. Install signs in concrete footing.
- C. Install signs facing roadway.

END OF SECTION

## SECTION 331002

### STEEL PIPE

#### PART 1 - GENERAL

##### 1.1 DESCRIPTION

- A. Scope of Work: Provide and install steel pipe of the sizes and pressure classes in the locations shown on the Plans and as specified herein.

##### 1.2 QUALITY ASSURANCE

- A. Commercial Standards: Unless otherwise stated, the latest edition for any commercial standards and all manufacturing tolerances referenced therein shall apply.
  - 1. ANSI/AWS D1.1 Structural Welding Code- Steel
  - 2. ANSI/AWS B2.1 Specification for Welding Procedure and Performance Qualification
  - 3. ANSI/AWWA C200 Steel Water Pipe—6 In. and Larger
  - 4. ANSI/AWWA C205 Cement-Mortar Protective Lining and Coating for Steel Water Pipe – 4 In. and Larger- Shop Applied
  - 5. ANSI/AWWA C206 Field Welding of Steel Water Pipe
  - 6. ANSI/AWWA C207 Steel Pipe Flanges for Waterworks Service—Sizes 4 In. Through 144 In.
  - 7. ANSI/AWWA C208 Dimensions for Fabricated Steel Water Pipe Fittings
  - 8. ANSI/AWWA C216 Heat-Shrinkable Cross-Linked Polyolefin Coatings for the Exterior of Special Sections, Connections, and Fitting
  - 9. ANSI/AWWA C222 Polyurethane Coatings for the Interior and Exterior of Steel Water Pipe and Fittings
  - 10. ASME Section IX International Boiler & Pressure Vessel Code: Welding and Brazing Qualifications
  - 11. AWWA M11 Steel Water Pipe: A Guide for Design and Installation
  - 12. SSPC-PA 2 Systems and Specifications SSPC Painting Manual, Volume 2 Chapter 7: Measurement of Dry Coating Thickness with Magnetic Gages

##### 1.3 QUALIFICATIONS

- A. Steel Plate Fabricators Association (SPFA) Certification or ISO 9001:2000.
- B. Demonstrate current production capability for volume of work required for this project.
- C. Manufacturer must have 10 years of experience in the manufacture of AWWA C200 steel pipe.
- D. All steel pipe shall be manufactured in the USA.
- E. Experience for the successful pipe manufacturer shall include successful manufacture of at least 100,000 lineal feet of 42 inch diameter or larger pipe, with wall thickness of 0.188 inches or greater, within the past ten years with the type of joint specified and shall have been manufactured in the United States to AWWA C200, lined with cement mortar in accordance with AWWA C205, and coated with either tape in accordance with AWWA C214 or polyurethane in accordance with AWWA C222. Experience in manufacturing pipe to standards other than AWWA C200 shall not apply. Lining and coating shall be applied by the same company that is manufacturing the pipe.
- F. Successful manufacturing experience required in 1.3.C above shall be of the same pipe fabrication process (straight-seam or spiral-seam) as will be used for the bidding project.

- G. When the SUPPLIER employs fabrication subcontractors, the SUPPLIER will be responsible for all aspects of outsourcing, submittals, drawings, etc. All submittal drawings, regardless of origin, shall be provided in an identical format. SUPPLIER shall be responsible for any additional inspection costs of fabrication subcontractor, and will assure work is performed in full conformance to the project specifications. Fabrication subcontractor(s) must be Steel Plate Fabricators Association (SPFA) Certified.
- H. SUPPLIER shall be responsible for compiling their own design calculations, details, and layout as part of the submittal process. The required submittals shall not be performed by a 3rd party but by direct staff of the Supplier. The submittal process must be overseen by a Professional Engineer (P.E.) employed by the Manufacturer.
- I. Qualified Steel Pipe Manufacturers shall be:
  - 1. American Spiral Weld Pipe Company
  - 2. Northwest Pipe Company
  - 3. Thompson Pressure Pipe

#### 1.4 SUBMITTALS

- A. Shop Drawings
  - 1. Drawings shall be submitted to the Engineer for approval and shall include the following:
    - a. Pipeline layout showing stations and elevations.
    - b. Details of standard pipe, joints, specials and fittings.
    - c. Thickness of steel pipe wall, lining, and coating.
    - d. Information regarding bracing and shipping packaging.
    - e. A listing of welder certifications and qualifications.
- B. Design
  - 1. Calculations for pipe design and fittings reinforcement and/or test data.
  - 2. Details of joint bonding and field welded joint restraint calculations.
- C. Certifications
  - 1. The Contractor shall furnish a certified affidavit of compliance that meets or exceeds the requirements of these specifications for all pipe and fittings furnished.
  - 2. Linings for potable piping shall be NSF certified.

#### 1.5 VERIFICATION

- A. Inspections
  - 1. All pipe shall be subject to inspection at the place of manufacture in accordance with the provisions of AWWA C200 and AWWA coating and lining standard as supplemented by the requirements herein.
  - 2. The Contractor shall inspect pipe and specials before and after unloading. Any pipe or special that shows dents or kinks will be rejected. Any rejected materials will be repaired or replaced by the manufacturer in accordance with AWWA C200 and M11 at no cost to the Owner.

B. Tests

1. Except as modified herein, all materials used in the manufacture of the pipe shall be tested in accordance with the requirements of AWWA C200 and AWWA coating and lining standards.
2. The Contractor shall perform required tests at no additional cost to the Owner. The Engineer shall have the right to witness all testing conducted by the Contractor.

C. Welding Requirements

1. All welding procedures used to fabricate pipe shall be qualified under the provision of AWS D1.1 or ASME Section IX.

D. Welder Qualifications

1. Skilled welders, welding operators, and tackers who have had adequate experience in the methods and materials to be used shall do all welding. Welders shall maintain current qualifications under the provisions of AWS D1.1 or ASME Section IX. Machines and electrodes similar to those in the work shall be used in qualification tests. The Contractor shall furnish all material and bear the expense of qualifying welders

1.6 HANDLING, STORAGE AND SHIPPING

- A. Pipe shall be studded as required to maintain roundness of +/- 1% during shipping and handling.
- B. Coated pipe shall be shipped on padded bunks with nylon belt tie-down straps or padded banding located approximately over bracing.
- C. Coated pipe shall be stored on padded skids, sand or dirt berms, sand bags, old tires or other suitable means so that coating will not be damaged.
- D. Coated pipe shall be handled with wide belt slings. Chains, cables or other equipment likely to cause damage to the pipe or coating shall not be used.
- E. Prior to shipment, dielectrically coated pipe shall be visually inspected for damage to the coating by the following procedure:
  1. When visual inspection shows a dielectric coating system has sustained physical damage, the area in question shall be subjected to an electrical holiday test. Voltage shall be per AWWA C222.
  2. When the area is tested and there are no holidays, the area shall be noted "OK" and shipped with no patching required.
  3. When the damaged area does show damage going clear to the steel from either a visual inspection or a jeep from a holiday detector, the area shall be repaired in accordance with Section 2.02 of these specifications and per manufacturer's recommendations.

1.7 MARKINGS

- A. The Contractor shall legibly mark all pipes and specials in accordance with the laying schedule and marking diagram. Each pipe shall be numbered in sequence and said number shall appear on the laying schedule and marking diagram in its proper location for installation. All special pipe sections and fittings shall be marked at each end with top field centerline. The word "top" or other suitable markings shall be painted or marked on the outside top spigot end of each special pipe section and fitting.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

#### A. Pipe

1. Steel pipe shall conform to AWWA C200. Steel plate used in the manufacture and fabrication of steel pipe shall meet the requirements of AWWA C200. All longitudinal and girth seams, whether straight or spiral, shall be butt-welded using an approved electric-fusion-weld process.
2. Pipe design shall be in accordance with AWWA M11 and AWWA C200.
3. Unless otherwise shown on the plans, pipe shall be designed for 175 psi working pressure with an additional 87.5 psi allowance for surge.
4. The steel cylinder thickness shall be not less than the diameter divided by 240. Standard AWWA C200 thickness tolerances will be allowed.
5. Pipe shall be designed for the cover conditions as shown on the plans. Modulus of soil reaction ( $E'$ ) values to be used for design shall be taken from the following table:

<u>Depth of Cover</u>	<u><math>E'</math></u>
2 to 10 feet	1000 psi
10 to 15 feet	1200 psi
15 to 20 feet	1300 psi

6. The allowable design deflection shall be 3% of the pipe nominal inside diameter.
7. Pipe shall be designed for HS-20 live loading for piping installed in roads.
8. Pipe shall be bedded and backfilled per the Plan details.
9. Pipe shall be furnished principally in 40 to 50-foot net laying lengths with shorter lengths, field trim pieces and closure pieces as required by Plan and profile for location of elbows, tees, reducers and other in-line fittings. Or as required for construction. The pipe fabricator shall prepare a pipe laying schedule showing the location of each piece by mark number with station and invert elevation at each bell end.
10. The maximum circumferential stress shall be limited to 50% of the minimum yield strength at working pressure and 75% at the greater of working pressure plus transient allowance, or test pressure.
11. All steel pipe shall be designed and manufactured to have a minimum finished inside diameter inclusive of lining according to the following table:

NOMINAL DIAMETER (Inches)	MINIMUM INSIDE DIAMETER (Inches)
36	36.00
42	42.00
48	48.00

12. Pipe shall be lined and coated in accordance with part 2.2 of this Section.



B. Fittings

1. Unless otherwise shown on the Plans, all specials and fittings shall conform to the dimensions of AWWA C208. Pipe material used in fittings shall be of the same material and pressure class as the adjoining pipe. The minimum radius of elbows shall be 2 ½ times the pipe diameter and the maximum miter angle on each section of the elbow shall not exceed 11 ¼-degrees (one cut elbow up to 22 ½-degrees). If elbow radius is less than 2 ½ times the pipe diameter, stresses shall be checked per AWWA M-11 and the pressure class increased if necessary.
2. Fittings shall be equal in pressure class design as the adjoining pipe. Specials and fittings, unless otherwise shown on the Plans, shall be made of segmental welded sections from hydrostatically tested pipe, with ends compatible with the type of joint or coupling specified for the pipe. All welds made after hydrostatic testing of the straight sections of pipe shall be tested per the requirements of AWWA C200 Section 5.2.2.1.

C. Joints

1. Lap Weld

- a. Lap weld joints shall conform to AWWA C200 and as shown in Chapter 8 of AWWA M11.
- b. Lap field welded joints shall be used where restrained joints are required or indicated on the Plans. The standard bell shall provide for a 2 ½-inch lap. The minimum lap shall be 1-inch. The design maximum joint deflection or offset shall be a 1-inch joint pull.
- c. Lap welded joints shall be welded externally or internally. Holdbacks for coating and linings shall be provided as shown on the approved shop drawings. "Weld-after-backfill" of interior welds may be performed any time after joint completion and backfilling has been completed

2. Mechanical Couplings

- a. Mechanical couplings where indicated on the Plans shall be Smith Blair Style 411, Baker Style 200, Victaulic Depend-O-Loc or equal.
- b. Insulating mechanical couplings where indicated on the Plans shall be double insulated Smith Blair Style 416, Baker Style 216, or equal for working pressures up to 150 psi only.
- c. Couplings for buried service shall have all metal parts painted with polyurethane paint and conform to AWWA C222.
- d. Pipe ends for mechanical couplings shall conform to AWWA C200 and M11. The shop applied outside coating shall be held back as required for field assembly of the mechanical coupling or to the harness lugs or rings. Harness lugs or rings and pipe ends shall be painted with one shop coat of polyurethane conforming to AWWA C222.
- e. Pipe for use with sleeve-type couplings shall have plain ends at right angles to the axis.

3. Flanges

- a. Flanges shall be in accordance with AWWA C207 Class D for operating pressures to 175 psi on 4-inch through 12-inch diameter, and operating pressures to 150 psi on diameters over 12-inches.
- b. Flanges shall be AWWA C207 Class E for operating pressures over 150 psi to 275 psi or shall be AWWA C207 Class F for pressures to 300 psi (drilling matches ANSI B 16.5 Class 250).

- c. Shop lining and coating shall be continuous to the end of the pipe or back of the flange. Flange faces shall be shop coated with a soluble rust preventive compound.
  - d. Gaskets shall be full face, 1/8-inch thick, cloth-inserted rubber, Garlock 3000, John Crane Co. Style 777 or equal.
- 4. Bolts and Nuts for Flanges
  - a. Bolts for flanges shall be carbon steel, ASTM A 307, Grade B for Class B and D flanges and nuts shall be ASTM A 563, Grade A heavy hex. Bolts for Class E and F flanges shall be ASTM A 193, Grade B7 and nuts shall be ASTM A 194, Grade 2H heavy hex.
  - b. Bolts shall extend a minimum of three threads past the nut.
- 5. All unwelded pipe joints shall be bonded for electrical continuity in accordance with the Pipe Manufacturer's recommendations unless otherwise specified in the Plans.

## 2.2 LININGS AND COATINGS

### A. Cement-mortar lining

- 1. Interior surface of all steel pipe, fittings and specials shall be lined in the shop with cement-mortar lining applied centrifugally in conformity with AWWA C205.
- 2. Holdbacks shall be left bare and be provided as shown on the approved shop drawings. Holdbacks shall be filled with cement mortar after joint completion per AWWA C205.
- 3. Defective linings as identified in AWWA C205 shall be removed from the pipe wall and shall be replaced to the full thickness required. Defective linings shall be cut back to a square shoulder in order to avoid feather edged joints.
- 4. Fittings shall be cement-mortar lined per AWWA C205. Pipe and fittings too small to cement-mortar line may be lined with AWWA C222 polyurethane.
- 5. Cement-mortar lining shall be kept moist during storage and shipping. The Contractor shall provide a polyethylene or other suitable bulkhead on the ends of the pipe and on all special openings to prevent drying out the lining. All bulkheads shall be substantial enough to remain intact during shipping and storage until the pipe is installed.
- 6. Lining thickness shall conform to AWWA C205.

### B. Polyurethane Coating

- 1. Polyurethane coating shall be per AWWA C222 to a minimum thickness of 25 mils, measured in accordance with SSPC-PA 2. Coating shall be continuous to the ends of the pipe except where field welding is indicated. Exterior field joints shall be completed utilizing heat-shrink sleeves per AWWA C216.
- 2. Coating repairs shall be per AWWA C222 and paint manufacturer's recommendations

## PART 3 - EXECUTION

### 3.1 Installation

- A. The Contractor shall provide and install all required piping and accessories in accordance with the contract documents and manufacturer's recommendations. Pipe installation as specified in this section supplements AWWA M11.
- B. Installing Buried Piping

1. Handle pipe in a manner to avoid any damage to the pipe. Do not drop or roll pipe into trenches under any circumstances.
2. Inspect each pipe and fitting before lowering into the trench. Inspect the interior and exterior protective coatings. Repair damaged areas in the field in accordance with Section 2.02. Clean ends of pipe thoroughly. Remove foreign matter and dirt from inside of pipe and keep clean during and after laying.
3. Grade the bottom of the trench and place a 4-inch minimum layer of select or scarified material under the pipe. Before laying each section the pipe, check the grade and correct any irregularities found. The trench bottom shall form a uniform bearing and support for the pipe.
4. At the location of each joint, dig bell (joint) holes in the bottom of the trench and at the sides to permit completion and visual inspection of the entire joint.
5. Keep the trench in a dewatered condition during pipe laying.
6. When the pipe laying is not in progress, including the noon hours, close the open ends of the pipe. Do not permit trench water, animals, or foreign objects to enter the pipe.

C. Joints Assembly

1. Lap Field Welded Joints

- a. Clean exposed end of joint surfaces.
- b. Provide a minimum overlap of 1-inch at any location around the joint circumference.
- c. Field welders and field weld procedures shall be certified in accordance with AWS D1.
- d. Provide a full fillet weld per AWWA C206 on the inside or outside of the pipe. Inside welding may be performed after backfilling in accordance with manufacturer's recommendations.
- e. Testing of field welds shall be in accordance with AWWA C206.
- f. Grout the interior of the joints with cement-mortar per AWWA C205. Complete the exterior of the joints with heat-shrink sleeve per AWWA C216 and manufacturer's recommendations.

2. Flanged Joints

- a. Bolt holes of flanges shall straddle the horizontal and vertical centerlines of the pipe. Clean flanges by wire brushing before installing flanged fittings. Clean flange bolts and nuts by wire brushing; lubricate bolts with graphite or oil.
- b. Insert the nuts and bolts (or studs), finger tighten, and progressively tighten diametrically opposite bolts uniformly around the flange to the proper tension.
- c. Execute care when tightening joints to prevent undue strain upon valves, pumps and other equipment.
- d. If flanges leak under pressure testing, loosen or remove the nuts and bolts, reset or replace the gasket, reinstall or re-tighten the bolts and nuts, and retest the joints.

3.2 Field Quality Control

- A. Perform hydrostatic pressure test in the presence of the Engineer in accordance with Section 331400. Field test pressure should not exceed 120% of the pipes rated pressure class as measured at the lowest elevation for the section being tested. Leakage allowance shall be per AWWA M11 Chapter 12.

- B. Provide all necessary piping between the reach being tested and the water supply, together with all required materials and equipment.
- C. Provide dished heads, blind flange or bulkheads as necessary to isolate and test pipeline.
- D. Methods and scheduling of tests to be approved by the Engineer.
- E. Protect pipes and provide thrust restraint as required to complete test.
- F. Provide for proper legal disposal of test water.

**END OF SECTION**

## SECTION 331113

### WATER PIPE AND FITTINGS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. This specification includes Ductile iron and PVC water pipeline, valves, valve boxes, blocking, fittings, and other appurtenances, outside building limits.

##### 1.2 REFERENCES

- A. City of Hot Springs Engineering Standard Specifications and standard terms and conditions for Water and Wastewater Projects.
  - 1. All products and executed work must meet or exceed the City of Hot Springs Standard Specifications, except as modified or augmented herein.
- B. Ductile Iron Pipe Research Association (DIPRA), Birmingham, AL
  - 1. Handbook of Ductile Iron Pipe, Sixth Edition
- C. American Society for Testing and Materials (ASTM), Philadelphia, PA
  - 1. ASTM A53 - Pipe, Steel, Black and Hot Dipped, Zinc-Coated Welded and Seamless.
  - 2. ASTM A126 - Gray Iron Castings for Valves, Flanges and Pipe Fittings.
  - 3. ASTM A307 - Carbon Steel Bolts and Studs 60,000 psi Tensile.
  - 4. ASTM A536 - Ductile Iron Castings.
  - 5. ASTM D1784 - Rigid Polyvinyl Chloride (PVC) Compounds and Chlorinated Polyvinyl Chloride (CPVC) Compounds.
  - 6. ASTM D1785 - PVC Plastic Pipe, Schedules 40, 80, and 120.153
  - 7. ASTM D2241 - PVC Plastic Pipe (SDR-PR).
  - 8. ASTM D2466 - PVC Plastic Pipe Fittings, Schedule 40.
  - 9. ASTM D2564 - Solvent Cement for PVC Plastic Pipe and Fittings.
  - 10. ASTM D2737 - Polyethylene (PE) Plastic Tubing.
  - 11. ASTM D2855 - Making Solvent-Cemented Joints with PVC Pipe and Fittings.
  - 12. ASTM D3139 - Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
  - 13. ASTM F477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
- D. American Water Works Association (AWWA)
  - 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
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 PVC Pressure Pipe, 4 Inch through 12 Inch
18. AWWA C905 - Standard for PVC Water Transmission Pipe, Nominal Diameters 14 Inch through 36 Inch.

E. American Welding Society

1. AWS D11.2 Guide for Welding Iron Casting

F. 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

### 1.3 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Shop Drawings: The Contractor 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.
- C. Certificate of Compliance: Submit Certificates of Compliance attesting that materials provided are in compliance with referenced standards.
- D. Contract Closeout Submittals: Submit documents in accordance with Section 01700. Accurately record installed location of valves, piping, and accessories.

### 1.4 QUALITY ASSURANCE

- A. Water line installation shall be in accordance with manufacturer's recommendations and as supplemented by these Specifications.
- B. Pipe shall be kept clean of all foreign matter.
  1. At temporary termination of pipe laying, provide suitable cover to close open end until burying operations are resumed.
- C. Jointing shall be by trained employees

## PART 2 - PRODUCTS

### 2.1 STEEL PIPE

- A. Steel pipe for water transmission pipeline must comply with requirements in Section 331102.

### 2.2 DUCTILE IRON PIPE

- A. General: Ductile iron pipe (DIP) shall conform to AWWA C151, subject to the following supplemental requirements. The pipe shall be of the diameter and class shown, shall be furnished complete with rubber gaskets as indicated in the Contract Documents, and all specials and fittings shall be provided as required under the Contract Documents.
- B. All Ductile Iron Pipe shall be manufactured in an ISO 9001 Certified Plant. Contractor shall provide documentation from the Pipe and Fitting Manufacturer of ISO 9001 Certification prior to ordering Ductile Iron Pipe and Fittings.
- 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-foot depth of cover at 120 pounds 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 percent of the pipe diameter.
  - 4. The pipe trench, per AWWA C150, for design purposes shall be:
    - a. 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 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.
- E. Polyethylene Encasement: All ductile iron pipe shall be installed with polyethylene encasement in accordance with AWWA C105.
- F. Pipe Class: All pipe shall have a minimum pressure rating as indicated below, or higher ratings as indicated on the drawings.

<u>Pipe Sizes (inch)</u>	<u>Pressure Class (psi)</u>
4-12	350
14-20	250
24	200
30-64	150

- G. Joint Design: Ductile iron pipe and fittings shall be furnished with push-on joints, mechanical joints (MJ), or flanged joints as detailed on the Drawings.

1. Push-on Joints: Any ductile iron pipe joint not specifically noted on the Drawings to be otherwise shall be considered to be push-on joint. 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"B30" Fastite pipe (or equal) shall be 5 degrees.
2. 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.
3. 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.

H. 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. In addition to complying with AWWA C104, the linings shall also comply with the following additional requirements:
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:

<u>Nominal Pipe Diameter</u>	<u>Minimum Lining Thickness</u>
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.
6. ~~Exception: Ductile iron pipe used for the filter backwash air piping from the air blower to the filters in the water treatment plant shall be unlined.~~

I. Exterior Coating:



1. All buried and below-floor DIP shall be furnished and installed with standard asphaltic coating one mil thick in accordance with AWWAC151, AWWA C110 and AWWA C153.
2. All ductile iron pipe that will not be buried or encased in concrete shall have a shop applied primer. Primer shall be a bluish-grey color, single component moisture-cured urethane containing among other ingredients, micaceous iron oxide (MIO) pigments and zinc. Primer shall be specifically formulated and evaluated for use on ductile iron pipe and fittings, suitable for immersed and non-immersed applications. The primer must be compatible with acrylic, coal tar, catalyzed epoxy, polyurethane, moisture-cure urethane and asphalt-based topcoats. The shop applied primer shall be MC-FerroCladJ Primer, manufactured by Wasser High Tech Coatings, Tnemec Series 1 Omnithane, or approved equal.
  - a. Surface Preparation & Application: Follow carefully manufacturer=s published surface preparation requirements for ductile iron pipe. Primer shall be applied per manufacturer=s recommendations to achieve a minimum dry film thickness of 3.5 mils as measured per Steel Structures Painting Council SSPC-PA2, Paint Application Specification No. 2, Measurement of Dry Paint Thickness with Magnetic Gages.

## 2.3 DUCTILE IRON FITTINGS

- A. General: Fittings shall be ductile iron in accordance with AWWA C153, latest revisions.
- B. All Ductile Iron Fittings shall be manufactured in an ISO 9001 Certified Plant. Contractor shall provide documentation from the Pipe and Fitting Manufacturer of ISO 9001 Certification prior to ordering Ductile Iron Pipe and Fittings.
- C. Cement Lining: Fittings shall be internally lined with cement mortar and internally lined with one mil asphaltic seal coat in accordance with AWWA C104. The cement lining thicknesses shall be equal to or greater than those for comparable size pipe.
- D. Fittings shall have distinctly cast on them the manufacturer's identification, pressure rating, nominal diameter of openings, and the number of degrees or fraction of the circle on bends.
- E. Flanged Fittings: Flange fittings shall be ductile iron in accordance with AWWA C110 or AWWA C153, 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. Bolts, gaskets and installation shall be in accordance with AWWA C110 or AWWA C115, Appendix A. Flanged gaskets for all water applications shall be NSF 61 certified 1/8" thick Toruseal7 gaskets as manufactured by American Ductile Iron Pipe. Gaskets shall be full face NSF 61 certified Toruseal7 design. ~~Flange gaskets for the filter backwash air piping from the air blower to the filters in the water treatment plant shall be high temperature Ethylene Propylene Diene Monomer (EPDM) material or equal.~~ Gaskets for flanged ductile iron pipe fittings 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 C110 or AWWA C153, no raised face flanges.
- F. Fittings 2 Inches and 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.
- G. Exterior Coating:

1. All buried and below-floor DIP fittings shall be furnished and installed with standard asphaltic coating one mil thick in accordance with AWWAC151, AWWA C110 and AWWA C153.
2. All ductile iron pipe fittings that will not be buried or encased in concrete shall have a shop applied primer. Primer shall be a bluish-grey color, single component moisture-cured urethane containing among other ingredients, micaceous iron oxide (MIO) pigments and zinc. Primer shall be specifically formulated and evaluated for use on ductile iron pipe and fittings, suitable for immersed and non-immersed applications. The primer must be compatible with acrylic, coal tar, catalyzed epoxy, polyurethane, moisture-cure urethane and asphalt-based topcoats. The shop applied primer shall be MC-FerroClad Primer, manufactured by Wasser High Tech Coatings or approved equal.
  - a. Surface Preparation & Application: Follow carefully manufacturer=s published surface preparation requirements for ductile iron pipe. Primer shall be applied per manufacturer=s recommendations to achieve a minimum dry film thickness of 3.5 mils as measured per Steel Structures Painting Council SSPC-PA2, Paint Application Specification No. 2, Measurement of Dry Paint Thickness with Magnetic Gages.

#### 2.4 PVC PIPE

- A. All schedule 40 and schedule 80 PVC pipe shall conform to ASTM D-1785, latest revision
- B. All Schedule 40 fittings shall be pressure fittings and shall conform to ASTM D-2446 and ANSI B1.20.1 (as appropriate)
- C. All PVC Schedule 80 fittings shall be pressure fittings and shall conform to ASTM D-2464/D-2467/ANSI B1.20.1, latest revision.
- D. Solvent cement used for PVC socket fittings shall conform to ASTM D-2564, latest revision.
- E. Solvent shall not be used on threaded connections.
- F. All PVC pipe conveying chemicals shall be Schedule 80.

#### 2.5 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 MEGALUG7 restraints by EBAA Iron of Eastland, Texas. or equal.

#### 2.6 LOCATING TAPE

- A. Terra Tape "Extra Stretch", or equal.
- B. Blue in color and including the words AWater Line Below@ in black print.

#### 2.7 TRACE WIRE

- A. 14-gauge insulated copper.
- B. Fittings, splice kits ,and accessories as required.
- C. Repair Kits shall be 3MJ Model DBY-6 or equal electrical direct bury splice kit.

- D. Trace wire splice caps and poles shall be Carsonite Model LCTSI508 and Model CTP307201 respectively.

## 2.8 TEMPORARY PIPE PLUGS

- A. Non-pressure polyethylene plugs with handles sized to fit bells or spigots or sizes 6" to 60" shall be Taylor Made Plastics or equal.

## PART 3 - EXECUTION

### 3.1 PIPE INSTALLATION

- A. Water line pipe shall be cut, made up, handled, and installed in accordance with the pipe manufacturer's recommendations. Do not place anything, such as forklift fork, inside pipe for the purpose of handling. Use only equipment recommended by the manufacturer or by DIPRA for safe handling of the pipe.
- B. Clean the socket and bell of the pipe or fitting. Make sure all recesses are cleaned of dirt. Use clean rags for this purpose.
- C. Press the gasket or special gasket into the socket using the technique recommended by the manufacturer. Make sure the metal carrying the retainer end of the gasket is seated completely and uniformly. Take care that no gasket loops or bulges protrude into the path of the pipe when it enters.
- D. Apply the lubricant to both the spigot end and to the gasket. Use a clean brush.
- E. With the pipe straightly aligned, bring the spigot end into the bell. Do not deflect the pipe at this time.
- F. Push the pipe spigot into the socket until it is home. At this time the joint may be deflected as needed but not more than two degrees. The assembly stripe should be visible just outside the bell.
- G. If the joint is incorrectly made disassemble it and correct the problem. Do not attempt to pressure test a joint that is improperly put together.
- H. Offset shall be as recommended by the manufacturer for the maximum temperature variation between time of installation and final use.
- I. Typically, the bell of the pipe shall be facing in the direction in which the pipe is laid. BELL UP.

### 3.2 THRUST BLOCKS

- A. Install 3,000 psi concrete thrust blocks at bends, wyes, or other thrust points on pressure piping such as behind tapping sleeves as required.
- B. Block to bear against undisturbed soil and shall be sized in the field based on actual field conditions such as estimated allowable soil bearing pressure and other information provided on the Drawings.
- C. Where directed by the Engineer the thrust block shall be formed in order to efficiently transfer the thrust forces to the soil and to conserve room in the trench or easement for future use.

### 3.3 SEPARATION FROM EXISTING UTILITIES

- A. Maintain 12 inches minimum vertical separation between water main and all existing utilities (except sewer).
- B. Maintain 18 inches minimum vertical separation (water over sewer) and 10 feet minimum horizontal separation between water main and existing sewer mains.
- C. If minimum separation distances cannot be maintained, construct water main from ductile iron pipe and provide steel encasement around water main using casing spacers inside and end seals.

### 3.4 LOCATING TAPE

- A. Shall be used on ALL pipe including ductile iron.
- B. Install 12 to 18 inches above the pipe as shown on Drawings.
- C. The tape shall be in addition to trace wire specified later for PVC pipe.

### 3.5 TRACE WIRE FOR PVC

- A. Typically used only on PVC pipe.
- B. Run wire continuous from valve box to valve box, meter box, air release vault, cleanout, or other access points.
- C. Bring wire up inside boxes and vaults in an accessible method.
- D. Bring wire around or tape wire to each pipe section.
- E. Pipe testing shall include trace wire.
- F. Wire breaks shall be repaired at no additional expense to the Owner.

### 3.6 KEEPING THE PIPE CLEAN

- A. Contractor shall keep pipe free from dirt, rocks, and other debris during construction.
- B. Contractor shall install a temporary plastic plug in open ends to prevent mud from washing into pipe.
- C. No pipe shall be left unattended with an open end. Always plug the open end with a suitable plug made or closely adapted for the purpose even during the lunch hour and more importantly overnight.

### 3.7 CLEANING THE PIPE

- A. Clean pipe per Section 331400: Hydrostatic Testing of Water Distribution System.

### 3.8 TESTING

- A. Pressure lines shall be hydrostatically tested at the pressures listed in Section 331400.
- B. Engineer and Owner shall observe and document tests.
- C. Use pipe-locating equipment to test continuity of trace wire.

### 3.9 FIELD REPAIRS

- A. In the event that testing reveals a leak either at the joint or anywhere in between field repairs shall utilize mechanical joint solid sleeves similar or equal to American Table 5-18 or 5-19 conforming to AWWA C153 and C110 respectively. Leaks originating with improperly installed or defective gaskets shall not be repaired with bell joint leaks clamps or other similar device. Leaks originating from a perforation in the pipe wall shall not be repaired with full circle clamps or similar. Instead the source of the leak shall be cut out and suitable length of new pipe inserted in place of the cut out section and then coupled together with the solid sleeves.

### 3.10 INSPECTION

- A. Construction of the water line will be inspected by the Engineer and the Owner. Do not cover any work without approval of Inspector. Work covered prior to inspection will be uncovered and reworked as required at Contractor=s expense.

**END OF SECTION**



## **SECTION 331216**

### **WATER VALVES AND APPURTENANCES**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. Furnish and install manually operated buried service valves, outside building limits.

##### **1.2 RELATED SECTIONS**

- A. Section 331100 - Water Pipe and Fittings.

##### **1.3 REFERENCES**

- A. American Water Works Association (AWWA), 6666 West Quincy Ave., Denver, CO 80235
  - 1. AWWA C207- Hydrated Lime for Masonry Purposes
  - 2. AWWA C500 - Gate Valves for Water and Sewerage Systems
  - 3. AWWA C501 - Sluice Gates
  - 4. AWWA C504 - Rubber-Seated Butterfly Valves
  - 5. AWWA C509 - Resilient-Seated Gate Valve for Water and Sewage Systems
  - 6. AWWA C512 - Test Method for Creep of Concrete in Compression
  - 7. AWWA C515 - Reduced Wall, Resilient-Seated Gate Valves for Water Supply Service
  - 8. AWWA C550 - Protective Interior Coatings for Valves and Hydrants
- B. American Society for Testing and Materials (ASTM), 100 Barr Harbor Drive, West Conshohocken, PA 19428
  - 1. ASTM A126 - Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
  - 2. ASTM B61 - Steam of Valve Bronze Castings.
- C. National Sanitation Foundation (NSF), 789 N. Dixboro Road Ann Arbor, MI 48105
  - 1. NSF Standard 61 - Drinking Water System Components - Health Effects
- D. Steel Structure Painting Council (SSPC), 800 Trumbull Drive, Pittsburgh, PA 15205
  - 1. SSPC-SP10 - Near White Blast Cleaning

##### **1.4 SUBMITTALS**

- A. Submit under the provisions of Specifications Section 013300 - Submittal Procedures.
- B. Product Data
  - 1. Listing of valve material and manufacturers
  - 2. Manufacturer=s certificates for conformance to specified standards.
  - 3. Manufacturer=s standard installation instructions.

- C. Certificate of Compliance: Submit Certificates of Compliance attesting that materials provided are in compliance with referenced standards. Submit certificate that valve has been subjected to hydrostatic testing and meets specified level of performance per the standard.

## **PART 2 - PRODUCTS**

### **2.1 GENERAL**

- A. Items specified shall be the end products of one manufacturer in order to achieve standardization for operation, maintenance, spare parts, and manufacturer's services.
- B. Valves to be complete and arrive at job site assembled with all necessary operators, valve boxes, extension stems, operating nuts, etc., required for proper completion of the work.
- C. Valves of equal quality by other manufacturers will be considered in accordance with the General Conditions.
- D. Renewable parts including discs, packing, and seats shall be of types recommended by valve manufacturer for intended service.
- E. Units shall have name of manufacturer and size of valve cast on the body or bonnet or shown on a permanently attached plate in raised letters.

### **2.2 DESIGN FEATURES**

- A. Brass and bronze components of valves and appurtenances which have surfaces in contact with the water shall be alloys containing less than 16 percent zinc and 2 percent aluminum.
- B. Stainless steel Alloy 18-8 may be substituted for bronze with the approval of the Engineer.
- C. Generally, where there is a design standard prepared by the American Water Works Association (AWWA) the valve shall meet that standard.

### **2.3 VALVE OPERATORS**

- A. Open by turning counterclockwise.
- B. Worm and gear operators to be of totally enclosed design, so proportioned as to permit operation of the valve under full operating head with a maximum pull of 40 pounds on the operator.
- C. Self-locking type to prevent the disc or plug from creeping.
- D. Self-locking worm gears to be a one-piece design of gear bronze material, accurately machine cut.
- E. Worm to be hardened alloy steel with thread ground and polished.
- F. Reduction gearing to run in a proper lubricant.
- G. Provide gear operators with position indicators, where specified, to show the position of the valve disc or plug.



- H. Buried valves to have 2-inch x 2-inch square operating nut.

## 2.4 GATE VALVES

- A. Shall meet or exceeds all applicable requirements of ANSI/AWWA C515 Standard, UL Listed, FM Approved, and certified to ANSI/NSF 61.
- B. Gate valves shall be designed for working pressures not less than 250 psi.
- C. Gate valves shall have O-ring stem seals.
- D. 2-inch square wrench nut. Valve shall open when the nut is turned to the left.
- E. All buried gate valves shall have mechanical joint (MJ) ends unless otherwise noted on the Drawings and shall be furnished with full joint accessories. Buried gate valves shall be non-rising stem with standard 2-inch operating nut.
- F. All interior and exterior ferrous surfaces of the valve body and bonnet shall be coated with a fusion-bonded epoxy coating, 8 mils D.F.T., complying with ANSI/AWWA C550.
- G. Approved manufacturers:
  - 1. Mueller Company, Decatur, Illinois
  - 2. Clow Corporation, Oskaloosa, Iowa
  - 3. American Flow Control, Birmingham, AL

## 2.5 EXTENSION STEMS FOR VALVE OPERATORS

- A. Where the depth of the valve is such that its centerline is more than 4 feet below grade, provide operating extension stems to bring the operating nut to a point 6 inches below the surface of the ground and/or box cover.
- B. Constructed of steel.
- C. Complete with 2-inch square operating nut.
- D. Bolt to valve stem to prevent separation.

## 2.6 VALVE BOXES

- A. All buried gate valves shall be provided with cast iron valve boxes with cast iron lids.
- B. Valve boxes shall be the screw type suitable for the depth of bury as required.
- C. Valve boxes shall have 5-1/4 inch shaft.
- D. Valve boxes for valves on the water line shall have the word "WATER" cast into the top of the lid.
- E. Round precast concrete collars shall be provided for all valve boxes as detailed on the Drawings.
- F. Support valve boxes with concrete blocks so that no weight exerted on the valve box will be transmitted to the valve.
- G. Boxes shall be as by Tyler, Mueller, or approved equal.

- H. Valve boxes for 2 inch and smaller valves shall be large flanged base type.

## 2.7 AIR RELEASE VALVE

- A. Air release valve shall adhere to AWWA C512 standards.
- B. Air and vacuum valves shall be fully automatic float operated valves designed to exhaust large quantities of air during the filling of the piping system and close upon liquid entry. The valve shall re-open during draining or if a negative pressure occurs.
- C. The valve body shall be constructed of NSF 61 Certified Reinforced Nylon.
- D. The internal parts shall be constructed of stainless steel and NSF 61 Certified Reinforced Nylon.
- E. The valves shall have a 2-inch NPT inlet size and a 1½-inch NTP outlet size, and shall be D-040 Series Combination Air Valve by A.R.I., or approved equal.

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. Joints shall be watertight at test pressures before acceptance.

### 3.2 VALVE INSTALLATION

- A. All valves shall be set with operating stems in a true vertical position. Bottom of valve shall bear upon firm, undisturbed material. All valve boxes shall be adjusted such that the top of the valve box is flush with adjacent ground contours or street surfacing. Contractor will readjust valve boxes as required to compensate for any settlement.
- B. Buried valves shall have bolts protected by wrapping in polyethylene material.
- C. Upon the conclusion of the work, and after the system has been disinfected and activated, Contractor will be required to inspect every valve, apply a valve wrench, and ascertain that the valve is in the fully open position. Valve boxes will be left true and vertical. Valve boxes will be cleaned of all debris.
- D. Round precast concrete collars shall be provided for all valve boxes as detailed on the Drawings.

### 3.3 ACCESS

- A. Location of valves shall be as required to provide accessibility for control and maintenance.

### 3.4 TESTING

- A. General: It is the intention that all valves used in this contract be tested in the manufacturer's plant before shipping. This is in accordance with the AWWA standards. The manufacturer will follow the procedures outlined in the standard (or in conformance with ASME, ANSI or other recognized standards producing body). The Contractor shall be responsible for conveying this requirement to the Manufacturer.

- B. The manufacturer will test each and every valve used in this contract before it leaves the factory where it was built. The valves shall be subjected to the test procedures stated in the AWWA or other applicable standard. If the valve fails to meet the requirements of the test it shall be re-worked, overhauled or otherwise repaired and or replaced until a valve passing the test is produced. The passing valve shall be shipped bound together with the test certificate enclosed in a packing envelope. The valve shall be clearly marked with serial number or other identifying mark which shall match the test certificate. The test certificate shall document the name of the standard to which the valve was held, the name of the test to which the valve was subjected, the numerical value or criteria which represents the threshold between passing and failing the test, and then the actual value which was obtained from the test of this valve.
- C. If requested by the Engineer, the valve manufacturer shall furnish an affidavit stating the materials options furnished and/or that he has complied with these and other referenced Specifications.

END OF SECTION



## **SECTION 331400**

### **HYDROSTATIC TESTING OF WATER DISTRIBUTION SYSTEM**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. This Section covers testing of the water piping and appurtenances.

#### **PART 2 - PRODUCTS**

##### **2.1 WATER FOR HYDROSTATIC TESTING OF WATER LINES**

- A. Furnish water from the nearest hydrant or other suitable source for flushing and testing purposes. Coordinate with owner of source, backflow prevention, and meter.
- B. The Owner will supply water for the initial test procedure. The Contractor will be responsible for all water costs and fees associated with re-testing a water line in the event a water line does not pass the initial hydrostatic test procedure.

#### **PART 3 - EXECUTION**

##### **3.1 HYDROSTATIC AND LEAK TESTING OF PRESSURE LINES**

- A. All water lines shall be subjected to a pressure and leakage test after installation and completion of backfill.
- B. Engineer and/or Owner shall observe and document tests
- C. Hydrostatic testing for ductile iron pipe and steel pipe shall be conducted separately.
- D. Generally, follow AWWA Standards C200, C600, C604, and M11 (except where otherwise directed) which each contain sections or articles governing the execution of pressure testing.
- E. Owner shall provide all reasonable amounts of water for test purposes without charge to Contractor. Pump suction and vessel shall prevent contamination of the water supply and shall be approved by Engineer.
- F. Open interior valves, including fire hydrants and other appurtenances, during tests.
- G. Provide water into pipeline for testing and flushing, including necessary:
  - 1. Pumps, gages (increment at 10 psi or less), and meters.
  - 2. Plugs and caps.
  - 3. Temporary blowoff piping to discharge water.
  - 4. Reaction blocking to prevent pipe movement during testing.
- H. Filling and Venting:
  - 1. Contractor shall fill piping with water at a controlled rate so as to avoid surging, and all air shall be expelled from the piping. If necessary, to properly expel air prior to test Contractor shall tap the water line at high points with corporation stops.
  - 2. Pipe shall be filled for at least 24 hours prior to testing.

- I. While the pipe being tested is under pressure, it shall be walked to check for leakage appearing at the surface of the ground or from any exposed appurtenances. Contractor shall repair all visible leaks regardless of the amount of leakage. Retest after repairs are complete.
- J. All leaks shall be repaired in accordance with Section 331113 – Water Pipe and Fittings and Section 331102 – Steel Pipe.
- K. Upon completion of installation, pressure test pipelines:
  - 1. Test Duration:
    - a. Hydrostatic testing shall be at least 2 hours
  - 2. Test Pressure:
    - a. Measured at the lowest elevation of the line.
    - b. Pressure shall be applied to the water line by means of a pump, pipe connections, and all other necessary apparatus for applying pressure and measuring the resultant leakage from the line under test.
    - c. **For steel pipe**
      - 1) Not to exceed a maximum recommended test pressure of 120 percent of working pressure at any point in the line.
      - 2) Test pressure at the lowest elevation shall be 210 psi and shall not vary more than 5 psi for duration of test.
    - d. **For ductile iron pipe**
      - 1) Test pressure at the lowest elevation shall not exceed 1.5 times the working pressure of the pipe.
      - 2) Test pressure shall be at least 1.25 time the working pressure at any point in the pipe.
      - 3) Test pressure at the lowest point shall be 200 psi and shall not vary more than 5 psi for the duration of the test.

3. For **steel pipe** the allowable make-up water for the water line being tested shall not be greater than that determined by the following formula:

From AWWA C604:

$$Q = \frac{10 \text{ gallons}}{24 \text{ hour}} * L * D$$

Q = Allowable makeup water usage (gallons per hour)

L = Length of pipe tested (Miles)

D = Nominal diameter of the pipe (inches)

- 1) Makeup water usage is defined as the quantity of water that must be supplied into the test section to maintain the specified test pressure within 5 psi, after the air in the pipe has been expelled and the line completely filled with water.
- 2) If test of pipe discloses makeup water usage greater than the allowable as calculated from the above formula, locate the leak or leaks and perform corrective work and retest.

4. For **ductile iron pipe** measured leakage from the water line being tested shall not be greater than that determined by the following formula:

$$Q = \frac{L * D * \sqrt{P}}{148,000}$$

where Q = Quantity of makeup water in gallons per hour

L = Length of pipe section being tested (feet)

D = Nominal diameter of the pipe (inches)

P = Average test pressure during the hydraulic test (psig)

- 1) Makeup water usage is defined as the quantity of water that must be supplied into the test section to maintain the specified test pressure within 5 psi, after the air in the pipe has been expelled and the line completely filled with water.
- 2) If test of pipe discloses makeup water usage greater than the allowable as calculated from the above formula, locate the leak or leaks and perform corrective work and retest.

- L. Corrective work shall be approved by Engineer.

**END OF SECTION**





## SECTION 333100

### SANITARY SEWER

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. The Contractor shall furnish and install gravity sewer pipe, gravel bedding material, and all appurtenances.
- B. All pipe and other materials shall be new
- C. Pipe shall be made in the USA.

##### 1.2 SUBMITTALS

- A. Submit in accordance with Section 013300 – Submittals.

#### PART 2 - PRODUCTS

##### 2.1 DUCTILE IRON GRAVITY SEWER PIPE

- A. Ductile iron pipe shall conform to the requirements of AWWA C150 and AWWA C151.
- B. Pipe shall have a minimum pressure rating as indicated below, or higher ratings as indicated on the drawings.

<u>Pipe Sizes (inch)</u>	<u>Pressure Class (psi)</u>
4-12	350
14-20	250
24	200
30-64	150

- C. Joints: Pipe shall be furnished as follows unless otherwise noted on the Drawings.

- 1. Buried Pipe: Push-on joint and integral bell complying with AWWA C111.

- D. Cement Mortar Lining

- 1. Ductile iron pipe shall be internally lined with ADouble@ cement-mortar lining in accordance with AWWA C104.
- 2. 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.

- E. Pipe shall be furnished with standard bitumastic coating per AWWA standard.

##### 2.2 SDR-26 PVC GRAVITY SEWER PIPE (8")

- A. PVC pipe and fittings for 8" gravity sewer lines shall be suitable for use as a gravity sewer and shall be SDR-26 heavy wall sewer pipe meeting the requirements of ASTM D3034 and ASTM F679.

- B. Pipe shall have an integral bell end with flexible elastomeric seal complying with ASTM D3212. Gaskets shall be of a lock in type gasket meeting the requirements of ASTM F477
- C. Pipe shall bear the NSF seal of approval.
- D. 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 certification
  - 5. SDR designation

## 2.3 OPEN PROFILE PVC GRAVITY SEWER PIPE (24")

- A. Open profile 24" PVC pipe and fittings shall have a smooth interior and an open profile cross sectional ribbed exterior or dual wall corrugated exterior as specified in ASTM F794.
- B. Open profile PVC pipe and fittings for gravity sewer lines shall be suitable for use as a gravity sewer and shall be manufactured and tested in accordance with ASTM F794 and ASTM F949.
- C. Pipe shall be manufactured with a pipe stiffness of 46 psi when tested in accordance with ASTM D2412.
- D. Pipe shall have an integral bell end with flexible elastomeric seal complying with ASTM D3212. Gaskets shall be of a lock in type gasket meeting the requirements of ASTM F477.
- E. Pipe shall be green or white in color and 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 certification.
- F. Gasket lubricant shall be supplied by the pipe manufacturer.
- G. Gravity sewer pipe shall be green or white in color.
- H. Provide proper manhole adapters for all pipe entering manholes.

## 2.4 POLYETHYLENE ENCASEMENT

- A. Polyethylene encasement shall be used on all ductile iron pipe.
- B. Polyethylene encasement shall be manufactured and installed in accordance with ANSI/AWWA C105/A21.5 and shall be a tube or in the form of flat sheet or rolls.
- C. Tape shall be provided with polyethylene encasement.

## 2.5 PIPE TRENCH EXCAVATION, BACKFILL AND COMPACTING

- A. Trench excavation, backfill, compacting and pipe zone material shall be in accordance with

2.6 MANHOLES

- A. Manholes shall be in accordance with Section 333913 ASanitary Sewer Manholes, Frames and Covers@ of these specifications.

2.7 CONCRETE

- A. Concrete for manholes shall be in accordance with Section 333913 ASanitary Sewer Manholes, Frames and Covers.@
- B. Class AB@ concrete for concrete encasement, pipe backing, piers and other uses shall have a 28 day compressive strength of 3,000 psi and shall contain not less than 5 sacks of cement per cubic yard of concrete.
- C. Concrete shall be plant mixed concrete which is mixed and delivered in accordance with ASTM C94.

2.8 CEMENTITIOUS NON-SHRINK GROUT

- A. Cementitious non-shrink grout for use in installing pipe at existing manhole structures and other places as designated to receive non-shrink grout shall be one specially formulated for stopping active infiltration and filling voids in manholes and similar locations. Grout mix shall provide a quick setting, volume stable, cementitious product suitable for patching the interior of manholes when mixed and applied according to the manufacturer=s recommendations. Grout mix shall be Strong Seal QSR, or equal.

2.9 SERVICES

- A. Tapping saddles shall be DFW rubber.
- B. Service lines shall be 4" SDR 21 or Schedule 40 PVC.
- C. Cleanouts shall be 2 - 4"x4" combination cleanouts with brass countersunk plugs drilled and tapped for 1/4"- 20 screws.
- D. Wyes shall be made of material and joints that match the mainline pipe. Wyes shall terminate in a 4 inch bell connection.
- E. Flexible rubber couplings shall be Fernco or equal with two stainless steel bands.

**PART 3 - EXECUTION**

3.1 GENERAL

- A. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.
- B. Install manholes for changes in direction or pipe diameter.

- C. Flow control and bypass pumping shall be in accordance with Section 010000 Basic Requirements of these specifications.

### 3.2 STRINGING THE PIPE

- A. The contractor shall properly and safely chock the strung pipe so that it cannot roll loose and strike either personnel, livestock, or property.
- B. Do not place anything inside pipe for the purpose of handling.

### 3.3 HANDLING AND LAYING PIPE AND FITTINGS

- A. Trench and backfill shall be in accordance with Section 312300 - Trench Excavation, Backfill, and Compacting. Pipe bedding shall be in accordance with details on the Drawings.
- B. Each pipe section shall be laid to the proper line and grade using a laser.
- C. All materials shall be transported, unloaded, stored, stacked, cut, handled and installed in accordance with the manufacturer's recommendations and as approved by the Owner in a manner to prevent damage to the materials and material coating and lining. Do not place anything, such as forklift fork or hook, inside the pipe for the purpose of handling. Pipe and fittings shall not be dragged along the ground or dropped into the trench.
- D. All material shall be carefully inspected immediately before installation and any found to be faulty or damaged shall be marked in an obvious and permanent manner and removed from the site. A faulty or damaged pipe may be used in the Work if the fault or damaged area is removed by cutting the pipe leaving a shortened section of sound pipe.
- E. Pipe shall be lowered into the trench in such a manner that spigot and bell shall not become contaminated. Pipe joints shall be assembled in accordance with procedures recommended by the pipe manufacturer, using proper gaskets, lubricants, tools, and jointing techniques. All surfaces of the joint including the socket and bell of the pipe or fitting shall be cleaned immediately before insertion of spigot into bell. Use clean rags for this purpose. Particular care shall be taken to clean the gasket seat if the gasket was not installed at the factory.
- F. The spigot end of the pipe shall be inserted into the bell of the pipe, to which connection is being made, and forced to a firm contact with the shoulder of the bell. When this initial insertion is made, the alignment of the added pipe shall deviate from true alignment not more than 5 degrees for 4-inch pipe, nor more than 3 degrees for 12-inch pipe. Deviations for intermediate size pipe shall be in accordance with the stated maximum deviations of the pipe manufacture. Deviation of any type, from true alignment, shall be approved by the Owner.
- G. No gasket loops or bulges shall protrude in the path of the pipe when it enters.
- H. Apply gasket lubricant supplied by the manufacturer to both the spigot end and to the gasket. Use a clean applicator brush.
- I. Each spigot shall be properly centered in the bell of the preceding pipe and that the entire length of each pipe section is solidly bedded so as to prevent displacement during subsequent backfill and settlement.

- J. When pipe is cut, the plain ends shall be beveled similar to the bevel on full lengths of pipe from the manufacturer. After beveling, stop marks shall be applied to the ends.
- K. If the joint is incorrectly made disassemble it and correct the problem.
- L. Contractor shall keep the interior of the pipe and manholes free from dirt, rocks, and other debris during construction.
- M. Pipe shall not be left unattended with an open end. Plug the open end with a temporary plastic plug or cap to prevent trench water, foreign matter, debris, and dirt from entering the pipe.
- N. Proper facilities shall be provided for lowering sections of pipe into trenches. Under no circumstances shall pipe be laid in water, and no pipe shall be laid in trench when conditions or weather are not suitable for work. Diversion of drainage and dewatering of trenches during construction shall be the Contractor's responsibility.
- O. All joints shall be watertight in accordance with ASTM standards.

#### 3.4 INSTALLATION OF POLYETHYLENE PROTECTION MATERIAL

- A. Polyethylene material, either in tubing form or in the form of flat sheet or rolls shall be placed around all ductile iron pipe and fittings.
- B. Fittings and appurtenances shall be completely encased in polyethylene material. It is not the intent that the material form an enclosure that is absolutely air and water tight, but to prevent pipe to soil contact.
- C. Polyethylene material shall be applied to ductile iron pipe, fittings and appurtenances by one of the following methods:
  - 1. Method A - Cut polyethylene tubing material to a length approximately 2 feet longer than the length of pipe section. Slip the tube around the pipe centering it to provide a one foot overlap on each adjacent pipe section, and bunching it accordian fashion lengthwise until it clears the pipe ends. Lower the pipe section into the trench and make up the pipe joint with the preceding section of pipe. A shallow bell hole must be made at joints to facilitate installation of the polyethylene tube. After assembling the pipe joint, take bunched polyethylene from the preceding length of pipe, slip it over the end of the new length of pipe and secure in place. Then slip the end of the polyethylene from the new pipe section of the at the end of the first wrap until it overlaps the joint at the end of the preceding length of pipe. Secure the overlap in place. Take up the slack width to make snug, but not tight, fit along the barrel of the pipe, securing the fold at quarter points with tape.
  - 2. Method B - Cut polyethylene tube to a length approximately 1 foot shorter than the length of the pipe section. Slip the tube around the pipe, centering it to provide 6 inches of bare pipe at each end. Make polyethylene snug, but not tight and secure the ends. Before making up a joint, slip a 3 foot length of polyethylene tube over the end of the preceding pipe section, bunching it accordion fashion lengthwise. After completing the joint, pull the 3 foot length of polyethylene over the joint, overlapping the polyethylene previously installed on each adjacent section of pipe by at least 1 foot; make snug and secure each end.
- D. Ductile iron pipe shaped appurtenances such as bends, reducers, offsets and other pipe

shaped appurtenances shall be covered with polyethylene in the same manner as pipe.

- E. Odd shaped appurtenances such as valves, tees, crosses and other odd shaped pieces which cannot practically be wrapped in a tube, shall be wrapped with a flat sheet or split length of polyethylene tube. The sheet shall be passed under the appurtenance and brought up around the body. Seams shall be made by bringing the edges together, folding over twice, and taping down. Slack width and overlaps at joints shall be handled as described above. Tape polyethylene securely in place at valve stem and other penetrations.
- F. Openings in tubing material for branches, service taps, blow-offs, air valves, and similar appurtenances shall be made by making an X-shaped cut in the polyethylene and temporarily folding the film back. After the appurtenance is installed, tape the slack securely to the appurtenance and repair the cut, as well as any other damaged areas in the polyethylene with tape.
- G. At junctions between wrapped and unwrapped pipe - Where polyethylene wrapped pipe joins a pipe which is not wrapped, extend the polyethylene tube to cover the unwrapped pipe a distance of at least 2 feet and secure the end.
- H. The polyethylene material shall be secured around the pipe and appurtenances by at least three circumferential wraps of tape.
- I. All tongs, cables or chains that are used for lifting pipe and appurtenances that have been encased in polyethylene material shall be adequately padded to prevent damage to the material.
- J. Repair any rips, punctures, or other damage to the polyethylene with tape or with a short length of polyethylene tube cut open and wrapped around the pipe or appurtenance and secured in place.
- K. Polyethylene material shall be stored on the project site in such a manner that it is not exposed to direct sunlight. Exposure during installation shall not exceed 48 hours.
- L. Backfill material shall be the same as specified and shown on the Drawings for pipe or appurtenances without polyethylene wrapping. Special care shall be taken to prevent damage to the polyethylene wrapping when placing backfill.

### 3.5 SEPARATION FROM EXISTING UTILITIES

- A. Maintain 18 inches minimum vertical separation (water over sewer) and 10 feet minimum horizontal separation between water mains and sewer mains.

### 3.6 CONNECTIONS TO EXISTING MANHOLES

- A. The sewage flow through the existing manhole shall be controlled by temporary plugs or bypass pumping as necessary to facilitate the new connection and grouting of the manhole invert. The existing flow of sewage shall be maintained in a manner to prevent overflow or discharge of sewage onto the ground surface and prevent damage caused by excessive surcharge in upstream sewer mains and service connections.
- B. Cut opening in the wall of existing manhole of sufficient size to permit proper installation of the new pipe at the designated line and grade.
- C. Insert new pipe through wall of manhole with manhole gasket positioned around the pipe

at the midpoint of the wall.

- D. The opening in the wall around the new pipe shall be filled with non-shrink grout and properly finished inside and outside with cement mortar, so that leakage does not occur.
- E. The invert of the existing manhole shall be chipped out and re-grouted with cement mortar as necessary to provide a smooth transition between the invert of the new pipe and the other pipes entering and leaving the manhole.

### 3.7 MANDREL TESTING FOR SEWER LINES

- A. Contractor shall test completed PVC gravity sewer lines for internal roundness using a mandrel device. The test shall be in accordance with ASTM D2321.
- B. Contractor shall test completed sewer lines for internal roundness using a mandrel device recommended by the pipe manufacturer.
- C. Test mandrel shall be of such design which will positively detect pipe deflection in excess of 5 percent of the internal diameter of the pipe. Maximum allowable pipe deflection shall not exceed 5 percent of the inside pipe diameter.
- D. The mandrel shall be hand pulled by the Contractor through all sewer lines. Any pipe for which the mandrel test reveals pipe deflection in excess of 5 percent of the pipe's internal diameter shall be repaired and retested until a satisfactory test result is obtained.
- E. Any sewer pipe which fails the mandrel test shall be repaired and retested by the Contractor.

### 3.8 ACCEPTANCE INSPECTION BY CCTV

- A. All gravity sewer line segments shall be inspected for final acceptance by CCTV by the Contractor, before acceptance of the work by the Owner.
- B. The television camera used for the inspection should be designed and constructed specifically for such inspection, producing a highly legible picture. Lighting for the camera shall allow a clear, bright, and sharp picture for the entire periphery of the pipe. The camera shall be operative in conditions of 100% humidity and/or under water. The lighting and camera quality shall be suitable to allow a clear, in focus picture of a minimum of 6 linear feet of the entire inside periphery of the sewer pipe.
- C. Picture quality and definition shall be to the satisfaction of the Engineer and Owner.
- D. The section of gravity sewer line being inspected shall be suitably isolated from the remainder of the sewer line as necessary.
- E. The Contractor shall make all provisions for pumping or bypassing the flow around the manhole section and the cost shall be incidental to the CCTV inspection. Contractor shall not be allowed to float the camera.
- F. The camera shall be moved through the sewer line in either direction at a uniform slow rate not to exceed 60 feet per minute. Under no circumstances shall the camera be tethered to a hydraulically propelled or high velocity jet cleaning device while the cleaning device is on.

- G. The camera shall stop at each service connection and provide a view up the service line.
- H. TV inspection shall be done one manhole section at a time and the flow in the section being inspected shall be suitably controlled. Sewer flow shall not exceed the following:
- |                 |          |
|-----------------|----------|
| 6" to 10" pipe  | 1 inch   |
| 12" to 14" pipe | 2 inches |
| 14" to 24" pipe | 3 inches |
| Over 24" pipe   | 4 inches |
- I. The Contractor shall furnish DVD=s of the lines televised to the Engineer for review and comments, which may require up to 30 calendar days from the date submitted. Each DVD shall be labeled with the following information:
1. Project Job Number
  2. Manhole to Manhole Designation
  3. Date Televised
  4. Street or Other Location
- J. CCTV log information shall include:
1. Project Job Number
  2. Name of Owner
  3. Name of Contractor
  4. Date Televised
  5. Street or Other Location
  6. Upstream Manhole Designation
  7. Downstream Manhole Designation
  8. Pipe Material
  9. Pipe Diameter
  10. Direction of Televising (downstream or upstream)
  11. Continuous Distance Log
  12. Location of Service Connections
- K. DVD=s shall become the property of the Owner and will be retained by the Engineer.
- L. If the DVD=s are of such poor quality that the Engineer is unable to evaluate the condition of the sewer line or to locate service connections, the Contractor shall be required to re-televising and provide a good quality DVD of the sewer line at no additional cost to the Owner.
- M. All sections of sewer lines considered to be unsatisfactory shall be repaired using new materials. The cost of such repairs shall be the responsibility of the Contractor and the Owner shall make no payments for repair of unsatisfactory or defective work.
- N. Contractor shall provide all CCTV equipment.

### 3.9 TESTING OF MANHOLES

- A. New manholes shall be tested in accordance with Section 333913 A Sanitary Sewer Manholes of these specifications.

END OF SECTION



# APPENDIX A

## OSHA Standards



**29 CFR Part 1926 Subpart P**  
**OSHA Trench Safety Standards**



## § 1926.606

If it is necessary to stand at the out-board or inboard edge of the deckload where less than 24 inches of bulwark, rail, coaming, or other protection exists, all employees shall be provided with a suitable means of protection against falling from the deckload.

(d) *First-aid and lifesaving equipment.*

(1) Provisions for rendering first aid and medical assistance shall be in accordance with subpart D of this part.

(2) The employer shall ensure that there is in the vicinity of each barge in use at least one U.S. Coast Guard-approved 30-inch lifering with not less than 90 feet of line attached, and at least one portable or permanent ladder which will reach the top of the apron to the surface of the water. If the above equipment is not available at the pier, the employer shall furnish it during the time that he is working the barge.

(3) Employees walking or working on the unguarded decks of barges shall be protected with U.S. Coast Guard-approved work vests or buoyant vests.

(e) *Commercial diving operations.* Commercial diving operations shall be subject to subpart T of part 1910, §§ 1910.401-1910.441, of this chapter.

[39 FR 22801, June 24, 1974, as amended at 42 FR 37674, July 22, 1977]

### § 1926.606 Definitions applicable to this subpart.

(a) *Apron*—The area along the water-front edge of the pier or wharf.

(b) *Bulwark*—The side of a ship above the upper deck.

(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: Sec. 107, Contract Worker Hours and Safety Standards Act (Construction Safety Act) (40 U.S.C. 333); Secs. 4, 6, 8, Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Order No. 12-71 (36 FR 8754), 8-76 (41 FR

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25059), or 9-83 (48 FR 35736), 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 at-

mospheric 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 sufficiently removed from the excavation so as to be unaffected by the excavation activity; or
- (iv) A registered professional engineer has approved the determination that such excavation work will not pose a hazard to employees.

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

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

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

(k) *Inspections.* (1) Daily inspections of excavations, the adjacent areas, and protective systems shall be made by a competent person for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. An inspection shall be conducted by the competent person prior to the start of work and as needed throughout

the shift. Inspections shall also be made after every rainstorm or other hazard increasing occurrence. These inspections are only required when employee exposure can be reasonably anticipated.

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

(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 by 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 man-

ner 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—SOIL CLASSIFICATION

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

(2) *Application.* This appendix applies when a sloping or benching system is designed in accordance with the requirements set forth in §1926.652(b)(2) as a method of protection for employees from cave-ins. This appendix also applies when timber shoring for excavations is designed as a method of protection from cave-ins in accordance with appendix C

to subpart P of part 1926, and when aluminum hydraulic shoring is designed in accordance with appendix D. This Appendix also applies if other protective systems are designed and selected for use from data prepared in accordance with the requirements set forth in §1926.652(c), and the use of the data is predicated on the use of the soil classification system set forth in this appendix.

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

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

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

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

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

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

*Layered system* means two or more distinctly different soil or rock types arranged in layers. Micaceous seams or weakened planes in rock or shale are considered layered.

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

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

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

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

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

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

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

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

*Type B* means:

- (i) Cohesive soil with an unconfined compressive strength greater than 0.5 tsf (48 kPa) but less than 1.5 tsf (144 kPa); or
- (ii) Granular cohesionless soils including: angular gravel (similar to crushed rock), silt, silt loam, sandy loam and, in some cases, silty clay loam and sandy clay loam.
- (iii) Previously disturbed soils except those which would otherwise be classed 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 or a slope of four horizontal to one vertical (4H:1V) or steeper.

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

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

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

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

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

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

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

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

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

material is cohesive material. Soil composed primarily of coarse-grained sand or gravel is granular material.

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

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

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

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

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

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

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

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

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

(iii) *Thumb penetration.* The thumb penetration test can be used to estimate the unconfined compressive strength of cohesive soils. (This test is based on the thumb penetration test described in American Society for Testing and Materials (ASTM) Standard

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

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

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

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

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

#### APPENDIX B TO SUBPART P—SLOPING AND BENCHING

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

(b) *Definitions.*

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

*Distress* means that the soil is in a condition where a cave-in is imminent or is likely

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

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

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

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

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

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

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

- Numbers shown in parentheses next to maximum allowable slopes are angles expressed in degrees from the horizontal. Angles have been rounded off.
- 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°).
- Sloping or benching for excavations greater than 20 feet deep shall be designed by a registered professional engineer.

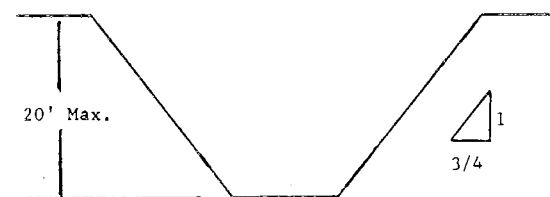
Figure B-1

## Slope Configurations

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

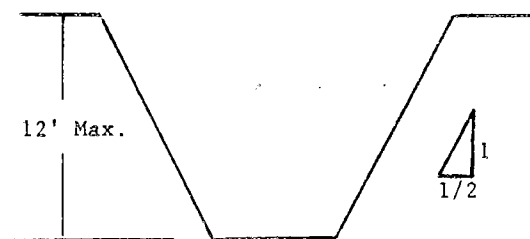
## B-1.1 Excavations made in Type A soil.

1. All simple slope excavation 20 feet or less in depth shall have a maximum allowable slope of  $\frac{3}{4}:1$ .



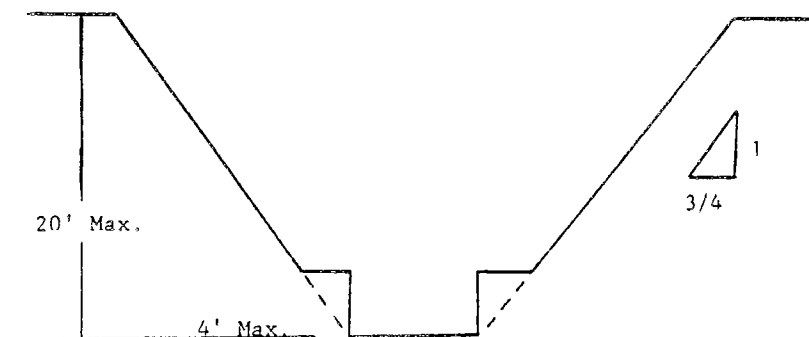
## SIMPLE SLOPE—GENERAL

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  $\frac{1}{2}:1$ .



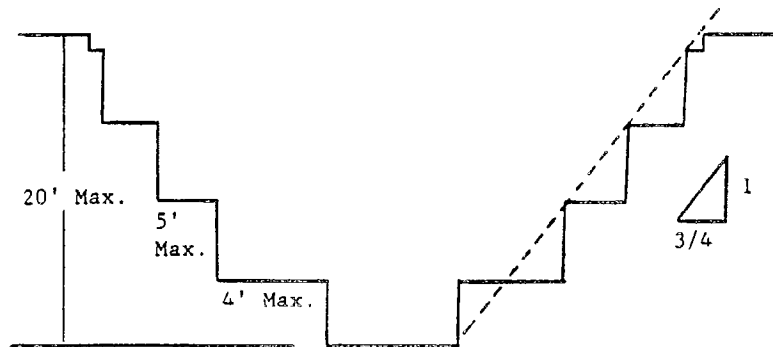
## SIMPLE SLOPE—SHORT TERM

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



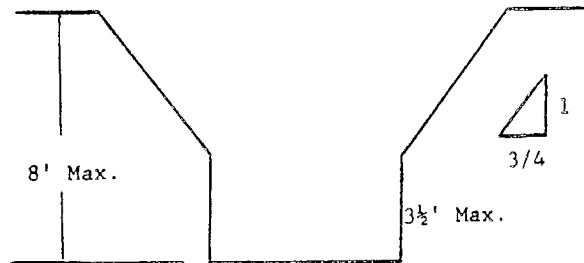


SIMPLE BENCH



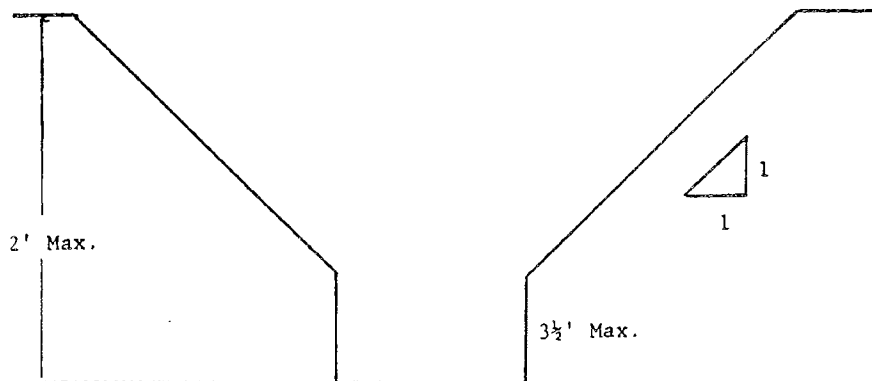
MULTIPLE BENCH

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



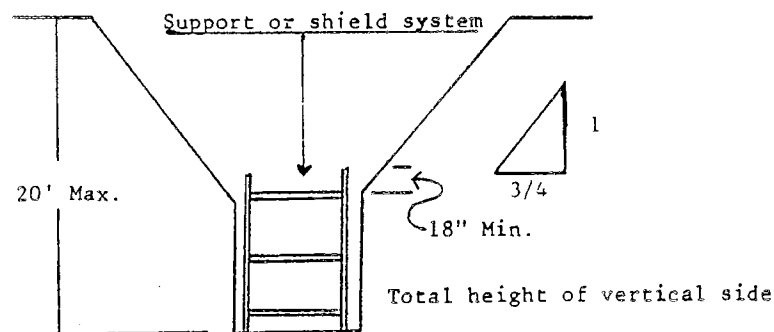
UNSUPPORTED VERTICALLY SIDED LOWER PORTION—MAXIMUM 8 FEET IN DEPTH

All excavations more than 8 feet but not more than 12 feet in depth which unsupported vertically sided lower portions shall have a maximum allowable slope of 1:1 and a maximum vertical side of  $3\frac{1}{2}$  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  $\frac{3}{4}$ :1. The support or shield system must extend at least 18 inches above the top of the vertical side.

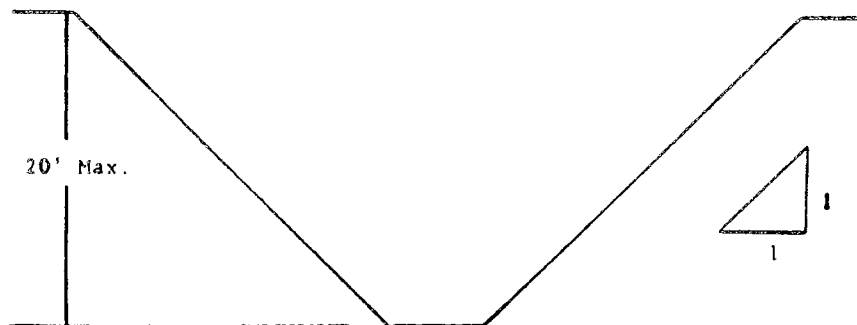


## SUPPORTED OR SHIELDED VERTICALLY SIDED LOWER PORTION

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

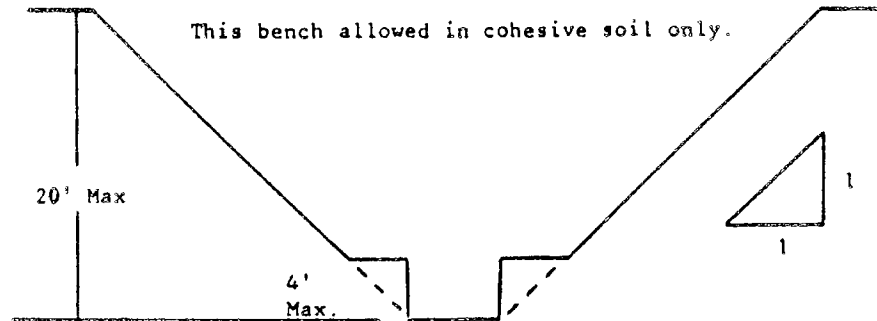
## B-1.2 Excavations Made in Type B Soil

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

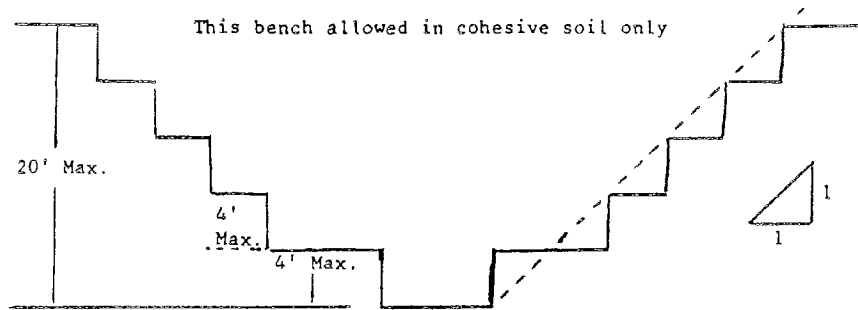


## SIMPLE SLOPE

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

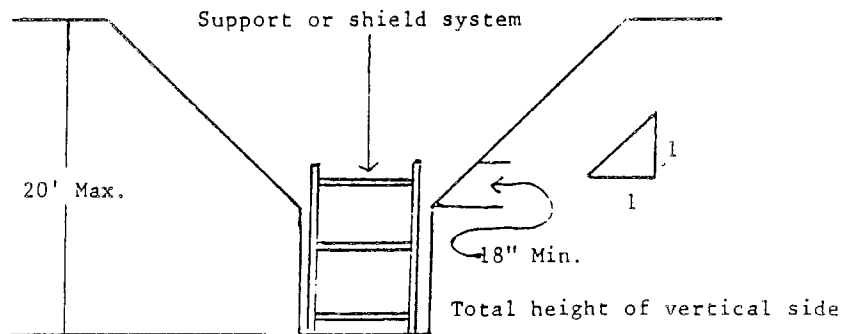


SINGLE BENCH



MULTIPLE BENCH

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

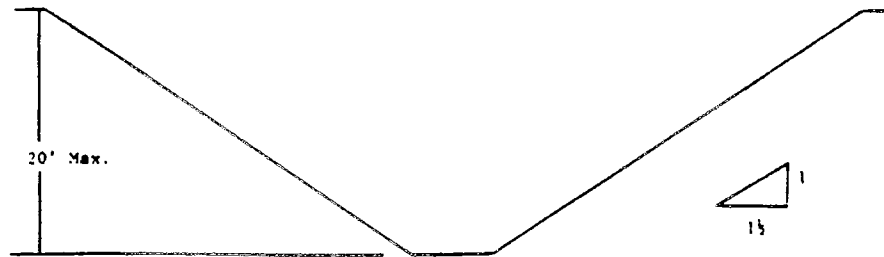


VERTICALLY SIDED LOWER PORTION

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

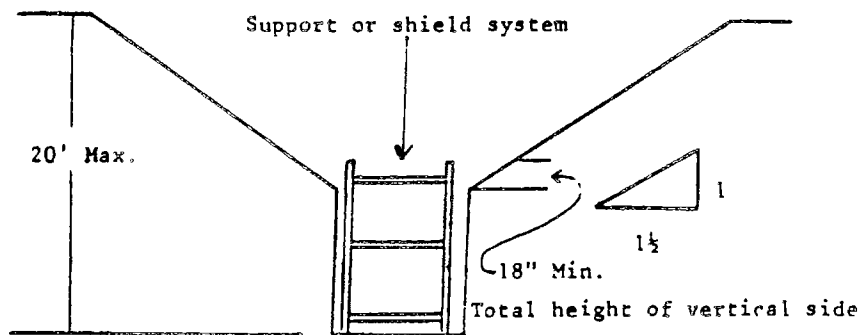
## B-1.3 EXCAVATIONS MADE IN TYPE C SOIL

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



SIMPLE SLOPE

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

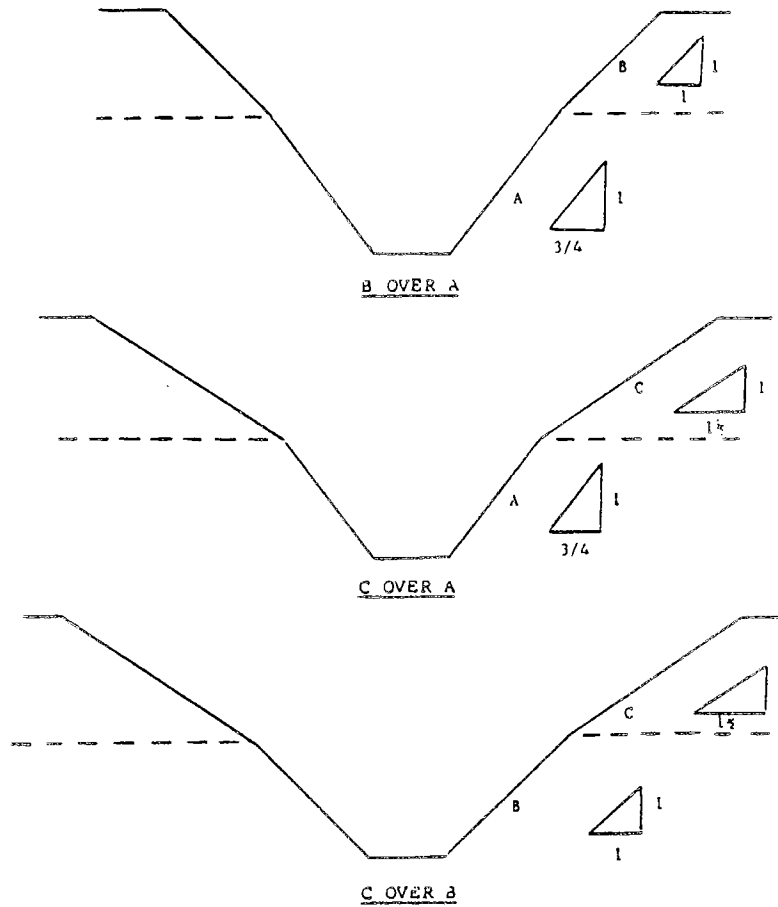


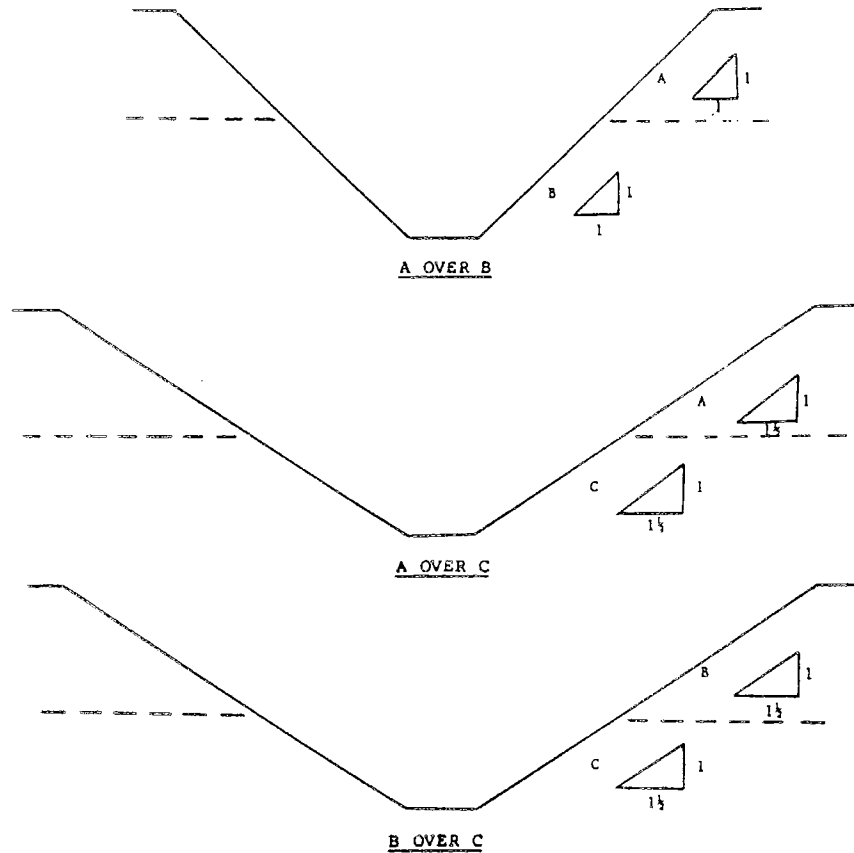
VERTICAL SIDED LOWER PORTION

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

## B-1.4 Excavations Made in Layered Soils

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





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

#### APPENDIX C TO SUBPART P—TIMBER SHORING FOR TRENCHES

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

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

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

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

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

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

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

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

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

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

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

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

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

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

(B) When vertical loads imposed on 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 4x4 crossbraces at six feet horizontally and four feet vertically.

Wales are not required.

Space 3x8 uprights at six feet horizontally. This arrangement is commonly called "skip shoring."

#### *Arrangement #B2*

Space 4x6 crossbraces at eight feet horizontally and four feet vertically.

Space 8x8 wales at four feet vertically.

Space 2x6 uprights at four feet horizontally.

*Arrangement #B3*

Space 6x6 crossbraces at 10 feet horizontally and four feet vertically.

Space 8x10 wales at four feet vertically.

Space 2x6 uprights at five feet horizontally.

*Arrangement #B4*

Space 6x6 crossbraces at 12 feet horizontally and four feet vertically.

Space 10x10 wales at four feet vertically.

Spaces 3x8 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 6x6 crossbraces at six feet horizontally and five feet vertically.

Space 8x8 wales at five feet vertically.

Space 2x6 uprights at two feet horizontally.

*Arrangement #B2*

Space 6x8 crossbraces at eight feet horizontally and five feet vertically.

Space 10x10 wales at five feet vertically.

Space 2x6 uprights at two feet horizontally.

*Arrangement #B3*

Space 8x8 crossbraces at 10 feet horizontally and five feet vertically.

Space 10x12 wales at five feet vertically.

Space 2x6 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 8x8 crossbraces at six feet horizontally and five feet vertically.

Space 10x12 wales at five feet vertically.

Position 2x6 uprights as closely together as possible.

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

*Arrangement #B2*

Space 8x10 crossbraces at eight feet horizontally and five feet vertically.

Space 12x12 wales at five feet vertically.

Position 2x6 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 8x10 crossbraces at six feet horizontally and five feet vertically.

Space 12x12 wales at five feet vertically.

Use 3x6 tight sheeting.

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

*(g) Notes for all Tables.*

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

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

3. All spacing indicated is measured center to center.

4. Wales to be installed with greater dimension horizontal.

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

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

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



TABLE C-1.1

## TIMBER TRENCH SHORING -- MINIMUM TIMBER REQUIREMENTS \*

SOIL TYPE A  $P_a = 25 \times H + 72$  psf (2 ft Surcharge)

DEPTH OF TRENCH (FEET)	SIZE (ACTUAL) AND SPACING OF MEMBERS **													
	HORIZ. SPACING (FEET)	CROSS BRACES					VERT. SPACING (FEET)	WALES		UPRIGHTS				
		WIDTH OF TRENCH (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	6X6	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 be 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**													
	HORIZ. SPACING (FEET)	CROSS BRACES					VERT. SPACING (FEET)	WALES		UPRIGHTS				
		WIDTH OF TRENCH (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 be substituted for wood.

TABLE C-1.3

TIMBER TRENCH SHORING -- MINIMUM TIMBER REQUIREMENTS \*

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

DEPTH OF TRENCH (FEET)	SIZE (ACTUAL) AND SPACING OF MEMBERS**													
	HORIZ. SPACING (FEET)	CROSS BRACES					VERT. SPACING (FEET)	SIZE (IN)	VERT. SPACING (FEET)	UPRIGHTS				
		WIDTH OF TRENCH (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  $P_a = 25 \times H \pm 72$  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 6 TO	4X4	4X4	4X4	4X4	4X6	4	Not Req'd	Not Req'd				4X6	
	UP 8 TO	4X4	4X4	4X4	4X6	4X6	4	Not Req'd	Not Req'd					4X8
	UP 10 TO	4X6	4X6	4X6	6X6	6X6	4	8X8	4			4X6		
	UP 12 TO	4X6	4X6	4X6	6X6	6X6	4	8X8	4				4X6	
10 TO 15	UP 6 TO	4X4	4X4	4X4	6X6	6X6	4	Not Req'd	Not Req'd				4X10	
	UP 8 TO	4X6	4X6	4X6	6X6	6X6	4	6X8	4		4X6			
	UP 10 TO	6X6	6X6	6X6	6X6	6X6	4	8X8	4			4X8		
	UP 12 TO	6X6	6X6	6X6	6X6	6X6	4	8X10	4		4X6		4X10	
15 TO 20	UP 6 TO	6X6	6X6	6X6	6X6	6X6	4	6X8	4	3X6				
	UP 8 TO	6X6	6X6	6X6	6X6	6X6	4	8X8	4	3X6	4X12			
	UP 10 TO	6X6	6X6	6X6	6X6	6X8	4	8X10	4	3X6				
	UP 12 TO	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<sub>a</sub> = 45 X H + 72 psf (2 ft. Surcharge)

DEPTH OF TRENCH (FEET)	SIZE (S4S) AND SPACING OF MEMBERS **													
	HORIZ. SPACING (FEET)	CROSS BRACES					VERT. SPACING (FEET)	WALES		UPRIGHTS				
		WIDTH OF TRENCH (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  $P_a = 80 \times H + 72$  psf (2 ft. Surcharge)

DEPTH OF TRENCH (FEET)	SIZE (S4S) AND SPACING OF MEMBERS **														
	HORIZ. SPACING (FEET)	CROSS BRACES					VERT. SPACING (FEET)	WALES		VERT. SPACING (FEET)	UPRIGHTS				
		WIDTH OF TRENCH (FEET)						SIZE (IN)	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--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 ap-

pendix must be used when design of the aluminum hydraulic protective system cannot be performed in accordance with §1926.652(c)(2).

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

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

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

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

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

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

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

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

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

(d) *Basis and limitations of the data.*

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

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

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

(3) Limitation of application.

(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 Ta-

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

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

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

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

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

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

(1) Example 1:

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

(2) Example 2:

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

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

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

(4) Example 4: A trench is dug in previously disturbed Type B soil, with characteristics of a Type C soil, and will require sheeting. The trench is 18 feet deep and 12 feet wide. 8 foot horizontal spacing between cylinders is desired for working space. From Table D-1.3: Find horizontal wale with a section modulus of 14.0 spaced at 4 feet o.c. vertically and 3 inch diameter cylinder spaced at 9 feet maximum o.c. horizontally. 3x12 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. 3x12 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 (3.5x3.5x0.1875) oversleeves, or structural oversleeves of manufacturer's specification, extending the full, collapsed length.

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

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

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

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

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

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

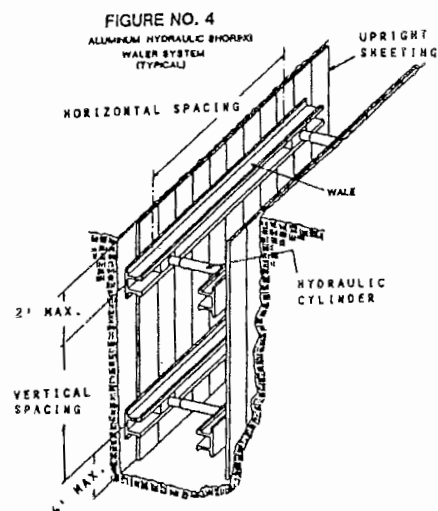
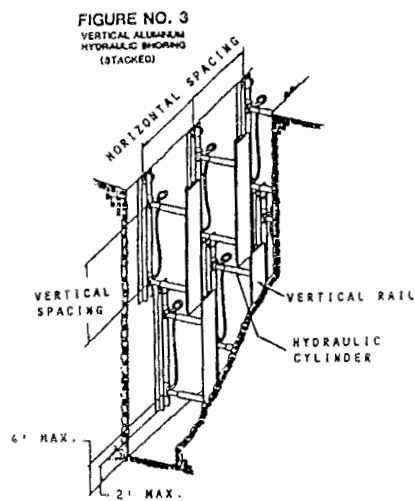
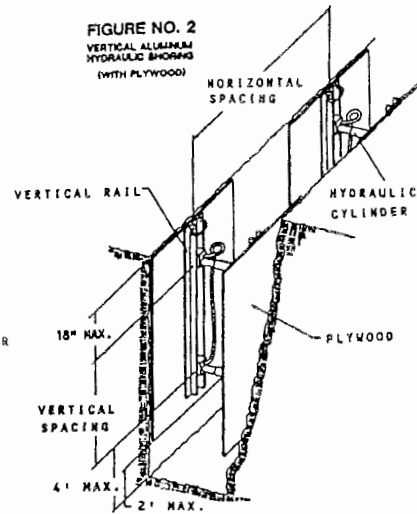
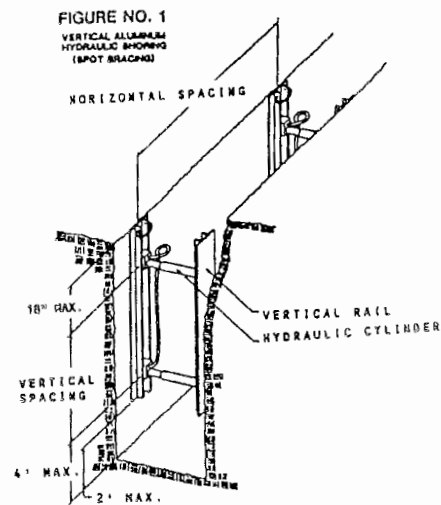
(8) See appendix C for timber specifications.

(9) Wales are calculated for simple span conditions.

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



# ALUMINUM HYDRAULIC SHORING TYPICAL INSTALLATIONS



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

DEPTH OF TRENCH  (FEET)	HYDRAULIC CYLINDERS				
	MAXIMUM HORIZONTAL SPACING  (FEET)	MAXIMUM VERTICAL SPACING  (FEET)	WIDTH OF TRENCH (FEET)		
			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		
	VERTICAL SPACING  (FEET)	SECTION MODULUS  (IN <sup>3</sup> )	WIDTH OF TRENCH (FEET)						MAX. HORIZ. SPACING (ON CENTER)		
			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	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		
	VERTICAL SPACING  (FEET)	SECTION MODULUS  (IN³)	WIDTH OF TRENCH (FEET)						MAX.HORIZ.SPACING (ON CENTER)		
			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—ALTERNATIVES TO TIMBER SHORING

Figure 1. Aluminum Hydraulic Shoring

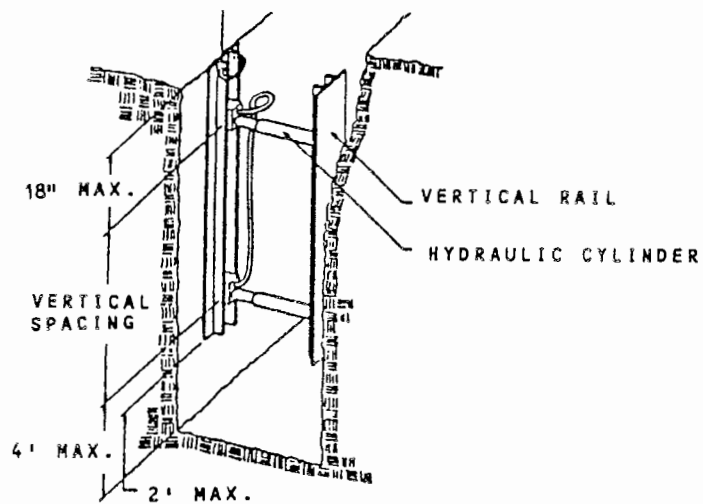


Figure 2. Pneumatic/hydraulic Shoring

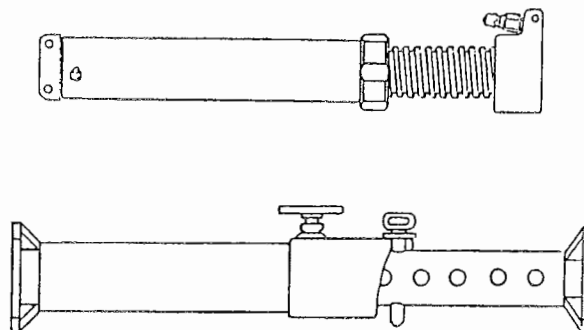


Figure 3. Trench Jacks (Screw Jacks)

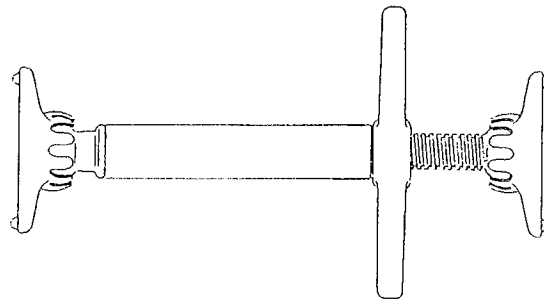
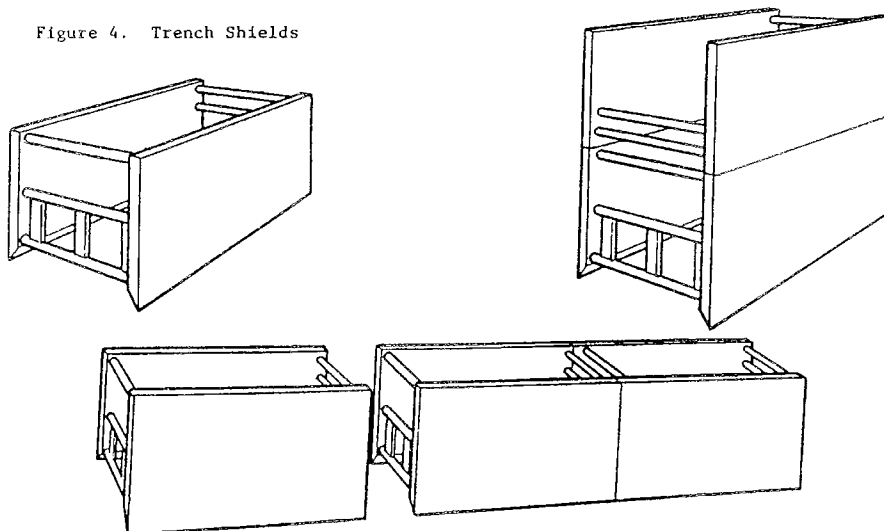
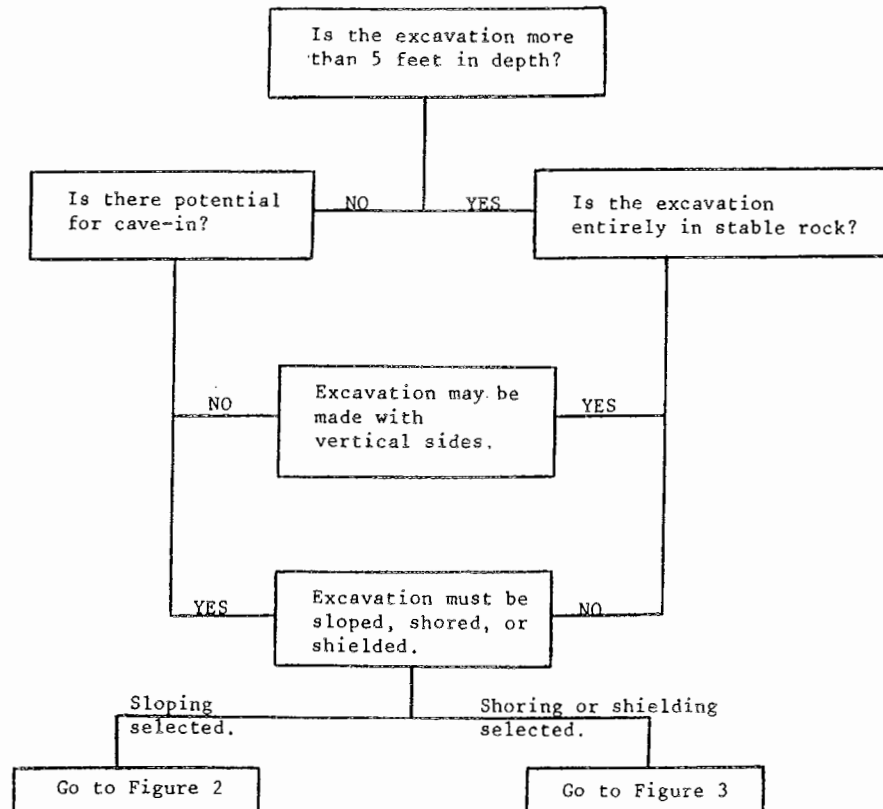


Figure 4. Trench Shields



APPENDIX F TO SUBPART P—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



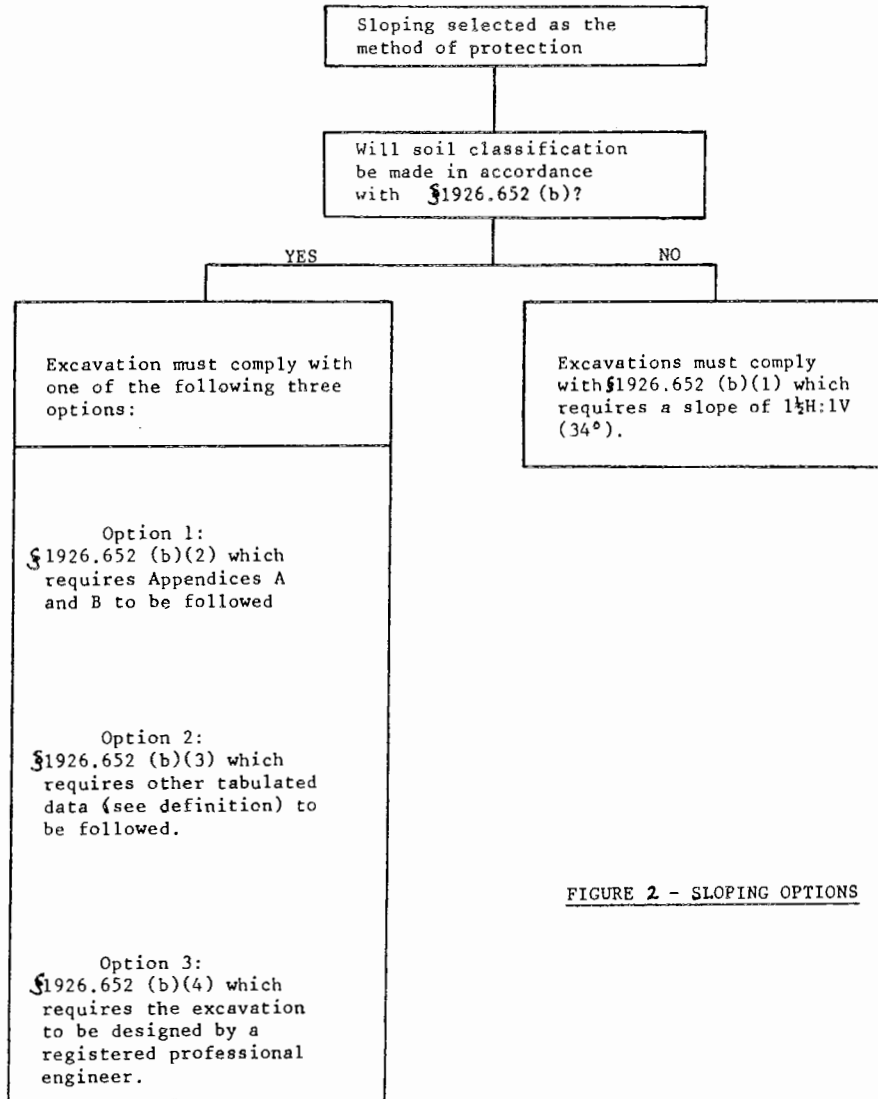


FIGURE 2 - SLOPING OPTIONS

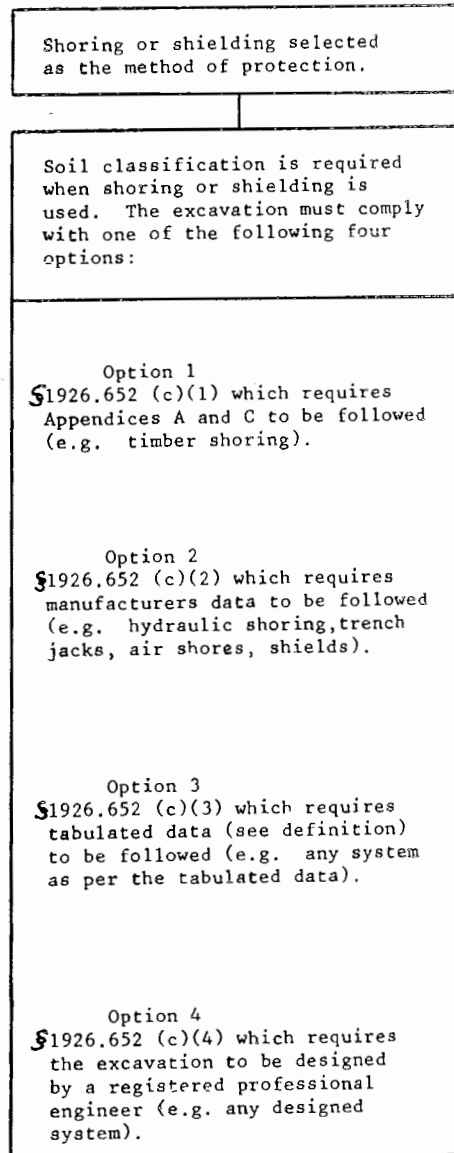


FIGURE 3 - SHORING AND SHIELDING OPTIONS