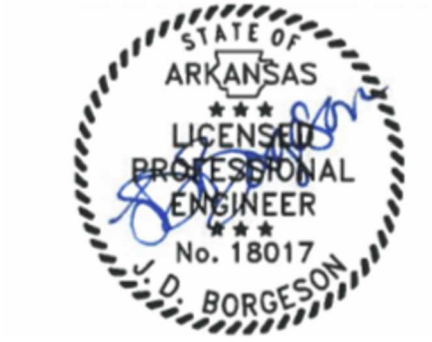
PROJECT MANUAL

Forrest City Public Library Amphitheater

Forrest City, Arkansas

100% Construction Documents

September 20, 2024



Prepared by
Ecological Design Group

120 South Izard Street
Little Rock, Arkansas 72201
Project Number 23-084

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SECTION 000900 - ENGINEERING INSPECTIONS AND OBSERVATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Engage and provide a qualified Engineering Inspections and Observations firm to provide Owner and Engineer of Record daily Inspections and Observations and reports in addition to other inspections and observations required in other Specification Sections for the project. Frequency of Inspections and Observations shall be on an as-needed basis.

1. At a minimum the Inspections and Observations Engineer shall witness materials sampling and testing, City Inspections requiring an Owner Representative, and monthly Progress meetings.
2. Engineer of record may be retained at their standard hourly billing rate.
3. A third-party Engineer licensed in the State of Arkansas may be retained to provide the required daily Inspections and Observations.

B. Inspections and Observations Engineer shall report directly to the project Engineer of Record and the Owner.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 001002 - ENDANGERED SPECIES ACT COMPLIANCE

PART 1 - GENERAL

1.1 SUMMARY

A. Contractor shall comply with all requirements and recommendations of the United States Endangered Species Act and Gold and Bald Eagle Protection Act. All construction activity shall comply with the recommendations and requirements of the US Fish and Wildlife Service for the protection of endangered species. The following documents and codes are hereby incorporated by reference to these Project Specifications.

1. Endangered Species Act of 1973 (ESA; 16 U.S.C. 1531 et seq.)
2. Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d)

B. There are NOT known endangered species, or Bald or Golden Eagles present at or near the proposed work areas.

C. If endangered species or Bald or Golden Eagles are encountered during construction the Contractor shall stop work immediately and notify the Owner and Engineer. Contractor shall await direction prior to commencing work activities.

D. Contractor shall conduct a tree removal pre-construction conference to review the trees to be removed.

E. Contractor shall obtain written approval form the City, Owner, and Engineer prior to any burning of trees or brush onsite.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 001003 - STORMWATER POLLUTION PREVENTION PLAN

PART 1 - GENERAL

1.1 SUMMARY

A. Contractor shall comply with all requirements and recommendations of the Arkansas Department of Energy and Environment (ADEE) Construction Stormwater Discharge Permit. The following documents and codes are hereby incorporated by reference to these Project Specifications.

1. Stormwater Pollution Prevention Plan (SWPPP) for Construction Activities for Small Construction Sites.
2. ADEQ SWPPP General Permit No. ARR150000 Small Site (AUTOMATIC COVERAGE for 1 Acre or More but Less than 5 acres)

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 001004 - ARKANSAS HISTORIC PRESERVATION PROGRAM REFERENCE

PART 1 - GENERAL

1.1 SUMMARY

A. Contractor shall comply with all requirements and recommendations of the Arkansas Department of Heritage, Arkansas Historic Preservation Program and National Historic Preservation Act. The following documents and codes are hereby incorporated by reference to these Project Specifications.

1. National Historic Preservation Act of 1966 (NHPA, Public Law 89-665; 54 U.S.C. 300101 et seq.)

B. There are NOT known historic properties or cultural resources at or near the proposed work areas.

C. If cultural resources or historic properties are encountered during construction the Contractor shall stop work immediately and notify the Owner and Engineer. Contractor shall await direction prior to commencing work activities.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 001113 - ADVERTISEMENT FOR BIDS

PART 1 - GENERAL

1.1 SUMMARY

A. **FORREST CITY PUBLIC LIBRARY** (Owner) is requesting Bids for the construction of the following Project: **Forrest City Public Library Park Landscape and ADA Improvements**

1. Bids for the construction of the Project will be received at the **Forrest City Public Library** located at **421 S. Washington St., Forrest City, AR 72335**, until **Monday, October 21st** at **2 PM** local time. At that time the Bids received will be **publicly** opened and read.

B. The Project includes the following Work:

1. Construction of a small public park adjacent to the library, which includes grading, a play area, a custom wooden stage/pavilion, installation of concrete walks and pavers, site lighting installation, and landscaping.
2. The Site of the Work includes property, easements, and designated work areas described in greater detail in the Contract Documents but generally located **in the lot adjacent to the library to the northwest at the southeast corner of E Cross St. and S Washington St. in Forrest City, AR.**

C. Bids are requested for the following Contract: **FCPLA23.00 Contract for Construction of a Small Project.**

1. The Issuing Office for the Bidding Documents is: **Ecological Design Group, Inc. 120 S. Izard St., Little Rock, AR 72201.** Prospective Bidders may obtain or view the Bidding Documents, during business hours at: **Southern Reprographics, 901 West 7th St., Little Rock, AR 72201, (501) 372-4011;** and **Jonesboro Blue Print & Supply, 222 Madison St., Jonesboro, AR 72401, (870) 932-4349.**
2. A set of (3) printed copies of the Bidding Documents may be obtained by paying a deposit of **$100** per set to the issuing office. Deposit price does not include shipping, if required. Bidders who return full sets of the Bidding Documents in good condition within 10 days after opening of Bids will receive a full refund. A bidder receiving a contract award may retain the bidding documents and the Bidder's deposit will be refunded. Prime Bidders requiring additional sets and Sub-Bidders may purchase bidding documents through **Southern Reprographics**.
3. Electronic copies of documents may be obtained at the following digital plan room: **https://SRIPlanRoom.com**
4. Bidding Documents may be downloaded from the designated website. Prospective Bidders are urged to register with the designated website or issuing office as plan holders. Neither Owner nor Engineer will be responsible for Bidding Documents, including addenda, if any, obtained from sources other than the designated website.
5. Bid Security in the amount of five (5) percent of the bid must accompany each bid in accordance with the Instructions to Bidders.
6. A pre-bid conference for the Project will be held on **Monday, October 14th** at **2 PM** at **the Forrest City Public Library.** Attendance at the pre-bid conference is encouraged but not required.
7. BIDDERS ARE ADVISED that Arkansas State Contractor Licensing Law applies to this project. Subcontractors are also required to be licensed according to Arkansas State

Law. Licensure is not required to submit a bid; however, evidence of licensure shall be provided to the Owner prior to signing the contract.

8. For all further requirements regarding bid submittal, qualifications, procedures, and contract award, refer to the Instructions to Bidders that are included in the Project Manual.

D. **This Advertisement is issued by**:

1. Owner: **Forrest City Public Library**
   By: **Arlisa Harris**
   Title: **Director**
   Date: **September 22nd, 2024**

END OF SECTION 001113

SECTION 002113 - INSTRUCTIONS TO BIDDERS FOR CONSTRUCTION CONTRACT

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ARTICLE 1—DEFINED TERMS

1.01 Terms used in these Instructions to Bidders have the meanings indicated in the Construction Contract. 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, and which registers plan holders.

ARTICLE 2—BIDDING DOCUMENTS

2.01 Bidder shall obtain a complete set of Bidding Requirements and proposed Contract Documents (together, the Bidding Documents). See the Agreement for a list of the Contract Documents. It is Bidder's responsibility to determine that it is using a complete set of documents in the preparation of a Bid. Bidder assumes sole responsibility for errors or misinterpretations resulting from the use of incomplete documents, by Bidder itself or by its prospective Subcontractors and Suppliers.

2.02 Bidding Documents are made available for the sole purpose of obtaining Bids for completion of the Project and permission to download or distribution of the Bidding Documents does not confer a license or grant permission or authorization for any other use. Authorization to download documents, or other distribution, includes the right for plan holders to print documents solely for their use, and the use of their prospective Subcontractors and Suppliers, provided the plan holder pays all costs associated with printing or reproduction. Printed documents may not be re-sold under any circumstances.

2.03 Bidder may obtain complete sets of Bidding Documents, in the number and format stated in the Advertisement or invitation to bid, from the Issuing Office. Bidders may rely that sets of Bidding Documents obtained from the Issuing Office are complete, unless an omission is blatant. Registered plan holders will receive Addenda issued by Owner.

2.04 Plan rooms (including construction information subscription services, and electronic and virtual plan rooms) may distribute the Bidding Documents or make them available for examination. Those prospective bidders that obtain an electronic (digital) copy of the Bidding Documents from a plan room are encouraged to register as plan holders from the Bidding Documents Website or Issuing Office. Owner is not responsible for omissions in Bidding Documents or other documents obtained from plan rooms, or for a Bidder's failure to obtain Addenda from a plan room.

2.05 *Electronic Documents*

A. When the Bidding Requirements indicate that electronic (digital) copies of the Bidding Documents are available, such documents will be made available to the Bidders as Electronic Documents in the manner specified.

1. Bidding Documents will be provided in Adobe PDF (Portable Document Format) (.pdf) that is readable by Adobe Acrobat Reader. It is the intent of the Engineer and Owner that such Electronic Documents are to be exactly representative of the paper copies of the documents. However, because the Owner and Engineer cannot totally control the transmission and receipt of Electronic Documents nor the Contractor's means of reproduction of such documents, the Owner and Engineer cannot and do not guarantee that Electronic Documents and reproductions prepared from those versions are identical in every manner to the paper copies.

B. Unless otherwise stated in the Bidding Documents, the Bidder may use and rely upon complete sets of Electronic Documents of the Bidding Documents, described in Paragraph 2.05. A above. However, Bidder assumes all risks associated with differences arising from transmission/receipt of Electronic Documents versions of Bidding Documents and reproductions prepared from those versions and, further, assumes all risks, costs, and responsibility associated with use of the Electronic Documents versions to derive information that is not explicitly contained in printed paper versions of the documents, and for Bidder's reliance upon such derived information.

ARTICLE 3—QUALIFICATIONS OF BIDDERS

3.01 To demonstrate Bidder's qualifications to perform the Work, after submitting its Bid and within **7** days of Owner's request, Bidder must submit the following information:

A. Written evidence establishing its qualifications such as financial data, previous experience, and present commitments.

B. A written statement that Bidder is authorized to do business in the state where the Project is located, or a written certification that Bidder will obtain such authority prior to the Effective Date of the Contract.

C. Bidder's state or other contractor license number, if applicable.

D. Subcontractor and Supplier qualification information.

E. Other required information regarding qualifications.

3.02 A Bidder's failure to submit required qualification information within the times indicated may disqualify Bidder from receiving an award of the Contract.

3.03 No requirement in this Article 3 to submit information will prejudice the right of Owner to seek additional pertinent information regarding Bidder's qualifications.

ARTICLE 4—PRE-BID CONFERENCE

4.01 A non-mandatory pre-bid conference will be held at the time and location indicated in the Advertisement or invitation to bid. Representatives of Owner and Engineer will be present to discuss the Project. Bidders are encouraged to attend and participate in the conference; however, attendance at this conference is not required to submit a Bid.

4.02 Information presented at the pre-Bid conference does not alter the Contract Documents. Owner will issue Addenda to make any changes to the Contract Documents that result from discussions at the pre-Bid conference. Information presented, and statements made at the pre-bid conference will not be binding or legally effective unless incorporated in an Addendum.

ARTICLE 5—SITE AND OTHER AREAS; EXISTING SITE CONDITIONS; EXAMINATION OF SITE; OWNER'S SAFETY PROGRAM; OTHER WORK AT THE SITE

5.01 *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.

5.02 *Existing Site Conditions*

A. *Underground Facilities:* Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data.

5.03 *Other Site-related Documents*

A. No other Site-related documents are available.

5.04 *Site Visit and Testing by Bidders*

A. Bidder is required to visit the Site and conduct a thorough visual examination of the Site and adjacent areas. During the visit the Bidder must not disturb any ongoing operations at the Site.

B. Bidders visiting the Site are required to arrange their own transportation to the Site.

C. Bidder is not required to conduct any subsurface testing, or exhaustive investigations of Site conditions.

5.05 *Owner's Safety Program*

A. Site visits and work at the Site may be governed by an Owner safety program.

5.06 *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 6—BIDDER'S REPRESENTATIONS AND CERTIFICATIONS

6.01 *Express Representations and Certifications in Bid Form, Agreement*

A. The Bid Form that each Bidder will submit contains express representations regarding the Bidder's examination of Project documentation, Site visit, and preparation of the Bid, and certifications regarding lack of collusion or fraud in connection with the Bid. Bidder should review these representations and certifications, and assure that Bidder can make the representations and certifications in good faith, before executing and submitting its Bid.

B. If Bidder is awarded the Contract, Bidder (as Contractor) will make similar express representations and certifications when it executes the Agreement.

ARTICLE 7—INTERPRETATIONS AND ADDENDA

7.01 Owner on its own initiative may issue Addenda to clarify, correct, supplement, or change the Bidding Documents.

7.02 Bidder shall submit all questions about the meaning or intent of the Bidding Documents to Engineer in writing. Contact information and submittal procedures for such questions are as follows:

A. **Submit via email to jdborgeson@ecologicaldg.com or via post to: ATTN: JD Borgeson, Ecological Design Group, Inc., 120 S. Izard St., Little Rock, AR, 72201**

7.03 Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda delivered to all registered plan holders. Questions received less than seven days prior to the date for opening of Bids may not be answered.

7.04 Only responses set forth in an Addendum will be binding. Oral and other interpretations or clarifications will be without legal effect. Responses to questions are not part of the Contract Documents unless set forth in an Addendum that expressly modifies or supplements the Contract Documents.

ARTICLE 8—BID SECURITY

8.01 A Bid must be accompanied by Bid security made payable to Owner in an amount of **5** percent of Bidder's maximum Bid price (determined by adding the base bid and all alternates). Such Bid bond will be issued in the form included in the Bidding Documents.

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, 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 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, in whole in the case of a penal sum bid bond, and to the extent of Owner's damages in the case of a damages-form bond. Such forfeiture will 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 7 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 7 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 (a) substantially completed and (b) ready for final payment, and (c) Milestones (if any) are to be achieved, are set forth in the Agreement.

9.02 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 10—SUBSTITUTE AND "OR EQUAL" ITEMS

10.01 The Contract for the Work, as awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents without consideration during the bidding and Contract award process of possible substitute or "or-equal" items. In cases in which the Contract allows the Contractor to request that Engineer authorize the use of a substitute or "or-equal" item of material or equipment, application for such acceptance may not be made to and will not be considered by Engineer until after the Effective Date of the Contract.

10.02 All prices that Bidder sets forth in its Bid will 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 11—SUBCONTRACTORS, SUPPLIERS, AND OTHERS

11.01 A Bidder must be prepared to retain specific Subcontractors and Suppliers for the performance of the Work if required to do so by the Bidding Documents or in the Specifications. If a prospective Bidder objects to retaining any such Subcontractor or Supplier and the concern is not relieved by an Addendum, then the prospective Bidder should refrain from submitting a Bid.

11.02 The apparent Successful Bidder, and any other Bidder so requested, must submit to Owner a list of the Subcontractors or Suppliers proposed for the following portions of the Work within five days after Bid opening:

A. **Electrical**
B. **Pavillion/Stage Construction**
C. **Landscaping**

11.03 If requested by Owner, such list must be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor or Supplier. If Owner or Engineer, after due investigation, has reasonable objection to any proposed Subcontractor or Supplier, Owner may, before the Notice of Award is given, request apparent Successful Bidder to submit an acceptable substitute, in which case apparent Successful Bidder will 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.

11.04 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 and Suppliers. Declining to make requested substitutions will constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor or Supplier, 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.

ARTICLE 12—PREPARATION OF BID

12.01 The Bid Form is included with the Bidding Documents.

A. All blanks on the Bid Form must be completed in ink and the Bid Form signed in ink. Erasures or alterations must be initialed in ink by the person signing the Bid Form. A Bid price must 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.”

12.02 If Bidder has obtained the Bidding Documents as Electronic Documents, then Bidder shall prepare its Bid on a paper copy of the Bid Form printed from the Electronic Documents version of the Bidding Documents. The printed copy of the Bid Form must be clearly legible, printed on 8½ inch by 11-inch paper and as closely identical in appearance to the Electronic Document version of the Bid Form as may be practical. The Owner reserves the right to accept Bid Forms which nominally vary in appearance from the original paper version of the Bid Form, providing that all required information and submittals are included with the Bid.

12.03 A Bid by a corporation must 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 must be shown.

12.04 A Bid by a partnership must be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership must be shown.

12.05 A Bid by a limited liability company must 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 must be shown.

12.06 A Bid by an individual must show the Bidder’s name and official address.

12.07 A Bid by a joint venture must be executed by an authorized representative of each joint venturer in the manner indicated on the Bid Form. The joint venture must have been formally established prior to submittal of a Bid, and the official address of the joint venture must be shown.

12.08 All names must be printed in ink below the signatures.

12.09 The Bid must contain an acknowledgment of receipt of all Addenda, the numbers of which must be filled in on the Bid Form.

12.10 Postal and e-mail addresses and telephone number for communications regarding the Bid must be shown.

12.11 The Bid must contain evidence of Bidder’s authority to do business in the state where the Project is located, or Bidder must certify in writing that it will obtain such authority within the time for acceptance of Bids and attach such certification to the Bid.

12.12 If Bidder is required to be licensed to submit a Bid or perform the Work in the state where the Project is located, the Bid must contain evidence of Bidder’s licensure, or Bidder must certify in writing that it will obtain such licensure within the time for acceptance of Bids and attach such

certification to the Bid. Bidder's state contractor license number, if any, must also be shown on the Bid Form.

ARTICLE 13—BASIS OF BID

13.01 *Lump Sum*

A. The Work under this Contract will be awarded under a stipulated sum contract to the lowest responsible base bid amount. No segregated bids or assignments will be considered. Bids are to include all labor, materials, equipment, sales tax, social security tax, State Unemployment Insurance and all other like items necessary to complete this project.

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

C. The unit prices provided in the bid are for the sole purpose of comparing bids and are not referenced in the construction contract.

ARTICLE 14—SUBMITTAL OF BID

14.01 The Bidding Documents include 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 2 of the Bid Form.

14.02 A Bid must be received no later than the date and time prescribed and at the place indicated in the Advertisement or invitation to bid and must 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 must be accompanied by the Bid security and other required documents. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid must be enclosed in a separate package plainly marked on the outside with the notation "BID ENCLOSED." A mailed Bid must be addressed to the location designated in the Advertisement.

14.03 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 15—MODIFICATION AND WITHDRAWAL OF BID

15.01 An unopened 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.

15.02 If a Bidder wishes to modify its Bid prior to Bid opening, Bidder must withdraw its initial Bid in the manner specified in Paragraph 15.01 and submit a new Bid prior to the date and time for the opening of Bids.

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

ARTICLE 16—OPENING OF BIDS

16.01 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 17—BIDS TO REMAIN SUBJECT TO ACCEPTANCE

17.01 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 18—EVALUATION OF BIDS AND AWARD OF CONTRACT

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

18.02 If the Owner awards the contract for the Work, such award will be to the responsible Bidder submitting the lowest responsive Bid.

18.03 In evaluating whether a Bidder is 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.

18.04 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 19—BONDS AND INSURANCE

19.01 Performance and Payment Bonds are not required as part of this contract.

19.02 Article 8, Bid Security, of these Instructions, addresses any requirements for providing bid bonds as part of the bidding process.

ARTICLE 20—SIGNING OF AGREEMENT

20.01 When Owner issues a Notice of Award to the Successful Bidder, it will 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 must 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 10 days thereafter, Owner will deliver one fully executed counterpart of the Agreement to Successful Bidder, together with printed and electronic copies of the Contract Documents.

ARTICLE 21—APPLICABLE LAWS

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

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

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

21.04 Arkansas State Contractor Licensing Law applies to this project.

SECTION 004113 - BID FORM FOR CONSTRUCTION CONTRACT

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 1—OWNER AND BIDDER

1.01 This Bid is submitted to:

Forrest City Public Library
421 S. Washington St.
Forrest City, AR 72335

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—ATTACHMENTS TO THIS BID

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

A. Required Bid security;

B. List of Proposed Subcontractors;

C. List of Proposed Suppliers;

D. Evidence of authority to do business in the state of the Project; or a written covenant to obtain such authority within the time for acceptance of Bids;

E. Contractor's license number as evidence of Bidder's State Contractor's License or a covenant by Bidder to obtain said license within the time for acceptance of Bids;

F. Required Bidder Qualification Statement with supporting data; and

G. Attachment A – Unit Prices

ARTICLE 3—BASIS OF BID—LUMP SUM BID AND UNIT PRICES

3.01 *Lump Sum Bids*

A. Bidder will complete the Work in accordance with the Contract Documents for the following lump sum (stipulated) price(s), together with any Unit Prices indicated in Paragraph 3.02:

1. Lump Sum Price (Single Lump Sum)

Lump Sum Bid Price	$

3.02 *Unit Prices*

A. Bidder will perform the Work for the Lump Sum Price stated above for the indicated unit prices in Attachment A – Unit Prices. Bidder is required to complete Attachment A and submit as part of Bid, but the construction contract is only .

B. Bidder acknowledges that:

1. each Bid Unit Price includes an amount considered by Bidder to be adequate to cover Contractor's overhead and profit for each separately identified item, and
2. unit prices and estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids.

ARTICLE 4—TIME OF COMPLETION

4.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.

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

ARTICLE 5—BIDDER'S ACKNOWLEDGEMENTS: ACCEPTANCE PERIOD, INSTRUCTIONS, AND RECEIPT OF ADDENDA

5.01 *Bid Acceptance Period*

A. This Bid will remain subject to acceptance for 60 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

5.02 *Instructions to Bidders*

A. Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security.

5.03 *Receipt of Addenda*

A. Bidder hereby acknowledges receipt of the following Addenda:

Addendum Number	Addendum Date

ARTICLE 6—BIDDER'S REPRESENTATIONS AND CERTIFICATIONS

6.01 *Bidder's Representations*

A. In submitting this Bid, Bidder represents the following:

1. Bidder has examined and carefully studied the Bidding Documents, including Addenda.
2. Bidder has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
3. Bidder is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work.
4. Bidder has carefully studied the reports of explorations and tests of subsurface conditions at or adjacent to the Site and the drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, with respect to the Technical Data in such reports and drawings.
5. 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 the Technical Data identified

in the Supplementary Conditions or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and performance of the Work; (b) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, if selected as Contractor; and (c) Bidder's (Contractor's) safety precautions and programs.

6. Based on the information and observations referred to in the preceding paragraph, Bidder 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.

7. 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.

8. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and of discrepancies between Site conditions and the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.

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

10. The submission of this Bid constitutes an incontrovertible representation by Bidder that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

6.02 *Bidder's Certifications*

A. The Bidder certifies the following:

1. 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.

2. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid.

3. Bidder has not solicited or induced any individual or entity to refrain from bidding.

4. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 8.02.A:

a. 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.

b. 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.

c. 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.

d. 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.

BIDDER hereby submits this Bid as set forth above:

Bidder:

_____
(typed or printed name of organization)

By: _____
(individual's signature)

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Date: _____
(typed or printed)

If Bidder is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.

Attest: _____
(individual's signature)

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Date: _____
(typed or printed)

Address for giving notices:

_____

_____

Bidder's Contact:

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Phone: _____

Email: _____

Address:

_____

_____

_____

Bidder's Contractor License No.: (if applicable) _____

SECTION 004113.01 - ATTACHMENT A – UNIT PRICES

Item No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Amount
1	Construction Entrance	EA	1		$
2	Concrete Washout	EA	1		$
3	Filter Sock	EA	1		$
4	Silt Fence	LF	359		$
5	Tree Preservation Fence	LF	853		$
6	Mobilization & Site Preparation	LS	1		$
7	Grading/Select Fill	CY	80		$
8	Undercut	CY	440		$
9	Fine Grading	SY	2339		$
10	Spread 4" Topsoil	SY	2339		$
11	Concrete Sidewalk (4" depth w/ WWM)	SY	208		$
12	Concrete Sidewalk (4" depth w/ WWM) w/ Integral Color	SY	204		$
13	Crushed Stone with Stabilizer	TON	55		$
14	Concrete Ribbon Curb	LF	87		$
15	Concrete Paving (6")	SY	47		$
16	Class 7 Aggregate Base	CY	107		$
17	Crowley's Ridge Drainage Rock / Landscape Gravel	CY	6		$
18	Pavilion (w/ screen)	LS	1		$
19	Fencing	LF	412		$
20	Playground Equipment	LS	1		$
21	Artificial Turf Play Surfacing	SF	880		$
22	Perforated Storm Pipe	LF	28		$
23	Benches	EA	3		$
24	Movable Tables & Chairs	LS	1		$
25	Picnic Table	EA	3		$
26	Trash Receptacle	EA	1		$
27	Trees 2.5" cal	EA	6		$
28	Trees 3" cal	EA	3		$
29	Plant Material - 1 quart	EA	215		$
30	Plant Material - 1 gallon	EA	105		$
31	Plant Material - 3 gallon	EA	104		$
32	Plant Material - 5 gallon	EA	46		$
33	Raw steel edging	LF	384		$
34	Flagstone	EA	1		$
35	Sod	SY	652		$
36	Hydroseed Bermudagrass	SY	300		$
37	Temporary Irrigation	LS	1		$
38	Door Replacement w/ Push-button Entry	LS	1		$

39	Utilities - Lighting	LS	1		$
40	Utilities – Electrical for Security Cameras (Conduit Only)	LF	225		$
41	Utilities - Electrical	LS	1		$
Total of All Unit Price Bid Items					$

END OF SECTION 004113

SECTION 004313 - BID BOND (PENAL SUM FORM)

Bidder Name: Address *(principal place of business)*:	**Surety** Name: Address *(principal place of business)*:
Owner Name: **Forrest City Public Library** Address *(principal place of business)*: **Forrest City Public Library** **421 S. Washington St.** **Forrest City, AR 72335**	**Bid** Project *(name and location)*: **FCPLA23.00 CONTRACT FOR CONSTRUCTION OF A SMALL PROJECT** Bid Due Date: **[Enter date bid is due]**
Bond Penal Sum: Date of Bond:	
Surety and Bidder, intending to be legally bound hereby, subject to the terms set forth in this Bid Bond, do each cause this Bid Bond to be duly executed by an authorized officer, agent, or representative.	
Bidder *(Full formal name of Bidder)* By: _____ *(Signature)* Name: _____ *(Printed or typed)* Title: _____ Attest: _____ *(Signature)* Name: _____ *(Printed or typed)* Title:	Surety *(Full formal name of Surety) (corporate seal)* By: _____ *(Signature) (Attach Power of Attorney)* Name: _____ *(Printed or typed)* Title: _____ Attest: _____ *(Signature)* Name: _____ *(Printed or typed)* Title:
Notes: (1) Note: Addresses are to be used for giving any required notice. (2) Provide execution by any additional parties, such as joint venturers, if necessary.	

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 will be Owner's sole and exclusive remedy upon default of Bidder.
2. Default of Bidder occurs 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 will 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 does not in the aggregate exceed 120 days from the Bid due date without Surety's written consent.
6. No suit or action will 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 will be commenced only in a court of competent jurisdiction located in the state in which the Project is located.
8. Notices required hereunder must 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 Postal Service registered or certified mail, return receipt requested, postage pre-paid, and will 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 will 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 governs and the remainder of this Bond that is not in conflict therewith continues in full force and effect.
11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.

SECTION 005213 - CONTRACT FOR CONSTRUCTION OF A SMALL PROJECT

This Contract is by and between Forrest City Public Library (Owner) and

_____ (Contractor).

Owner and Contractor hereby agree as follows:

ARTICLE 1 - THE WORK

1.01 WORK

A. Work includes all labor, materials, equipment, services, and documentation necessary to construct the Project defined herein. The Work may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.

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

1. **Forrest City Public Library Park Landscape and ADA Improvements** which includes **the construction of a small public park adjacent to the library, which includes grading, a play area, a custom wooden stage/pavilion, installation of concrete walks and pavers, and site lighting**.

2. The Site of the Work includes property, easements, and designated work areas described in greater detail in the Contract Documents but generally located **in the lot adjacent to the library to the northwest at the southeast corner of E Cross St. and S Washington St. in Forrest City, AR.**

ARTICLE 2 - CONTRACT DOCUMENTS

2.01 INTENT OF CONTRACT DOCUMENTS

A. It is the intent of the Contract Documents to describe a functionally complete project. The Contract Documents do not indicate or describe all of the Work required to complete the Project. Additional details required for the correct installation of selected products are to be provided by the Contractor and coordinated with the Owner and Engineer. This Contract supersedes prior negotiations, representations, and agreements, whether written or oral. The Contract Documents are complementary; what is required by one part of the Contract Documents is as binding as if required by other parts of the Contract Documents.

B. During the performance of the Work and until final payment, Contractor and Owner shall submit all matters in question concerning the requirements of the Contract Documents, or relating to the acceptability of the Work under the Contract Documents to the Engineer. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work thereunder.

C. Engineer will render a written clarification, interpretation, or decision on the issue submitted, or initiate a modification to the Contract Documents.

D. Contractor, and its subcontractors and suppliers, shall not have or acquire any title to or ownership rights to any of the Drawings, Specifications, or other documents (including copies or electronic media editions) prepared by Engineer or its consultants.

2.02 CONTRACT DOCUMENTS DEFINED

A. The Contract Documents consist of the following documents:

1. This Contract.

2. Specifications listed in the Table of Contents.

3. Drawings as listed on the Drawing Sheet Index.
4. Addenda.
5. The following which may be delivered or issued on or after the Effective Date of the Contract:
    a. Work Change Directives.
    b. Change Orders.
    c. Field Orders.

ARTICLE 3 - ENGINEER

3.01 ENGINEER

A. The Engineer for this Project is **Ecological Design Group**

ARTICLE 4 - CONTRACT TIMES

4.01 CONTRACT TIMES

A. The Work will be substantially completed within **150** days after the Effective Date of the Contract and completed and ready for final payment within **180** days after the Effective Date of the Contract.

4.02 LIQUIDATED DAMAGES

A. Contractor and Owner recognize that time is of the essence in the performance of the Contract, and that Owner will incur damages if Contractor does not complete the Work according to the requirements of Paragraph 4.01. Because such damages for delay would be difficult and costly to determine, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty) Contractor shall pay Owner **$100** for each day that expires after the Contract Time for substantial completion.

4.03 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 or their subcontractors or suppliers.

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.

D. 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 or Contractor's subcontractors or suppliers.

4.04 PROGRESS SCHEDULES

A. Contractor shall develop a progress schedule and submit to the Engineer for review and comment before starting Work on the Site. The Contractor shall modify the schedule in accordance with the comments provided by the Engineer.

B. The Contractor shall update and submit the progress schedule to the Engineer each month. The Owner may withhold payment if the Contractor fails to submit the schedule.

ARTICLE 5 - CONTRACT PRICE

5.01 PAYMENT

A. Owner shall pay Contractor in accordance with the Contract Documents, the lump sum amount of $**[Contract Price]** for all Work.

ARTICLE 6 - BONDS AND INSURANCE

6.01 BONDS

A. Performance and Payment Bonds are not required for this project.

6.02 INSURANCE

A. Before starting Work, Contractor shall furnish evidence of insurance from companies that are duly licensed or authorized in the jurisdiction in which the Project is located with a minimum AM Best rating of A-VII or better. Contractor shall provide insurance in accordance with the following:

1. Contractor shall provide coverage for not less than the following amounts, or greater where required by Laws and Regulations:

a. Workers' Compensation:

State:	Statutory
Employer's Liability:	
Bodily Injury, each Accident	$ 1,000,000
Bodily Injury By Disease, each Employee	$ 1,000,000
Bodily Injury/Disease Aggregate	$ 1,000,000

b. Commercial General Liability:

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

c. Automobile Liability herein:

Combined Single Limit of:	$ 1,000,000

d. Excess or Umbrella Liability:

Per Occurrence	$ 5,000,000
General Aggregate	$ 5,000,000

B. All insurance policies required to be purchased and maintained 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 insured and additional insured.

C. Automobile liability insurance provided by Contractor shall provide coverage 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.

D. Contractor's commercial general liability policy shall be written on a 1996 or later ISO commercial general liability occurrence form and include the following coverages and endorsements:

1. Products and completed operations coverage maintained for three years after final payment;

2. Blanket contractual liability coverage to the extent permitted by law;

3. Broad form property damage coverage; and

4. Severability of interest; underground, explosion, and collapse coverage; personal injury coverage.

E. The Contractor's commercial general liability and automobile liability, umbrella or excess, and pollution liability policies shall include and list Owner and Engineer and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each as 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.

1. Additional insured endorsements will 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). If Contractor demonstrates to Owner that the specified ISO endorsements are not commercially available, then Contractor may satisfy this requirement by providing equivalent endorsements.

2. Contractor shall provide ISO Endorsement CG 20 32 07 04, "Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured" or its equivalent for design professional additional insureds.

F. Umbrella or excess liability insurance shall be written over the underlying employer's liability, commercial general liability, and automobile liability insurance. Subject to industry-standard exclusions, the coverage afforded shall be procured on a "follow the form" basis as to each of the underlying policies. Contractor may demonstrate to Owner that Contractor has met the combined limits of insurance (underlying policy plus applicable umbrella) specified for employer's liability, commercial general liability, and automobile liability through the primary policies alone, or through combinations of the primary insurance policies and an umbrella or excess liability policy.

G. The Contractor shall provide property insurance covering physical loss or damage during construction to structures, materials, fixtures, and equipment, including those materials, fixtures, or equipment in storage or transit.

H. 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 15.

ARTICLE 7 - CONTRACTOR'S RESPONSIBILITIES

7.01 SUPERVISION AND SUPERINTENDENCE

A. Contractor shall supervise 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, safety, and procedures of construction.

B. Contractor shall assign a competent resident superintendent who is to be present at all times during the execution of the Work. This resident superintendent shall not be replaced without written notice to and approval by the Owner and Engineer except under extraordinary circumstances.

C. Contractor shall at all times maintain good discipline and order at the Site.

D. 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.

7.02 OTHER WORK AT THE SITE

A. In addition to and apart from the Work of the Contractor, other work may occur at or adjacent to the Site. 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.

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 new, of good quality and 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 SUBCONTRACTORS AND SUPPLIERS

A. Contractor may retain subcontractors and suppliers for the performance of parts of the Work. Such subcontractors and suppliers must be acceptable to Owner.

7.05 QUALITY MANAGEMENT

A. Contractor is fully responsible for the managing quality to ensure Work is completed in accordance with the Contract Documents.

7.06 LICENSES, FEES AND PERMITS

A. Contractor shall pay all license fees and royalties and assume all costs incident to performing 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.

B. Contractor shall obtain and pay for all construction permits and licenses unless otherwise provided in the Contract Documents.

7.07 LAWS AND REGULATIONS; TAXES

A. Contractor shall give all notices required by and shall comply with all local, state, and federal 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. 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 if Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations.

C. Contractor shall pay all applicable sales, consumer, use, and other similar taxes Contractor is required to pay in accordance with Laws and Regulations.

7.08 RECORD DOCUMENTS

A. Contractor shall maintain one printed record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, written interpretations and clarifications, and approved shop drawings in a safe place at the Site. Contractor shall annotate them to show changes made during construction. Contractor shall deliver these record documents to Engineer upon completion of the Work.

7.09 SAFETY AND PROTECTION

A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work.

B. 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.

C. All damage, injury, or loss to any property caused, directly or indirectly, in whole or in part, by Contractor, or anyone for whose acts the Contractor may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Contract Documents or to the acts or omissions of Owner or Engineer and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor).

D. 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.

E. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor shall 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.

7.10 SHOP DRAWINGS, SAMPLES, AND OTHER SUBMITTALS

A. Contractor shall review and coordinate the shop drawing and samples with the requirements of the Work and the Contract Documents and shall verify all related field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information.

B. 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.

C. With each submittal, Contractor shall give Engineer specific written notice, in a communication separate from the submittal, of any variations that the shop drawing or sample may have from the requirements of the Contract Documents.

D. Engineer will provide timely review of shop drawings and samples.

E. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction or to safety precautions or programs.

F. Engineer's review and approval of a separate item does not indicate approval of the assembly in which the item functions.

G. 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.

H. Shop drawings are not Contract Documents.

7.11 WARRANTIES AND GUARANTEES

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.

7.12 CORRECTION PERIOD

A. If within one year after the date of substantial completion, 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 and without cost to Owner, correct such defective Work.

7.13 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 they may be liable.

ARTICLE 8 - OWNER'S RESPONSIBILITIES

8.01 OWNER'S RESPONSIBILITIES

A. Except as otherwise provided in the Contract Documents, Owner shall issue all communications to Contractor through Engineer.

B. Owner shall make payments to Contractor as provided in this Contract.

C. Owner shall provide Site and easements required to construct the Project.

D. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, unless stated elsewhere in the Contract Documents, Owner shall have sole authority and responsibility for such coordination.

E. The Owner shall be responsible for performing inspections and tests required by applicable codes.

F. 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, 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.

G. 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.

H. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

ARTICLE 9 - ENGINEER'S STATUS DURING CONSTRUCTION

9.01 ENGINEER'S STATUS

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

B. Neither Engineer's authority or responsibility under this Article 9 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.

C. Engineer will make visits to the Site at intervals appropriate to the various stages of construction. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work.

D. Engineer has the authority to reject Work if Contractor fails to perform Work in accordance with the Contract Documents.

E. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work.

F. 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, 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.

ARTICLE 10 - CHANGES IN THE WORK

10.01 AUTHORITY TO CHANGE 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.

10.02 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 the Work which are: (a) ordered by Owner or (b) agreed to by the parties or (c) resulting from the Engineer's decision, 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

3. Changes in the Contract Price or Contract Times or other changes which embody the substance of any final binding results under Article 12.

B. 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 11 - DIFFERING SUBSURFACE OR PHYSICAL CONDITIONS

11.01 DIFFERING CONDITIONS PROCESS

A. If Contractor believes that any subsurface or physical condition including but not limited to utilities or other underground facilities that are uncovered or revealed at the Site either differs materially from that shown or indicated in the Contract Documents or 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), 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. After receipt of written notice, Engineer will promptly:

1. Review the subsurface or physical condition in question;

2. Determine necessity for Owner obtaining additional exploration or tests with respect to the condition;

3. Determine whether the condition falls within the differing site condition as stated herein;

4. Obtain any pertinent cost or schedule information from Contractor;

5. 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

6. Advise Owner in writing of Engineer's findings, conclusions, and recommendations.

C. After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor 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.

ARTICLE 12 - CLAIMS AND DISPUTE RESOLUTION

12.01 CLAIMS PROCESS

A. The party submitting a claim shall deliver it directly to the other party to the Contract and the Engineer promptly (but in no event later than 10 days) after the start of the event giving rise thereto.

B. 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. All actions taken on a claim shall be stated in writing and submitted to the other party.

C. 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 45 days, the claim is deemed denied.

D. If the dispute is not resolved to the satisfaction of the parties, Owner or Contractor shall give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction unless the Owner and Contractor both agree to an alternative dispute resolution process.

ARTICLE 13 - TESTS AND INSPECTIONS; CORRECTION OF DEFECTIVE WORK

13.01 TESTS AND INSPECTIONS

A. Owner and Engineer 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.

B. Contractor shall give Engineer timely notice of readiness of the Work for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.

C. If any Work 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.

13.02 DEFECTIVE WORK

A. Contractor shall ensure that the Work is not defective.

B. Engineer has the authority to determine whether Work is defective, and to reject defective Work.

C. Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.

D. The Contractor shall promptly correct all such defective Work.

E. 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. 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.

ARTICLE 14 - PAYMENTS TO CONTRACTOR

14.01 PROGRESS PAYMENTS

A. The Contractor shall prepare a schedule of values that will serve as the basis for progress payments. The schedule of values will be in a form of application for payment acceptable to Engineer. The unit price breakdown submitted with the bid will be used for unit price work. Break lump sum items into units that will allow for measurement of Work in progress.

14.02 APPLICATIONS FOR PAYMENTS:

A. Contractor shall submit an application for payment in a form acceptable to the Engineer, no more frequently than monthly, to Engineer. Applications for payment will be prepared and signed by Contractor. Contractor shall provide supporting documentation required by the Contract Documents. Payment will be paid for Work completed as of the date of the application for payment.

B. 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.

14.03 RETAINAGE

A. The Owner shall retain **10%** of each progress payment until the Work is substantially complete.

14.04 REVIEW OF APPLICATIONS

A. Within 10 days after receipt of each application for payment, the Engineer will either indicate in writing a recommendation for payment and present the application for payment to Owner or return the application for payment to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. The Contractor will make the necessary corrections and resubmit the application for payment.

B. Engineer will recommend reductions in payment (set-offs) which, in the opinion of the Engineer, are necessary to protect Owner from loss because the Work is defective and requires correction or replacement.

C. The Owner is entitled to impose set-offs against payment based on any claims that have been made against Owner on account of Contractor's conduct in the performance of the Work, incurred costs, losses, or damages on account of Contractor's conduct in the performance of the Work, or liquidated damages that have accrued as a result of Contractor's failure to complete the Work.

14.05 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.

14.06 SUBSTANTIAL COMPLETION

A. The Contractor shall notify Owner and Engineer in writing that the Work is substantially complete and request the Engineer issue a certificate of substantial completion when Contractor considers the Work ready for its intended use. 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. Engineer will make an inspection of the Work with the Owner and Contractor to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor and Owner in writing giving the reasons therefor.

C. If Engineer considers the Work substantially complete or upon resolution of all reasons for non-issuance of a certificate identified in 14.06.B, Engineer will deliver to Owner a certificate of substantial completion which shall fix the date of substantial completion and include a punch list of items to be completed or corrected before final payment.

14.07 FINAL INSPECTION

A. Upon written notice from Contractor that the entire Work 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.

14.08 FINAL PAYMENT

A. Contractor may make application for final payment after Contractor has satisfactorily completed all Work defined in the Contract, including providing all maintenance and operating

instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, annotated record documents and other documents.

B. The final application for payment shall be accompanied (except as previously delivered) by:

1. All documentation called for in the Contract Documents;

2. Consent of the surety to final payment;

3. 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;

4. A list of all disputes that Contractor believes are unsettled; and

5. 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.

C. 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.

14.09 WAIVER OF CLAIMS

A. The making of final payment will not constitute a waiver by Owner of claims or rights against Contractor.

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.

ARTICLE 15 - SUSPENSION OF WORK AND TERMINATION

15.01 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 60 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.

15.02 OWNER MAY TERMINATE FOR CAUSE

A. Contractor's failure to perform the Work in accordance with the Contract Documents or other failure to comply with a material term of the Contract Documents will constitute a default by Contractor and justify termination for cause.

B. If Contractor defaults in its obligations, 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. Owner may not proceed with termination of the Contract under Paragraph 15.02.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.

D. 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.

E. In the case of a termination for cause, if the cost to complete the Work, including related claims, costs, losses, and damages, exceeds the unpaid contract balance, Contractor shall pay the difference to Owner.

15.03 OWNER MAY TERMINATE FOR CONVENIENCE

A. Upon seven days written notice to Contractor, 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.

15.04 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) 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 provided Owner does not remedy such suspension or failure within that time, either stop the Work until payment is received, or terminate the Contract and recover payment from the Owner.

ARTICLE 16 - CONTRACTOR'S REPRESENTATIONS

16.01 CONTRACTOR REPRESENTATIONS

A. Contractor makes the following representations when entering into this Contract:

1. Contractor has examined and carefully studied the Contract Documents, and any data and reference items identified in the Contract Documents.

2. Contractor has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

3. Contractor is familiar with and is satisfied as to all Laws and Regulations that may affect cost, progress, and performance of the Work.

4. 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:

a. The cost, progress, and performance of the Work;

b. The means, methods, techniques, sequences, and procedures of construction to be employed by Contractor; and

c. Contractor's safety precautions and programs.

5. 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.

6. 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.

7. 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.

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

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

ARTICLE 17 - MISCELLANEOUS

17.01 CUMULATIVE REMEDIES

A. The duties and obligations imposed by this Contract 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.

17.02 LIMITATION OF DAMAGES

A. Neither Owner, 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.

17.03 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.

17.04 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.

17.05 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.

17.06 CONTROLLING LAW

A. This Contract is to be governed by the law of the state in which the Project is located.

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

This Contract will be effective on _____ (which is the Effective Date of the Contract).

OWNER:	CONTRACTOR:
Forrest City Public Library	
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:
	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 Contract.)	***NOTE TO USER: Use in those states or other jurisdictions where applicable or required.***

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SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

1.2 USE CHARGES

A. Installation and removal of and use charges for temporary facilities to be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Engineer, testing agencies, and authorities having jurisdiction.

B. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services and metering as required for construction operations.

C. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services and metering as required for construction operations.

1.3 INFORMATIONAL SUBMITTALS

A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.

B. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.

C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

D. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold. Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.

E. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Include the following:

1. Locations of dust-control partitions at each phase of work.

2. HVAC system isolation schematic drawing.
3. Location of proposed air-filtration system discharge.
4. Waste-handling procedures.
5. Other dust-control measures.

1.4 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

C. Accessible Temporary Egress: Comply with applicable provisions in the DOJ's "2010 ADA Standards for Accessible Design", and, ICC A117.1.

1.5 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 TEMPORARY FACILITIES

A. Field Offices:

1. Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Engineer, Construction Manager, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:

1. Furniture required for Project-site documents, including file cabinets, plan tables, plan racks, and bookcases.
2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot- square tack and marker boards.
3. Drinking water and private toilet.
4. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
5. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.

2.2 EQUIPMENT

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

B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating, Cooling, and Dehumidifying Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction.

C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

3.2 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.3 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.

C. Water Service:

1. Install water service and distribution piping in sizes and pressures adequate for construction.

D. Sanitary Facilities: Provide temporary toilets, wash facilities, safety shower and eyewash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

E. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.

F. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.

G. Electric Power Service:

1. Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

a. Install electric power service underground unless otherwise indicated.

H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

3.4 SUPPORT FACILITIES INSTALLATION

A. Comply with the following:

1. Maintain support facilities until Engineer schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas within construction limits indicated on Drawings.

1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

C. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain, including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

D. Parking: Provide temporary offsite parking areas for construction personnel.

E. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

F. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.

1. Identification Signs: Provide Project identification signs as indicated on Drawings.
2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.

a. Provide temporary, directional signs for construction personnel and visitors.

3. Maintain and touch up signs, so they are legible at all times.

G. Waste Disposal Facilities:

1. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."
2. Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."

H. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

I. Existing Elevator Use: Use of Owner's existing elevators will be permitted, provided elevators are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore elevators to condition existing before initial use, including replacing worn cables, guide shoes, and similar items of limited life.

1. Do not load elevators beyond their rated weight capacity.
2. Provide protective coverings, barriers, devices, signs, or other procedures to protect elevator car and entrance doors and frame. If, despite such protection, elevators become damaged, engage elevator Installer to restore damaged work, so no evidence remains of correction work. Return items that cannot be refinished in field to the shop, make required repairs and refinish entire unit, or provide new units as required.

J. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.

K. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.

1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas, so no evidence remains of correction work.

L. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

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

1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

C. Temporary Erosion and Sedimentation Control:

1. Comply with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent and requirements specified in Section 311000 "Site Clearing."
2. Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, in accordance with erosion- and sedimentation-control Drawings, requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

a. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant-protection zones.
b. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
c. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
d. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.

D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

E. Tree and Plant Protection:

1. Comply with requirements specified in Section 015639 "Temporary Tree and Plant Protection."
2. Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

F. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals, so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using materials approved by authorities having jurisdiction.

G. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people from easily entering site except by entrance gates.

1. Extent of Fence: As indicated on Drawings.
2. Maintain security by limiting number of keys and restricting distribution to authorized personnel.

H. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.

I. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

J. Temporary Egress: Provide temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction. Provide signage directing occupants to temporary egress.

K. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.

L. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.

1. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition in accordance with requirements of authorities having jurisdiction.
2. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
3. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign, stating that hoses are for fire-protection purposes only and are not to

be removed. Match hose size with outlet size and equip with suitable nozzles.

3.6 MOISTURE AND MOLD CONTROL

A. Contractor's Moisture-Protection Plan: Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.

1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
3. Indicate methods to be used to avoid trapping water in finished work.

B. Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:

1. Protect porous materials from water damage.
2. Protect stored and installed material from flowing or standing water.
3. Keep porous and organic materials from coming into prolonged contact with concrete.
4. Remove standing water from decks.
5. Keep deck openings covered or dammed.

C. Partially Enclosed Construction Period: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
2. Keep interior spaces reasonably clean and protected from water damage.
3. Periodically collect and remove waste containing cellulose or other organic matter.
4. Discard or replace water-damaged material.
5. Do not install material that is wet.
6. Discard and replace stored or installed material that begins to grow mold.
7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.

D. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:

1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.

3.7 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste

and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION

SECTION 015639 - TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. The Work of this Section Includes: General protection and pruning of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction.

B. Related Requirements:

1. Section 311000 "Site Clearing" for limits on clearing; disposition of vegetative clearing debris.
2. Section 31 2000 - Earthwork: Temporary and permanent grade changes for erosion control.
3. Section 32 1123 - Aggregate Base Courses: Temporary and permanent roadways.

1.2 DEFINITIONS

A. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.

B. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and indicated on Drawings, defined by a circle concentric with each tree with a radius 1.5 times the diameter of the drip line unless otherwise indicated, defined by a circle concentric with each tree with a radius 12 times the tree's caliper size and with a minimum radius of 96 inches unless otherwise indicated. Reference Demo and Tree Preservation Plan for tree protection fence locations.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Include plans, elevations, and sections showing trees and plants to be protected, locations of protection-zone fencing and signage, and the relationship between equipment-movement routes and material storage locations with protection zones.

C. Samples: For each type of the following:

1. Organic Mulch: 1-pint volume of organic mulch; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch.
2. Protection-Zone Fencing: Assembled Samples of manufacturer's standard size

made from full-size components.

3. Protection-Zone Signage: Full-size Samples of each size and text, ready for installation.

D. Tree-Pruning Schedule: Written schedule detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.

1.5 INFORMATIONAL SUBMITTALS

A. Certification: From ISA certified arborist, certifying that trees indicated to remain have been protected during construction in accordance with recognized standards and that trees were promptly and properly treated and repaired when damaged.

B. Maintenance Recommendations: From ISA certified arborist, for care and protection of trees affected by construction during and after completing the Work.

C. Existing Conditions: Documentation of existing trees and plantings indicated to remain, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.

1.6 QUALITY ASSURANCE

A. Arborist Qualifications: Certified Arborist as certified by ISA,Licensed arborist in jurisdiction where Project is located, Current member of ASCA, Registered Consulting Arborist as designated by ASCA.

1.7 FIELD CONDITIONS

A. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Moving or parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

B. Do not direct vehicle or equipment exhaust toward protection zones.

C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Backfill Soil: Stockpiled soil mixed with planting soil of suitable moisture content and granular texture for placing around tree; free of stones, roots, plants, sod, clods, clay

lumps, pockets of coarse sand, concrete slurry, concrete layers or chunks, cement, plaster, building debris, and other extraneous materials harmful to plant growth.

1. Mixture: Well-blended mix of 2 parts stockpiled soil to 1 part planting soil.
2. Planting Soil: Planting soil as specified in Section 329113 "Soil Preparation"

B. Organic Mulch: Free from deleterious materials and suitable as a top dressing for trees and shrubs, consisting of one of the following:

1. Type: Shredded hardwood.

C. Protection-Zone Fencing: Fencing fixed in position and meeting one of the following requirements: Previously used materials may be used when approved by Architect.

1. Plastic Protection-Zone Fencing: Plastic construction fencing constructed of high-density extruded and stretched polyethylene fabric with 2-inch maximum opening in pattern and weighing a minimum of 0.4 lb/ft; remaining flexible from minus 60 to plus 200 deg F; inert to most chemicals and acids; minimum tensile yield strength of 2000 psi and ultimate tensile strength of 2680 psi;secured with plastic bands or galvanized-steel or stainless steel wire ties; and supported by tubular or T-shape galvanized-steel posts spaced not more than 96 inches apart.

a. Height: 48 inches.

2. Gates: Single- swing access gates matching material and appearance of fencing, to allow for maintenance activities within protection zones; leaf width As indicated.

D. Protection-Zone Signage: Shop-fabricated, rigid plastic or metal sheet with attachment holes prepunched and reinforced; legibly printed with nonfading lettering, stating “Notice: Tree Preservation Area DO NOT ENTER” or other verbiage as required by Urban Forester for the jurisdiction in which work will take place.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Erosion and Sedimentation Control: Examine the site to verify that temporary erosion- and sedimentation-control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

B. Tree-Protection Area: An Arborist shall examine all trees to remain and assess the health and maintenance needed for each individual tree. A report shall be generated from the Arborist and submitted to the Contractor, Owner and Landscape Architect.

3.2 PREPARATION

A. 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.

B. Tree-Protection Zones: Mulch areas inside tree-protection zones and other areas

indicated. Do not exceed indicated thickness of mulch.

1. Apply 4-inch uniform thickness of organic mulch unless otherwise indicated. Do not place mulch within 6 inches of tree trunks.

3.3 PROTECTION ZONES

A. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones in a manner that will prevent people from easily entering protected areas except by entrance gates. Construct fencing so as not to obstruct safe passage or visibility at vehicle intersections where fencing is located adjacent to pedestrian walkways or in close proximity to street intersections, drives, or other vehicular circulation.

1. Chain-Link Fencing: Install to comply with ASTM F567 and with manufacturer's written instructions.
2. Posts: Set or drive posts into ground one-third the total height of the fence without concrete footings. Where a post is located on existing paving or concrete to remain, provide appropriate means of post support acceptable to Architect.
3. Access Gates: Install where indicated; adjust to operate smoothly, easily, and quietly; free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

B. Protection-Zone Signage: Install protection-zone signage in visibly prominent locations in a manner approved by Architect.

C. Maintain protection zones free of weeds and trash.

D. Maintain protection-zone fencing and signage in good condition as acceptable to Landscape Architect and remove when construction operations are complete and equipment has been removed from the site.

3.4 EXCAVATION

A. General: Excavate at edge of protection zones and for trenches indicated within protection zones in accordance with requirements in Section 312000 "Earth Moving" unless otherwise indicated.

B. Trenching within Protection Zones: Where utility trenches are required within protection zones, excavate under or around tree roots by hand or with air spade, or tunnel under the roots by drilling, auger boring, or pipe jacking. Do not cut main lateral tree roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots as required for root pruning. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots.

C. Do not allow exposed roots to dry out before placing permanent backfill.

3.5 ROOT PRUNING

A. Prune tree roots that are affected by temporary and permanent construction. Prune roots as follows:

1. Cut roots manually by digging a trench and cutting exposed roots with sharp pruning instruments; do not break, tear, chop, or slant the cuts. Do not use a backhoe or other equipment that rips, tears, or pulls roots.
2. Temporarily support and protect roots from damage until they are permanently covered with soil.
3. Cover exposed roots with burlap and water regularly.
4. Backfill as soon as possible in accordance with requirements in Section 312000 "Earth Moving."

B. Root Pruning at Edge of Protection Zone: Prune tree roots by hand or using an air spade of the protection zone by cleanly cutting all roots to the depth of the required excavation.

C. Root Pruning within Protection Zone: Clear and excavate by hand or with air spade to the depth of the required excavation to minimize damage to tree root systems. If excavating by hand, use narrow-tine spading forks to comb soil to expose roots. Cleanly cut roots as close to excavation as possible.

3.6 CROWN PRUNING

A. Prune branches that are affected by temporary and permanent construction. Prune branches as directed by arborist.

1. Prune to remove only injured, broken, dying, or dead branches unless otherwise indicated. Do not prune for shape unless otherwise indicated.
2. Do not remove or reduce living branches to compensate for root loss caused by damaging or cutting root system.
3. Pruning Standards: Prune trees in accordance with ANSI A300 (Part 1) and as indicated on Drawings.

B. Cut branches with sharp pruning instruments; do not break or chop.

C. Chip removed branches and spread over areas identified by Architect.

3.7 REGRADING

A. Lowering Grade: Where new finish grade is indicated below existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

B. Raising Grade: Where new finish grade is indicated above existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

C. Minor Fill within Protection Zone: Where existing grade is 2 inches or less below elevation of finish grade, fill with backfill soil. Place backfill soil in a single uncompacted layer and hand grade to required finish elevations.

3.8 FIELD QUALITY CONTROL

A. Inspections: Engage a qualified arborist to direct plant-protection measures in the vicinity of trees, shrubs, and other vegetation indicated to remain and to prepare inspection reports.

B. Reports: All trees disturbed or damaged within a tree protection area or easement are to be assessed and a report produced by an arborist. All trees to remain are to be evaluated individually in a report by an arborist. Report is to be reviewed and approved by the Landscape Architect. All associated cost of arborist and associated work recommended in reports are to be at the contractor’s expense. Including but not limited to pruning, dead wooding, tree removal and legal disposal of material offsite.

3.9 REPAIR AND REPLACEMENT

A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or to be relocated that are damaged by construction operations, in a manner approved by Architect.

1. Perform repairs of damaged trunks, branches, and roots within 24 hours in accordance with arborist's written instructions.
2. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Architect.

B. Excess Mulch: Rake mulched area within protection zones, being careful not to injure roots. Rake to loosen and remove mulch that exceeds a 4-inch uniform thickness to remain.

3.10 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove excess excavated material, displaced trees, trash, and debris and legally dispose of them off Owner's property.

END OF SECTION

SECTION 015713 - TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Prevention of erosion due to construction activities.

B. Prevention of sedimentation of waterways, open drainage ways, and storm and sanitary sewers due to construction activities.

C. Restoration of areas eroded due to insufficient preventive measures.

D. Performance bond.

E. Compensation of Owner for fines levied by authorities having jurisdiction due to non-compliance by Contractor.

1.2 RELATED REQUIREMENTS

A. Section 31 1000 - Site Clearing: Limits on clearing; disposition of vegetative clearing debris.

B. Section 31 2000 – Earthwork: Temporary and permanent grade changes for erosion control

C. Section 32 1123 - Aggregate Base Courses: Temporary and permanent roadways.

1.3 PERFORMANCE REQUIRMENTS

A. Comply with all requirements of U.S. Environmental Protection Agency (EPA)and Arkansas Department of Environmental Quality (ADEQ) for erosion and sedimentation control.

1. Comply with requirements and recommendations of the EPA National Pollutant Discharge Elimination System (NPDES), Phases I and II, under requirements for the 2003 Construction General Permit (CGP)
2. Comply with requirements and recommendations of the ADEQ Construction Stormwater Discharge Permit ARR150000.
3. Comply with requirements and recommendation of the ADEQ Short Term Activity Authorization Permit, Specification Section 001001.

B. Comply with requirements of State of Arkansas, Erosion and Sedimentation Control Manual.

C. Comply with requirements of the City of Forrest City.

D. Develop and follow an Erosion and Sedimentation Prevention Plan and submit weekly inspection reports.

E. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits.

1. Obtain and pay for permits and provide security required by authority having jurisdiction.

F. Provide to Owner a Performance Bond covering erosion and sedimentation preventive measures only, in an amount equal to 100 percent of the cost of erosion and sedimentation control work.

G. Timing: Put preventive measures in place prior to disturbance of surface cover and before precipitation occurs.

H. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.

1. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less.
2. Anticipate runoff volume due to the most extreme short term and 24-hour rainfall events that might occur in 25 years.

I. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.

1. Control movement of sediment and soil from temporary stockpiles of soil.
2. Prevent development of ruts due to equipment and vehicular traffic.
3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.

J. Erosion Off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this project.

1. Prevent windblown soil from leaving the project site.
2. Prevent tracking of mud onto public roads outside site.
3. Prevent mud and sediment from flowing onto sidewalks and pavements.
4. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.

K. Sedimentation of Waterways On Site: Prevent sedimentation of waterways on the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.

1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
2. If sediment basins are used as temporary preventive measures, pump dry and remove deposited sediment after each storm.

L. Sedimentation of Waterways Off Site: Prevent sedimentation of waterways off the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.

1. If sedimentation occurs, install or correct preventive measures immediately at no

cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.

M. Open Water: Prevent standing water that could become stagnant.

N. Maintenance: Maintain temporary preventative measures until permanent measures have been established.

O. All area left disturbed longer than 14 days shall be vegetated and/or stabilized.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Erosion and Sedimentation Control Plan:

1. Submit within 2 weeks after Notice to Proceed.
2. Include:

   a. Site plan identifying soils and vegetation, existing erosion problems, and areas vulnerable to erosion due to topography, soils, vegetation, or drainage.
   b. Site plan showing grading; new improvements; temporary roads, traffic accesses, and other temporary construction; and proposed preventive measures.
   c. Where extensive areas of soil will be disturbed, include storm water flow and volume calculations, soil loss predictions, and proposed preventive measures.
   d. Schedule of temporary preventive measures, in relation to ground disturbing activities.
   e. Other information required by law.
   f. Format required by law is acceptable, provided any additional information specified is also included.

3. Obtain the approval of the Plan by authorities having jurisdiction.
4. Obtain the approval of the Plan by Owner.

C. Certificate: Mill certificate for silt fence fabric attesting that fabric and factory seams comply with specified requirements signed by legally authorized official of manufacturer; indicate actual minimum average roll values; identify fabric by roll identification numbers.

D. Inspection Reports: Submit report of each inspection; identify each preventive measure, indicate condition, and specify maintenance or repair required and accomplished.

E. Maintenance Instructions: Provide instructions covering inspection and maintenance for temporary measures that must remain after Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Mulch: Use one of the following:

1. Straw or hay, certified weed seed free ‘clean’.
2. Erosion control matting or netting, bio- or photo-degradable straw, coconut, coir or jute.
3. 100% Wood Fiber Hydroseeding Mulch

B. Grass Seed for Temporary Cover: If same area will later be planted with permanent vegetation, do not use species known to be excessively competitive or prone to volunteer in subsequent seasons.

1. Summer Temporary Cover: May -September shall be Browntop Millet seeded at 100 lbs per acre and Plains Coreopsis seeded at 2 lbs per acre.
2. Winter Temporary Cover: September-May – shall be Cereal Rye -Secale cereale grain – 200 lbs/acre.

C. Stakes: One of the following, minimum 3 feet long:

1. Steel U- or T-section, with minimum mass of 1.33 lb per linear foot.
2. Wood, 2 by 2 inches in cross section.

D. Silt Fence Fabric: Polypropylene geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; fabric including seams with the following minimum average roll lengths:

1. Average Opening Size: 30 U.S. Std. Sieve, maximum, when tested in accordance with ASTM D 4751.
2. Permittivity: 0.05 sec^-1, minimum, when tested in accordance with ASTM D 4491.
3. Ultraviolet Resistance: Retaining at least 70 percent of tensile strength, when tested in accordance with ASTM D 4355 after 500 hours exposure.
4. Tensile Strength: 100 lb-f, minimum, in cross-machine direction; 124 lb-f, minimum, in machine direction; when tested in accordance with ASTM D 4632.
5. Elongation: 15 to 30 percent, when tested in accordance with ASTM D 4632.
6. Tear Strength: 55 lb-f, minimum, when tested in accordance with ASTM D 4533.
7. Color: Manufacturer's standard, with embedment and fastener lines preprinted.

E. Silt Fence Posts: One of the following, minimum 5 feet long:

1. Steel U- or T-section, with minimum mass of 1.33 lb per linear foot.

F. Gravel: See Section 32 1123 for aggregate.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

3.2 PREPARATION

A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

3.3 SCOPE OF PREVENTIVE MEASURES

A. In all cases, if permanent erosion resistant measures have been installed temporary preventive measures are not required.

B. Construction Entrances: Traffic-bearing aggregate surface.

1. Width: As required; 20 feet, minimum.
2. Length: 50 feet, minimum.
3. Provide at each construction entrance from public right-of-way.
4. Where necessary to prevent tracking of mud onto right-of-way, provide wheel washing area out of direct traffic lane, with drain into sediment trap or basin.

C. Linear Sediment Barriers: Made of silt fences.

1. Provide linear sediment barriers:

a. Along downhill perimeter edge of disturbed areas, including soil stockpiles.
b. Along the toe of cut slopes and fill slopes.
c. Perpendicular to flow across the bottom of existing and new drainage channels and swales that traverse disturbed areas or carry runoff from disturbed areas; space at maximum of 200 feet apart.
d. Across the entrances to culverts that receive runoff from disturbed areas.

2. Space sediment barriers with the following maximum slope length upslope from barrier:

a. Slope of Less Than 2 Percent: 100 feet..
b. Slope Between 2 and 5 Percent: 75 feet
c. Slope Between 5 and 10 Percent: 50 feet.
d. Slope Between 10 and 20 Percent: 25 feet.
e. Slope Over 20 Percent: 15 feet.

D. Storm Drain Curb Inlet Sediment Trap: Protect each curb inlet using one of the following measures:

1. Filter fabric wrapped around hollow concrete blocks blocking entire inlet face area; use on piece of fabric wrapped at least 1-1/2 times around concrete blocks and secured to prevent dislodging; orient cores of blocks so runoff passes into inlet.
2. Straw bale row blocking entire inlet face area; anchor into pavement.

E. Storm Drain Drop Inlet Sediment Traps: As detailed on drawings.

F. Temporary Splash Pads: Stone aggregate over filter fabric; size to suit application; provide at downspout outlets and storm water outlets.

G. Soil Stockpiles: Protect using one of the following measures:

1. Cover with polyethylene film, secured by placing soil on outer edges.
2. Cover with mulch at least 4 inches thickness of pine needles, sawdust, bark, wood chips, or shredded leaves, or 6 inches of straw or hay.

H. Mulching: Use only for areas that may be subjected to erosion for less than 6 months.

I. Temporary Seeding: Use where temporary vegetated cover is required.

3.4 INSTALLATION

A. Traffic-Bearing Aggregate Surface:

1. Excavate minimum of 6 inches.
2. Place geotextile fabric full width and length, with minimum 12 inch overlap at joints.
3. Place and compact at least 6 inches of 1.5 to 3.5 inch diameter stone.

B. Silt Fences:

1. Store and handle fabric in accordance with ASTM D 4873.
2. Where slope gradient is less than 3:1 or barriers will be in place less than 6 months, use nominal 16 inch high barriers with minimum 36 inch long posts spaced at 6 feet maximum, with fabric embedded at least 4 inches in ground.
3. Where slope gradient is steeper than 3:1 or barriers will be in place over 6 months, use nominal 28 inch high barriers, minimum 48 inch long posts spaced at 6 feet maximum, with fabric embedded at least 6 inches in ground.
4. Where slope gradient is steeper than 3-1:1 and vertical height of slope between barriers is more than 20 feet, use nominal 32 inch high barriers with woven wire reinforcement and steel posts spaced at 4 feet maximum, with fabric embedded at least 6 inches in ground.
5. Install with top of fabric at nominal height and embedment as specified.

3.5 CLEAN UP

A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by Ecological Design Group, Inc.

B. Clean out temporary sediment control structures that are to remain as permanent measures.

C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

3.6 MAINTENANCE

A. Contractor shall maintain, repair, replace or add best management practices and structural erosion and sediment controls as necessary or required to maintain project compliance with all applicable local, state and federal requirements, including Project specific Permits.

3.7 WARRANTY

A. Contractor shall warrant the project for Permit compliance for the duration of all project work or project area surface disturbance and for one year after project completion, whichever is longer.

B. Contractor shall pay for any and all fines, fees or costs incurred by the Project or Owner for non-compliance with Permit requirements.

END OF SECTION

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SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Selective demolition and removal of selected site elements.
2. Abandonment and removal of existing utilities and utility structures.

B. Related Requirements:

1. Section 312000 – Earthwork

C. References

1. 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.
2. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2004.

1.2 SUBMITTALS

A. Site Plan: Showing areas for temporary construction and field offices.

B. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.

1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences.
2. Identify demolition firm and submit qualifications.
3. Include a summary of safety procedures.

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

1.3 QUALITY ASSURANCE

A. Demolition Firm: Company specializing in the type of work required.

1.4 PROJECT CONDITIONS

A. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

PART 2 - PRODUCTS
PART 3 - EXECUTION

3.1 SCOPE

A. Remove paving and curbs as required to accomplish new work.

B. Remove other items indicated, for salvage, relocation, and recycling.

C. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill; compact fill as required so that required rough grade elevations do not subside within one year after completion.

3.2 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.

1. Obtain required permits.
2. Comply with applicable requirements of NFPA 241.
3. Use of explosives is not permitted.
4. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
5. Provide, erect, and maintain temporary barriers and security devices.
6. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
7. Do not close or obstruct roadways or sidewalks without permit.
8. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
9. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.

B. Do not begin removal until receipt of notification to proceed from the Owner.

C. Protect existing structures and other elements that are not to be removed.

1. Provide bracing and shoring.
2. Prevent movement or settlement of adjacent structures.
3. Stop work immediately if adjacent structures appear to be in danger.

D. Hazardous Materials: Comply with 29 CFR 1926 and state and local regulations.

E. Perform demolition in a manner that maximizes salvage and recycling of materials.

1. Dismantle existing construction and separate materials.
2. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.

F. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

3.3 EXISTING UTILITIES

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to the owner.

E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to the owner.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

H. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone; identify and mark utilities to be subsequently reconnected, in same manner as other utilities to remain.

I. Coordinate re-location or modifications to all utilities affected by new access street tie ends to any public or private drives and or streets.

3.4 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.

1. Verify that construction and utility arrangements are as shown.
2. Report discrepancies to landscape architect before disturbing existing installation.
3. Beginning of demolition work constitutes acceptance of existing conditions.

B. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.

C. Remove existing work as indicated and as required to accomplish new work.

1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
2. Remove items indicated on drawings.

D. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.

1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components
2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete

and ready for service.
3. Verify that abandoned services serve only abandoned facilities before removal.
4. Remove abandoned pipe, ducts, conduits, and equipment; remove back to source of supply where possible, otherwise cap stub and tag with identification.

E. Protect existing work to remain.

1. Prevent movement of structure; provide shoring and bracing if necessary.
2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
3. Repair adjacent construction and finishes damaged during removal work.
4. Patch as specified for patching new work.

3.5 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

B. Remove from site all materials not to be reused on site.

C. Leave site in clean condition, ready for subsequent work.

D. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Stripping and stockpiling rock.
6. Removing above- and below-grade site improvements.
7. Disconnecting, capping or sealing, and removing site utilities, abandoning site utilities in place.
8. Temporary erosion and sedimentation control.

B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for temporary erosion- and sedimentation-control measures.
2. Section 015639 – Temporary Tree and Plant Protection
3. Section 015713 – Temporary Erosion and Sediment Control
4. Section 312000- Earth Moving

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 MATERIAL OWNERSHIP

A. Except for materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.4 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed trafficways if required by Owner or authorities having jurisdiction.

B. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.

C. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.

D. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.

E. Tree- and Plant-Protection Zones: Protect according to requirements in Section 015639 "Temporary Tree and Plant Protection."

PART 2 - PRODUCTS

2.1 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 312000 "Earth Moving."

1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Verify that trees, shrubs, and other vegetation to remain or to be relocated have been flagged and that protection zones have been identified and enclosed according to requirements in Section 015639 "Temporary Tree and Plant Protection."

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

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

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

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

B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

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

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

3.3 TREE AND PLANT PROTECTION

A. Protect trees and plants remaining on-site according to requirements in Section 015639 "Temporary Tree and Plant Protection."

B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.4 EXISTING UTILITIES

A. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.

1. Arrange with utility companies to shut off indicated utilities.

B. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others, unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Engineer not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Engineer's written permission.

C. Removal of underground utilities is included in earthwork sections; in applicable fire suppression, plumbing, HVAC, electrical, communications, electronic safety and security, and utilities sections; and in Section 024116 "Structure Demolition" and Section 024119 "Selective Demolition."

3.5 CLEARING AND GRUBBING

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

1. Grind down stumps and remove roots larger than 3 inches in diameter, obstructions, and debris to a depth of 18 inches below exposed subgrade.
2. Use only hand methods or air spade for grubbing within protection zones.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

3.6 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to depth indicated on Drawings, of 6 inches in a manner to prevent intermingling with underlying subsoil or other waste materials.

C. Stockpile topsoil away from edge of excavations without intermixing with subsoil or other materials. Grade and shape stockpiles to drain surface water. Cover to prevent

windblown dust and erosion by water.

3.7 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

B. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials, and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION

SECTION 312000 - EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Excavating and filling for rough grading the Site.
2. Preparing subgrades for slabs-on-grade,pavements, turf and grasses, and, plants.
3. Excavating and backfilling for buildings and structures.
4. Drainage course for concrete slabs-on-grade.
5. Subbase course for concrete walks, pavements.
6. Subbase course and base course for asphalt paving.
7. Excavating and backfilling trenches for utilities and pits for buried utility structures.

1.2 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, will be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other fabricated stationary features

constructed above or below the ground surface.

I. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

J. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

K. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct preexcavation conference at Project site.

1.4 INFORMATIONAL SUBMITTALS

A. Material Test Reports:

1.5 FIELD CONDITIONS

A. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth-moving operations.

B. Do not commence earth-moving operations until plant-protection measures specified in Section 015639 "Temporary Tree and Plant Protection" are in place.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D2487, Groups A-1, A-2-4, A-2-5, and A-3 according to AASHTO M 145, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D2487, Groups A-2-6, A-2-7, A-4, A-5, A-6, and A-7 according to AASHTO M 145, or a combination of these groups.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200

sieve.

E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.

1. Arkansas Highway and Transportation Department Class 7 Aggregate Base Course (ABC)

F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

H. Drainage Course: Narrowly graded mixture of washedcrushed stone, or crushed or uncrushed gravel; ASTM D448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and zero to 5 percent passing a No. 8 sieve.

2.2 ACCESSORIES

A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored as follows:

B. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:

1. To comply with local practice or requirements of authorities having jurisdiciton.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.

B. Protect and maintain erosion and sedimentation controls during earth-moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.3 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
2. Pile Foundations: Stop excavations 6 to 12 inches above bottom of pile cap before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.
3. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.

B. Excavations at Edges of Tree- and Plant-Protection Zones:

1. Excavate by hand or with an air spade to indicated lines, cross sections, elevations, and subgrades. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.4 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.5 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.

1. Clearance: 12 inches each side of pipe or conduit.

C. Trench Bottoms:

1. Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

a. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

D. Trenches in Tree- and Plant-Protection Zones:

1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
3. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.6 SUBGRADE INSPECTION

A. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

B. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Engineer, without additional compensation.

3.7 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.

1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

3.8 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.9 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Section 033000 "Cast-in-Place Concrete."

D. Trenches under Roadways: Provide 4-inch- thick, concrete-base slab support for piping or conduit less than 30 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase course. Concrete is specified in Section 0321313 "Concrete Pavement"."

E. Initial Backfill:

1. Soil Backfill: Place and compact initial backfill of subbase material, satisfactory soil, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.

    a. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

F. Final Backfill:

1. Soil Backfill: Place and compact final backfill of satisfactory soil to final subgrade elevation.

G. Warning Tape:

1. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.10 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use engineered fill.
4. Under building slabs, use engineered fill.
5. Under footings and foundations, use engineered fill.

3.11 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.12 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D698, ASTM D1557:

1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 92 percent.
3. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.
4. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent.

3.13 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:

1. Turf or Unpaved Areas: Plus or minus 1 inch.
2. Walks: Plus or minus 1 inch.
3. Pavements: Plus or minus 1/2 inch.

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.14 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:

1. Shape subbase course and base course to required crown elevations and cross-slope grades.
2. Place subbase course and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
3. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D698, ASTM D1557.

3.15 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

A. Place drainage course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:

1. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
2. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D698.

3.16 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

B. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.

C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Engineer.

E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.17 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.18 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION

SECTION 312116 - TRENCHING

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Section Includes:

1. Excavating trenches for piped utilities.

B. Related Sections:

1. Section 312000 "Earthwork" for backfilling and compaction of utility trenches.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:

1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:

1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
3. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method.
4. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft3 (2,700 kN-m/m3)).
5. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
6. ASTM D6938 - 10 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

1.3 DEFINITIONS

A. Utility: Any buried pipe, duct, conduit, or cable.

1.4 SUBMITTALS

A. Section 013000 – Administrative Requirements: Requirements for submittals.

B. Excavation Protection Plan: Describe sheeting, shoring, and bracing materials and installation required to protect excavations and adjacent structures and property; include structural calculations to support plan.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with all applicable codes, and City of Jonesboro Ordinances.

1.6 QUALIFICATIONS

A. Prepare excavation protection plan under direct supervision of Professional Engineer experienced in design of this Work and licensed in State of Arkansas.

1.7 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.8 COORDINATION

A. Section 013000 - Administrative Requirements: Coordination and project conditions.

B. Verify Work associated with lower elevation utilities is complete before placing higher elevation utilities.

PART 2 - PRODUCTS
PART 3 - EXECUTION

3.1 LINES AND GRADES

A. Lay pipes to lines and grades indicated on Drawings.

1. Engineer reserves right to make changes in lines, grades, and depths of utilities when changes are required for Project conditions.

B. Use laser-beam instrument with qualified operator to establish lines and grades.

3.2 PREPARATION

A. Call “One Call”, the local utility information service at 811 not less than three (3) working days before performing Work.

1. Request underground utilities to be located and marked within and surrounding construction areas.

B. Identify required lines, levels, contours, and datum locations.

C. Protect plant life, lawns, and other features remaining as portion of final landscaping.

D. Protect bench marks, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

E. Maintain and protect above and below grade utilities indicated to remain.

F. Establish temporary traffic control and detours when trenching is performed in public right-of-way. Relocate controls and reroute traffic as required during progress of Work.

3.3 TRENCHING

A. Excavate subsoil required for utilities to utility service.

B. Remove lumped subsoil, boulders, and rock up of 1/6 of a cubic yard measured by volume. Remove larger material as specified in Section 312000 as rock excavation.

C. Perform excavation within 24 inches of existing utility service and in accordance with utility's requirements.

D. Do not advance open trench more than 200 feet ahead of installed pipe.

E. Cut trenches sufficiently wide to enable installation and allow inspection. Remove water or materials that interfere with Work.

F. Excavate bottom of trenches maximum 2 feet wider than outside diameter of pipe.

G. Excavate trenches to depth indicated on Drawings. Provide uniform and continuous bearing and support for bedding material and pipe utilities.

H. Do not interfere with 45 degree bearing splay of foundations.

I. When Project conditions permit, slope side walls of excavation starting 2 feet above top of pipe. When side walls cannot be sloped, provide sheeting and shoring to protect excavation as specified in this section.

J. When subsurface materials at bottom of trench are loose or soft, excavate to greater depth as directed by notify Engineer, and request instructions.

K. Cut out soft areas of subgrade not capable of compaction in place. Backfill with satisfactory fill material as defined in Section 312000, Earthwork and compact to density equal to or greater than requirements for subsequent backfill material.

L. Trim excavation. Hand trim for bell and spigot pipe joints. Remove loose matter.

M. Correct over excavated areas with compacted backfill as specified for authorized excavation or replace with satisfactory fill as directed by Engineer.

N. Remove excess subsoil not intended for reuse, from site.

3.4 SHEETING AND SHORING

A. Sheet, shore, and brace excavations to prevent danger to persons, structures and adjacent properties and to prevent caving, erosion, and loss of surrounding subsoil.

B. Support trenches more than 5 feet deep excavated through unstable, loose, or soft material. Provide sheeting, shoring, bracing, or other protection to maintain stability of excavation.

C. Design sheeting and shoring to be removed at completion of excavation work.

D. Repair damage caused by failure of the sheeting, shoring, or bracing and for settlement of filled excavations or adjacent soil.

E. Repair damage to new,and,existing Work from settlement, water or earth pressure or other causes resulting from inadequate sheeting, shoring, or bracing.

3.5 BACKFILLING

A. Backfill trenches to contours and elevations with unfrozen fill materials.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.

C. Refer to Drawings and Section 312000, Earthwork for backfill procedure and materials for various pipe types.

D. Employ placement method that does not disturb or damage utilities in trench.

E. Maintain optimum moisture content of fill materials to attain required compaction density.

F. Do not leave more than 50 feet of trench open at end of working day.

G. Protect open trench to prevent danger to the public.

3.6 TOLERANCES

A. Section 014000 - Quality Requirements: Tolerances.

3.7 FIELD QUALITY CONTROL

A. Quality Control Testing During Construction: Allow testing service to inspect and approve each subgrade and fill layer before further backfill or construction work is performed. Basis of acceptance shall include but not be limited to compacted density performed as specified herein.

1. Perform field density tests in accordance with ASTM D 1556 (sand cone method), ASTM D 2167 (rubber balloon method) or ASTM D 6938.

B. If in the opinion of the Engineer, based on testing service reports and inspection, subgrade or fills that have been placed are below specified density, Contractor shall perform additional compaction and testing, at his expense, until specified density is obtained.

3.8 PROTECTION OF FINISHED WORK

A. Reshape and re-compact fills subjected to vehicular traffic during construction.

END OF SECTION

SECTION 312319 - DEWATERING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Construction dewatering.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 FIELD CONDITIONS

A. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of groundwater and permit excavation and construction to proceed on dry, stable subgrades.

PART 3 - EXECUTION

3.1 PREPARATION

A. Provide temporary grading to facilitate dewatering and control of surface water.

B. Protect and maintain temporary erosion and sedimentation controls, which are specified in Section 015000 "Temporary Facilities and Controls,",Section 311000 "Site Clearing," during dewatering operations.

3.2 INSTALLATION

A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.

1. Space well points or wells at intervals required to provide sufficient dewatering.
2. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.

B. Place dewatering system into operation to lower water to specified levels before excavating below groundwater level.

C. Provide standby equipment on-site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails.

3.3 OPERATION

A. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed or until dewatering is no longer required.

B. Operate system to lower and control groundwater to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.

1. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.
2. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.
3. Maintain piezometric water level a minimum of 24 inches below bottom of excavation.

C. Remove dewatering system from Project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of 36 inches below overlying construction.

3.4 FIELD QUALITY CONTROL

A. Survey-Work Benchmarks: Resurvey benchmarks regularly during dewatering and maintain an accurate log of surveyed elevations for comparison with original elevations. Promptly notify Architect if changes in elevations occur or if cracks, sags, or other damage is evident in adjacent construction.

END OF SECTION

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SECTION 320523 - CONCRETE FOR EXTERIOR IMPROVEMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

B. Related Sections:

1. 312000 – EARTH MOVING

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture.

C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement.

D. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Material certificates.

C. Material test reports.

D. Floor surface flatness and levelness measurements.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
2. Manufacturer shall provide concrete mix designs stamped and sealed by a licensed professional Engineer licensed in the State of Arkansas.

B. Testing Agency Qualifications: An independent agency, approved by Owner and Engineer qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Testing Agency shall be managed by a licensed professional engineer licensed in the State of Arkansas.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel."

D. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5.
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

E. Concrete Testing Service: Engage and provide a qualified independent testing agency to perform material evaluation tests and to sample and test concrete mixtures.

F. Preinstallation Conference: Conduct conference at Project site.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

2.2 STEEL REINFORCEMENT

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 , deformed.

1. Galvanized Reinforcing Bars: ASTM A 767/A 767M, Class I or Class II, as approved, zinc coated after fabrication and bending.
2. Epoxy-Coated Reinforcing Bars: ASTM A 775/A 775M, epoxy coated, with less than 2 percent damaged coating in each 12-inch bar length.

C. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.

D. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.

E. Galvanized-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from galvanized-steel wire into flat sheets.

F. Epoxy-Coated Welded Wire Reinforcement: ASTM A 884/A 884M, Class A coated, Type 1, plain or deformed steel, as approved.

G. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and

fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice.

2.3 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type I or Type II gray. Supplement with the following:

a. Fly Ash: ASTM C 618, Class F or C.
b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

B. Normal-Weight Aggregates: ASTM C 33, graded.

1. Maximum Coarse-Aggregate Size: 1 inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94/C 94M and potable.

2.4 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.5 WATERSTOPS

A. Flexible Rubber Waterstops: CE CRD-C 513,with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

B. Chemically Resistant Flexible Waterstops: Thermoplastic elastomer rubber waterstops with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints; resistant to oils, solvents, and chemicals. Factory fabricate corners, intersections, and directional changes.

C. Flexible PVC Waterstops: CE CRD-C 572, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate

corners, intersections, and directional changes.

D. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch.

E. Self-Expanding Rubber Strip Waterstops: Manufactured rectangular or trapezoidal strip, bentonite-free hydrophilic polymer modified chloroprene rubber, for adhesive bonding to concrete, 3/8 by 3/4 inch.

2.6 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.

B. Sheet Vapor Retarder-1: Polyethylene sheet, ASTM D 4397, not less than 10 mils thick.

2.7 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq.yd. when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

F. Clear, Waterborne, Membrane-Forming Curing Compound-1: ASTM C 309, Type 1, Class B, non-dissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.

G. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

1. VOC Content: Curing and sealing compounds shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

H. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

1. VOC Content: Curing and sealing compounds shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.8 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic

fiber.

2.9 CONCRETE MIXTURES

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

1. Concrete mixture designs shall be stamped and signed by a registered professional Engineer registered in the State of Arkansas.

B. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.

C. Admixtures: Use admixtures with approval from Engineer and according to manufacturer's written instructions.

1. Use water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

D. Proportion normal-weight concrete trail and pavement mixture as follows:

1. Minimum Compressive Strength: 3500 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.45.
3. Slump Limit: 4 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
4. Air Content: 5.0 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.

E. Proportion normal-weight concrete bridge pier, abutment and structure mixture as follows:

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.45.
3. Slump Limit: 4 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
4. Air Content: 5.0 percent, plus or minus 1.5 percent at point of delivery for1-inchnominal maximum aggregate size.

2.10 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.11 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 fours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Chamfer exterior corners and edges of permanently exposed concrete.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.3 VAPOR RETARDERS

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.4 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.5 JOINTS

A. Coordinate joint types, description, and location with Drawings. Joint types have been consolidated in this article for consistency rather than for strict sequence of installation.

B. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

C. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

D. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch . Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8 inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

E. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

F. Waterstops: Install in construction joints and at other joints indicated according to manufacturer's written instructions.

3.6 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Concrete shall not be placed on top of mud, standing water, ice, trash, debris or anything other than the specified subbase material.

C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

D. Cold-Weather Placement: Comply with ACI 306.1.

E. Hot-Weather Placement: Comply with ACI 301.

3.7 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and

patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view.

C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.8 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.

1. Apply scratch finish to surfaces indicated.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces indicated.

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces indicated.

2. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding,10-ft- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/4 inch.

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated. While concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.

3.9 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq.ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.10 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

3.11 FIELD QUALITY CONTROL

A. Testing and Inspecting: Engage and provide a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Sample concrete materials for slump, temperature and strength testing as required by ACI 301.

C. Provide one (1) set of concrete tests for each 50 cubic yards of material or fraction thereof.

D. Concrete test samples shall include four concrete cylinders for strength testing; one to be tested at 7 day, two to be tested at 28 day, and one spare to be tested at 56 days as required.

END OF SECTION

SECTION 321123 - AGGREGATE BASE COURSE

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Aggregate base course for Portland cement or asphalt concrete paving.

1.2 RELATED SECTIONS

A. Section 312000: Earthwork

B. Section 321313: Concrete Pavement

1.3 REFERENCES

A. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).

B. ASTM D1557 – Test Methods for Moisture – Density Relations of Soils and Soil-Aggregate Mixtures Using 10lb (4.54 Kg) Rammer and 18 inch (457 mm) Drop.

C. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.

D. ASTM D6938 - 10 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

PART 2 - PRODUCTS

2.1 MATERIALS

A. Class 7 Base Course: Crushed stone base material with the following gradation:

1. Sieve (mm): 3” (75); Class 7 Percent Passing: N/A
2. Sieve (mm)-1: 2” (50); Class 7 Percent Passing: N/A
3. Sieve (mm)-2: 1-1/2” (37.5); Class 7 Percent Passing: 100
4. Sieve (mm)-3: 1” (25.0); Class 7 Percent Passing: 60-100
5. Sieve (mm)-4: 3/4” (19.0); Class 7 Percent Passing: 50-90
6. Sieve (mm)-5: 3/8” (9.5); Class 7 Percent Passing: N/A
7. Sieve (mm)-6: #4 (4.75); Class 7 Percent Passing: 25-55
8. Sieve (mm)-7: #10 (2.00); Class 7 Percent Passing: N/A
9. Sieve (mm)-8: #40 (0.425); Class 7 Percent Passing: 10-30
10. Sieve (mm)-9: #200 (0.075); Class 7 Percent Passing: 3-10

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify substrate has been inspected, gradients and elevations are correct, and is dry.

3.2 PREPARATION

A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.

B. Do not place fill on soft, muddy, or frozen surfaces

3.3 AGGREGATE PLACEMNT

A. Spread aggregate over prepared substrate to a maximum compacted thickness of 6 inches per lift.

B. Level and contour surfaces to elevations and gradients indicated.

C. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.

D. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.4 TOLERANCES

A. Flatness: Maximum variation of ¼ inch measured with 10 foot (3 m) straight edge.

B. Scheduled Compacted Thickness: Within ¼ inch.

C. Variation From Design Elevation: Within ½ inch.

3.5 FIELD QUALITY CONTROL

A. Compaction testing will be performed in accordance with ASTM D1557 and ASTM D6938, as indicated.

B. If tests indicate Work does not meet specified requirements, remove Work, replace, and retest.

C. Frequency of Tests: One per lift per 2,500 square feet or as otherwise recommended by the Geotechnical Engineer.

END OF SECTION

SECTION 321313 - CONCRETE PAVING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Furnish and construct all exterior portland cement concrete as shown on Drawings and herein specified.

1. Work to be included under this Section shall consist of the following:

a. Driveways, fire access lanes, dumpster approach, sidewalks, and any concrete pavement specified on the drawings.

B. Related Work Specified Elsewhere:

1. Section 312000: Earthwork

1.2 QUALITY ASSURANCE

A. Qualifications of Installers:

1. Provide at least 1 person at all times during execution of this portion of Work and who is thoroughly familiar with the type of materials being installed and is directly responsible for all Work performed under this Section.

B. Requirements of Regulatory Agencies:

1. It is Contractor's responsibility to comply with the requirements of the regulatory agencies, including the purchase of any permits at their own expense.

C. Construction Tolerances:

1. Vertical alignment shall not vary more than 1/8 inch from the edge of a 10-foot straight edge.
2. Horizontal alignment shall not vary more than 1/2 inch from the plan alignment for pavement.
3. Concrete thickness shall not be less than specified.
4. Reinforcing bars shall be placed to the following tolerances:

a. Clear distance to formed surface, plus or minus ¼ inch.
b. Sheared length, plus or minus 1 inch.
c. Concrete cover on top bars in slabs and beams 8 inches deep or less, 2 inches plus or minus 1/4 inch.
d. Concrete cover on top bars in members 8 inches to 24 inches deep, 2 inches plus or minus 1/2 inch.
e. Crosswise or lengthwise spacing, plus or minus 2 inches provided minimum spacing and cover requirements are not violated.

D. Referenced Standards:

1. The current editions of the following American Concrete Institute (ACI) publications shall govern all Work performed hereunder, unless otherwise specified:

    a. Recommended Practice for Concrete Floor and Slab Construction - ACI 302.
    b. Recommended Practice for Hot Weather Concreting – ACI 305.
    c. Recommended Practice for Cold Weather Concreting - ACI 306.
    d. Recommended Practice for Construction of Concrete Pavements and Concrete Bases - ACI 316.
    e. Building Code Requirements for Reinforced Concrete - ACI 318.

E. Design Criteria:

1. Contractor shall employ an approved independent materials testing laboratory and pay for the service of setting up the design mixes and to analyze the fine and coarse aggregate for the various uses of concrete utilized on the project. Design mixes shall be in accordance with the previously cited ACI 318 publication and in compliance with this Specification. The proposed mixes shall be submitted to OWNER for approval prior to placing of any concrete. The approved mixes established by the laboratory shall be used in the Work as long as the characteristics of the ingredients remain unchanged. If any significant change is made in the ingredients, new mixes shall be prepared and submitted to OWNER for approval.
2. Concrete shall consist of a minimum 28 day compressive design strength of 4,000 psi using portland cement, aggregate, air entraining admixture, water and an air content ranging from 5 to 7 percent. Slump of concrete shall have a range of 2 to 4 inches.

    a. If any of the conditions vary from those as described, Contractor shall submit a revised mix design prepared by the testing laboratory along with a written request for the variance desired to OWNER for their consideration and approval.
    b. Concrete for portions of the structure required to be watertight, such as water storage, pumpstation wetwells and waste treatment tanks, shall be air-entrained and have a water-cement ratio not exceeding 0.48.
    c. Admixtures shall be used only with the approval in writing by OWNER. All admixtures shall be used in accordance with the manufacturer's instructions and shall be added at the plant. Calcium chloride shall not be used as an admixture.
    d. Mix designs shall be based on Type I cement. Type III (high early) cement or any other types of cement shall be used only when approved in writing by OWNER. When high-early cement is used, the 7-day strength test shall exceed the specified 28-day strength tests.

1.3 SUBMITTALS

A. Product Data:

1. Prepare and submit product data for OWNER'S approval. Product data shall include manufacturer's recommended installation instructions.

B. Samples:

1. If requested by OWNER, submit samples for approval of proposed materials.

C. Certification:

1. Submit 3 copies of certification of material compliance as requested by OWNER.

D. Delivery Tickets:

1. Submit a delivery ticket with each truck load of concrete delivered which indicates OWNER'S design mix, truck number, project number, Contractor, ready mix producer, time of batching and total yards of concrete.

E. Test Reports and Design Mixes:

1. Submit 3 copies of design mixes and material test reports to OWNER.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Form Material:

1. Form material shall be either sound lumber or steel, free of defects and variations in dimensions. The sides of all lumber shall be surfaced and matched to prevent mortar leakage. Metal forms shall be of standard manufacture and need not be new, but shall be free from rust and dirt. Metal forms shall be flat and true to line without punctures. All form material shall be sized and of strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal of same.

a. Rigid forms are to be utilized on tangent alignment and curves having a radius of 150 feet or greater.
b. Curved forms shall be utilized on the curved Work with a radius of 150 feet or less, and shall consist of flexible spring steel or laminated lumber.

B. Reinforcement Materials:

1. Reinforcing bars and dowels shall be of new billet steel conforming to ASTM A615, Grade 60 (60,000 psi yield). Sizes of bars shall be as indicated on Drawings or herein specified.

a. Dowel bars when used for contraction and expansion joints shall be smooth steel bars coated with a thin uniform coating of liquid asphalt (MC-250) or grease on 1/2 the length of the bar plus 2 inches. In addition, dowel bars for expansion joints shall be furnished with end caps designed with one end closed, a minimum length of 3 inches and be positioned to allow bar movement of not less than 1 inch.
b. Dowel bar assemblies may be permitted if fabricated to the width of the pavement section.
c. Tie bars for control, longitudinal and construction joints shall be deformed bars.

C. Concrete Materials:

1. Portland cement shall conform to ASTM C150.

a. Cement shall be a low alkali cement (Type I) containing not more than 0.6 percent by weight of tri-sodium silicate oxide.

2. Coarse aggregate shall conform to Size 57 grade requirements of Table 2 of ASTM C33 standard.
3. Fine aggregate shall conform to ASTM C33 with fineness modulus not to vary more than 0.20 from value assumed in design mix.
4. Water shall be potable, clean and free from deleterious amounts of acid, alkali or organic material.

D. Admixtures:

1. Air entraining agent shall conform to ASTM C260 and shall be added at the mixer.
2. Water reducing agents, (such as super plasticizers), retarding agents, accelerating agents and all other admixtures, shall require approval by OWNER and if used, shall conform to ASTM C494. In no case shall admixtures be permitted as substitute for cement content specified, unless approved by OWNER.

E. Expansion Joint Material:

1. Joint filler material shall consist of a non-extruding standard bituminous bound type "Sealtight Asphalt Expansion Joint" as manufactured by W.R. Meadows, Inc., Elgin, Illinois or OWNER approved equal.

a. Material shall conform to ASTM D994.

2. Joint filler material shall consist of preformed non-extruded bituminous bound type "Sealtight-Fibre Expansion Joint" as manufactured by W.R. Meadows, Inc., Elgin, Illinois; "Code 1390" as manufactured by W.R. Grace Company, Cambridge, Massachusetts or OWNER approved equal.

a. Material shall conform to ASTM D1751.
b. Material shall be 1/2 inch thick, unless otherwise noted, of widths equal to slab thickness less 1/2 inch or as otherwise indicated.

3. Joint sealant shall be a single component, polyurethane type "Sikaflex-la" as manufactured by Sika Chemical Corporation, Lyndhurst, New Jersey or OWNER approved equal. Color as selected by OWNER.

F. Curing Materials:

1. Kraft paper shall be waterproof and nonstaining "Sisalkraft 5K-10" conforming to ASTM C171.
2. Polyethylene film shall be white opaque sheet or roll material not less than 0.006 inch thick (6 mil) conforming to AASHTO-M171.
3. Contractor may at their option use a liquid curing compound for surfaces that will not receive treating oil or waterproofing membrane. Liquid curing compound shall conform to ASTM C309 and shall consist of the following:

a. Type 1D, translucent with fugitive dye.
b. Type 2, white pigmented, Class B (vehicle solids restricted to all resin).

2.2 PRODUCTION

A. Concrete shall be ready-mixed, and shall be batched, mixed and transported in accordance with "Specification for Ready-Mixed Concrete" ASTM C94. The production plant equipment and facilities shall meet the requirements of the National Ready Mixed Concrete Association.

PART 3 - EXECUTION

3.1 JOB CONDITIONS

A. Hot Weather Conditions:

1. The following precautions shall be adhered to:

   a. Reject concrete mixture having temperature of 85ºF or greater.
   b. Pre wet subgrade.
   c. Crushed or flaked ice may be utilized in reducing temperature of mixture.
   d. If necessary, reduce temperature of reinforcing steel with wet burlap.
   e. Reduce mixing time (agitating time) in truck to 45 minutes.
   f. During periods of high winds, shelter windward side with adequate wind breaks.
   g. Apply no chemical retarder to finished surface unless permission is granted in writing by OWNER.

B. Cold Weather Conditions:

1. When ambient temperature is 40ºF or less, the following precautions are to be adhered to:

   a. Subbase shall not be frozen.
   b. Concrete mixture delivered at Worksite shall be 55ºF (minimum), 85ºF (maximum).
   c. No calcium chlorides, salts or other chemical accelerators shall be permitted, unless otherwise acceptable in writing by OWNER.
   d. Concrete surface shall be maintained at a minimum of 50ºF with appropriate thermal insulation for a period of 7 days (normal concrete), 3 days (high early-strength concrete).
   e. Refer to previously cited ACI 306 for minimum thickness of thermal protection required.
   f. Any concrete that has frozen or disintegrated as a result of freezing shall be removed and replaced at Contractor's expense.

3.2 SUBGRADE PREPARTION

A. Fine grade and compact subgrade to the plan cross section. Compaction shall be as specified in Section 312000 of this Specification or as indicated on the Drawings.

B. After compaction, cut-out soft spots and unstable areas in the subgrade and fill with select fill material and compact as specified in Section 312000.

3.3 GRANULAR BASE

A. Construct the select fill and granular base as shown on Drawings on the prepared subgrade after the final shaping and compacting of the subgrade is completed.

B. Compact as specified base in Section 312000 of this Specification.

3.4 FORM CONSTRUCTION

A. Forms shall have the strength and rigidity, regardless of material, such that when they are set in place and braced, they will withstand weight of equipment and weight of concrete without settlement or lateral displacement.

B. Keyway forms in the edge of pavement slabs and at construction joints shall be constructed to the dimensions shown on Drawings. Wood keyway forms, if used, shall be bolted or nailed to the side forms. Metal keyway forms shall be fixed or held rigidly in place by staking or other OWNER approved method.

C. Forms shall be coated prior to the placement of concrete, with a nonstaining form release agent. Wooden form may be prewetted with water. No standing water, adjacent to forms, shall be permitted.

3.5 REMOVAL OF FORMS

A. Forms for slabs on grade shall not be removed earlier than 12 hours after the placement of concrete has been completed. Within 24 hours of form removal backfill adjacent to the pavement shall be completed.

B. Forms supporting the weight of concrete shall not be released until the concrete has reached its specified 28-day strength. Minimum time elapse after casting and before the false Work supports are released shall be 8 days for spans up to 96 inches center to center of supports, plus 1 additional day for each 12 inches of increase in span length over 84 inches up to 14 days for span of 14 feet and over. Such time period shall be exclusive of those time intervals during which the concrete surface temperature is below 40ºF. If temperature remains below 40ºF during the casting and curing period no forms shall be removed until approved field tests indicating adequate concrete strength have been provided.

3.6 REINFORCEMENT PLACEMENT

A. Tie bars, reinforcement bars and dowel bars shall be clean, free from rust and shall be placed on adequate supports in locations as shown on Drawings. Provide the following minimum thickness of concrete cover:

1. Concrete deposited on ground: 3 inches
2. Formed surfaces against ground: 1-1/2 inches
3. Beams, girders and columns: 1-1/2 inches
4. Slabs, walls and joists: 1 inch
5. Clear distance between parallel bars: 1 inch or nominal bar distance
6. For No. 6 bars or larger: 2 inches
7. No broken brick, block or concrete shall be permitted as reinforcement supports.

B. Welded steel wire fabric shall be placed free from rust, kinks and bends and shall be cut in such a way that the overlap measured between outermark cross wires of each fabric sheet is not less than 2 inches. The fabric shall be cut at contraction joints. It shall be supported by a layer of fresh concrete placed to the depth of the mesh shown on Drawings, followed by placement of the upper layer of concrete.

3.7 JOINTS

A. General:

1. Construct expansion, contraction and construction joints with face perpendicular to surface of concrete.
2. Where joining existing structures, match existing contraction or expansion joints.

B. Expansion Joints:

1. All fixed objects, such as buildings and structures or pavement, sidewalks or curb intersections shall be separated by a 1/2 inch expansion joint placed at the full depth of the concrete thickness. Expansion joints, in addition to the above, shall be placed at 60 foot intervals in the following:

    a. Concrete curb and gutter
    b. Concrete walk

C. Construction Joints:

1. Contraction joints shall be placed at the following intervals and dimensions or as shown on Drawings:

    a. Concrete curb and gutter – 10 feet; 1/8 inch wide by 1 1/2 inch depth.
    b. Concrete walk – 10 feet; 1/8 inch wide by 1/4 the depth of concrete.

2. Cut plastic concrete with appropriate tool to specified depth. Finish edges with 1/4 inch radius tool.
3. Saw-cut joints to specified width and depth on hardened concrete as soon as concrete has hardened sufficiently to prevent raveling or damage to the joint.

D. Joint Sealer:

1. Apply joint sealer to a clean and dry expansion or contraction joint if specified to a point approximately 1/4 inch below the top surface. Where oil treatment is specified, joint sealer shall be applied prior to application of the oil.

3.8 CONCRETE PLACEMENT

A. Place concrete to required depth and width to form a continuous mass requiring a minimum of rehandling. Concrete adjacent to side forms and fixed structures shall be consolidated by means of portable vibrators or by mechanical means with the use of hand spading. Vibrators shall not be used to move concrete horizontally.

B. If it is necessary to place a construction joint prior to a contraction joint, the distance between the construction joint and the previous contraction joint shall not be less than 60 inches.

C. Automatic machine may be used for curb and gutter placement at Contractor's option, if acceptable to OWNER. If machine placement is to be used, submit revised mix design and laboratory test results, which meet or exceed the minimum herein specified. Machine placement must produce curbs and gutters to the required cross-section, lines, grades, finish, and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete as specified.

3.9 CONCRETE FINISH

A. After initial strike-off and floating, and prior to finishing, test surface with 10-foot straightedge. Correct irregularities prior to final finishing operations.

B. Apply the following surface finish after surface sheen or excess moisture has disappeared:

1. Apply steel trowel finish followed by stiff-bristled broom drawn across concrete surfaces, perpendicular to line of traffic:

a. Sidewalk
b. Concrete pavement
c. Curb and gutter

3.10 CONCRETE CURING AND PROTECTION

A. Cure concrete surfaces for 7 days (normal concrete) and for 3 days (high early-strength concrete), using appropriate means of protection as previously cited in ACI 305 and ACI 306.

B. Curing methods shall consist of one of the following:

1. Keep concrete surface continuously wet by ponding with water.
2. Apply moisture proof fabric to entire area lapping joints and edges at least 3 inches. Tape interior joints and weight edges down with sand or other approved material.
3. Apply liquid membrane curing compound to the finished surface in a 2 coat continuous operation with second application applied transversely to the direction of the first application, and in accordance with the manufacturer's directions. Replace damaged areas with equal applications of membrane using compound. Liquid membrane curing compound shall not be permitted where the surface will be subjected to an application of waterproof coatings, bonding agents, treating oil or paint.

3.11 TESTING AND EVALUATION

A. Concrete materials and operations shall be tested and inspected as the Work progresses, by an independent testing laboratory. Contractor shall furnish any necessary labor who is familiar with methods of sampling and shall assist the testing agency in obtaining and handling samples, and for safe storage and proper curing of concrete test specimens on Worksite.

B. Mold and cure three standard 6-inch diameter specimens from each sample in accordance with ASTM C31. Compressive strength test specimens shall be in

accordance with ASTM C39. Two specimens shall be tested at 28 days for acceptance and one shall be tested at 7 days for information. The acceptance test results shall be the average of the strengths of the two specimens tested at 28 days. If one specimen in a test manifests evidence of improper sampling, molding or testing, it shall be discarded and the strength of the remaining cylinder shall be considered the test result. Should both specimens in a test show any of the above defects, the entire test shall be discarded. When high-early strength concrete is used, the first specimen shall be tested at 3 days; the remaining two at 7 days.

C. Make at least one strength test for each 50 cubic yards, or fraction thereof, of each mix design of concrete placed in any one day.

D. Determine slump of the concrete sample for each strength test and whenever consistency of concrete appears to vary, using standard slump cone as per ASTM C143.

E. The testing laboratory shall report all test and inspection results to OWNER, OWNER'S Engineer, and Contractor immediately after they are performed. All concrete test reports shall include name of job, date of placement, date of test, batch mix design, slump and the exact location in the Work at which the batch represented by the test was deposited.

F. All costs necessary to prepare concrete test cylinders, make tests and furnishing of written reports shall be borne by the Contractor.

3.12 DEFECTIVE WORK

A. When tests and inspections of the aggregate base and/or concrete Work indicate non-compliance with the Specification, Contractor and OWNER shall mutually agree on the number and location of additional tests to define and/or verify the deficiency. If the average of the tests for a given area indicate non-compliance the area is considered defective and Contractor shall:

1. Remove and replace defective Work at no cost to OWNER;
2. Correct the Work at no cost to OWNER in a manner acceptable to OWNER;
3. Give OWNER a credit towards the Contract Price if it is acceptable to OWNER;
4. If Work is found to be in noncompliance, Contractor shall pay for the defective area removal and replacement, and the tests and inspection costs; or
5. If Work is found to be in compliance, OWNER shall pay for tests and inspection costs.

END OF SECTION

SECTION 321373 - CONCRETE PAVING JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cold-applied joint sealants.
2. Hot-applied joint sealants.
3. Joint-sealant backer materials.
4. Primers.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: for each type of product

B. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of joint sealant.

C. Paving-Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

A. Product certificates.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backer materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

2.2 COLD-APPLIED JOINT SEALANT

A. Single-Component, Nonsag, Silicone Joint Sealant: ASTM D 5893/D 5893M, Type NS.

B. Single-Component, Self-Leveling, Silicone Joint Sealant: ASTM D 5893/D 5893M, Type SL.

C. Multicomponent, Nonsag, Urethane, Elastomeric Joint Sealant: ASTM C 920, Type M, Grade NS, Class 25, for Use T.

D. Single Component, Pourable, Urethane, Elastomeric Joint Sealant: ASTM C 920, Type S, Grade P, Class 25, for Use T.

E. Multicomponent, Pourable, Urethane, Elastomeric Joint Sealant: ASTM C 920, Type M, Grade P, Class 25, for Use T.

2.3 HOT-APPIED JOINT SEALANT

A. Hot-Applied, Single-Component Joint Sealant: ASTM D 6690, Type I.

B. Hot-Applied, Single-Component Joint Sealant ASTM D 6690, Type I or Type II.

C. Hot-Applied, Single-Component Joint Sealant ASTM D 6690, Type I, II, or III.

D. D 6690, Type IV.

2.4 JOINT-SEALANT BACKER MATERIALS

A. Round Backer Rods for Cold- and Hot-Applied Joint Sealants: ASTM D5249, Type 1, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

B. Round Backer Rods for Cold-Applied Joint Sealants: ASTM D5249, Type 3, of diameter and density required to control joint-sealant depth and prevent bottom-side adhesion of sealant.

C. Backer Strips for Cold- and Hot-Applied Joint Sealants: ASTM D5249; Type 2; of thickness and width required to control joint-sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

2.5 PRIMERS

A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated.

PART 3 - EXECUTION

3.1 INSTALLATION OF JOINT SEALANTS

A. Comply with joint-sealant manufacturer's written installation instructions for products and

applications indicated unless more stringent requirements apply.

B. Cleaning of Joints: Clean out joints immediately to comply with joint-sealant manufacturer's written instructions.

C. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer.

D. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions.

E. Install joint-sealant backers to support joint sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of joint-sealant backer materials.
2. Do not stretch, twist, puncture, or tear joint-sealant backer materials.
3. Remove absorbent joint-sealant backer materials that have become wet before sealant application and replace them with dry materials.

F. Install joint sealants immediately following backer material installation, using proven techniques that comply with the following:

1. Place joint sealants so they fully contact joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

G. Tooling of Nonsag Joint Sealants: Immediately after joint-sealant application and before skinning or curing begins, tool sealants in accordance with the following requirements to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint:

1. Remove excess joint sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.

H. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.

I. Clean off excess joint sealant as the Work progresses, by methods and with cleaning materials approved in writing by joint-sealant manufacturers.

END OF SECTION

SECTION 328400 - LANDSCAPE IRRIGAITON PERFORMANCE SPECIFICAITON

PART 1 - GENERAL

1.1 DESCRIPTION

A. It is the intent of this Specification that a finished system is complete in every respect and shall be ready for operation satisfactory to the Landscape Architect and Owner. The design is to be delegated by the contractor and approved by the Landscape Architect

B. The work shall include all materials, labor, services, transportation, and equipment necessary to perform the work as indicated in these Specifications, and as necessary to complete the contract Section 321123 "Aggregate Base Course" for aggregate subbase and base courses.

C. Section Includes:

1. Pipe and fittings, valves, outlets, backflow preventer, and accessories.
2. Connection to utilities and meter installation.
3. Automatic control system

1.2 REFERENCES, DEFINITIONS AND APPLICABLE STANDARDS

A. ASTM D 1785 - Poly Vinyl Chloride (PVC) Plastic Pipe (SDR-PR)

B. ANSI/ASTM D 2564 - Solvent Cement for Poly Vinyl Chloride (PVC) Plastic Pipe and Fittings.

C. Reference and comply with applicable plumbing codes, standards, or specifications by building code or governing utility authority for the project location.

D. Rain Bird Irrigation Installation Details and Specifications.

E. Irrigation Main Piping: Downstream from point of connection to water distribution piping to, and including, control valves. Piping is under water-distribution-system pressure.

F. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50V or for remote control, signaling power-limited circuits.

G. Notice of Completion: The date at the close of the Maintenance Period when the work has been completed, checked, accepted, and written approval of the work has been given by the Architect.

H. Date of Acceptance: The date at the end of the warranty periods as specified herein, and written acceptance has been given by the Architect.

I. Finish Grade: Elevation of finished surface of planting soil within 1/10th of an inch

1.3 GENERAL DESIGN SYSTEM REQUIREMENTS

A. Contractor's delegated design for an automatic 2-wire system, electric valve, irrigation system with 100 percent coverage and minimal over spray onto buildings and paved surfaces to meet the following design standards:

1. Compliance with all applicable plumbing codes for the project location.
2. Irrigation water meter and tap to be provided as part of the irrigation system. Meter size and location to be determined by contractor’s system design and coordination with owner and general contractor.
3. General Contractor to provide irrigation system sleeving under pavement crossings at the locations and sizes shown in the irrigation shop drawings. Coordinate with General Contractor to provide any additional sleeves that may be necessary.
4. Provide backflow preventer assembly with insulated housing. Provide automatic controller, control wiring, and hardwired connections to power source. Coordinate controller location with owner, general contractor and electrical contractor.
5. Provide wireless rain and heat sensor device to shut off, delay, and adjust watering cycle times.
6. Pipe sizing must provide for a maximum velocity of 5 feet per second and must provide adequate pressure delivery at all heads for proper performance.
7. Provide separate valve zones for turf and planted bed areas.
8. Provide pop-up spray and/or rotor type outlets for turf areas.
9. Space spray and/or rotor type outlets to provide near 100% overlapped coverage between each outlet.
10. Provide drip irrigation for planted bed areas.
11. Provide drip pop up indicators at all drip areas.
12. Provide additional drip emitters for trees in drip zone areas.
13. Coordinate the locations of controller and backflow preventers to minimize visibility and screen with landscape materials where possible.
14. Piping to be located along back of curbs, pavement edges, and bed edges.
15. Spray from perimeter of areas where feasible.
16. Provide 100% coverage of all newly planted landscape areas on site and in adjacent street rights-of-way and/or other areas as indicated in the Landscape Plan.
17. Provide manual drain valves and sumps, or piped connections to drainage system in sufficient locations to drain the entire system for winterizing.
18. Provide valve boxes and covers at all locations described. Align all valve boxes parallel or perpendicular to adjacent hardscape where applicable.
19. Minimize the number of outlets, trenching, and pipe installation where possible.

1.4 PRE-CONSTRUCTION SUBMITTALS

A. Contractor to provide a delegated design for a fully automated 2- wire irrigation system to be review and approved by the Landscape Architect through shop drawings.

B. Product Data:

1. Prior to ordering of any materials, and for each type of product indicated provide submittals for acceptance by the Landscape Architect. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
2. The submittals shall include the following information:

    a. A title sheet with the job name, the Contractor’s name, address and

telephone number, submittal date and submittal number.

b. Shop Drawings with the following clearly indicated: Irrigation layout plan showing the sleeving locations, mainline routing, lateral line routing, controller location, meter location, backflow location and head or drip line locations.
c. An index sheet showing the item number (i.e. 1, 2, 3, etc.); an item description (i.e. sprinkler head); the manufacturer's name (i.e. Rain Bird); the item model number (i.e. 44DLRC); and the page(s) in the submittal set that contain the catalog cuts.
d. The catalog cuts shall clearly indicate the manufacturer's name and the item model number. The item model number, all specified options and specified sizes shall be circled or highlighted on the catalog cuts.
e. Submittals for equipment shall contain the manufacturer, Class or Schedule, ASTM numbers and/or other certifications as indicated in these specifications.

3. Submittal format requirements:

a. Submittals shall be provided as one complete package for the project. Multiple or partial submittal packages will not be reviewed.
b. Submittal package shall be submitted as a single PDF file.

1.5 POST CONSTRUCTION SUBMITTALS

A. Record Drawings:

1. Record accurately on one set of drawings all changes in the work constituting departures from the original approved Shop Drawings and the actual final installed locations of all required components as shown below.
2. Record Drawings shall be prepared to the satisfaction of the Architect. Prior to final inspection of work, submit Record Drawings to the Architect.
3. Show locations and depths of the following items:

a. Point of connection (including water POC, basket strainer, pressure regulator, master control valve, flow sensors, etc.)
b. Routing of sprinkler pressure main lines (dimensions shown at a maximum of 100 feet along routing.)
c. Isolation valves.
d. Mainline air release valves.
e. Automatic remote-control valves (indicate station number and size.)
f. Quick coupling valves.
g. Routing of control wires where separate from irrigation mainline.
h. Irrigation controllers
i. Related equipment (as directed)

B. Controller Charts:

1. Provide one controller chart for each automatic controller. Chart shall show the area covered by the controller. The areas covered by the individual control valves shall be indicated using colored highlighter pens. A minimum of six individual colors shall be used for the controller chart unless less than six control valves are indicated.
2. When completed and approved, the chart shall be hermetically sealed between two pieces of plastic, each piece being a minimum 20 mils in thickness. The

contractor is to provide a minimum of three (3) copies to the owner.

1.6 FIELD QUALITY CONTROL

A. Provide at least one English speaking person who shall be present at all times during execution of this portion of the work and who shall be thoroughly familiar with the type of materials being installed and the manufacturer's recommended methods of installation and who shall direct all work performed under this section.

B. Manufacturer's directions and detailed drawings shall be followed in all cases where the manufacturer of articles used in this contract furnish directions covering points not shown in the Specifications.

C. All local, municipal, and state laws, rules and regulations governing or relating to any portion of this work are hereby incorporated into and made a part of these specifications, and their provisions shall be carried out. Anything contained in these Specifications shall not be construed to conflict with any of the above rules and regulations of the same. However, when these Specifications call for or describe materials, workmanship, or construction of a better quality, higher standard, or larger size than is required by the above rules and regulations, the provisions of these Specifications shall take precedence.

D. Materials supplied for this project shall be new and free from any defects. Defective materials shall be replaced immediately at no additional cost.

E. Secure the required licenses and permits including payments of charges and fees, give required notices to public authorities, verify permits secured or arrangements made by others affecting the work of this section.

F. Acquire certificate of compliance from local authority indicating approval of backflow preventer installation.

1.7 FIELD MEASUREMENTS

A. Verify that field conditions are as shown in the drawings. Revise design and record drawing as required.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

B. Exercise care in handling, loading, unloading, and storing plastic pipe and fittings under cover until ready to install. Transport plastic pipe only on a vehicle with a bed long enough to allow the pipe to lay flat to avoid undue bending and concentrated external load.

C. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

D. Use all means necessary to protect irrigation system materials before, during, and after

installation and to protect the installation work and materials of all other trades. In the event of damage, immediately make all repairs and replacements necessary to the acceptance of the Landscape Architect and at no additional cost.

1.9 PROJECT CONDITIONS

A. Verify and determine the locations, size and detail of points of connection provided as the source of water and electrical supply to the irrigation system.

B. Irrigation design shall be based on the available water pressure. Verify the dynamic water required is available on the project prior to the start of construction. Should a lack of pressure exist to achieve the flow necessary to operate the system, notify the Landscape Architect prior to beginning construction.

C. Prior to cutting into the soil, locate all cables, conduits, sewer septic tanks, and other utilities that are commonly encountered underground, and take proper precautions not to damage or disturb such improvements. If a conflict exists between such obstacles and the proposed work, promptly notify the Landscape Architect who will arrange for relocations. Proceed in the same manner if a rock layer or any other such conditions are encountered. Call in utility locates prior to all trenching or excavation.

D. Protect all existing utilities and features to remain on and adjacent to the project site during construction. Repair, at Contractor’s own cost; all damage resulting from Contractor’s operations or negligence.

E. Coordinate installation of required sleeving per approved Shop Drawings

F. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied, unless permitted under the following conditions and then only after arranging to provide temporary water service according to the requirements indicated:

1. Notify Water Utility provider prior to Interruption.
2. Notify Owner no fewer than two working days (48 hours) in advance of proposed interruption of water service.
3. Do not proceed with interruption of water service without the Owner's written permission.

1.10 GUARANTEE

A. The entire irrigation system, including all work done under this contract, shall be unconditionally guaranteed against all defects and fault of material and workmanship, including settling of backfilled areas below grade, for a period of one (1) year following the approved final acceptance.

B. Should any problem with the irrigation system be discovered within the guarantee period, it shall be corrected by the Contractor at no additional expense to the Owner within ten (10) calendar days of receipt of written notice from the Landscape Architect. When the nature of the repairs as determined by the Landscape Architect constitutes an emergency (i.e. broken mainline) the Landscape Architect may proceed to make repairs at the Contractor's expense. Damages to existing improvement resulting either from faulty materials or workmanship shall be repaired to the satisfaction of the Landscape Architect by the Contractor, all at no additional cost.

C. Manufacturer's warranties shall not relieve the Contractor of his liability under the guarantee. Such warranties shall only supplement the guarantee.

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

A. Rain Bird Corporation, Turf Division: For all irrigation system equipment and accessories.

B. NDS: For valve boxes.

C. Wilkins/Zurn: For backflow preventers

2.2 MATERIALS

A. Pipe:

1. PVC in accordance with ASTM D 1785: PVC Schedule 40 pipe for all sleeving, main lines, lateral lines, and fittings throughout system. Solvent-weld sockets.
2. Rigid copper pipe required from tap at public main through backflow preventer.

B. Fittings: Type and style of connection to match pipe.

C. Solvent Cement: ANSI/ASTM D 2564 for PVC pipe and fittings.

D. Tracer Wire: 14 AWG solid copper wire with insulating cover, to be tagged as “Tracer wire” with metal tags. Color of insulating cover must be different from other wiring.

E. Turf Outlets:

1. Spray Outlets: Pop-up spray bodies, 6 inch minimum to 12 inch riser heights as needed for adequate performance, with installed check valves and pressure regulating devices.
2. Stream Rotor Outlets: Pop-up stream rotor bodies, 6 inch and/or 12 inch riser heights as needed for adequate performance, with installed check valves and internal pressure regulating devices. Rotors without internal pressure regulation may be used if combined with a pressure regulating PVC pipe swing joint.

F. Drip System Outlets:

1. Drip Line: Pressure compensating surface type installation drip line with flexible tubing, 12 inch emitter spacing, and internal emitter check valves. Anchor line with galvanized wire anchors at 24”-30” spacing. Lines and connector fittings must be capable of operating at 50 PSI without supplementary clamps.
2. Drip Emitters: Pressure Compensating drip emitters for additional water to tree placements within drip zones; one drip emitter for each ornamental size tree and two drip emitters for each medium or large size tree. Provide diffuser caps for each emitter.

2.3 BACKFLOW PREVENTERS

A. Control Valves: Electric solenoid operating valves with glass filled nylon body construction. Size valves for minimum pressure loss for designed flow rate. Provide and install pressure regulating devices for each valve placement.

B. Backflow Preventer: Wilkins/Zurn: 975XL or 975XLSEU backflow preventer sized for maximum flow in system with a maximum pressure loss limited to 10% of available residual pressure.

C. Backflow Preventer Housing: DekoRRa model 301/302, Class II, turf brown granite color, anchored to 4” minimum concrete base per manufacturer’s details and specifications. Provide minimum size to cover with insulation bag.

2.4 CONTROLS

A. Controller: Automatic controller for electric valve operation sized for required number of stations, with grounding per manufacturer specifications and hardwired connections to power source.

B. Controller Housing:

1. Indoor Installations: Wall mount plastic housing with lockable access door. Indoor installations must be able to accommodate wiring or wireless system remote operation of rain and heat sensing device. Coordinate with electrician for power source
2. Outdoor Installations:

    a. Wall Mount: Stainless steel housing with lockable access door.
    b. Ground Mount: Stainless steel housing and pedestal with lockable access door.

C. Accessories: Include required fittings, galvanized metal electrical conduit, and accessories for installation.

D. Control Wiring: Gauge of wire to be sized by contractor for adequate operation of valves. Use waterproof connectors for all connections. Use different color wire jackets for valve power wires and white jacket for common wire.

E. System Grounding: Provide grounding at controller and throughout control wiring and valve layout to meet manufacturer’s standards with grounding devices as recommended by manufacturer.

F. Rain and Heat Sensor Device: Wireless automatic, adjustable, shutoff device to disable/delay operations during or after recent rainfall and adjust watering cycle times for local heat and rainfall conditions. Provide and install connection equipment necessary for operation at controller.

2.5 OTHER EQUIPMENT

A. Swing Joints: Provide PVC pipe swing joints for all full circle rotor outlet placements.

B. Pressure Regulating Swing Joints: Provide pressure regulating PVC pipe swing joints for

all rotor outlet placements without internal pressure regulation.

C. Valve Boxes and Covers: Valve boxes and covers required for all control valves, drip filters, drain valves, surge protector devices, wiring changes of direction, and wiring junctions.

D. Drip Filters: Replaceable and/or cleanable sized to match zone flows, installed with valve in valve box.

E. Drain Valves: Manual, PVC valves on tees for low points in system.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

B. Verify location of existing utilities. Repair utilities damaged as a result of this work at no increase in Contract Sum.

C. Verify that required utilities are available in proper location and ready for use.

D. Verify available water pressure at meter or backflow preventer locations.

E. Verify sleeve locations.

F. Beginning of installation means installer accepts existing conditions.

3.2 PREPARATION

A. Layout and stake locations of system components.

B. Review layout requirements with other affected work. Coordinate locations of sleeves under paving to accommodate system. Notify Architect/Engineer for approval of field changes to system design.

C. Coordinate location of controller, rain and heat sensor device, and connections to power source with Owner, General Contractor, and Electrical Contractor.

3.3 TRENCHING

A. Minimum Trench Depth: Trench depth must provide a minimum of 18 inches of cover over all main lines and wiring and 12 inches of cover over all lateral lines.

B. Trench to accommodate grade changes and slope to manual drain valves at low points in system.

C. Maintain trenches free of rocks, obstructions, or other debris that may damage pipe or wiring.

D. Repair or replace existing improvements damaged by work performed under this

contract with equivalent materials or products.

3.4 INSTALLATION

A. Install irrigation sleeving under all pavement crossings and buried at a minimum depth of 18 inches below finish grade. All sleeving trenches must match finish grade and be compacted to minimum subgrade requirements for paving.

B. Install pipe, backflow preventer, valves, valve boxes, wiring, grounding, drains, controls, and outlets in accordance with all applicable plumbing codes, manufacturer's details, instructions, and minimum standards.

C. Trenches for irrigation main and lateral lines must match finish grade and be compacted to the degree that no settlement will occur.

D. Install cast concrete thrust blocking at all piping bends for 3 inch or larger pipe sizes.

E. Install zone valves with pressure regulating devices in valve boxes per manufacturer specifications and details. Provide metal tag with zone number for each valve.

F. After piping is installed but before sprinkler heads are installed and trenches backfilled, open valves and flush system with full head of water.

G. Install spray and rotor outlets with fittings, flex pipe, swing joints, etc. Use threaded connections to lateral lines. Install in accordance with manufacturer's details, instructions and minimum standards.

H. Install drip lines, emitters, filters, fittings, etc. in accordance with manufacturer's details, instructions and minimum standards. Anchor line with galvanized wire anchors at 3 feet on center, minimum spacing.

I. Install manual drain valves at system piping low points and pipe connections from valves to site drainage system, or, provide 12" diameter by 24" deep, gravel filled drain sumps where piped connections are not feasible.

J. Connect to water and electrical services.

K. Set outlets and box covers at finish grade elevations.

L. Install control wiring in trenches along with main lines to valves and provide 30-inch expansion coil at each valve and change of direction. Also provide 30-inch expansion coils at 100-foot intervals between valves.

M. Tracer Wire: Install tracer wire from gate valve at backflow preventer along all main lines to each zone valve. Terminate at valve boxes with 24” wire coil and metal tags labeled as “Tracer Wire.”

N. Install automatic controller. Provide hardwired connection to power source, enclose wiring to system and power source in rigid metal conduit where exposed. Paint exposed conduit to match building exterior.

O. Install rain and heat sensor device and wireless connection device to controller. Verify proper operation of device.

P. Program remote irrigation controller and install connection equipment necessary for operation at controller. Verify proper operation of remote.

Q. Repair or replace any other work or improvements damaged as a result of work related to system installation at no increase to the Contract Sum.

3.5 FIELD QUALITY CONTROL

A. Prior to backfilling and installation of outlets, cap or plug pipes and test system for leakage. Maintain maximum available pressure for one hour. Piping is acceptable if no leakage or loss of pressure occurs during test period.

3.6 ADJUSTING

A. Adjust control system to achieve time cycles required for adequate watering at time of installation.

B. Adjust heads and/or nozzles to achieve proper coverage and performance. Make nozzle or head changes as necessary for proper coverage.

C. Adjust zone valves for proper operating pressures at valve zones.

3.7 EXTRA MATERIALS

A. Furnish to Owner the following extra components:

1. Two sprinkler heads of each type and size.
2. Two nozzle inserts for each type and size.
3. Two drip emitters of each type and size
4. Two drip line basket filters of each type and size.
5. Two keys each for valve boxes and controller (if locked boxes are used).
6. Two of any required special tools for adjustment or replacement of each type of outlet, nozzle, valve, and other system equipment.

3.8 CLOSEOUT

A. Provide system demonstration to Owner and Engineer for review and final acceptance of work. Coordinate demonstration of procedures for winterizing (draining system lines, backflow preventer, etc.) and spring start-up with Owner. Review system operation and components during service visit.

B. Instruct Owner or representative in operation and maintenance of system, including adjusting of sprinkler heads. Use operation and maintenance material as basis for demonstration.

C. Deliver record drawing of system, required operation and maintenance information, extra materials and backflow preventer certificate to Owner at the instruction meeting.

D. Provide system demonstration to Owner and Engineer for review and final acceptance of work. Coordinate demonstration of procedures for winterizing (draining system lines, backflow preventer, etc.) and spring start-up with Owner. Review system operation and

components during service visit.

E. Instruct Owner or representative in operation and maintenance of system, including adjusting of sprinkler heads. Use operation and maintenance material as basis for demonstration.

F. Deliver record drawing of system, required operation and maintenance information, extra materials and backflow preventer certificate to Owner at the instruction meeting.

3.9 WARRANTY

A. Provide one-year materials and workmanship warranty on all system components and installation beginning on date of acceptance of the work.

B. Replace failed components immediately upon notification by Owner or Architect/Engineer.

END OF SECTION

SECTION 329113 - SOIL PREPARATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work, as required to make a complete and thorough preparation of the planting soil, including soil amendment products, imported topsoil, as required, to make up deficiencies in quantity of soil available on site, as shown in the Contract Drawings, and as specified herein this Section.

B. Work under this Section consists of, but is not necessarily limited to, furnishing and installing the following:

1. Agronomic Soil Fertility Testing and Soil Percolation Testing.
2. Topsoil.
3. Pre-Plant Weed Control.
4. Soil Conditioners, Amendments and Fertilizers (Organic & Chemical).

C. Related Requirements:

1. Section 31 2000: Earthwork
2. Section 329300 "Plants" for placing planting soil for plantings.
3. Section 32 8400: Irrigation Systems
4. Section 329200 "Turf and Grasses" for placing planting soil for turf and grasses.

1.2 DEFINITIONS AND APPLICABLE STANDARDS

A. References:

1. USDA – United States Department of Agriculture.
2. ASTM – American Society for Testing & Materials.

B. Definitions:

1. Topsoil - Shall be friable soil, providing sufficient structure in order to give good tilth and aeration to the soil. Topsoil shall be free of roots, clods, stones larger than one-inch (1”) in the greatest dimension, pockets of coarse sand, noxious weeds, sticks, lumber, brush and other litter. It shall not be infested with nematodes or other undesirable disease-causing organisms such as insects and plant pathogens.
2. Gradation Limits - Soil shall be a sandy loam, loam, clay loam or clay. The definition of soil texture shall be per the USDA classification scheme. Gravel over ¼-inch in diameter shall be less than 20% by weight.
3. Permeability Rate - Hydraulic conductivity rate shall be not less than one-inch (1”) per hour, nor more than twenty-inches (20”) per hour, when tested in accordance with the USDA Handbook Number 60, Method 34b, or other approved Methods.
4. Fertility - The range of the essential elemental concentration in soil shall be as follows: (cont. next page) Ammonium Bicarbonate/DTPA Extraction (PPM)

Element Concentration of elements for Soil Selection, measured as mg/kilogram dry weight basis Concentration of Elements for Final Acceptance (amended and conditioned soil) measured as mg/kilogram dry weight basis Phosphorus 2 - 40 10 – 40 Potassium 40 - 220 100 – 220 Iron 2 - 35 24 – 35 Manganese 0.3 - 6 0.6 – 6 Zinc 0.6 - 8 1 – 8 Copper 0.1 - 5 0.3 – 5 Boron 0.2 - 1 0.2 – 1 Magnesium 50 - 150 50 – 150 Sodium 0 - 100 0 – 100 Sulfur 25 - 500 25 – 500 Molybdenum 0.1 - 2 0.1 - 2

5. Acidity - The soil pH range measured in the saturation extract (Method 21a, USDA Handbook Number 60) shall be 6.0 – 7.9.
6. Salinity - The salinity range measured in the saturation extract (Method 3a, USDA Hand Number 60) shall be 0.5 – 2.0 dS/m. If calcium and if sulfate ions both exceed 20 milli-equivalents per liter in the saturation extract, the maximum salinity shall be 4.0 dS/m.
7. Chloride - The maximum concentration of soluble chloride in the saturation extract (Medoth3a, USDA Handbook Number 60) shall be 150 mg/1 (parts per million).
8. Boron - The maximum concentration of soluble boron in the saturation extract (Method 3a, USDA Handbook Number 60) shall be 1 mg/1 (parts per million).
9. Sodium Adsorption Ratio (SAR) - The maximum SAR shall be 3 measured per Method 20b, USDA Handbook Number 60.
10. Aluminum – Available aluminum measured with the Ammonium Bicarbonate/DTPA Extraction shall be less than 3.0 parts per million.
11. Soil Organic Matter Content - Sufficient soil organic matter shall be present to impart good physical soil properties but not be excessive to cause toxicity or cause excessive reduction in the volume of soil due to decomposition of organic matter. The desirable range is 3% to 5%. The carbon/nitrogen ratio should be about 10. A high carbon/nitrogen ratio can indicate the presence of hydrocarbons or non-humified organic matter.
12. Calcium Carbonate Content - Free calcium carbonate (limestone) shall not be present in acid-loving plants.
13. Heavy Metals - The maximum permissible elemental concentration in the soil shall not exceed the following concentrations: (cont. on next page) Ammonium Bicarbonate/ DTPA Extraction (PPM) Element (mg/kilogram) dry weight basis Arsenic 1.0 Cadmium 1.0 Chromium 10.0 Cobalt 2.0 Lead 30.0 Mercury 1.0 Nickel 5.0 Selenium 3.0 Silver 0.5 Vanadium 3.0

    a. If the soil pH is between 6 and 7, the maximum permissible elemental concentration shall be reduced 50% to the above values. If the soil pH is less than 6.0, the maximum permissible elemental concentration shall be reduced 75% of the above values. No more than three (3) metals shall be present at 50% or more of the above values.

14. Phytotoxic constituent, herbicides, hydrocarbons, etc. – Germination and growth of plants shall not be restricted more than 10% compared to the reference soil. Total petroleum hydrocarbons shall not exceed 50 mg/kg dry soil measured per the modified EPA Method No. 8015. Total aromatic volatile organic hydrocarbons (benzene, toluene, xylene and ethylbenzene) shall not exceed 0.5 mg/kg dry soil measured per EPA Method No. 8020.
15. Sub Grade - Soil level resulting from the rough grading work under another Section. Cultivation of sub grade areas prior to placement of Topsoil is included in this Section.
16. Stockpiled Topsoil - Soil stockpiled for spreading over prepared sub-grade.
17. Stockpiled Native Topsoil - Topsoil stripped from the site prior to rough grading Work (under another Section), to be spread and amended as Work under this Section.
18. Imported Topsoil - Off-site Topsoil, imported and stockpiled under this Section, to be spread and amended as Work under this Section.

C. Measurements:

1. PPM: Measurement, in parts per million.

1.3 QUALITY ASSURANCE

A. Installer Qualifications for requirements indicated herein this Section:

1. Licensed Landscape Contractor, in the State of Arkansas.

a. Engage an experienced, licensed Contractor who has completed landscaping work similar in material, design, and extent to that indicated for this Project and with a record of successful landscape establishment.
b. Installer's Field Supervision: Contractor shall maintain an experienced, full-time landscape supervisor/superintendent at the Project Site during times that landscaping operations identified herein the Contract are in progress.

B. Manufacturer’s Directions: Follow Manufacturer’s directions and drawings in cases where the Manufacturers of articles used in this Section furnish directions covering points not shown in the Contract Drawings or Contract Specifications.

C. Permits, Fees, Bonds, Testing, and Inspections: Contractor shall arrange and pay for permits, fees, bonds, testing, and inspections necessary to perform and complete his portion of the Work.

D. Approved Testing Laboratory and Procedures for Agronomic Soil Fertility Analyses:

1. Agronomic Soil Fertility Analyses shall be conducted by a reputable, certified, agronomic soils laboratory. Laboratory shall be a member of the Council on Soil Testing and Plant Analysis. The same laboratory shall be used throughout the duration of the Contract:
2. Contractor shall verify and confirm the selected Testing Laboratory and specific location(s) of soil sample(s) with the Landscape Architect prior to commencing soil sampling operations.
3. For each Soil type, submit the physical Soil Samples directly to the selected Laboratory for analysis, per the procedures outlined per Part III herein this Section.

a. In addition to the physical Soil Samples, Contractor shall also provide the Laboratory with a copy of the Soil Amendment and Fertilizer products indicated herein this Section.

4. Along with the testing data results, the Agronomic Soil Fertility Analysis shall also include written recommendations authored by the Laboratory conducting the Analyses for amending, treating, and/or correcting the sampled soils. Laboratory shall utilize the organic-based Soil Amendments and Fertilizers described herein this Section to the greatest extent possible to produce satisfactory planting soil(s) suitable for sustaining healthy viable plant growth.

a. The Analyses shall also include Maintenance and Post-Maintenance fertilization programs for planted areas within the Contract.

5. Agronomic Soil Fertility Analyses shall be performed on each Soil Type samples, and include testing results for the following pH Electro-conductivity (salinity) measurement – saturated extract. Measurement of sodicity (Sodium Absorption

Ratio) Estimate of soil texture and soil organic matter Presence of lime Nutrients/Toxic Elements measurement of DPTA extract Saturation extracts for nitrate, sulfate, sodium, calcium, magnesium, potassium, soluble phosphate, and boron Parasitic nematodes Herbicide contamination (For Lightweight Soil Mixes) Test for physical and chemical composition, and saturated weight per cu.ft.

6. Planting operations shall not commence until the results of the Agronomic Soil Fertility Analysis and Recommendations are reviewed accordingly by the Landscape Architect.
7. The quantity or type of amendments may be modified by the Landscape Architect within fourteen (14) days of receipt of the results. The Agronomic Soil Fertility Analysis and Recommendations shall take precedence over the amendment and fertilizer application rates specified herein or on the Contract Documents.
8. The Agronomic Soil Fertility Report/Recommendation shall take precedence over the amendment and fertilizer application rates specified herein or on the Contract Documents.

1.4 SUBMITTALS

A. General:

1. Collect information into a single Submittal for each element of construction and type of product or equipment identified under this Section for review.
2. Submittal Format: As applicable, furnish Submittal as a single electronic digital PDF (Portable Document Format) file.

B. Digital Submittal Information:

1. Product/Material Data: Submit available product/material literature supplied by manufacturer's, indicating that their products comply with specified requirements. Provide manufacturing source (name, address, and telephone number), and distributor source (name, address, and telephone number) for each type of product/material.

    a. Planting Soil (Imported/Amended Topsoil).
    b. Soil Amendments (for each type used, for Sand, Perlite, Peat Humus, Gypsum, Soil Sulfur, Iron, etc).
    c. Bulk Composted Organic Soil Amendment Material.
    d. Granular Soil Conditioning Material.
    e. Mycorrhizal Inoculum.
    f. Fertilizers (for each type used).

2. Agronomic Soil Fertility Analysis and Recommendations: Submit a minimum of fourteen (14) days prior to amending of the soil and ordering soil amendments. The locations of where each of the soil test samples were derived from the Project Site shall be keyed to the site plan and shall be included with the results.
3. Qualification Data: Submit names for firms and persons specified in the "Quality Assurance and Control" Article to demonstrate their capabilities and experience on similar installations.

C. Material Samples: Submit four (4) sets of physical Material Samples for review of kind, color, pattern, size, and texture for a check of these characteristics with other elements, and for a comparison of these characteristics between Submittal and actual component as delivered and installed. Include the full range of exposed color and texture expected in the completed work. Provide Material Samples bound and individually wrapped in re-

sealable labeled 1-gallon plastic bags (as applicable):

1. Provide Material Sample sets for each item submitted under Product/Material Data.

D. Submittals under this Article will be rejected without the benefit of review by the Landscape Architect if they are difficult to read due to insufficient scale, poor image quality, or poor drafting quality; or if the required information is missing or not presented in the format as requested.

E. No Work shall proceed under this Section until Submittal requirements indicated herein have been reviewed accordingly by the Landscape Architect.

1.5 DELIVERY, STORAGE, AND HANDLING

A. General: Deliver and install materials so as to not delay Work and install only after preparations for installation have been completed.

B. Packaged Materials Deliver packaged materials in original, unopened packages or containers, with manufacturer's labels intact and legible, showing weight, analysis, and name of manufacturer. Store and secure properly to prevent theft or damage.

1. Store packaged materials off ground and under cover, away from damp surfaces and inclement weather.
2. Protect during storage and construction against soilage or contamination from earth and other materials.

C. Bulk Materials:

1. Deliver and store bulk materials so as not to impede Work of others.
2. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
3. Protect during storage and construction against soilage or contamination from earth and other materials. Provide adequate separation between bulk materials so as not to cross-contaminate bulk materials.
4. Store under cover, away from inclement weather.
5. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
6. Do not move or handle materials when they are wet or frozen.
7. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates. Furnish original certificates to Landscape Architect upon request.

1.6 COORDINATION, SCHEDULING, AND OBSERVATIONS

A. Notify the Contractors performing Work related to installation of Work under this Section in ample time to allow sufficient time for them to perform their portion of Work and that progress of Work is not delayed. Verify conditions at the Project Site for Work that affects installation under this Section. Coordinate items of other trades to be furnished and set in place.

B. Utilities: Determine location of above grade and underground utilities and perform Work in a manner which will avoid damage to utilities. Hand excavate, as required. Maintain

grade stakes until removal is mutually agreed upon by parties concerned.

C. Excavation: When conditions detrimental to adequate Soil Preparation operations are encountered, such as rubble fill, adverse drainage conditions, or obstructions, cease operations and notify Landscape Architect for further direction.

D. Installation: Perform Soil Preparation operations only when weather and soil conditions are suitable in accordance with locally accepted practices.

E. Construction Site Observations: Periodic site observations shall be made by the Landscape Architect during the installation of Work under this Section for compliance with requirements for type, size, and quality. Landscape Architect retains right to observe Work for defects and to reject unsatisfactory or defective material at any time during progress of Work. Contractor shall remove rejected materials immediately from Project site, all associated cost are to be paid by the contractor.

1.7 SITE CONDITIONS

A. Project Site shall be free of weeds, native grasses, evasive grasses, (Bermuda Grass, Johnson Grass, Nut Grass, etc.) prior to Topsoil distribution or soil amendment placement.

B. Excessive rock, dead or declining vegetation, trash, debris, or other items that has accumulated throughout the duration of the Project shall be removed from the Project Site by the Contractor, and as directed by the Landscape Architect.

C. Grading and soil preparation Work shall be performed only during the period when beneficial and optimum horticultural results may be obtained. If the moisture content of the soil should reach such a level that working it would destroy soil structure or cause compaction, spreading and grading operations shall be suspended until, in the opinion of the Landscape Architect, the moisture content is increased or reduced to acceptable levels and the desired results are likely to be obtained.

1. Soil moisture level prior to planting shall be no less than 75% of field capacity. The determination of adequate soil moisture for planting shall be in the sole judgment of the Landscape Architect.
2. If the soil moisture level is found to be insufficient for planting, planting pits shall be filled with water and allowed to drain before commencing planting operations.

D. Planting areas which become compacted in excess of 85% relative compaction due to construction activities shall be tilled and thoroughly cross-ripped to a minimum depth of twelve-inches (12”) to alleviate the condition, taking care to avoid all existing subsurface utilities, drainage, etc.

PART 2 - PRODUCTS

2.1 PLANTING SOIL (TOPSOIL)

A. Topsoil: Meet ASTM D5268, pH range of 5.5 to 7, 4 percent organic material minimum.

1. Topsoil Source: Reuse native surface soil stockpiled on the site. Verify suitability of native surface soil stockpiled on site to produce Topsoil meeting requirements;

amend, as necessary. Supplement native surface soil stockpiled on site with imported Topsoil when quantities are insufficient.

a. Composition: Fertile, friable, well-drained soil, of uniform quality, free of stones over one-inch (1”) diameter or larger in any dimension sticks, oils, chemicals, plaster, concrete, roots, plants, sod, and other deleterious or extraneous materials harmful to plant growth.
b. Obtain an Agronomic Soil Fertility Report/Recommendation of the stockpiled Topsoil from the approved Testing Laboratory indicated herein this Section.
c. Test Results: Request Testing Agency to send one (1) copy of test results direct to the Landscape Architect and one (1) copy to the Owner. Amend as required.

2. Topsoil Source Provide Imported Topsoil obtained from off-site sources, from naturally well-drained sites do not obtain from bogs or marshes.

a. Quantity: Provide Imported Topsoil as soon as an insufficient quantity of native stockpiled surface soil is verified. Quantity of Imported Topsoil to complete the Work shall be calculated by Contractor
b. Stockpiling: Stockpile on site as directed by Owner.
c. Composition: To match in quality, accepted native stockpiled Topsoil.
d. Analysis: Obtain an Agronomic Soil Fertility Report/Recommendation of the Imported Topsoil from the approved Testing Laboratory indicated herein this Section.
e. Review: Landscape Architect reserves the right to take samples of the Imported Topsoil delivered to the site for conformance to the Contract Specifications.
f. Rejected Imported Topsoil: Immediately remove rejected Imported Topsoil off site, at Contractor's expense.

2.2 SOIL MIXES/BLENDS (BACKFILL/PLANTING MIX)

A. Soil Conditioner Blend, for amending on-site native soil planting surfaces, stockpiled, plant back fill or imported topsoil: Furnish a thoroughly blended composition of Bulk Composted Organic Soil Amendment Material and Granular Soil Conditioning Material & Fertilizer. Any substitution for the “Soil Conditioner Blend” listed herein must be requested by the Contractor and approved, in writing, by the Landscape Architect at least thirty (30) days prior to installation.

1. Bulk Composted Organic Soil Amendment Material:

a. Material Composition: Bulk Composted Organic Soil Amendment Material shall be thoroughly cured for a minimum of 100 days, and shall be free from any trash (glass, metal, plastic, etc.) deleterious materials, bio-solids, and/or toxic chemicals. The Material shall be non-hazardous, and conform to US Environmental Protection Agency 40 CFR503 criteria for “Class A” products. It shall also exceed standards and specifications for unrestricted application as a landscaping and agricultural soil amendment.
b. Humus material shall have an acid-soluble ash content of no less than 6% and no more than 20%. The organic matter content shall be at least 50% on a dry weight basis.
c. Types of acceptable products are composts, manures, mushroom composts, straw, alfalfa, peat mosses etc. low in salts, low in heavy metals, free from weed seeds, free of pathogens and other deleterious materials.

d. Composted wood products are conditionally acceptable . Wood based products are not acceptable which are based on red wood or cedar.
e. Sludge-based materials are not acceptable.

1) Gradation/Screen Analysis: A minimum of 90% of the material by weight shall pass a ½" screen. Material passing the screen shall meet the following criteria: Percent Passing Sieve Designation 80 – 100% 6.35 mm (1/4") 50 – 80% 2.38 mm (No.8) 0 – 40% 500 micron (No.35)
2) Maturity: Physical characteristics suggestive of maturity include shall include:

a) Color: Dark brown to black.
b) Odor: Aerobic, without malodorous presence of decomposition products.
c) Particle characterization: Identifiable wood pieces are acceptable, but the balance of Material should be soil-like without recognizable grass or leaves.
d) Analytical Properties: Contractor shall submit proof of the Bulk Composted Organic Soil Amendment Material by providing a sample as identified herein this Section, and a lab analysis that has been performed within 30 days of the installation of the planting. Soil mix shall have (at a minimum) the following properties: Material Minimum Targeted Property/Range Total Nitrogen (N%) .50-1.0% Phosphorus (as P2O5) 2.0% Potassium (as K2O) 0.2% pH (units) 6.0 to 7.5, as determined in saturated paste. Organic Content Minimum 50% based on dry weight and determined by ash method. Minimum 205 lbs. organic matter per cubic yard of compost. ECe (millimho/cm) 5.0; based on pre-leaching with equal volume of water. Carbon-to-Nitrogen Ratio 25-to-1, nitrogen stabilized. Bulk Density 1,000 to 1,100 pounds/cubic yard. Sodium Absorption Ratio (SAR) Under 20.0 Total Iron 1.5% - 3.0% Moisture Content 35%-60% Acid-soluable Ash content No less than 6% and no greater than 20%. Salt Content 10millimho/cm @ 25d C. on a saturated paste extract. Boron Content 1.0 parts per million on a saturated paste extract. Silicon-Content (acid-insoluable ash) 50% Calcium Carbonate No presence on alkaline soils. Maximum Total Permissible Pollutant Concentrations Parts per million (mg/kg dry-weight basis) • Arsenic: 1.0 • Cadmium: 1.0 • Chromium: 10.0 • Cobalt: 2.0 • Copper: 1.0 • Lead: 30.0 • Mercury: 1.0 • Molybdenum: 2.0 • Nickel: 5.0 • Selenium: 1.0 • Silver: 0.5 • Vanadium: 3.0 • Zinc: 2.0
e) Application Rate: As indicated herein this Section under "Planting Soil Amendments Schedule".
f) Commercial-Grade Products & Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

3) Provide submittal and sample to be approved by the Landscape Architect

2. Granular Soil Conditioning Material & Fertilizer:

a. Material Composition and Analytical Properties: Granular Soil Conditioning Material & Fertilizer shall be a singular manufacturer-blended combination of

soil conditioning material and fertilizer. It shall be granular in form, long-lasting, free flowing, and suitable for application with approved equipment. It shall not contain any sewage sludge or manure-based products, and shall contain the following guaranteed minimum available analysis range: Element/Material Targeted Property Range Nitrogen (N) 5.0% to 6.0% Phosphoric Acid (as P2O5) 2.0% to 3.0% Potash (as K2O) 1.0% to 4.0% Humic Acids 15.0 % to 20.0% Calcium 7.0% Sulfur 0.0% to 5.0%

b. Commercial-Grade Products, Manufacturers and Associated Rates of Application: Subject to compliance with requirements.

1) Provide submittal and sample to be approved by the Landscape Architect.

B. Washed Plaster Sand: Clean, washed, natural or manufactured sand, sharp, fine-textured, free of toxic materials. Sieve tested in accordance with ASTM C136, with 100% passing through a #4 screen, 0% passing through a #200 screen.

1. Chemical Properties: (by DPTA Saturation Extract Method):

a. Soluble Salts/Salinity: Maximum conductivity of 3.0 millimhos/cm at 25 degrees C.
b. Boron: Maximum concentration of 1.0 PPM.
c. Sodium Absorption Ratio (SAR): Maximum 6.0.
d. pH: 7.0.

C. Perlite: Horticultural Perlite, soil amendment grade, 6.5 to 7.5 pH.

1. Unacceptable Materials: Polystyrene beads shall not be used as a substitution for horticultural Perlite.

D. Vermiculite: Horticultural Vermiculite, gold-brown in color.

1. Size: 2-4mm, 5 mesh to 10 mesh sieve size.
2. Density: 4.5 to 5.5 lb./cu ft.
3. Grade: #2, Medium Grade.

2.3 INORGANIC SOIL AMENDMENTS

A. Peat Humus:

1. Type: Canadian Sphagnum Peat, as derived from the genus Sphagnum, medium-divided, coarse fibrous texture, brown in color.
2. Measurement: Measure peat in air dry condition, containing not more than 35% moisture by weight on an "as-received" basis.
3. Physical Properties: Percent Passing Sieve Designation 95 – 100% 9.51 mm (3/8”) 0 – 40% 500 micron (No.35)
4. Organic Content (dry weight basis): Minimum 95%.
5. Fiber Content: Greater than 66%.
6. Water Holding Capacity: 20x to 30x its dry weight in water.
7. Range in Ash Content (%): 1.0 to 5.0.
8. Chemical Properties:

a. Nitrogen (dry weight basis): 0.6-3.0%.
b. Salinity/Soluble Salts: Saturation extract conductivity 0.0-3.0 millimhos/cm @

25 degrees C.
c. pH range: 3.0 to 4.0.

9. Unacceptable Materials:

a. Coir Dust.
b. Sedge Peat.
c. Reed Peat.
d. Hypnum Peat.

B. Mycorrhizal Inoculum

1. Mycorrhizal Inoculum for Plant Material: Dual soil-conditioning biological inoculum system of endo-and ecto- Mycorrhizal, used to further aid the plants ability to efficiently uptake available soil nutrients and increase resistance to drought.

a. Products & Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1) 7-gram Myco-Pak, Tri-C Enterprises LLC, Chino, CA, 800-927-3311.
2) 4 oz. Packet - Roots 1 Step, Roots, Inc., Independence, MO, 800-342-6173.
3) Or equal, as approved by the Landscape Architect.

b. Provide at the prescribed application rate, per the Manufacturer's written recommendations.

2.4 CHEMICAL SOIL AMENDMENT COMPONENTS

A. General: Chemical Soil Amendment Components listed herein may or may not be used, depending on the results of the Agronomic Soil Fertility Report. Provide as required.

B. Gypsum: Commercially-processed and packaged agricultural-grade hydrated calcium sulfate product (CaSO4), 92.0% minimum, pH at 7.1.

1. Commercial-Grade Products & Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Ben Franklin® No. 1 Agricultural Gypsum, U.S. Gypsum Company.
b. 100% Good Stuff Gypsum™, Art Wilson Company.
c. CAL-SUL® Pelletized Agricultural Gypsum, North Pacific Group.
d. Bumper Harvest Agricultural Gypsum, Domtar Gypsum.
e. Premium 97 Solution-Grade Gypsum, Diamond K, Inc.
f. Or equal, as approved by the Landscape Architect.

C. Soil Sulfur: Elemental Sulfur (90% min.) commercially manufactured, water degradable, palletized.

1. Commercial-Grade Products & Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Disper-Sul, Martin Resources, Inc.
b. Soil Sulfur, Red Top.
c. Or equal, as approved by the Landscape Architect.

D. Iron: Non-staining, 40% Fe minimum, complete with micro-nutrients and 2% humic acids, as derived from iron oxide, manganese oxide, or zinc oxide.

1. Commercial-Grade Products & Manufacturers: Subject to compliance with requirements, provide products by one (1) of the follo

a. Gro-Power Iron, Gro-Power, Chino, CA.
b. Iron 45 w/ Micronutrients, Tri-C Enterprises LLC, Chino, CA.
c. Or equal, as approved by the Landscape Architect.

E. Dolomite Lime: Agricultural-grade mineral soil conditioner containing 35% minimum magnesium carbonate, and 49% minimum calcium carbonate, 100% passing #65 sieve.

F. Potassium Sulfate (Sulfate of Potash K2O), (0-0-50 guaranteed analysis N-P2O5-K2O): Agricultural-grade, containing minimum 50% of water-soluble potash and 18% Sulfur (S).

G. Single Superphosphate P2O5 (0-15-0 guaranteed analysis N-P2O5-K2O): Commercial product, containing 15% available phosphoric acid and 14% Sulfur.

H. Triple Superphosphate P2O5, (0-45-0 guaranteed analysis N-P2O5-K2O): Commercial product, containing 45% available phosphate and 15% Calcium (Ca).

I. Ammonium Sulfate (NH4)2SO4, (21-0-0 guaranteed analysis N-P2O5-K2O): Commercial product containing approximately 21% ammonia.

J. Ammonium Nitrate NH4NO3, (34-0-0 guaranteed analysis N-P2O5-K2O): Commercial product containing approximately 34% ammonia.

K. Calcium Nitrate CaNO3, (15.5-0-0 guaranteed analysis N-P2O5-K2O): Agricultural grade containing 15-1/2% nitrogen.

L. Potassium Nitrate KNO3, (13-0-45 guaranteed analysis N-P2O5-K2O): Commercial product containing approximately 13% nitrogen and 45% potassium.

M. Ureaformaldehyde (38-0-0 guaranteed analysis N-P2O5-K2O): Granular commercial product containing approximately 38% nitrogen.

N. Urea CO(NH2)2, (46-0-0 guaranteed analysis N-P2O5-K2O): Granular commercial product containing 46% nitrogen

O. I.B.D.U. (Iso Butyldiene Diurea): Commercial product containing 31% nitrogen.

2.5 FERTILIZERS

A. Composition: Nitrogen (N), phosphorous (P2O5), and potassium (K2O) content, plus other elements, as indicated.

B. Fertilizer Tablet:

1. General: Fertilizer Tablet shall be a 7-gram tablet, organic-based, tightly compressed chip-type commercial grade, 12-month slow-release planting tablets, and shall be composed of the following available percentages by weight of plant food: Element/Material Targeted Property Range Nitrogen (N) 12% Minimum Phosphoric Acid (as P2O5) 8% Minimum Potash (as K2O) 8% Minimum Humus

20% Minimum Humic Acids w/ micronutrients and soil enhancers 4% Minimum

2. Commercial-Grade Products & Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Gro-Power 12-8-8 Planting Tablets, Gro-Power.

        1) Application Rate: As indicated herein Part III this Section.

    b. Or equal, as approved by the Landscape Architect.

2.6 ACCESSORIES

A. Drain Rock/Aggregate: Crushed Stone, conforming to ASTM C33, graded to ¾”-size, clean, hard, durable, free of materials toxic to plant growth, set in bottom of Planters, at depth indicated in Contract Drawings. Provide Geotextile Filter Fabric between Drain Rock/Aggregate and amended planting backfill soil.

B. Wetting Agent/Water Storing Polymer: Non-biodegradable, granular, polyacrylamide polymer soil amendment.

1. Commercial-Grade Products & Manufacturers: Subject to compliance with requirements, approved through submittal.

C. Landscape Mulch Material:

1. Organic Wood Mulch: Triple Hammered Hardwood Mulch
2. Rock Mulch: Crowley's Ridge Drainage Rock. Refer to plans for size.

PART 3 - EXECUTION

3.1 ARGONOMIC SOIL FERTILITY REPORT/RECOMMENDATION

A. Once rough grading has been accomplished, and prior to commencing Soil Preparation operations, (amendments, fertilizers, etc.), soil samples shall be taken from representative areas and below grade depths of the Project Site. Locations and depths to gather the representative soil samples shall be accomplished by the Contractor under the direction of the Landscape Architect.

1. Provide a minimum of ten (10) Soil Samples from locations to be coordinated.

B. Guidelines for Selecting the Soil Samples:

1. Select representative areas to sample. The area needs to be uniform in color, texture, depth, and drainage with the same fertilizing program and type of use. Planting areas to receive lawns, flowerbeds, trees, cut areas, fill areas, etc. should be tested separately. An area containing multiple trees and shrubs can be grouped into one area if the planting is the same.
2. Depths and process of soil sampling:

    a. Sample as deep as the soil will be amended, generally six-inches (6”) deep for groundcover/lawns, eighteen-inches (18”) deep for shrub areas, twenty-four-inches (24”) deep for small boxed trees, and three-feet (3’) to four-feet

(4') for large boxed trees.

b. Use a soil probe or soil auger to remove a core sample; otherwise, use a shovel to dig a hole to the desired depth. Sample the soil from the side of the excavated hole, scraping the side with a trowel. The tools used for digging shall be clean and not rusty. Avoid sampling when the soil is too wet.

3. In desired areas where multiple sub-samplings are taken from any one (1) area to create a combined sample, mix the sub-samples homogenously together in a clean plastic bucket prior to placing in the plastic bag.
4. Each Sample shall be sent directly to the laboratory in a separate, re-sealable, one (1)-gallon plastic bag. Provide a minimum of four (4) cups of soil within each respective sample to allow for adequate testing.

3.2 SOIL PERCOLATION TESTING

A. Type/Quantity: During operations of Agronomic Soil Fertility Testing and prior to installing Plant Material, Contractor shall perform Soil Percolation Tests, through the direction of the Landscape Architect, in selected representative areas of the Project Site, to verify acceptable natural drainage, soil structure, and soil composition. Contractor shall verify the locations of the Soil Percolation Tests with the Landscape Architect

1. Required Number of Soil Percolation Tests: ten (10)

B. Procedure: Each Soil Percolation Test shall be performed as follows:

1. Dig a hole: 2'-0" wide x 2'-0" long x 2'-0" deep.
2. Fill the hole with water to top and cover with plywood and barricade. Allow hole to drain and fill again to top.
3. Make daily observations, noting the depth of water each day.
4. Report findings, in writing, to the Landscape Architect. Include the length of time the water takes to drain completely from each hole, date of test, location, and other information, which may be useful in providing further recommendations.

C. Results: Based on the combined results of the Agronomic Soil Fertility Testing and the Soil Percolation Tests, Contractor may be required to install additional tree drainage sumps or other drainage methods at each planting pit for trees larger than 15-gallon container stock. Contractor shall include, as a line-item price within the Base Bid, the price per each additional tree drainage sump, should they be required (based on the testing).

3.3 SOIL MOISTURE CONTENT

A. General: Do not work soil when moisture content is so great that excessive compaction occurs, or when it is so dry that dust will form in air, or that clods will not break readily. Apply water, if necessary, to bring soil to an optimum moisture content for tilling and planting. Soil moisture level prior to planting shall be no less than 75% of field capacity. The determination of adequate soil moisture for planting shall be the judgment of the Landscape Architect. Range: Maintain within tw

3.4 CLEARING, CULITIVATION, & EXCAVATION

A. Clearing: Clear planting areas free of stones two-inches (2") in diameter and larger,

weeds, debris, and other extraneous materials prior to soil preparation Work.

B. Pre-Plant Weed Control:

1. Clear and remove existing weeds by spraying and grubbing to at least one-inch (1”) below the soil surface.
2. Dead weeds shall be cleared and removed prior to planting
3. Maintain a weed-free Project Site until final acceptance by the Owner, utilizing mechanical, chemical, or manual treatment.

C. Cultivation of Native Site, with Amendments/Fertilizers:

1. Verification: In planting areas where Native Topsoil blend will be applied, verify that sub-grades prior to installation of Topsoil have been established under rough grading. Do not spread Topsoil prior to acceptance of sub-grade Work.
2. Cultivation: Following Pre-Plant Weed Control operations, rip or cultivate verified planting areas of Native Site Soil at the indicated depth, prior to applying Imported Topsoil (if required) and Soil Amendments/Fertilizers.

    a. Depth of Cultivation for existing soils: As specified in Drawings or minimum 8-inches (8”).
    b. Depth of Excavation for imported soils: As specified in Drawings or minimum 8-inches (8”).

3. Following initial cultivation or excavation of existing Native Site Soil, evenly spread Imported Topsoil (if required) throughout all planting areas at the minimum indicated depth to meet finished landscape grades.

    a. Depth of Imported Topsoil: As indicated on the Drawings.
    b. Minimum of eight-inch (8”) at Landscape Beds or Mass Planting areas.
    c. Minimum of four-inches (4”) at Sodded areas.

4. Once Imported Topsoil has been spread, uniformly broadcast all required Soil Amendments and Fertilizers as recommended through the results of the Agronomic Soil Fertility Report.
5. Thoroughly cultivate/blend all materials to provide a homogenous planting soil mixture at the indicated depth:

    a. Depth of Cultivation: Minimum eight-inches (8”).

6. Lightly tamp/compact prepared Planting Soil to eliminate settlement, and complete finish grading operations.
7. Planting Soil Amendment Schedule: The Planting Soil Amendment Schedule shall be based on the combined results of the Agronomic Soil Fertility Tests and Percolation Tests and recommendations provided by the Testing Agency/Lab.

3.5 APPLICATION RATES

A. Fertilizer Tablets shall be spread equidistantly around the perimeter within the Amended Planting Backfill Mixture, up to within three-inches (3”) of the finished grade of the Mixture, and at the following rates: Size of Plant Material Total Quantity of 7-gram tablets One (1)-gallon Container stock. One (1) Tablet Five (5)-gallon Container stock. Nine (6) Tablets Fifteen (15)-gallon container stock Fifteen (10) Tablets 2.5” Caliper Stock Fifteen (15) Tablets 3”-4” Caliper Stock Twenty

1. Contractor shall not provide Fertilizer Tablets for designated native plant species, if directed by the Landscape Architect. Contractor shall verify with the Landscape Architect, in writing, as to which plants are subject to not receive the Fertilizer Tablets.

B. Mycorrhizal Inoculum Application Rate:

1. During application of Fertilizer/Planting Tablets, Mycorrhizal Inoculum shall be spread equidistantly around the perimeter within the Amended Planting Backfill Mixture, up to within three (3”) inches of the finished grade of the Mixture, at the prescribed application rate per the Manufacturer’s written recommendations.

3.6 DRAINAGE OF PLANTING AREAS

A. Surface Drainage:

1. Discrepancies: Provide proper surface drainage of planted areas. Submit in writing all discrepancies in the Contract Drawings or Specifications, or prior Work done by others, which Contractor feels precludes establishing proper drainage.
2. Correction: Include description of work required for correction or relief of said condition

B. Detrimental Drainage, Soils and Obstructions:

1. Notification: Submit in writing all soils or drainage conditions considered detrimental to growth of plant materials. State condition and submit proposal and cost estimate for correcting condition.
2. Correction: Submit for acceptance a written proposal and cost estimate for the correction before proceeding with Work.
3. Obstructions: If rock, underground construction Work, tree roots, or other obstructions are encountered in the performance of Work under this Section, submit cost required to remove the obstructions to a depth of not less than six-inches (6”) below the required soil depth.

3.7 MAINTENANCE

A. Protect graded areas from traffic and erosion. Keep free of trash and debris. Repair and reestablish grades in settled, eroded, and damaged areas.

B. Where completed areas are disturbed by construction operations or adverse weather, scarify surface, reshape, and compact to required density.

3.8 WASTE MATERIALS

A. Haul from site and legally dispose of waste materials including trash and debris as required and approved by the owner typical.

3.9 CLEAN UP

A. Upon completion of filling and grading work, remove equipment and tools. Leave site clear, clean, free of debris and ready for subsequent trades work.

END OF SECTION

SECTION 329200 - TURF AND GRASSES

PART 1 - GENERAL

1.1 SUMMARY

A. Provide sodded lawns as shown and specified. The work includes:

1. Soil Preparation
2. Sodding lawns and other indicated areas.
3. Maintenance.

1.2 QUALITY ASSURANCE

A. Sod: Comply with American Sod Producers Association (ASPA) classes of sod materials.

B. Provide and pay for materials testing. Testing agency shall be acceptable to the Architect. Provide the following data:

1. Test representative materials samples proposed for use.
2. Topsoil:

a. pH factor.
b. Mechanical analysis.
c. Percentage of organic content.
d. Recommendations of type and quantity of additives required to establish satis-factory pH factor and supply of nutri¬ents to bring nutrients to satisfactory level for planting.

1.3 INFORMATIONAL SUBMITTALS

A. Submit sod growers certification of grass species. Identify source location.

B. Submit the following materials certification:

1. Fertilizer(s) analysis.

C. Submit materials test report.

D. Upon sodded lawn acceptance, submit written maintenance instructions recommending procedures for maintenance of sodded lawns.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Cut, deliver, and install sod within a 24-hour period.

1. Do not harvest or transport sod when moisture content may adversely affect sod survival.

2. Protect sod from sun, wind, and dehydration prior to installation.
3. Do not tear, stretch, or drop sod during handling and installation.

1.5 FIELD CONDITIONS

A. Work notification: Notify Landscape Architect at least 7 working days prior to start of sodding operations.

B. Protect existing utilities, paving, and other facilities from damage caused by sodding operations.

C. Perform sodding work only after planting and other work affecting ground surface has been completed.

D. Restrict traffic from lawn areas until grass is established. Erect signs and barriers as required.

E. Provide hoses and lawn watering equipment as required.

1.6 WARRANTY

A. Provide a uniform stand of grass by watering, mowing, and maintaining lawn areas until final acceptance. Re sod areas, with specified materials, which fail to provide a uniform stand of grass until all affected areas are accepted by the Landscape Architect.

PART 2 - PRODUCTS

2.1 TURFGRASS SOD

A. Reference plan for turf material type.

B. Provide well-rooted, healthy sod, free of diseases, nematodes and soil borne insects. Provide sod uniform in color, leaf texture, density, and free of weeds, undesirable grasses, stones, roots, thatch, and extraneous material; viable and capable of growth and development when planted.

C. Fertilizer:

1. Granular, non-burning product composed of not less than 50% organic slow acting, guaranteed analysis professional fertilizer.

    a. Fertilizer with a ratio of 20-27-5 for establishing sod areas.
    b. Fertilizer with a ratio of 30-3-3 for maintaining the lawn.

D. Water: may not be available on site. Landscape contractor will provide necessary hoses and other watering equipment required to maintain and complete work. An automatic/drip irrigation system will be installed simultaneously with the landscape planting. The landscape contractor shall not anticipate the use of the irrigation system during installation of this contract.

E. Lime: Apply appropriate rate of pelleted lime as the pH test indicates. No lime is needed

if the pH test is between 6.0-7.0.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine finish surfaces, grades, topsoil quality, and depth. Do not start sodding work until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Limit preparation to areas which will be immediately sodded.

B. Loosen topsoil of lawn areas to minimum depth of 4". Remove stones over 1" in any dimension and sticks, roots, rubbish, and extraneous matter.

C. Grade lawn areas to smooth, free draining and even surface with a loose, uniformly fine texture. Roll and rake; remove ridges and fill depressions as required to drain.

D. Apply Type A fertilizer at the rate equal to 1.0 lb. of actual nitrogen per 1,000 sq. ft. (220 lbs./acre). Apply fertilizer by mechanical rotary or drop type distributor, thoroughly and evenly incorporated with the soil to a depth of 3" by disking or other approved methods. Fertilize areas inaccessible to power equipment with hand tools and incorporate it into soil. Buffalo Grass Sod may not require fertilizer submit soil test for review by Landscape Architect.

E. Dampen dry soil prior to sodding.

F. Restore prepared areas to specified condition if eroded, settled, or otherwise disturbed after fine grading and prior to sodding.

3.3 INSTALLATION

A. Sodding:

1. Lay sod per plans to form a solid mass with tightly-fitted joints. Butt ends and sides of sod strips. Do not overlay edges. Stagger strips to offset joints in adjacent courses. Remove excess sod to avoid smothering of adjacent grass. Provide sod pad top flush with adjacent curbs, sidewalks, drains, and seeded areas.
2. Do not lay dormant sod or install sod on saturated or frozen soil.
3. Install initial row of sod in a straight line, beginning at bottom of slopes, perpendicular to direction of the sloped area. Place subsequent rows parallel to and lightly against previously installed row.
4. Peg sod on slopes greater than 3 to 1 to prevent slippage at a rate of 2 stakes per yd. of sod.
5. Water sod thoroughly with a fine spray immediately after laying.
6. Roll with light lawn roller to ensure contact with sub-grade.

B. Sod indicated areas within contract limits and areas adjoining contract limits disturbed as a result of construction operations.

3.4 MAINTENANCE

A. Maintain sodded lawn areas, including watering, spot weeding, mowing, application of herbicides, fungicides, insecticides and resodding until a full, uniform stand of grass free of weed, undesirable grass species, disease, and insects is achieved and accepted by the Architect at the completion and acceptance of the entire project.

1. Water sod thoroughly every 2 to 3 days, or as required to establish proper rooting.
2. Repair, rework, and resod all areas that have washed out or are eroded. Replace undesirable or dead areas with new sod.
3. Mow lawn areas as soon as lawn top growth reaches a 3" height. Cut back to 2" height. Repeat mowing as required to maintain specified height. Not more than 40% of grass leaf shall be removed at any single mowing.
4. Apply Type B fertilizer to lawns approximately 30 days after sodding at a rate equal to 2.0 lbs. of actual nitrogen per 1,000 sq. ft. (140 lbs./acre). Apply with a mechanical rotary or drop type distributor. Thoroughly water into soil. *Only as required per soil test for Buffalo Sod
5. Apply herbicides as required to control weed growth or undesirable grass species.
6. Apply fungicides and insecticides as required to control diseases and insects

3.5 ACCEPTANCE

A. Inspection to determine acceptance of sodded lawns will be made by the Architect, upon contractor's request at the completion of the entire project. Provide notification at least 10 working days before required inspection date.

1. Sodded areas will be acceptable provided all requirements, including maintenance, have been complied with, and a healthy, even colored viable lawn is established, free of weeds, undesirable grass species, disease, and insects.

B. Upon final acceptance, the Owner will assume lawn maintenance.

3.6 CLEANUP AND PROTECTION

A. Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, debris, and equipment. Repair damage resulting from sodding operations.

END OF SECTION

SECTION 329300 - PLANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Provide trees, shrubs, ground covers, native perennials, native grasses and native wildflower and grass seed as shown and specified.

1. Soil preparation.
2. Trees, shrubs, groundcovers, native perennials and native grasses.
3. Mulch and planting accessories.
4. Maintenance and Extended Management.

B. Related Requirements:

1. Section 015713: Temporary Erosion and Sediment Control
2. Section 328400 "Planting Irrigation" for complete irrigation systems.
3. Section 329200 "Turf and Grasses" for turf (lawn) and erosion-control materials.
4. Section 329400: Soil Preparation

C. Definitions:

1. Plant Material(s) – Refers to living plant species, inclusive of trees, shrubs, groundcovers, vines, ornamental grasses, cacti/succulents, espaliers, annuals, perennials, etc., as indicated in the Contract Drawings.
2. Planting Area (PA) – As denoted on the Contract Drawings, shall refer to areas to be installed with Plant Material(s), or areas where existing vegetation shall be protected.
3. Plant Height – Measurement of main body height, not measurement to branch tip.
4. Plant Spread – Measurement of main body diameter, not measurement from branch tip to branch tip.
5. Amended Planting Backfill Mixture – Refer to Section 32 91 13 – Soil Preparation.
6. Balled and Burlapped Stock – Healthy, vigorous exterior plants with firm, natural balls of earth in which they are grown, with ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of tree or shrub required; wrapped, tied, rigidly supported, and drum laced as recommended by ANSI Z60.1.
7. Balled and Potted Stock – Healthy, vigorous exterior plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than diameter and depth recommended by ANSI Z60.1 for type and size of exterior plant required.
8. Bare-Root Stock – Healthy, vigorous exterior plants grown with a well-branched, fibrous-root system developed by transplanting or root pruning, with soil or growing medium removed, and with not less than minimum root spread according to ANSI Z60.1 for type and size of exterior plant required.
9. Compacted Settling Layer – Subgrade under where a plant is directly planted.
10. Container-Grown Stock – Healthy, vigorous, well-rooted exterior plants grown in a container with well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of exterior plant required.
11. Fabric Bag-Grown Stock – Healthy, vigorous, well-rooted exterior plants

established and grown in-ground in a porous fabric bag with well-established root system reaching sides of fabric bag. Fabric bag size is not less than diameter, depth, and volume required by ANSI Z60.1 for type and size of exterior plant.

12. Finish Grade – Elevation of finished surface of planting soil.
13. Manufactured Topsoil – Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
14. Multi-Stem – Where three (3) or more main stems arise from the ground from a single root crown or at a point right above the root crown.
15. Sub-grade – Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing planting soil.
16. Subsoil – All soil beneath the topsoil layer of the soil profile and typified by the lack of organic matter and soil organisms.

1.2 QUALITY ASSURANCE

A. Installer Qualifications:

1. Requirement: Valid Arkansas Landscaping Contractor License.
2. Engage an experienced Installer who has demonstrated completed landscaping work similar in material, design, and extent to that indicated for this Project and with a record of successful landscape establishment.
3. Installer's Field Supervision Installer shall maintain an experienced full-time supervisor on the Project site during times that landscaping installations under this Section are in progress.
4. Selections of Plant Material may be sourced and purchased by the Owner directly. Contractor to provide a line item installation cost and separate warranty identifying the schedule of values for each.

B. Plant Material:

1. Trees, Shrubs, Grasses and Seed: Provide quality, size, genus, species, and variety of Plant Material indicated, complying with applicable requirements of ANSI Z60.1 "American Standard for Nursery Stock."

    a. At least one (1) plant of each Plant Material species delivered to the Project Site shall have an identification tag from supplying nursery showing botanical and common name of the plant as identified in the Contract Drawings. Landscape Architect shall be provided the opportunity for an on-site debriefing by the Contractor that identifies the size and specific type of Plant Material upon delivery.

        1) Provide replacements equal to the size and quality to match the planted materials at the time the untrue species is discovered.

    b. Replace, at no cost to Owner, Plant Material that is revealed during the course of the Contract as to being untrue to the species indicated in the Contract Drawings and reviewed accordingly under this Section.
    c. Replacement of Plant Material: Refer to the Guarantee Article indicated herein this Section.

C. Plant Material Observation: Landscape Architect may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Landscape Architect may also observe trees

and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and may reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.

D. Regulatory Requirements:

1. Contractor shall meet the requirements of applicable laws, codes, and regulations as required by the authorities having jurisdiction over the Work. Plant names indicated, comply with "Standardized Plant Names" as adopted by the latest edition of the American Joint Committee of Horticultural Nomenclature. Names of varieties not listed conform generally with names accepted by the nursery trade. Provide stock true to botanical name and legibly tagged.

E. Permits, Fees, Bonds, and Inspections: Contractor shall arrange and pay for permits, fees, bonds, and inspections necessary to perform and complete Work under this Section.

F. Plant Material Review and Selection (Tagging):

1. At the discretion of the Landscape Architect, Plant Material will be subject to review, photographed, and selected/tagged by the Landscape Architect at the nursery, or other place of growth, prior to delivery to the Project Site. Contractor shall verify with the Landscape Architect if tagging operations are required.
2. Selecting/Tagging of Plant Materials at the nursery or place of growth does not cancel the right of the Landscape Architect to reject Plant Materials at the Project Site, if damaged or unacceptable conditions are found that were not detected at the nursery, place of growth, or in the submitted photographs.

G. Plant Material Delivery: Plant Material shall be delivered with original Plant Material tagging materials set in place, as selected, and marked by the Landscape Architect at the nursery or place of growth. Seed, topdressing, and any fertilizer materials shall be delivered in original containers. Include materials showing weight, analysis, and names of growers. Store all seed material in a manner to prevent wetting, excessive heating, or other deterioration. Contractor shall notify Landscape Architect upon delivery of Plant Material for review of stock and tagging materials. Plant Materials delivered without original tagging materials, or with broken, damaged, or altered tagging materials, shall be subject to rejection by the Landscape Architect. Rejected Plant Material shall be removed immediately.

H. Pre-installation Conference: Conduct conference at Project Site.

I. Protection of Existing Plant Material:

1. Refer to Requirements specified in Section 015639 – Temporary Tree and Plant Protection.
2. It is the intent of the Contract Documents that certain existing Plant Materials shall be retained. Prior to the removal of any Plant Materials, the Contractor shall confer with the Landscape Architect to determine which Plant Materials are to remain.
3. All existing Plant Materials which are to remain in the project shall be tagged and identified by the Contractor prior to start of Work.
4. Contractor shall be responsible for Plant Materials that are designated to remain. Damage to any Plant Materials which results in death or permanent disfiguration of said Materials shall result in compensation outlined in Section 01 56 39 – Temporary Tree and Plant Protection. The Landscape Architect shall be the sole

judge of the condition of the Plant Materials.

5. Existing Plant Materials designated to remain shall be protected at all times from damage by construction activity (tools, materials, equipment, personnel, etc.). Damage by the Contractor to existing Plant Materials shall be repaired at the Contractor's expense to the satisfaction of the Owner, as directed by the Landscape Architect.
6. Contractor shall insure that no foreign material and/or liquid, such as paint, concrete, cement, oil, turpentine, acid or the like, be deposited or allowed to be deposited on soil within the drip line (the outside edge of the foliage overhang) of any Plant Material. Do not store construction materials, debris, or excavated material within drip line of existing Plant Material. Should any such poisoning of the soil occur, the Contractor shall thoroughly remove said soil as directed by the Landscape Architect and replace with acceptable soil at no additional cost to the owner.
7. Excavation adjacent to existing Plant Materials: Where it is necessary to excavate in close proximity to the drip lines of existing Plant Materials, all possible caution shall be exercised to avoid injury to roots and trunk. Excavation close to Plant Materials shall be done by hand, with narrow-tine spading forks or other approved tools to comb soil to expose roots. Tunnel under roots two-inches (2") and larger in diameter. Cutting of roots two-inches (2") and larger shall be only on the approval of the Landscape Architect.
8. Replacement of Damaged Plant Material: Replace existing Plant Material to remain as required, hat are damaged by Contractor during construction with accepted Plant Material of the same species, size, and quantity as those damaged, at no additional cost to Owner. Owner shall be the sole judge as to the extent of the damage and the value of said damaged Plant Material.

1.3 SUBMITTALS

A. General

1. Collect information into a single submittal.
2. Submittal shall be organized and presented into specific sections or headings. Furnish neat, concise, legible, and clearly identifiable information, and sufficiently explicit detail, to enable proper evaluation for Contract compliance. Highlight catalog, product data, or brochures containing various products, sizes, and materials to show particular item submitted.
3. Submittal Format: As applicable, furnish Submittal as a single electronic digital PDF (Portable Document Format) file.

B. Digital Submittal Information:

1. Alphabetized List of Plant Material.
2. Submitted in the following format.

    a. Project Name
    b. Botanical Name
    c. Common Name
    d. Container Size
    e. Overall Height
    f. Caliper Size
    g. Quantity

3. The submittal shall not be construed as to acceptance of the plant material. All

plant material shall be subject to review and approval by the Landscape Architect upon delivery to the project site.

C. No work shall proceed under this Section until submittal requirements indicated herein have been review accordingly by the Landscape Architect.

D. Provide plant material record drawings:

1. Legibly mark drawings to record actual construction.
2. Indicate horizontal and vertical locations, referenced to permanent surface improvements.
3. Identify field changes of dimension and detail and changes made by Change Order.

E. Submit for the Landscape Architect's approval five samples of each container grown plant under the number 15 container size. The five approved samples shall be retained in a protected location on the project site at a location approved by the General Contractor. The Landscape Contractor shall maintain the sample plants until completion of the site planting. The sample plants may then be used in the site planting.

1.4 DELIVERY, STORAGE, AND HANDLING

A. General: Do not prune Plant Material before delivery, except as approved by the Landscape Architect. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie Plant Material in such a manner as to destroy natural shape.

1. Immediately after digging field-grown Plant Materials, pack root systems in wet straw, hay, burlap, or other suitable material to keep root system moist until final planting installation.
2. Deliver freshly dug field-grown Plant Materials with firm, natural balls of earth of sufficient depth to include fibrous and feeding roots, meeting, or exceeding requirements of ANSI Z60.1 for root ball diameter.
3. Store all seed material in a manner to prevent wetting, excessive heat, or other deterioration.

B. Handling Plant Materials:

1. Handle balled and burlap Plant Material stock by the root ball.
2. Handle container-grown Plant Materials only by their containers.
3. DO NOT handle Plant Materials by their trunks or stems.
4. DO NOT drop any Plant Materials.
5. DO NOT bind or handle Plant Materials with wire or rope.
6. Pad trunk and branches of Plant Materials whenever using hoisting cables, chains, or straps.
7. Should the Contractor engage in handling any Plant Material(s) by any unacceptable method(s), the Landscape Architect shall reserve the right to reject any of the mishandled Plant Material(s). The Contractor shall replace rejected Plant Material(s) with approved Plant Material(s), at no additional cost to the Owner.

C. Delivery: Provide protective covering during delivery. Deliver Plant Material only after preparations for planting have been completed and install immediately. If planting is delayed more than six (6) hours after delivery, set Plant Materials in shade, protect from

weather and mechanical damage, and keep roots moist. Anchor plants to prevent damage from winds.

1. Heel-in bare-root Plant Material stock. Soak roots in water for two (2) hours prior to planting.
2. Set balled Plant Material stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
3. DO NOT remove container-grown Plant Material stock from containers before time of planting.
4. Water root systems of Plant Material stored on site with a fine-mist spray. Water as often as necessary to maintain root systems in a moist condition.

1.5 FIELD CONDITIONS

A. Work notification: Notify Architect at least 7 working days prior to installation of plant material.

B. Protect existing utilities, paving, and other facilities from damage caused by landscaping operations.

C. A complete list of plants, including a schedule of sizes, quantities, and other requirements is shown on the drawings. In the event that quantity discrepancies or material omissions occur in the plant materials list, the planting plans shall govern.

1.6 WARRANTY

A. Warrant plant material to remain alive and be in healthy, vigorous condition for a period of 1 year after completion and acceptance of entire project.

1. A review of plants will be made by the Architect at Substantial Completion and Final Completion.

B. Replace, in accordance with the drawings and specifications, all plants that are dead or, as determined by the Architect, are in an unhealthy or unsightly condition, and have lost their natural shape due to dead branches, or other causes such as bark abrasions and misuse of chemicals, due to the Landscape Contractor's negligence. The cost of such replacement(s) is at Landscape Contractor's expense. Warrant all replacement plants for 1 year after installation.

C. Warranty shall not include damage or loss of trees, plants, or ground covers caused by fires, floods, freezing rains, lightning storms, or winds over 75 miles per hour, winter kill caused by extreme cold and severe winter conditions not typical of planting area, acts of vandalism or negligence on the part of the owner.

D. Remove and immediately replace all plants, as determined by the Architect, to be unsatisfactory during the initial planting installation.

PART 2 - PRODUCTS

2.1 PLANT MATERIALS

A. Immediately upon award of Contract for Work in this Section, Contractor shall locate and purchase or hold for purchase plant material as required.

1. Contractor shall verify with Landscape Architect of Plant Material that has been nursery “contract grown” by the Owner for use of Work under this Contract.
2. Contractor shall review the condition of the Plant Material with Landscape Architect at the nursery maintaining the Plant Material prior to delivery, and when delivered to the Project Site.

B. Quality: Plant Materials shall have a growth habit typical for each variety and species indicated in the Plant List (as detailed on the Contract Drawings).

1. All Plant Materials specified shall be superior/premium-grade nursery stock, full, densely foliated, symmetrical, with tightly knit branching, so trained or favored in development and appearance in form, number of branches, compactness and symmetry, healthy, and vigorous in growth, as reviewed and determined by the Landscape Architect
2. Plant Materials shall be free from insect pests, eggs and larvae, plant diseases, sun scalds, fresh bark abrasions, excessive abrasions, windburn, salt burn, weeds, or other disfigurements or conditions, as reviewed and determined by the Landscape Architect.
3. Plant Material shall be subject per the Arkansas State Department of Agriculture’s Regulations for Nursery Inspections of Rules and Grading.
4. Growing Conditions: Plant Materials shall be nursery-grown in accordance with good horticultural practices under climatic conditions similar to those of project unless otherwise specifically authorized.

C. Container Stock (excluding annuals) shall be grown in boxes or containers in which delivered for at least one (1) growing season, but not over two (2) years. Plant Material grown in boxes or containers shall be cultivated during this time to permit full rooting within the specified box or container to bind the planting soil, but not so long as to create a “root-bound” condition.

1. Plant Material shall be completely free of circling, kinked or girdling trunk surface and center roots, and show no evidence of a pot-bound condition.
2. No boxed nor container Plant Material shall be planted which have cracked or broken balls of earth when separated from their boxes or containers.
3. No Plant Material shall be planted with damaged roots, broken root balls, or which are found to be “root-bound” when separated from their containers.

D. Pruning:

1. Do not prune Plant Materials unless directed by the Landscape Architect.
2. Pruning of Plant Material as grown at the nursery shall conform to ANSI A300 Standards.
3. Consult with Landscape Architect for pruning Plant Materials after delivery and installation.

E. Measurements: Measure Plant Material according to ANSI Z60.1 with branches and trunks or canes in their normal position. Do not prune to obtain required sizes.

1. Take caliper measurement at a point on the trunk six-inches (6”) above natural ground line for trees up to four-inches (4”) in caliper (at a point twelve-inches (12”) above the natural ground line for trees over four-inches (4”) in caliper).

    a. Measure foliage across mean foliage dimension when branches are in their normal upright position.
    b. For trees to be supplied in “raised up” condition, foliage origin along main trunk shall be measured from soil line after installation.
    c. Height and spread dimensions specified refer to main body of plant and not branch tip to tip. Properly trimmed plants shall measure the same in any direction. If a plant is unevenly grown, it shall be classified in the size category of the smallest dimension.

2. Size Range: If a range of size is given, do not use Plant Materials less than the minimum size. The measurements specified are the minimum size acceptable and are the measurements after pruning, where pruning is required. Plant Materials that meet the measurements specified, but do not possess a normal balance between height and spread shall be rejected.

F. Field Dug Stock: Prior to digging of field-grown Plant Materials, ensure that excess loose fill resulting from cultivation around trunks/stems and over roots be removed down to natural finish grade at crown of Plant Materials. During digging, verify that size of tree spade or other equipment is adequate to encompass the actively growing root zone of all Plant Materials. Plant Materials which, after digging, show mostly large fleshy roots and few fibrous roots, will be rejected.

G. Condition of Root Systems: Plant Materials must prove to be completely free of circling, kinked or girdling trunk surface and center roots and show no evidence of a root-bound condition. Upon inspection by Landscape Architect at the job site, if five-percent (5%) or more of the plants of each species are found to contain kinked, circling or girdling roots, all plants of that species shall be rejected.

H. Unacceptable Trees: Trees that have damaged, broken, pruned, or crooked leaders will be rejected. Trees having a main leader shall not have been headed back. Trees with abrasions of the bark, sunscalds, disfiguring knots, or fresh cuts of limbs over 3/4 in. which have not completely callused will be rejected.

2.2 TREES

A. Shade and Flowering Trees: Single-stem trees with straight trunk, well-balanced crown, and intact leader, of height and caliper indicated, conforming to ANSI Z60.1 for type of trees required, subject to review and acceptance by the Landscape Architect. Container-grown trees will be acceptable and shall be subject to meeting ANSI Z60.1 limitation for container stock.

1. Branching Height: 1/2 of tree height, unless otherwise indicated on Contract Drawings.

B. Small Trees: Small upright or spreading type, branched, or pruned naturally according to species and type, and with relationship of caliper, height, and branching recommended by ANSI Z60.1, subject to review and acceptance by the Landscape Architect. Container-grown trees will be acceptable and shall be subject to meeting ANSI Z60.1 limitation for container stock.

1. Form: As indicated on the Contract Drawings for individual selected species.

C. Field Dug Specimen Trees:

1. Form and Size: As specified on the Contract Documents for height, spread, and/or caliper, subject to review and acceptance by the Landscape Architect at the supplying nursery prior to delivery and installation. Provide superior quality, full, symmetrical, well-rooted, upright, spreading, with well-balanced crown.
2. Throughout the duration of excavation, transport, delivery, storage, and installation, all Field Dug Specimen Trees shall have their root balls remain moist, firm and intact, with no damage. Provide metal cages, as required, to insure root ball stability. Any tree that exhibits a broken, damaged, or dry root ball at any time under the Contract shall be subject to immediate rejection by the Landscape Architect.

2.3 SHRUBS

A. Form and Size: Shrubs with not less than the minimum number of canes required by and measured according to ANSI Z60.1 for type, shape, and height of Shrub, subject to review and acceptance by the Landscape Architect. Container-grown Shrubs will be acceptable in lieu of balled and burlapped.

1. Container-grown Shrubs shall be subject to meeting ANSI Z60.1 limitations for container stock, and other requirements as indicated on the Contract Drawings.

2.4 BROADLEAF EVERGREENS

A. Form and Size: Normal-quality, well-balanced, well-rooted , broadleaf evergreens, of type, height, spread, and shape required, subject to review and acceptance by the Landscape Architect.

1. Container-grown broadleaf evergreens shall be subject to meeting ANSI Z60.1 limitations for container stock, and other requirements as indicated on the Contract Drawings.

2.5 GROUNDCOVERS

A. Provide ground covers full, established, and well-rooted in removable flats, containers, or integral peat pots, and with not less than the minimum number and length of runners required by ANSI Z60.1 for the container size indicated, and other requirements as indicated on the Contract Drawings, subject to review and acceptance by the Landscape Architect.

2.6 NATIVE GRASSES AND PLUGS

A. Form and Size: High-quality, established, full, well-balanced, well-rooted, of type, height, spread, and shape required, subject to review and acceptance by the Landscape Architect.

1. Container-grown stock shall be subject to meeting ANSI Z60.1 limitations for container stock.

2.7 PLANT LIST

A. The plant list including quantities is located on the plans and is for reference only. It is the responsibility of the contractor to determine total quantities in conformance with the plans. Height of plants specified and height of lowest branches of trees is above soil line.

PART 3 - EXECUTION

3.1 INSPECTION

A. No work under this section shall commence until submittals under this section have been reviewed accordingly by the Landscape Architect.

B. Prior to commencing Work under this Section, Contractor shall examine previously installed Work from other trades and verify that such Work is complete and to the point where Work herein may commence properly. Do not proceed with Work until unsatisfactory conditions have been corrected.

C. Installation practices of the Plant Materials shall be performed during those periods when weather and soil conditions are suitable and in accordance with locally accepted horticultural practices, as judged by the Landscape Architect.

1. Soil moisture levels prior to planting shall be no less than seventy-five-percent (75%) of field capacity. The determination of adequate soil moisture for planting shall be in the sole judgment of the Landscape Architect, and their decision shall be final.

    a. If the soil moisture level is found to be insufficient for planting installation, planting pits shall be filled with water and allowed to drain before commencing planting operations.
    b. Any planting area that may become compacted in excess of eighty-five-percent (85%) relative compaction (due to construction operations or other activities during the Contract) shall be tilled and thoroughly cross-ripped to a minimum depth of nine-inches (9”) to alleviate the condition, taking care to avoid all existing subsurface utilities, drainage, etc.
    c. Do not commence planting installation prior to acceptance of Section 329113 –Soil Preparation.

D. Contractor shall notify the Landscape Architect, in writing, on the anticipated commencement date and length of duration of the landscape installation.

E. Preparation of Planting Installation: Lay out individual Plant Material locations and areas for multiple plantings. Stake locations, outline areas, and gain the Landscape Architect’s acceptance prior to commencing physical planting installation.

F. At the discretion of the Landscape Architect, Contractor shall make field adjustments to the planting layout, as required, per the direction of the Landscape Architect. Layout changes made accordingly shall be performed at no additional cost to the Owner.

G. No more Plant Materials shall be distributed in the planting area on any day than can be installed and watered on that day. Plant Materials shall be planted and watered immediately after the removal of their containers, as applicable.

H. Contractor shall protect existing and new improvements and systems installed prior to planting installation. Maintain protection in place until completion of Work and Landscape Establishment Period.

I. Finish Grades for planting areas shall have been established (per Section 31 22 19 – Landscape Grading) prior to Work under this Section. Verify that grades are within one-inch plus or minus (1"+/-) of the required finish grade, and that all proper soil amendments and fertilizers have been furnished and installed accordingly as specified (per Section 329113 – Soil Preparation).

1. Maintain positive surface drainage of all planted areas throughout the duration of the Contract.

J. Pre-Planting: Where Plant Materials are to be pre-planted to permit site improvements to be installed around them, Contractor shall be responsible for the accurate layout and placement of those Plant Materials, as measured to their centerlines. Confirm designated pre-planting operations with Landscape Architect prior to commencing Work. Contractor shall also be responsible for the protection of pre-planted Plant Materials while other Work is taking place around them. Provide automated irrigation, as necessary, prior to installation and functioning of irrigation systems (per Section 32 84 00 – Irrigation Systems).

3.2 EXCAVATION FOR PLANT MATERIALS

A. General: Upon completion of applicable pre-planting soil preparation requirements indicated in Section 32 91 13 – Soil Preparation, excavate planting hole(s) for Plant Material with scarified vertical sides, with the bottom of the excavated hole slightly raised and compacted at the center to assist drainage and to minimize settlement of the Plant Material. Excavate holes according to the spacing alignment (i.e. hedge spacing, grid spacing, triangular spacing, etc.) and the on-center (O.C.)

B. Planting areas that have not been excavated prior to planting.

1. Balled and Burlap Plant Material:

a. Excavate the planting hole to the width and depth indicated in the Contract Drawings. Depth of the planting hole includes the depth indicated for the compacted setting layer at the bottom of the excavation, where the top of the plant's root collar is two-inch (2") higher than finished grade or as further directed by the Landscape Architect
b. Compacted Setting Layer: Provide a crown of a minimum six-inch (6") depth of native planting soil.

2. Container-Grown Plant Material:

a. Excavate the planting hole to the width and depth indicated on the Contract Drawings. Depth of the planting hole includes the depth indicated for the compacted setting layer at the bottom of the excavation, where the top of the plant's root collar is two-inch (2") higher than finished grade or as further directed by the Landscape Architect:
b. Compacted Setting Layer: Provide a crown of a minimum six-inch (6") depth of native planting soil.

3. Field Grown/Specimen Trees:

a. Excavate the planting hole to the width and depth indicated on the Contract Drawings. Depth of the planting hole includes the depth indicated for the compacted setting layer at the bottom of the excavation, where the top of the plant's root collar is three-inch (3") higher than finished grade or as further directed by the Landscape Architect
b. Compacted Setting Layer: Provide a crown of a minimum six-inch (6") depth of native planting soil.
c. In areas where special subsurface drainage for planting is indicated, tie drainage pipes, as required, into the drain system.
d. Excavate planting hole at 3x the diameter of the rootball.

C. Obstructions: Notify the Landscape Architect immediately if unexpected rock, debris, contaminants, obstructions, or other items that are detrimental to the healthy sustained growth of Plant Material is encountered in the excavation process.

1. Hardpan Layer: If encountered, drill six-inch (6") diameter holes into free-draining strata or to a depth of ten-feet (10'), whichever is less, and backfill with free-draining material.

D. Drainage: Notify the Landscape Architect if subsoil conditions show evidence of unexpected water seepage or retention in planting holes.

E. Time of planting:

1. Evergreen material: Plant evergreen materials between September 1 and November 1 or in spring before new growth begins. If project requirements require planting at times, other than winter months, plants shall be sprayed with anti-desiccant prior to planting operations.
2. Deciduous material: Plant deciduous materials in a dormant condition. If deciduous trees are planted in-leaf, they shall be sprayed with an anti-desiccant prior to planting operation.

3.3 INSTALLATION

A. Balled and Burlapped Plant Material: Set the Balled and Burlapped Plant Material plumb and in center of the excavated hole, with top of the root ball raised above adjacent finish grade as indicated. Set Balled and Burlapped Plant Material in the proper spacing and/or alignment(s) as indicated on the Contract Documents, or as further directed at the Project Site by the Landscape Architect.

1. Carefully place the Balled and Burlapped Plant Material stock on the specified setting layer of compacted native soil, with the top of root ball set two-inch (2") above the finished grade to allow for settlement of the Plant Material within the excavated planting hole. Provide the orientation of the Plant Material that is confirmed and accepted by the Landscape Architect. During the process of determining an acceptable orientation of the Plant Material, handle the Plant Material by its root ball; avoid handling the Plant Material by its trunk.
2. Once orientation is accepted, carefully remove the burlap and wire baskets from the tops of the root ball and partially from the sides, but do not remove from under the root ball. Do not damage the root ball or any part of the plant. Plant Material shall be rejected if the root ball is cracked or broken before or during the planting operation.
3. Prepare the Amended Planting Backfill Mixture: Amend each cubic yard (cu/yd) of native soil excavated from the planting hole by incorporating and thoroughly

mixing/blending the following:

a. ¼ yard of Bulk Composted Organic Soil Amendment Material (per Section 32 91 13 – Soil Preparation).
b. ½ pound of Granular Soil Conditioning Material & Fertilizer (per Section 32 91 13– Soil Preparation).
c. Add Mycorrhizal Inoculum to the excavated native soil, (per Section 32 91 13 –Soil Preparation), per the Manufacturer's latest printed instructions.

4. Backfilling the excavated planting hole:

a. Place the Amended Planting Backfill Mixture around the root ball in the excavated planting hole. Place the Mixture in six-inch (6") lifts, tamping each lift accordingly to settle the Mixture and eliminate voids and air pockets.
b. Maintain the plant plumb while working the Mixture around the root ball. When the planting hole is approximately half-backfilled, water thoroughly before placing the remainder of the Mixture.
c. Add the Fertilizer Tablets and other amendments, (per Section 32 91 13 – Soil Preparation) as required, at the prescribed application rates indicated herein this Article or if not indicated, per the Manufacturer's instructions.
d. Place the final layers of the Mixture, tamping accordingly, to the top of the root ball. Do not place the Mixture on top of the root ball. Pull soil away and exposed root flare. Ensure root flare is planted above finished grade.
e. Dish and tamp top of the Mixture to form a three-inch (3") deep watering basin centered on the Plant Material's trunk to the rim width of the planting hole. Do not cover the top of the root ball with the backfill mixture.
f. Thoroughly mix water and Plant Vitamin/Hormone Stimulant in application ratio as recommended by Stimulant Manufacture. Apply liquid matrix in sufficient quantity to thoroughly saturate the basin to settle the Mixture, and to eliminate voids and air pockets. Should any portions of the root mass be exposed, add additional Mixture as needed to thoroughly cover the root mass.

5. Mulching: Apply mulch in watering basins as indicated on the Contract Drawings. Refer to plans for type and requirements.
6. Wrapping:

a. Inspect trees for injury to trunks, evidence of insect infestation, and improper pruning before wrapping.
b. Wrap trunks of all trees as directed spirally from bottom to top with specified tree wrap and secure in place.
c. Overlap 1/2 the width of the tree wrap strip and cover the trunk from the ground to the height of the second branch.
d. Secure tree wrap in place with twine wound spirally downward in opposite direction, tied around the tree in at least 3 places in addition to the top and bottom.

7. Staking/guying:

a. Stake/guy all trees immediately after each tree planting.
b. Stake all trees and all multi-trunk trees.
c. Flag or color all cables.
d. All work shall be acceptable to the Landscape Architect.

B. Container-Grown and Ball and Burlap Plant Material: Set Plant Material plumb and in the

center of the excavated planting hole, with top of the root ball raised above adjacent finish grade as indicated. Set Plant Material in the proper spacing and/or alignment(s) as indicated on the Contract Documents, or as further directed at the Project Site by the Landscape Architect.

1. For plastic container stock (4" pot, 1-gallon, 5-gallon, 15-gallon, etc.), carefully remove the plant container prior to setting the plant in the excavated hole so as not to damage root ball. Tip container to horizontal position and shake carefully to remove Plant Material. Support root ball during installation to prevent cracking or shedding of soil.
2. Set the Plant Material stock on the specified setting layer of compacted native soil, with the top of root ball set one-inch (1") above the finished grade to allow for settlement of the Plant Material within the excavated planting hole. Provide the orientation of the Plant Material that is confirmed and accepted by the Landscape Architect. During the process of determining an acceptable orientation of the plant material, carefully handle the Plant Material by its container; avoid handling the Plant Material by its trunk.

    a. Plant Material with a damaged root ball upon removal of the container, or if the root ball fails to thoroughly hold the soil as it is removed from the container, or if the plant is mishandled or damaged during planting operations, shall be rejected.

3. For Ball and Burlap stock, carefully set whole root ball of the Plant Material stock on the specified setting layer of compacted native soil, with the top of root ball set two-inch (2") above the finished grade to allow for settlement of the Plant Material within the excavated planting hole. Provide the orientation of the Plant Material that is confirmed and accepted by the Landscape Architect. During the process of determining an acceptable orientation, carefully handle the Plant Material by its basket; avoid handling the Plant Material by its trunk or branches. Once orientation is accepted, remove 1/3 of the wire basket so as not to damage the root ball or any part of the plant. Do not remove the bottom of the wire basket. Discard top 1/3, do not bend back or bury.

    a. Plant Material with a damaged root ball upon placing/planting, or if the root ball fails to thoroughly hold the soil as it is planted, or if the plant is mishandled or damaged during planting operations, shall be rejected.

4. Prepare the Amended Planting Backfill Mixture: Amend each cubic yard (cu/yd) of native soil excavated from the planting hole by incorporating and thoroughly mixing/blending the following:

    a. ¼ yard of Bulk Composted Organic Soil Amendment Material (per Section 32 91 13 – Soil Preparation).
    b. ½ pound of Granular Soil Conditioning Material & Fertilizer (per Section 32 91 13– Soil Preparation).
    c. Add Mycorrhizal Inoculum to the excavated native soil, (per Section 32 91 13 –Soil Preparation), per the Manufacturer's latest printed instructions.

        1) Pending the results of the Agronomic Soil Fertility Report, the Amended Planting Backfill Mixture may be modified accordingly to include additional soil amendments or fertilizers (gypsum, iron, potash, etc.) or the ratios as indicated in the Mixture indicated above may be modified.

a) The cost of providing modifications to the Amended Planting Soil Backfill Mixture (as recommended through the Agronomic Soil Fertility Report and as directed by the Landscape Architect) shall be borne by the Contractor.

5. Backfilling the excavated planting hole:

   a. Place the Amended Planting Backfill Mixture around the root ball in the excavated planting hole. Place the Mixture in six-inch (6”) lifts, tamping each lift accordingly to settle the Mixture and eliminate voids and air pockets. Foot tamp the backfill, as required.
   b. Maintain the plant plumb while working the Mixture around the root ball. When the planting hole is approximately half-backfilled, water thoroughly before placing the remainder of the Mixture.
   c. Add the Fertilizer Tablets and other amendments (per Section 32 91 13 – Soil Preparation) as required, at the prescribed application rates indicated herein this Article or if not indicated, per the Manufacturer’s instructions.
   d. Place the final layers of the Mixture, tamping accordingly, to the top of the root ball. Do not place the Mixture on top of the root ball.
   e. Dish and tamp top of the Mixture to form a three-inch (3”) deep watering basin centered on the Plant Material’s trunk to the rim width of the planting hole. Do not cover the top of the root ball with the backfill mixture.

6. Mulching: Apply mulch in watering basins as indicated on the Contract Drawings. Refer to drawings for type and requirements.
7. Wrapping:

   a. Inspect trees for injury to trunks, evidence of insect infestation, and improper pruning before wrapping.
   b. Wrap trunks of all trees as directed spirally from bottom to top with specified tree wrap and secure in place.
   c. Overlap 1/2 the width of the tree wrap strip and cover the trunk from the ground to the height of the second branch.
   d. Secure tree wrap in place with twine wound spirally downward in opposite direction, tied around the tree in at least 3 places in addition to the top and bottom.

8. Staking/guying:

   a. Stake/guy all trees immediately after each tree planting.
   b. Stake all trees and all multi-trunk trees.
   c. Flag or color all cables.
   d. All work shall be acceptable to the Landscape Architect.

3.4 PRUNING AND THINNING OF PLANT MATERIAL

A. Pruning/Thinning of Tree Canopy

1. At no time shall Plant Material be pruned, trimmed, thinned, shaped, or topped prior to delivery. Pruning, trimming, thinning, shaping, or topping of Plant Material shall be only conducted on the Project Site, and under the presence and direction of the Landscape Architect or approved Certified Arborist. Plant Material that has been pruned and delivered to the Project Site without prior approval by the Landscape Architect or an approved Certified Arborist will be rejected.

B. When directed by the Landscape Architect or an approved Certified Arborist, Contractor shall prune, thin, and shape plant material, according to standard horticultural practice, to preserve the natural character of the Plant Material.

1. Pruning and remedial work shall be done per ANSI A300.
2. Prune trees to retain required height and spread. Do not cut tree leaders; remove only injured or dead branches from trees.
3. Prune shrubs accordingly to retain natural character.
4. Provide pruning, cabling and bracing, irrigation, pest and disease control and other remedial treatments as recommended to assure the long-term health of the trees and existing vegetation, and the safety of persons and property.
5. Newly planted trees shall be pruned near the termination of the Landscape Establishment Period, per the direction of the Landscape Architect, as required.

3.5 CLEANING AND PROTECTION

A. During installation operations, keep Work area in an orderly and safe condition. Contractor shall remove trash caused from his Work on a weekly basis throughout the duration of the Work.

B. Protect plants from damage due to landscape operations and operations of other contractors and trades, and trespassers. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.

C. Upon completion of his Work under this Section, the Contractor shall remove rubbish, waste, debris, excess construction materials, surplus soil and other items resulting from construction operations and legally dispose of it off the Owner’s property.

D. Scars, ruts, or other marks in the ground caused by the Contractor’s Work shall be repaired.

E. Remove equipment and implements of service and leave the entire Project Site area in a neat, clean, and Owner-approved condition.

F. Labels: Remove all nursery-type labels, flags, and or identification markings from Plant Materials AS DIRECTED BY THE Landscape Architect.

3.6 PLANT MAINTENANCE

A. Maintain the trees, shrubs, groundcovers, perennials, native grasses until Final Completion of the entire project. Upon Final Completion, the Owner will assume maintenance as recommended by the written maintenance instructions submitted by the Landscape Contractor for Sodded areas only.

B. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, application of appropriate insecticides and fungicides necessary to maintain plants free of insects and disease, and performing other operations as required to establish healthy, viable plantings.

C. Re-set settled plants to proper grade and position. Restore planting saucer and adjacent material and remove dead material.

D. Correct defective work as soon as possible after deficiencies become apparent and weather and season permit.

E. Deep-water trees, plants, groundcover, perennial and native grass beds within the first 24 hours of initial planting, and thereafter as required for healthy growth until final acceptance.

3.7 SUBSTANTIAL COMPLETION

A. An inspection of the trees, shrubs, groundcovers, perennials and native grasses will be made by the Landscape Architect upon request for Application of Substantial Completion by the Landscape Contractor. Provide notification of at least five (5) working days before requested inspection date.

3.8 FINAL COMPLETION

A. An inspection of the trees, shrubs and ground covers will be made by the Landscape Architect upon request for Final Completion by the Landscape Contractor.

END OF SECTION

SECTION 330500 - COMMON WORK RESULTS FOR UTILITIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Piping joining materials.
2. Dielectric fittings.
3. Sleeves.
4. Identification devices.
5. Grout.
6. Piping system common requirements.
7. Concrete bases.
8. Metal supports and anchorages.

1.2 DEFINITIONS

A. Exposed Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions.

B. Concealed Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Dielectric fittings.
2. Identification devices.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.5 QUALITY ASSURANCE

A. Steel Support Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Steel Piping Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

PART 2 - PRODUCTS

2.1 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness, unless otherwise indicated.

a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

D. Solder Filler Metals: ASTM B32, lead-free alloys. Include water-flushable flux according to ASTM B813.

E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

F. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

G. Solvent Cements for Joining Plastic Piping:

1. ABS Piping: ASTM D2235.
2. CPVC Piping: ASTM F493.
3. PVC Piping: ASTM D2564. Include primer according to ASTM F656.
4. PVC to ABS Piping Transition: ASTM D3138.

H. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

2.2 DIELECTRIC FITTINGS

A. Dielectric Fittings, General: Assembly of copper alloy and ferrous materials or ferrous material body with separating nonconductive insulating material suitable for system fluid, pressure, and temperature.

B. Dielectric Unions:

1. Description: Factory fabricated, union, NPS 2 and smaller:

a. Pressure Rating: 250 psig at 180 deg F.
b. End Connections: Solder-joint copper alloy and threaded ferrous; threaded ferrous.

C. Dielectric Flanges:

1. Description Factory-fabricated, bolted, companion-flange assembly, NPS 2-1/2 to NPS 4 and larger:

a. Pressure Rating: 300 psig.
b. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric Couplings:

1. Description Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining, NPS 3 and smaller:

a. Pressure Rating: 300 psig at 225 deg F.
b. End Connections: Threaded.

E. Dielectric Nipples:

1. Description: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining.

a. Pressure Rating: 300 psig at 225 deg F.
b. End Connections: Threaded or grooved.

2.3 SLEEVES

A. Mechanical sleeve seals for pipe penetrations are specified in Section 220500 "Common Work Results for Plumbing."

B. Galvanized-Steel Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

C. Steel Pipe Sleeves: ASTM A53/A53M, Type E, Grade B, Schedule 40, galvanized, plain ends.

D. Cast-Iron Sleeves: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

E. Molded PVC Sleeves: Permanent, with nailing flange for attaching to wooden forms.

F. PVC Pipe Sleeves: ASTM D1785, Schedule 40.

G. Molded PE Sleeves: Reusable, PE, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

2.4 IDENTIFICATION DEVICES

A. Equipment Nameplates: Metal permanently fastened to equipment with data engraved or

stamped.

1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and essential data.
2. Location: Accessible and visible.

B. Snap-on Plastic Pipe Markers: Manufacturer's standard preprinted, semirigid, snap-on type. Include color-coding according to ASME A13.1, unless otherwise indicated.

C. Pressure-Sensitive Pipe Markers: Manufacturer's standard preprinted, color-coded, pressure-sensitive-vinyl type with permanent adhesive.

D. Pipes with OD, including Insulation, Less than 6 inches:

1. Full-band pipe markers, extending 360 degrees around pipe at each location.

E. Pipes with OD, Including Insulation, Less Than 6 Inches: Full-band pipe markers, extending 360 degrees around pipe at each location.

F. Pipes with OD, Including Insulation, 6 Inches and Larger: Either full-band or strip-type pipe markers, at least three times letter height and of length required for label.

G. Pipes with OD, including Insultation, 6 inches and Larger:

1. Either full-band or strip-type pipe markers, at least three times letter height and of length required for label.

H. Lettering:

1. Use piping system terms indicated and abbreviate only as necessary for each application length.

a. Arrows: Either integrally with piping system service lettering to accommodate both directions of flow, or as separate unit on each pipe marker to indicate direction of flow.

I. Plastic Tape: Manufacturer's standard color-coded, pressure-sensitive, self-adhesive vinyl tape, at least 3 mils thick.

1. Width: 1-1/2 inches on pipes with OD, including insulation, less than 6 inches; 2-1/2 inches for larger pipes.
2. Color: Comply with ASME A13.1, unless otherwise indicated.

J. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch sequenced numbers. Include 5/32-inch hole for fastener.

1. Material:

a. 0.032-inch-thick, aluminum.
b. 0.0375-inch-thick stainless steel.
c. 3/32-inch-thick plastic laminate with 2 black surfaces and a white inner layer.
d. Valve manufacturer's standard solid plastic.

2. Size: 1-1/2 inches in diameter, unless otherwise indicated.

3. Shape: As indicated for each piping system.

K. Valve Tag Fasteners: Brass, wire-link or beaded chain; or brass S-hooks.

L. Engraved Plastic-Laminate Signs: ASTM D709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine subcore, unless otherwise indicated. Fabricate in sizes required for message. Provide holes for mechanical fastening.

1. Engraving: Engraver's standard letter style, of sizes and with terms to match equipment identification.
2. Thickness:

    a. 1/8 inch unless otherwise indicated.
    b. 1/16 inch for units up to 20 sq. in. or 8 inches in length, and 1/8 inch for larger units.

3. Fasteners: Self-tapping, stainless steel screws or contact-type permanent adhesive.

M. Plastic Equipment Markers: Manufacturer's standard laminated plastic, in the following color codes:

1. Green: Cooling equipment and components.
2. Yellow: Heating equipment and components.
3. Brown: Energy reclamation equipment and components.
4. Blue: Equipment and components that do not meet criteria above.
5. Hazardous Equipment: Use colors and designs recommended by ASME A13.1.
6. Terminology: Match schedules as closely as possible. Include the following:

    a. Name and plan number.
    b. Equipment service.
    c. Design capacity.
    d. Other design parameters such as pressure drop, entering and leaving conditions, and speed.

7. Size: 2-1/2 by 4 inches for control devices, dampers, and valves; 4-1/2 by 6 inches for equipment.

2.5 GROUT

A. Description: ASTM C1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post hardening, volume adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

2.6 CLEANOUTS

A. Cast-Iron Cleanouts for Main Lines:

1. Description: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.
2. Top-Loading Classification(s): Heavy Duty and Extra-Heavy Duty.
3. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.

B. Cast-Iron Cleanouts for RV Stalls:

1. Description: 4” RV Female Footloose Sewer Cap (White), Enviro Design Products or equal. Submit shop drawing.
2. Sewer Pipe Fitting and Riser to Cleanout: Schedule 40 PVC

PART 3 - EXECUTION

3.1 DIELECTRIC FITTING APPLICATIONS

A. Dry Piping Systems: Connect piping of dissimilar metals with the following:

1. NPS 2 (DN 50) and Smaller: Dielectric unions.
2. NPS 2-1/2 to NPS 12 (DN 65 to DN 300): Dielectric flanges or dielectric flange kits.

B. Wet Piping Systems: Connect piping of dissimilar metals with the following:

1. NPS 2 (DN 50) and Smaller: Dielectric couplings or dielectric nipples.
2. NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Dielectric nipples.

3.2 INSTALLATION OF PIPING

A. Install piping according to the following requirements and utilities Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on the Coordination Drawings.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping to permit valve servicing.

E. Install piping at indicated slopes.

F. Install piping free of sags and bends.

G. Install fittings for changes in direction and branch connections.

H. Select system components with pressure rating equal to or greater than system operating pressure.

I. Sleeves are not required for core-drilled holes.

J. Permanent sleeves are not required for holes formed by removable PE sleeves.

K. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of equipment areas or other wet areas 2 inches above finished floor level.

2. Install sleeves in new walls and slabs as new walls and slabs are constructed.

a. Pipe Sleeves: PVC. For pipes smaller than NPS 6.
b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.

L. Verify final equipment locations for roughing-in.

M. Refer to equipment specifications in other Sections for roughing-in requirements.

3.3 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and utilities Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

E. Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

F. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

G. Grooved Joints: Assemble joints with grooved-end pipe coupling with coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

H. Soldered Joints: Apply ASTM B813 water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B828 or CDA's "Copper Tube Handbook,"

using lead-free solder alloy (0.20 percent maximum lead content) complying with ASTM B32.

I. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

J. Pressure-Sealed Joints: Assemble joints for plain-end copper tube and mechanical pressure seal fitting with proprietary crimping tool to according to fitting manufacturer's written instructions.

K. Plastic Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements.
2. ABS Piping: Join according to ASTM D2235 and ASTM D2661 appendixes.
3. CPVC Piping: Join according to ASTM D2846/D2846M Appendix.
4. PVC Pressure Piping: Join schedule number ASTM D1785, PVC pipe and PVC socket fittings according to ASTM D2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D2855.
5. PVC Nonpressure Piping: Join according to ASTM D2855.
6. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D3138Appendix.

L. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D3139.

M. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D3212.

N. Plastic Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D2657.

1. Plain-End PE Pipe and Fittings: Use butt fusion.
2. Plain-End PE Pipe and Socket Fittings: Use socket fusion.

O. Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

3.4 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
3. Install dielectric fittings at connections of dissimilar metal pipes.

3.5 INSTALLATION OF EQUIPMENT

A. Install equipment level and plumb, unless otherwise indicated.

B. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference

with other installations. Extend grease fittings to an accessible location.

C. Install equipment to allow right of way to piping systems installed at required slope.

3.6 IDENTIFICATION

A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.

1. Stenciled Markers: According to ASME A13.1.
2. Plastic markers, with application systems. Install on insulation segment if required for hot noninsulated piping.
3. Locate pipe markers on exposed piping according to the following:

    a. Near each valve and control device.
    b. Near each branch, excluding short takeoffs for equipment and terminal units. Mark each pipe at branch if flow pattern is not obvious.
    c. Near locations where pipes pass through walls or floors or enter inaccessible enclosures.
    d. At manholes and similar access points that permit view of concealed piping.
    e. Near major equipment items and other points of origination and termination.

B. Equipment: Install engraved plastic-laminate sign or equipment marker on or near each major item of equipment.

1. Lettering Size: Minimum 1/4 inch high for name of unit if viewing distance is less than 24 inches, 1/2 inch high for distances up to 72 inches , and proportionately larger lettering for greater distances. Provide secondary lettering two-thirds to three-fourths of size of principal lettering.
2. Text of Signs: Provide name of identified unit. Include text to distinguish among multiple units, inform user of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.

C. Adjusting: Relocate identifying devices that become visually blocked by work of this or other Divisions.

3.7 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

7. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Section 033000 "Cast-in-Place Concrete."

3.8 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Section 055000 "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor piped utility materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.9 GROUTING

A. Mix and install grout for equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

3.10 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and use cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.

1. Use Light-Duty, top-loading classification cleanouts in earth or unpaved foot-traffic areas.
2. Use Medium-Duty, top-loading classification cleanouts in paved foot-traffic areas.
3. Use Heavy-Duty, top-loading classification cleanouts in vehicle-traffic service areas.
4. Use Extra-Heavy-Duty, top-loading classification cleanouts in roads.

B. Set cleanout frames and covers in earth in cast-in-place-concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding grade.

C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

END OF SECTION

SECTION 334111 - STORM DRAINAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Storm drainage piping.
2. Accessories.
3. Underground pipe markers.

B. Related Sections:

1. Section 31 2000 – Earthwork: Backfill and compaction for structures and storm piping.
2. Section 31 2116 - Trenching: Execution requirements for trenching required by this section.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:

1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:

1. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings.
2. ASTM C14 - Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe.
3. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
4. ASTM C443 - Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
5. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
6. ASTM C924 - Standard Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method.
7. ASTM C969 - Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.
8. ASTM C1103 - Standard Practice for Joint Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.
9. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
10. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft3 (2,700 kN-m/m3)).
11. ASTM D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
12. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.

13. ASTM D2564 - Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
14. ASTM D2729 - Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
15. ASTM D2751 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.
16. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
17. ASTM D6938 - 10 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
18. ASTM D3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
19. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

1.3 SUBMITTALS

A. Product Data: Submit data indicating pipe, pipe accessories, and appurtenances.

B. Manufacturer's Installation Instructions: Submit special procedures required to install Products specified.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents:

1. Accurately record actual locations of pipe runs, connections, catch basins, structures, and invert elevations.
2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with the City of Forrest City's applicable standards requirements.

1.6 COORDINATION

A. Coordinate the Work with termination of storm sewer connection outside building, trenching, and to the connection to municipal storm sewer utility service.

PART 2 - PRODUCTS

2.1 STORM DRAINAGE PIPING

A. Polyethylene Pipe:

1. Piping and fittings shall be ADS N-12 ST IB pipe as manufactured by Advanced Drainage Systems (ADS) of Hilliard, OH, or equal.

2. Piping and fittings shall have a smooth interior and annular exterior corrugations.
3. Pipe shall be manufactured in accordance with AASHTO M252, Type S or SP for 4-inch through 10-inch diameter, and AASHTO M294 or ASTM F2306 for 12-inch through 60-inch diameter.
4. Pipe shall be joined using a bell and spigot joint meeting AASHTO M252, AASHTO M294 or ASTM F2306. The joint shall be soil-tight and gaskets shall meet the requirements of ASTM F477.
5. Fittings shall conform to AASHTO M252, AASHTO M294, or ASTM F2306. Bell and spigot connections shall utilize a spun-on or welded bell and valley or saddle gasket meeting the soil-tight joint performance requirements of AASHTO M252, AASHTO M294 or ASTM F2306.
6. Virgin material for pipe and fitting production shall be high density polyethylene conforming with the minimum requirements of cell classification 424420C for 4- through 10-inch diameters, or 435400C for 12- through 60-inch diameters, as defined and described in the latest version of ASTM D3350, except that carbon black content should not exceed 4%. The 12- through 60-inch virgin pipe material shall comply with the notched constant ligament-stress (NCLS) test as specified in Sections 9.5 and 5.1 of AASHTO M294 and ASTM F2306, respectively.

B. Perforated Pipe for Underdrains:

1. Piping and fittings shall be perforated ADS single wall corrugated HDPE pipe as manufactured by Advanced Drainage Systems (ADS) of Hilliard, OH, or equal.
2. Perforations shall be Type B pattern as specified by ADS. Contractor shall obtain approval if perforation pattern other than Type B is to be used.
3. Perforated pipe shall be wrapped in geotextile fabric. Fabric shall be 4-oz non-woven geotextile fabric, Mirafi 140N or equivalent.

2.2 ACCESSORIES

A. Filter Fabric: Non-biodegradable, non-woven, 6 oz minimum weight.

B. Grout: Specified in Section 320523.

2.3 UNDERGROUND PIPE MARKERS

A. Trace Wire: Magnetic detectable conductor, brightly colored plastic covering, imprinted with "Storm Sewer Service" in large letters.

2.4 BEDDING AND COVER MATERIALS

A. Bedding: As indicated on the Drawings.

B. Cover: As indicated on the Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify excavation base is ready to receive work and excavations, dimensions, and

elevations are as indicated on layout drawings.

3.2 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with fine aggregate.

B. Remove large stones or other hard matter which could damage piping or impede consistent backfilling or compaction.

3.3 BEDDING

A. Excavate pipe trench in accordance with Section 312116 for work of this Section. Hand trim excavation for accurate placement of pipe to elevations indicated.

B. Place bedding material at trench bottom, level materials in continuous layer not exceeding 8 inches compacted depth.

C. Maintain optimum moisture content of bedding material to attain required compaction density.

3.4 INSTALLATION - PIPE

A. Install pipe, fittings, and accessories in accordance with ASTM D2321. Seal joints watertight.

B. Place pipe on bedding material as indicated on the Drawings.

C. Lay pipe to slope gradients noted on drawings with maximum variation from indicated slope of 1/8 inch in 10 feet.

D. Place bedding backfill around pipe as indicated on the Drawings.

E. Install trace wire continuous over top of pipe buried 12 inches below finish grade, above pipe line.

F. Install site storm drainage system piping to 5 feet of building. Connect to building storm drainage system.

3.5 INSTALLATION - CATCH BASINS AND STRUCTURES

A. Perform work in accordance with Drawings.

B. Refer to Section 330513, Manholes and Structures.

3.6 FIELD QUALITY CONTROL

A. Request inspection prior to and immediately after placing aggregate cover over pipe.

3.7 PROTECTION OF FINISHED WORK

A. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

1. Take care not to damage or displace installed pipe and joints during construction of pipe supports, backfilling, testing, and other operations.
2. Repair or replace pipe that is damaged or displaced from construction operations.

END OF SECTION