TECHNICAL SPECIFICATIONS

NWACC Irrigation Line Relocation

July 2020

MCE PROJECT NO. 20-2147

McCLELLAND CONSULTING ENGINEERS, INC.
DESIGNED TO SERVE

SECTION 01001

BASIC REQUIREMENTS

PART 1. GENERAL

1.1 SUMMARY OF WORK

A. Section Includes:

1.2 Description of Project
1.3 Site Investigation
1.4 Existing Utilities
1.5 Payment Schedule
1.6 Application for Payment
1.7 Change Order Procedures
1.8 Cutting and Patching
1.9 Conferences
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1.35 Substitutions
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1.40 Project Record Documents (“As-Builts”)
1.41 Operation and Maintenance Data
1.42 Guarantees, Bonds, Affidavits, and Warranties

1.43 Spare Parts and Maintenance Materials

1.2 DESCRIPTION OF PROJECT

A. Wherever in these Documents the word "Engineer" appears, it shall be understood to mean McClelland Consulting Engineers, Inc., acting either directly or indirectly as authorized agents of the Owner. In these Documents where the word "Owner" appears, it shall be understood to mean the Northwest Arkansas Community College (NWACC).

B. The project shall consist of installing approximately 830 linear feet of 6” PVC waterline, encasement, fittings and valves, replacing irrigation line and control wiring, associated backfill and surface restoration on the east side of the NWACC Campus.

1.3 SITE INVESTIGATION

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

1.4 EXISTING UTILITIES

A. Approximate locations of major utilities and structures are shown on the Drawings, there may be some discrepancies and omissions in the locations and size of utilities and structures shown.

B. Notify all utilities affected by the construction operation at least 48 hours in advance of beginning work, and contact Arkansas One-Call at 1-800-482-8998.

1.5 PAYMENT SCHEDULE

A. Payment shall be made based on the payment schedule submitted by the Contractor.

1.6 APPLICATION FOR PAYMENT

A. Submit three copies of each application on EJCDC Form C-620 or other format approved by the Owner.

B. For payment of stored materials, the Contractor shall submit a copy of supplier/vendor’s invoice for the materials with job name, delivery date, invoice number, and invoice amount on invoice attached with the Application for Payment. Stored materials shall be on site and stored in accordance with Contract Documents prior to making Application for Payment.

C. Contractor shall submit copies of paid invoices and proof of payment in the form of a lien release from the supplier/vendor for stored materials that the Owner has paid for previously with Application for Payment. Contractor’s subsequent Applications for Payment will not be approved without copies of paid invoices and lien releases.

D. Contractor shall submit lien release for all previous progress payments for materials, labor, and equipment that has been billed to the Owner in the present pay request. Lien release

shall be submitted to the Engineer with next Application for Payment. Application for Payment submitted without lien release from previous Application for Payment will not be approved for payment until Engineer has received lien release. Submit lien release on the form found at the end of this Section.

E. Utilize Payment Schedule or Unit Prices for listing items in Application for Payment.

F. Pay Periods: Calendar Month.

1.7 CHANGE ORDER PROCEDURES

A. Submit on EJCDC Form 1910-8B.

1.8 CUTTING AND PATCHING

A. Employ a skilled and experienced installer to perform cutting and patching new Work; restore Work with new products.

B. Submit written request in advance of cutting or altering existing structures or utilities.

C. Fit work tight to adjacent elements and maintain integrity of existing work.

1.9 CONFERENCES

A. Owner will schedule a preconstruction conference after Notice of Award for all affected parties.

B. Where required in individual specification Section, convene a pre-installation conference at project site prior to commencing Work of the Section.

1.10 PROGRESS MEETINGS

A. Schedule and administer meetings at the site throughout progress of the Work as required by the Owner.

B. Preside at meetings, record minutes, and distribute typed copies within two days to those affected by decisions made.

1.11 SUBMITTAL PROCEDURES

A. The Contractor shall submit a digital copies to the Owner for review. Submittals shall include shop drawings, electrical diagrams, and catalog cuts for fabricated items and manufactured items (including mechanical and electrical equipment) required for construction.

B. Submittal form to identify Project, Contractor, subcontractor or supplier, and pertinent Contract Document reference.

C. Apply Contractor's stamp, signed or initialed, certifying that review, verification of products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.

D. Identify variations from Contract Documents and product or system limitations which may be detrimental to successful performance of completed Work.

E. Revise and resubmit as required; identify all changes made since previous submittal.

1.12 CONSTRUCTION PROGRESS SCHEDULE

A. Submit initial Construction Progress Schedule in duplicate within 10 days after date of Contract. Owner shall review Construction Progress Schedule and approve. Once approved by Owner this Construction Progress Schedule shall become the "Approved Construction Progress Schedule" by which the Contractor shall plan, organize, direct, coordinate, and execute the Work, and the basis of evaluating progress of the Work.

B. "Approved Construction Progress Schedule" shall be a horizontal bar chart with separate lines for each major section of Work or operation, identifying first work day of each week.

C. Submit updated Construction Progress Schedule with each Application for Payment, identifying changes since previous updated Construction Progress Schedule. Indicate estimate percentage of completion for each item of Work at each submission.

D. Should updated Construction Progress Schedule show the Contractor to be 10 percent or more behind schedule, Contractor shall immediately devise a plan for recovery of lost time and submit to the Engineer for approval within 1 week. Once approved by the Engineer, the Contractor shall immediately put "Recovery Construction Progress Schedule" into action.

E. During period covered by "Recovery Construction Progress Schedule" plan, Contractor's progress will be monitored against the "Approved Construction Progress Schedule."

F. Contractor shall bear all cost and expenses related to recovery from the Contractor's delays, including costs, expenses, and lost revenue by the Owner.

1.13 PROSECUTION OF THE WORK

A. It is expressly understood and agreed that the time of beginning, rate of progress, and time of completion of the Work are the essence of this Contract. The Work shall be prosecuted at such time, and in or on such part or parts of the Project as may be required, to complete the Project as contemplated in the Contract Documents and the approved construction schedule.

B. Regular Work hours shall be from 7:00 a.m. to 6:00 p.m. Monday through Friday. No Work requiring the presence of the Owner'Engineer's representative will be performed outside of regular Work hours. If, however, the Contractor works additional hours (other than specified herein), the Contractor shall pay the Owner for additional engineering services as outlined below.

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

1.14 SHOP DRAWINGS

A. Submit digital copies to the Owner.

B. Include as a minimum dimensions, size, location of connections to other work, weight of equipment, and supporting calculations.

1.15 PRODUCT DATA

A. Submit digital copies to the Owner.

B. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturer's standard data to provide information unique to this Project.

1.16 MANUFACTURERS' INSTRUCTIONS AND CERTIFICATIONS

A. Submit as noted in individual specification Sections.

1.17 QUALITY ASSURANCE

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

B. Comply fully with manufacturer's instructions.

C. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

1.18 REFERENCES

A. Conform to reference standard by date of issue current as of date of Contract.

B. Should specified reference standard conflict with Contract Documents, request clarification from Engineer before proceeding.

1.19 MANUFACTURERS' FIELD SERVICES

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

1.20 TESTING LABORATORY SERVICES

A. Owner will approve the Contractor's selection of a testing laboratory to perform inspections, tests, and other services required by individual Specification Sections.

B. All costs for laboratory testing of earthwork and concrete shall be paid for by the Contractor.

C. Services will be performed in accordance with requirements of governing authorities and with specified standards.

D. Contractor shall cooperate with Testing Laboratory personnel; furnish tools, samples of materials, design mix, equipment, storage and assistance as requested.
   E. Notify Engineer/Testing Laboratory 48 hours prior to expected time for operations requiring testing services.
   F. Furnish and deliver samples/cylinders to lab for testing.
   G. Pay for testing.

1.21 TEMPORARY ELECTRIC POWER AND LIGHTING

A. Provide and pay for power services required from source.

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

1.22 TEMPORARY WATER

A. Provide water, as needed, for own use.

B. Provide an adequate supply of potable drinking water for use by employees and Engineer's employees.

1.23 SANITARY FACILITIES

A. Provide and maintain required sanitary facilities and enclosures.

B. Maintain clean and sanitary condition.

1.24 WATER FOR TESTING

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

1.25 TEMPORARY TELEPHONE SERVICE

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

1.26 TEMPORARY WATER CONTROL

A. Maintain excavations and trenches free of water. Provide and operate pumping equipment of a capacity to control water flow.

B. Provide dewatering system and pumping to maintain excavations dry and free of water inflow on a 24 hours basis.

C. Provide piping to handle pumping outflow to discharge in a manner to avoid erosion or deposit of silt.

1.27 TEMPORARY ACCESS ROADS AND PARKING

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

1.28 TEMPORARY HEATING AND VENTILATING

A. Provide adequate heat and ventilation to all parts of the Work.

B. See requirements of Specifications for minimum temperature to be maintained for various trades.

C. Ventilate enclosed areas.

D. Do not use permanent systems to provide temporary heating or ventilation.

1.29 PROTECTION OF FINISHED WORK

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

1.30 PROGRESS CLEANING

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

1.31 FIELD OFFICES

A. Contractor shall provide a field office upon request from the Owner.

1.32 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary erosion control construction, above grade or buried utilities, equipment, facilities, and materials, prior to Substantial Completion inspection.

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

1.33 PRODUCTS

A. Products: New material, machinery, components, equipment, and systems forming Work, but does not include machinery or equipment used for preparation, fabrication, or erection of Work.

B. Use interchangeable components of the same manufacture for similar components.

1.34 TRANSPORTATION, HANDLING, STORAGE, AND PROTECTION

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

1.35 SUBSTITUTIONS

A. Possible substitutions ("or approved equal"/ "or equal") shall be submitted no later than 10 days prior to bid date for Owner to review and consider requests from Contractor or Bidder for substitutions as equal. The Bidder may include substitutions not specified only if written approval is received from the Owner prior to bidding. Otherwise, substitutions will be not be allowed.

B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.

1.36 SYSTEMS DEMONSTRATION

A. Prior to final inspection, demonstrate operation of each system to Engineer and Owner.

B. Instruct Owner's personnel in operation, adjustment, and maintenance of equipment and systems, using the operation and maintenance data as the basis of instruction.

1.37 CONTRACT CLOSEOUT PROCEDURES

A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and Work is complete in accordance with Contract Documents and ready for Engineers inspection.

B. Submit final Application for Payment identifying total adjusted Contract Price, previous payments, and amount remaining due after Engineer has given written approval of Project Record Documents.

1.38 FINAL CLEANING AND INSPECTION

A. Execute final cleaning prior to final inspection.

B. Clean interior and exterior surfaces exposed to view.

C. Clean debris, waste and surplus supplies, rubbish, and construction facilities from site.

D. After final cleaning and upon written notice from the Contractor that the Work is completed, the Engineer will make a preliminary inspection with the Owner and Contractor present. Upon completion of this preliminary inspection, the Engineer will notify the Contractor, in writing, of any particulars in which this inspection reveals that the Work is defective or incomplete.

E. Upon receiving written notice from the Engineer, the Contractor shall immediately undertake the work required to remedy defects and complete the Work to the satisfaction of the Owner.

F. When the Contractor has corrected or completed the items as listed in the Engineer's written notice, he shall inform the Engineer, in writing, that the required Work has been completed. Upon receipt of this notice, the Engineer, in the presence of the Owner and Contractor, shall make his final inspection of the Project.

G. Should the Engineer find all Work satisfactory at the time of his inspection, the Contractor will be allowed to make application for final payment in accordance with the provisions of the General Conditions. Should the Engineer still find deficiencies in the Work, the Engineer will inform the Contractor of the deficiencies and will deny the Contractor's request for final payment until the Contractor has satisfactorily completed the required Work.

H. Water courses, gutters, and ditches shall be opened and left in a condition satisfactory to the Engineer.

1.39 FINAL SUBMITTALS

A. No contract will be finalized until all of the following have been submitted:
   B. Final Shop Drawings.
   C. Record Drawings.
   D. Operations and Maintenance Manuals.
   E. Manufacturers' Certificates of Proper Installation.

1.40 PROJECT RECORD DOCUMENTS (“AS-BUILTS”)

A. Maintain on Project site, one set of Contract Documents, Shop Drawings, and Product Submittals to be utilized for Record Documents.

B. Keep Record Documents and samples available for inspection by Engineer.

C. Maintain Record Documents in a clean, dry, and legible condition. **Do not use Record Documents for construction purposes**. If Contractor submits Record Documents that are in poor condition and is unacceptable by the Engineer, Contractor shall re-purchase a new set of Project Drawings and Project Manual and re-recording information on new purchased set and resubmit to Engineer.

D. Specification, Record Documents, and Shop Drawings: Legibly mark each item to record actual construction or product installed.

E. Record information in red ink on a set of blue line opaque Drawings, and in a copy of a Project Manual.

F. Record information concurrently with construction progress.

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

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

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

R. Transmit with cover letter in duplicate, listing:
   S. Date.
   T. Project title and number.
   U. Contractor's name, address, and telephone number.
   V. Number and title of each Record Document.
   W. Signature of Contractor or authorized representative.

X. Final Application for Payment shall not be approved until Project Record Documents (“As-Builts”) are reviewed and approved by Owner.

1.41 OPERATION AND MAINTENANCE DATA

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

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

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

SECTION 02315

TRENCH EXCAVATION, BACKFILL, AND COMPACTING

PART 1. GENERAL

1.1 SUMMARY

A. Work of this Section also includes:
   1. Replacing topsoil that contains regenerative material.
   2. Disposal of trees, stumps, brush, roots, limbs, and other waste materials from clearing operations.
   3. Imported topsoil.
   4. Crush rock backfill required by over-excavation.
   5. Imported pipe zone material.
   6. Trench settlement repair, including replacing roadway surfacing, sidewalk, or other structures.
   7. Replacing damaged culverts.

B. Trench excavation is classified as common excavation and includes removal of material of whatever types encountered including rock to depths shown or as directed by Engineer.

C. Pipe zone includes full width of excavated trench from bottom of pipe to a point 6 inches above top outside surface of pipe barrel.

D. Conform to federal, state, and local codes governing safe loading of trenches with excavated material.

E. The right is reserved to modify the use, location, and quantities of the various types of backfill during construction as Engineer considers to be in the best interest of Owner.

F. There shall be no extra compensation for dewatering and rock excavation.

1.2 RELATED SECTIONS

A. Section 02515 - Polyvinyl Chloride (PVC) Pipe and Fittings.

1.3 REFERENCES

A. Arkansas Highway and Transportation Department, P.O. Box 2261, Little Rock, Arkansas 72203, latest edition.
   1. AHTD 303 - Aggregate Base Course.

B. ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA, 19428-2959.
   1. ASTM D448 - Classifications for Standard Sizes of Aggregate and Bridge Construction.
   2. ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5-lb. (2.49-kg.) Rammer and 12-inch (304.8-mm) Drop.
   3. ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 10-lb. (4.54-kg.) Rammer and 18-inch (457-mm) Drop.
   4. ASTM D2487 - Standard Classification of Soils for Engineering Purposes.
   5. ASTM D2922 - Test Methods for Density of Soils and Soil-Aggregates in Place by Nuclear Method.

C. Occupational Safety and Health Administration (OSHA) Standard for Excavation and Trenches Safety System, 29 CFR 1926, Subpart P = Excavations.

D. The Contractor shall be solely responsible for trench and excavation safety systems in accordance with Act 291 of 1993.

PART 2. PRODUCTS

2.1 FOUNDATION STABILIZATION

A. Crushed gravel or crushed rock, free from dirt, clay balls, or organic material, well graded from coarse to fine, containing sufficient finer material for proper compaction, and meeting ASTM D448 Size No. 67 (Concrete Aggregate).

2.2 PIPE ZONE MATERIAL

A. Select material shall consist of fine loose earth or sand free from clods or rocks larger than 3/4 inches in dimension and of proper moisture content for maximum consolidation.

B. Crushed granular material conforming to ASTM D448, Size No. 67.

C. Washed stone bedding size 1/4-inch to 3/4-inch.

2.3 COMMON FILL MATERIALS

A. Material shall not contain pieces larger than 3 inches, and shall be free of roots, debris, or organic matter.

2.4 SELECT FILL MATERIALS

A. Class 7, Class 3, and Class 4 as established by Section 303 of Arkansas Highway and Transportation Department Standard Specifications for Highway Construction.

B. ASTM Soil Classification GC as set forth in ASTM Designation D2487-92. On site material may be used, provided it is in accordance with ASTM D2487-92.

2.5 BEDDING MATERIAL

A. Pea gravel, sand, or other locally available bedding material, as approved.

2.6 TRENCH BACKFILL

A. Granular Backfill:
   1. Natural or artificial mixture of gravel and soil mortar uniformly well graded from coarse to fine.
   2. AHTD Section 303 Class 3, Class 4, or Class 7 as specified in this Section.

2.7 PVC WATER AND SEWER PIPE TRENCH

A. See Drawings for trench details.

2.8 COMPACTION EQUIPMENT

A. Suitable type and adequate to obtain the amount of compaction specified.

B. Operate in strict accordance with manufacturer's instructions and recommendations and maintain in such condition so that it will deliver manufacturer's rated compactive effort.

2.9 IMPORTED TOPSOIL

A. Suitable sandy loam from an approved source.

B. Must possess friability and a high degree of fertility.

C. Free of clods, roots, gravel, and other inert material.

D. Free of quackgrass, horsetail, and other noxious vegetation and seed.

PART 3. EXECUTION

3.1 PREPARATION

A. Where clearing or partial clearing of right-of-way is necessary, complete prior to start of trenching.

B. Cut trees and brush as near to surface of ground as practicable, remove stumps, and pile for disposal.

C. Do not permit excavated materials to cover brush or trees prior to disposal.

3.2 PREVENT TRENCH WATER AND ANIMALS FROM ENTERING PIPE

A. When pipe laying is not in progress, including noon hours, open ends of pipe shall be closed; and no trench water, animals, or foreign material shall be permitted to enter the pipe.

3.3 DISPOSAL OF CLEARED MATERIAL

A. Dispose of material in such a manner to meet requirements of state, county, and local regulations regarding health, safety, and public welfare.

B. Dispose of nonflammable and flammable material off the construction site in an approved location.

C. Do not leave material on the Project site, shove onto abutting private properties, or bury in embankments or trenches.

3.4 REMOVAL OF OBSTRUCTIONS

A. Remove obstructions within trench area or adjacent thereto such as tree roots, stumps, abandoned piling, logs, and debris.

B. Engineer may, if requested, make changes in the trench alignment to avoid major obstructions, if such alignment changes can be made within the easement or right-of-way without adversely affecting the intended function of the facility.

C. Dispose of obstructions in accordance with this Section.

3.5 REMOVAL AND REPLACEMENT OF TOPSOIL

A. Where trenches cross lawns, garden areas, pasturelands, cultivated fields, or other areas on which reasonable topsoil conditions exist, remove topsoil for a depth of 6 inches for full width of trench to be excavated.

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

C. Stockpile removed topsoil at regular intervals, and do not mix with other excavated material.

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

E. Minimum finished depth of topsoil over trenches: 5 inches.

F. Imported topsoil may be substituted for stockpiling and replacing topsoil.

G. Maintain finished grade of topsoil level with area adjacent to trench until final acceptance by Engineer.

H. Repair damage to adjacent topsoil caused by work operations.
   1. Remove rock, gravel, clay, and other foreign materials from the surface.
   2. Regrade.
   3. Add topsoil as required.

3.6 TRENCH WIDTH

A. Minimum width of unsheeted trenches where pipe is to be laid shall be 18 inches greater than the outside diameter of the pipe, or as approved.

B. Maximum width at top of trench will not be limited, except where excess width of excavation would cause damage to adjacent structures or property or cause undue stresses on the pipe.

C. Confine trench widths to dedicated rights-of-way or construction easements, unless special written agreements have been made with affected property owner.

3.7 EXCAVATION

A. Excavate trench to lines and grades shown or as established by Engineer with proper allowance for pipe thickness and for pipe base or special bedding when required.

B. If trench is excavated below required grade, correct with foundation stabilization material.

C. Place material over full width of trench in compacted layers not exceeding 6 inches deep to established grade with allowance for pipe base or special bedding.

3.8 PREPARATION OF TRENCH - LINE AND GRADE

A. Do not deviate more than ½ inch from line or ½ inch from grade. Measure for grade at the pipe invert, not at the top of the pipe, because of permissible variation in pipe wall thickness.

B. Grade the bottom of the trench by hand to the line and grade where the pipe is to be laid, with proper allowance for pipe thickness and for pipe base when specified or indicated.

C. Remove hard spots that would prevent a uniform thickness of bedding.

D. Check the grade with a straightedge and correct irregularities found.

E. The trench bottom shall form a continuous and uniform bearing and support for the pipe at every point between bell holes, except that the grade may be disturbed for the removal of lifting tackle.

3.9 SHORING, SHEETING, AND BRACING OF TRENCHES

A. Sheet and brace trench when necessary to prevent caving during excavation in unstable material or to protect adjacent structures, property, workers, and the public.
B. Increase trench widths accordingly by the thickness of the sheeting.

C. Maintain sheeting in place until pipe has been placed and backfilled at pipe zone.

D. Remove shoring and sheeting as backfilling is done in a manner that will not damage pipe or permit voids in backfill.

E. Conform to safety requirements of federal, state, or local public agency having jurisdiction for sheeting, shoring, and bracing of trenches; the most stringent of these requirements shall apply.

3.10 LOCATION OF EXCAVATED MATERIALS

A. Place excavated material only within construction easement, right-of-way, or approved working area.

B. Do not obstruct private or public traveled roadways or streets.

3.11 REMOVAL OF WATER

A. Provide and maintain ample means and devices to promptly remove and dispose of water entering trench during time trench is being prepared for pipe laying, during laying of pipe, and until backfill at pipe zone is completed.
    1. These provisions apply during the noon hour as well as overnight.
    2. Provide necessary means and devices, as approved, to positively prevent under water from entering the construction area of another contractor.

B. Dispose of water in a manner to prevent damage to adjacent property.

C. Drainage of trench water through the pipeline under construction is prohibited.

3.12 FOUNDATION STABILIZATION

A. When existing material in bottom of trench is unsuitable for supporting pipe, excavate unsuitable material.

B. Backfill trench to subgrade of pipe base with foundation stabilization material specified.

C. Place foundation stabilization material over the full width of trench and compact in layers not exceeding 6 inches deep to required grade by making passes with a vibratory compactor (or equivalent).

D. Material shall be considered unsuitable when it contains more than 5 percent organic material by volumetric sampling or when it will not support a reading of 1.5 on a hand penetrometer.

3.13 ROCK IN PIPE TRENCH

A. Where rock is encountered in bottom of trench, support pipe on bedding material.

B. Minimum Bedding Thickness: Minimum of 4 inches or one eighth of the outside diameter of pipe, whichever is greater.

C. Extend bedding up pipe sides one sixth of outside diameter of the pipe, minimum.

D. Backfill over pipe according to pipe zone type.

3.14 PIPE ZONE BACKFILL

A. Depth of the pipe zone above pipe barrel varies with pipe material.

B. Particular attention must be given to area of pipe zone from flow line to centerline of pipe to ensure firm support is obtained to prevent lateral movement of pipe during final backfilling of pipe zone.

C. Backfill area of pipe zone from bottom of pipe to horizontal centerline of pipe by hand-placing material around pipe in 4-inch layers.

D. Achieve continuous support beneath pipe haunches by "walking in" and slicing with shovel.

E. Backfill area of pipe zone from horizontal centerline to top of pipe zone with pipe zone material as determined by class of backfill.

F. In lieu of selected material for pipe zone in upper portion of pipe zone, imported pipe zone material approved by Engineer for trench backfill may be substituted.

G. If the Engineer determines that the existing material is insufficient or unsuitable at trench side for selected material for pipe zone in upper portion of pipe zone, provide suitable material from other trench excavation along pipeline or imported pipe zone material.

3.15 TRENCH BACKFILL ABOVE PIPE ZONE

A. When backfill is placed mechanically, push backfill material onto slope of backfill previously placed and allow to slide down into trench.

B. Do not push backfill into trench in such a way as to permit free fall of material until at least 2 feet of cover is provided over top of pipe.

C. Under no circumstances allow sharp, heavy pieces of material to drop directly onto pipe or tamped material around pipe.

D. Do not use backfill material of consolidated masses larger than ½ cubic foot.

3.16 EXCESS EXCAVATED MATERIAL

A. Dispose of excess excavated material off project site in an approved area.

3.17 DRAINAGE CULVERTS

A. Replace drainage culverts which are removed on near right angles to pipe centerline.

B. If pipe cannot be reused or is damaged during removal, dispose of it and provide new pipe.

C. Protect culverts from damage or restore to equivalent condition.

D. Replace culverts to existing lines and grades.

E. Do not replace culverts until proposed pipeline is installed and backfill of trench has been completed to subgrade of culvert.

3.18 PIPE COVER

A. Place select material from excavation over pipe to provide minimum coverage, as shown on Drawings or as directed by Engineer.

3.19 DRAINAGE DITCH RESTORATION

A. Undercrossings of minor drainage ditches not covered in another Specification Section shall be backfilled so that upper 1 foot of material in ditch between ditch banks is clay.

B. Compact material for full ditch width by 6 passes of vibratory compactor (or equivalent).

C. Where indicated on Drawings, provide concrete arch, and/or riprap on ditch banks.

3.20 SETTLEMENT

A. Correct settlement noted in backfill, fill, or in structures built over backfill or fill within warranty period.

3.21 IMPORTED TOPSOIL

A. Should regenerative material be present in soil, remove both surface and root which appears in within 1 year following acceptance of Project in a manner satisfactory to Owner.

END OF SECTION

D. Contents:
   E. Directory listing names, addresses, and telephone numbers of Engineer, Contractor, Subcontractors, and major equipment suppliers.
   F. Operation and maintenance instructions, arranged by system.
   G. Certificates.
   H. Shop drawings.
   I. Product data.
   J. Warranties.

1.42 GUARANTEES, BONDS, AFFIDAVITS, AND WARRANTIES

A. Provide duplicate notarized copies.

B. Execute and assemble documents from Subcontractors, suppliers, and manufacturers.

C. No contract will be finalized until all guarantees, performance tests, bonds, certificates, licenses, affidavits, and warranties required for Work or equipment as specified are satisfactorily filed with the Owner.

D. Submit prior to final Application for Payment.

1.43 SPARE PARTS AND MAINTENANCE MATERIALS

A. Provide products, spare parts, maintenance and extra materials in quantities specified in individual specification Sections.

B. Deliver to project site and place in locations as directed; obtain receipt prior to final payment.

PART 2. PRODUCTS

Not Used.

PART 3. EXECUTION

Not Used.

END OF SECTION

SECTION 02512

HYDROSTATIC TESTING OF WATER DISTRIBUTION SYSTEM

PART 1. GENERAL

1.1 SUMMARY

A. This Section covers test for water appurtenances and piping.

1.2 RELATED SECTIONS

A. Section 02515 - Polyvinyl Chloride (PVC) Pipe and Fittings - Water.

1.3 SUBMITTALS

A. Submit testing procedures in accordance with Section 01001.

PART 2. MATERIALS

2.1 WATER FOR HYDROSTATIC TESTING OF PRESSURE LINES

A. Furnish water from the nearest hydrant or other suitable source for testing purposes.

PART 3. EXECUTION

3.1 HYDROSTATIC AND LEAK TESTING OF PRESSURE LINES

A. Upon completion of installation, thoroughly clean new pipe:
   1. Flush with water to remove dirt, stones, pieces of wood, or other obstructions that may have entered pipe during construction.
   2. Flush pipelines at a minimum rate of 2.5 feet per second for a duration suitable to Engineer.

B. Upon completion of installation, pressure test water pipelines:
   1. Conduct test in presence of Engineer and Owner.
   2. Minimum Pressure: 125 psig measured at the lowest elevation of the line.
   3. Duration: 2 hours.
   4. Repair visible leaks regardless of the amount of leakage.

C. Provide water into pipeline for testing and flushing, including necessary:
   1. Pumps, gages (increment at 10 psi or less), and meters.
   2. Plugs and caps.
   3. Temporary blowoff piping to discharge water.
   4. Reaction blocking to prevent pipe movement during testing.

D. Water source for the pump suction shall be potable water from the Owner's distribution system; vessel used shall be approved by the Engineer.

E. Prevent contamination of the Owner's water distribution system.

F. After pipelines or isolated sections of pipelines have been filled with water, increase the pressure to test pressure by means of a pump.

G. Test pressure shall be 100 psi or 50 percent above normal operating pressure, whichever is greater.

H. Duration of hydrostatic leakage test shall be 2 hours, or as specified by Engineer.

I. Open interior valves, including fire hydrants and other appurtenances, open during tests.

J. After the specified test pressure has been applied, the entire pipeline shall be checked in the presence of the Engineer giving particular attention to parts of the pipeline and the appurtenances that are exposed.

K. If leaks are apparent, perform corrective work and replace material that is required to remedy the defect and stop the leaks at no extra cost to the Owner.

L. If no leaks were apparent or after corrective work has been completed, the pipelines shall be subjected to a leakage test at the pressure specified with a meter inserted in the test pump discharge line.

M. AWWA C600-05 leak test for Ductile Iron.

1. Hydrostatic Testing shall comply with Section 5.2 of AWWA C600-05.
2. Leakage Criteria to follow AWWA C600-05 Section 5.5.1.4 "Test Allowance."

$$L = \frac{SD/P}{148{,}000}$$

L = Quantity of makeup water in gallons per hour
S = Length of pipe section being tested, in feet
D = Nominal diameter of the pipe, in inches
P = Average test pressure during the hydrostatic test, in pounds per square inch (gauge)

Use Table 5A for Hydrostatic Testing Allowances per 1,000 ft. of pipline.

N. AWWA C605-05 leak test for PVC.
1. Hydrostatic Testing shall comply with Section 7.3 of AWWA C605-05.
2. Leakage Criteria to follow allowable criteria found in AWWA C605-05 Section 7.3.6. "Test Allowance."

$$Q = \frac{LD/P}{148{,}000}$$

Q = Quantity of makeup water in gallons per hour
L = Length of pipe section being tested, in feet
D = Nominal diameter of the pipe, in inches
P = Average test pressure during the hydrostatic test, in pounds per square inch (gauge)

This formula is based on a testing allowance of 10.5 GPD/mile/inch of nominal pipe diameter at a test pressure of 150 psi.

O. If test of pipe laid discloses leakage greater than the allowable leakage as calculated from the above formula, locate the leak or leaks and perform corrective work and replace material that is required in order to remedy the defect and stop the leak.

P. Corrective work shall be approved by Engineer.

END OF SECTION

SECTION 02515

POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS - WATER

PART 1. GENERAL

1.1 SUMMARY

A. Provide polyvinyl chloride (PVC) pipe and fittings.

1.2 RELATED SECTIONS

A. Section 02315 - Trench Excavation, Backfill, and Compacting.

B. Section 02512 - Hydrostatic Testing of Water Distribution System.

1.3 REFERENCES

A. Arkansas Department of Health.
   B. ADHHS: *"Rules and Regulations Pertaining to Public Water Systems, latest Edition."*

C. ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA, 19428-2959.
   D. ASTM D1784 - Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
   E. ASTM D2241 - Specifications for Poly (Vinyl Chloride) (PVC) Pressure - Rated Pipe (SDR Series).
   F. ASTM D3139 - Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
   G. ASTM F477 - Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

H. American Water Works Association, 6666 West Quincy Avenue, Denver, Colorado 80235.
   I. AWWA C110/A21.10-03 - American National Standard for Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. For Water and Other Liquids.
   J. AWWA C605-05 - Underground installation of Polyvinyl choride (PVC) Pressure Pipe and Fittings for Water.
   K. AWWA: *"The Ten States Standards for Water, 2007 Edition or latest version."*

PART 2. PRODUCTS

2.1 PIPE

A. PVC pressure pipe 6” or greater, C-900, SDR-25 in compliance with ASTM D1784 and manufactured from virgin PVC compound with a cell classification of 12454-B with gasket joints and integral bell for buried water piping.

B. Pipe Sizes 4” or smaller, Schedule 40 PVC

C. Pipe and fittings shall be manufactured in the United States. Foreign made products shall be unacceptable.

D. Pipe shall be permanently marked at 5-foot intervals with the following information:
1. Nominal size.
2. Material code designation.
3. Manufacturer's name or trademark and production record code.
4. ASTM or AWWA certification.
5. SDR designation.

E. Warranty:
1. Manufacturer of the pipe shall warrant product for a period of not less than one (1) year.
2. Forward copies of warranty to the Owner.
3. Replace defective materials at no extra cost to the Owner.

2.2 JOINTS

A. Buried Pipe: Gasketed slip joint.

B. Comply with ASTM D3139.

2.3 FITTINGS

A. Fittings 4 Inches and Larger: Ductile iron, 350 psi pressure class, cement-lined and seal-coated. Where taps are shown on fittings, tapping bosses shall be provided.
1. Flanged Joint: ANSI/AWWA C110/A21.10-03 and ANSI B16.1, faced and drilled
125-pound ANSI standard.
2. Mechanical Joint: ANSI/AWWA C110/A21.10-03 and ANSI/AWWA C110/A21.11-07.
3. Flexible Joint: American Flex-Lox pipe or equal.

B. Cement Linings: In accordance with ANSI A21.4.

C. Fittings shall receive an exterior coating of 1 mil thick bituminous material in accordance with ANSI A21.4.

D. Fittings shall have distinctly cast on them the manufacturer's identification, pressure rating, nominal diameter of openings, and the number of degrees or fraction of the circle on bends.

E. Fittings Smaller Than 4 Inches: PVC.

2.4 GASKETS

A. As recommended by pipe manufacturer to conform to pipe.

B. Comply with ASTM F477.

2.5 MARKING TAPE

A. 3” Wide Safety Blue Marker Tape.

B. Terra Tape "Extra Stretch."

C. Or equal.

PART 3. EXECUTION

3.1 GENERAL

A. Any connection to water main for the purpose of connecting any water line to the water main, shall use a minimum of Schedule 40, Polyvinyl chloride (PVC) pipe.

B. Rigid PVC pipe shall be cut, made up, and installed in accordance with the pipe manufacturer's recommendations.

C. Offset shall be as recommended by the manufacturer for the maximum temperature variation between time of installation and final use.

3.2 CONTROL WIRE

A. Furnish and install control wire- 2-wire, 14/2 decoder cable (black/red) with PVC pressure pipe.

B. Run wire continuous from valve box to valve box, meter box, air release vault, cleanout, or other access points.

C. Bring wire up inside boxes and vaults in an accessible method.

D. All connections shall be made with waterproof direct bury silicone tubes and wire nuts in 10" round valve boxes.

E. Bring wire around or tape wire to each pipe section.

F. Pipe testing shall include control wire.

G. Wire breaks shall be repaired at no additional expense to the Owner.

3.3 MARKING TAPE

A. On pressure installations of non-metallic pipe, metallic marking tape, Terra Tape Extra Stretch or equal shall be installed minimum 12 inches above the top of pipe or service line.

B. The tape shall be in addition to the control wire specified.

3.4 THRUST BLOCKS

A. Install 2,500 psi concrete thrust blocks at bends, wyes, or other thrust points on pressure piping.

B. Block to bear against undisturbed soil and shall be of size and with bearing area as shown on Drawings.

3.5 TESTING

A. Pressure lines shall be hydrostatically tested at the pressures listed in Section 02512.

B. Use pipe-locating equipment to test continuity of trace wire.

C. Engineer shall observe and document trace wire test.

END OF SECTION

SECTION 02747

ASPHALTIC CONCRETE PAVEMENT REPAIR

PART 1. GENERAL

1.1 SUMMARY

A. Repair asphaltic concrete pavement in accordance with this Section and where indicated on the Drawings.

B. Construct Work of this Section that is adjacent to or connected to city streets in accordance with requirements of the City for city streets.

C. Secure permits and inspections, post necessary bonds, and pay necessary fees.

1.2 RELATED SECTIONS

A. Section 01001 - Basic Requirements.

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials, 444 North Capitol Street, North West, Suite 249, Washington, DC 20001.
   B. AASHTO M14 - Anionic Emulsified Asphalt.
   C. AASHTO M81 - Cut-Back Asphalt Concrete (Rapid-Curing Type).
   D. AASHTO M82 - Cut-Back Asphalt Concrete (Medium-Curing Type).
   E. AASHTO M208 - Cationic Emulsified Asphalt.

F. ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA, 19428-2959 USA Phone: (610) 832-9585 Fax: (610) 832-9555.
   G. ASTM C207 - Specification for Hydrated Lime for Masonry Purposes.
   H. ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5-lb. Rammer and 12-in. Drop.
   I. ASTM D946 - Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction.
   J. ASTM D977 - Specification for Emulsified Asphalt.

K. Arkansas State Highway and Transportation Department, P.O. Box 2261, Little Rock, Arkansas 72203.
   L. AHTD - Standard Specifications for Highway Construction, latest Edition.
   M. AHTD 303 - Aggregate Base Course.
   N. AHTD 304 - Aggregate Surface Course.
   O. AHTD 305 - Asphaltic Concrete Hot Mix Stabilized Base Course.

PART 2. PRODUCTS

2.1 ASPHALTIC PAVING MATERIALS

A. Base Course: Crushed stone conforming to AHTD Standard Specifications for Highway Construction Section 303, Class 7.

B. Prime Coat: Medium curing cut-back asphalt; MC-30 or MC070; AASHTO M82; heated and applied within the temperature range 80 degrees F. - 150 degrees F.

C. Hot-mix surfacing material shall meet the following requirements: Asphaltic Cement, Type II in accordance with Arkansas State Highway and Transportation Department, 1996 edition.

PART 3. EXECUTION

3.1 SUBGRADE PREPARATION

A. Subgrade for asphalt paving improvements shall have organic silty and clayey topsoils and other unsuitable material removed and replaced with approved material.

B. Fill and tamp traces of utility trenches.

C. Replace soft spots as needed.

3.2 BASE COURSE FOR ASPHALTIC PAVING

A. Place material on prepared subgrade in 2 courses for a total compacted thickness of 8 inches.

B. Spread 1 course 4 inches thick (compacted) the same day the material is hauled. It shall be thoroughly mixed, either by repeated handling with a blade grader or by harrowing sufficiently to secure a uniform mixture or course and fine particles.

C. Compact base course by systematically rolling and watering as required to obtain a firm, uniform, smooth surface as specified in Part 300 of AHTD Standard Specifications for Highway Construction.

D. Minimum density shall be 95 Percent Standard Proctor (ASTM D698).

E. Prime coat shall not be put down until base course is compacted.

3.3 PRIME COAT

A. After acceptance of completed base course, a prime coat shall be uniformly distributed over the prepared base at the rate of 0.3 gallon per square yard.

B. Remove surplus asphalt material.

3.4 HOT-MIX SURFACING FOR ASPHALTIC PAVING

A. Plant Mixing and Transporting: Mixing, transportation, and temperature limitations for hot-mix surface course materials shall be in accordance with the requirements of Division 400, Asphalt Pavements of the AHTD Standard Specifications for Highway Construction, Edition, latest edition.

B. Placing, compacting, and acceptance shall be in accordance with Division 400, Asphalt Pavements of the AHTD Standard Specifications for Highway Construction, Edition, latest edition.

END OF SECTION

SECTION 02810

IRRIGATION SYSTEM

PART 1. GENERAL

1.1 SUMMARY

A. Provide irrigation system where shown on the Drawings, and as specified herein, complete in place, tested and approved, including but not necessarily limited to, pipe, automatic controller and remote control valves.

1.2 RELATED SECTIONS

A. Section 01001 - Basic Requirements.

B. Section 02315 - Trench Excavation, Backfilling, and Compacting.

C. Section 02900 - Landscaping.

D. Section 02924 - Sodding.

1.3 SUBMITTALS

A. Submit Shop Drawing, manufacturer's data, and other requested data to the Engineer in accordance with Section 01001.

1.4 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary trades and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Materials delivered to job site shall be packaged in a manner that damage will not occur during deliver and stored in original package and labeled in a locked area to prevent theft or possible damage.

PART 2. PRODUCTS

2.1 PIPE

A. Install 1-1/2 inch Schedule 40 PVC for the following lines: Main line to individual circuit valves.

B. Lateral lines to tree well areas must be Class 200 PVC.

2.2 REDUCED PRESSURE ZONE BACKFLOW PREVENTER

A. Manufacturer:
   B. Watts In-Line.
   C. Or approved equal.

D. Vault:
   E. Manufacturer: Dyer Fiberglass, Inc.
   F. Model No. D103.
   G. Exterior finish shall be white leophthallo gel-coating .02 to .04 inches.

2.3 VALVES

A. Automatic Drain Valves: Coordinate with Owner

B. Circuit Valves: Coordinate with Owner.

C. Pressure Regulators: Coordinate with Owner

D. Valve Boxes: Coordinate with Owner

2.4 AUTOMATIC CONTROLLER

A. Coordinate with Owner

2.5 IRRIGATION HEADS

A. Rain Bird 3500 Rotors

B. Rain Bird 1800 Spray Heads

C. All irrigation heads shall match existing.

PART 3. EXECUTION

3.1 INSTALLATION

A. PVC Piping:
   B. Exercise care in handling, loading, unloading and storing plastic pipe and fittings.
   C. Use protective cover until ready to install.
   D. In jointing, use only the specified solvent and make joints in accordance with the manufacturer's recommendations as approved by the Engineer.
      E. Give solvent welds at least 15 minutes set-up time before moving or handling and 24 hours curing time before filling with water.
   F. Centerload plastic pipe with a small amount of backfill to prevent arching and whipping under pressure.

G. Install irrigation main lines and stub out lateral lines.

H. Reduced Pressure Zone Preventer: Install between meter and master valve at least 12 inches above grade and locations as shown on Drawings.

I. Automatic Drain Valves:
   J. Install at low points of each circuit.
   K. Minimum of 2 per circuit.

L. Valve Boxes: Locate valve boxes at locations as shown on Drawings.

M. Irrigation Heads: Finished top elevations of irrigation heads shall be match finished grade. Do not place drippers in backfill.

N. Costs for installation of required 1 inch irrigation meter will be the responsibility of the Contractor.

O. Place main line in sleeves when located under driveways and crossing roadways.

P. Follow piping diagrams exactly in tree wells. Piping is designed to go around proposed trees. Do no disturb root ball of trees when installing irrigation system.

Q. Utilize common trenches when possible.

3.2 TESTING AND INSPECTING

A. Do not allow or cause any of the work in this Section to be covered up or enclosed until testing has been observed, tested, and approved by the Engineer. Irrigation system shall be fully operational within 48 hours of setting first tree into tree well.

B. Before backfilling the main line and with control valves in place but before lateral lines are connected, completely flush and test the main line.
   C. Repair leaks.
   D. Flush out each section of lateral lines before bubbler heads are attached.

E. Testing:
   F. Make necessary provisions for thoroughly bleeding the lines of air and debris.
   G. Before testing, fill the lines with water for a period of at least 24 hours.
   H. After valves have been installed, test live water lines for leaks at a pressure of 150 psi for a period of two hours, with couplings exposed and with pipe sections centerloaded.
   1. Provide required tested equipment and personnel.
   2. Repair leaks and retest until acceptance by the Engineer.

I. Final Inspection:
   J. Clean, adjust and balance irrigation system:
      K. Remote control valves are properly balanced.
      L. Heads are properly adjusted for radius and arc of coverage.
      M. The installed system is workable, clean, and efficient.

3.3 INSTRUCTIONS

A. Attach a typewritten legend inside each controller door stating the areas covered by each remote control valve.

B. After system has been completed, inspected, and approved, instruct the Owner's maintenance personnel in the operation and maintenance of the system. Contractor to provide typewritten instructions for winterizing shut down and spring start up procedures.

END OF SECTION

SECTION 02900

LANDSCAPING

PART 1. GENERAL

1.1 SUMMARY

A. Provide finish grading and grass establishment.

B. The intention of this Specification is that the Contractor establish turf on pipelines and areas damaged as a result of construction.

C. Where lawns are disturbed due to construction, restore lawns using same grass type as found in lawn prior to construction.

PART 2. MATERIALS

2.1 TOPSOIL

A. Existing topsoil shall be reused where practical.

B. Imported Topsoil:
   C. Furnished at sole expense of Contractor.
   D. Friable loam free from subsoil, roots, grass, excessive amounts of weeds, stone, and foreign matter; acidity range (pH) of 5.5 to 7.5; and containing a minimum of 4 percent and a maximum of 50 percent organic matter.

2.2 SEED

A. Certified, blue tag, clean, delivered in original, unopened packages and bearing an analysis of the contents, guaranteed 95 percent pure and to have a minimum germination rate of 85 percent, within 1 year of test.

2.3 SEED MIX

A. Mix for areas: Common Bermuda Grass. Follow the recommendations of the local Agricultural Extension Agent for requirements on coverage, fertilization, and seasons.

PART 3. EXECUTION

3.1 PROJECT SCHEDULE

A. Project Schedule shall show an anticipated time for grading and seeding to take place, so that seasonal consideration can be given attention.

3.2 SITE GRADING

A. Shape, trim, and finish slopes to conform with lines, grades, and cross sections shown.

B. Make slopes free of loose exposed roots and stones exceeding 3 inch diameter.

C. Ensure that site drains properly and there are no areas where water may pond.

D. Finished site grading will be reviewed by Engineer.

3.3 GRADING OF TOPSOIL

A. Shape the topsoil over the area to the desired shape and contour.

B. Apply commercial fertilizer at the Agricultural Extension Agent's recommended rate, distributing it uniformly with a mechanical spreader.

3.4 FINISH GRADING

A. Thoroughly mix the topsoil and fertilizer.

B. Rake the area to a uniform grade so that areas drain in the same manner as at the start of the Project.

C. Lightly compact before planting grass.

D. Remove trash and stones exceeding 2 inches in diameter from area to a depth of 2 inches prior to preparation and planting grass.

3.5 TIME OF SEEDING

A. Conduct seeding under favorable weather conditions during seasons which are normal for work as determined by accepted practice in locality of Project.

3.6 MECHANICAL SEEDING

A. Sow grassed areas evenly with a mechanical spreader at rate of 100 pounds per acre, minimum, or as otherwise recommended by the Agricultural Extension Agent. Roll

with cultipacker to cover seed, and water with fine spray. Method of seeding may be varied at discretion of Contractor on his own responsibility to establish a smooth, uniformly grassed area.

3.7 HYDROSEEDING

A. Seed may be applied by hydroseeding method. Seeding shall be done within 10 days following soil preparation. Hydroseed areas at rate of 100 pounds seed and 500 pounds ammonium phosphate per acre, minimum, or as otherwise recommended by the Agricultural Extension Agent.

B. Proceed with seeding operation on moist soil, but only after free surface water has drained away.

C. Exercise care to prevent drift and displacement of mixture into other areas.

3.8 WINTER PROTECTIVE SEEDING

A. Winter barley or annual rye grass applied at a rate of 120 pounds/acre shall be used after September 15 or as recommended by the Agricultural Extension Agent.

B. Areas receiving temporary winter protective seeding shall be re-seeded when weather conditions become favorable.

3.9 MAINTENANCE

A. Begin maintenance immediately after each portion of grass is planted and continue until a reasonable stand of grass has been obtained. Water to keep surface soil moist. Repair washed out areas by filling with topsoil, fertilizing, and seeding.

3.10 GUARANTEE

A. If, at the end of a 180-day period, a satisfactory stand of grass has not been produced, the Contractor shall renovate and reseed the grass or unsatisfactory portions thereof immediately, or, if after the usual planting season, during the next planting season. If a satisfactory stand of grass develops by July 1 of the following year, it will be accepted. If it is not accepted, a complete replanting will be required during the planting season.

B. A satisfactory stand is defined as grass or section of grass that has:
   C. No bare spots larger than 1 square foot.
   D. Not more than 10 percent of total area with bare spots larger than 1 square foot.
   E. Not more than 15 percent of total area with bare spots larger than 6 inches square.

END OF SECTION

SECTION 02924

SODDING

PART 1. GENERAL

1.1 SUMMARY

A. Provide slab sod, fertilizer, and water to establish and maintain grass. Owner shall provide access to water at no cost.

B. Planting Period: As recommended by sod producer for time of year, subject to Engineer's approval.

1.2 REFERENCES

A. Federal Specifications.
B. FS O-F-241 - Fertilizers, Mixed, Commercial.

1.3 DEFINITIONS

A. Weeds: Includes Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perrenial Sorrel, and Brome Grass.

1.4 REGULATORY REQUIREMENTS

A. Comply with regulatory agencies for herbicide composition.

1.5 QUALITY CONTROL

A. Grass that has been cut more than 48 hours before placing shall not be used.

B. Sod shall not be loaded in bulk on vehicles and dumped in bulk on planting site.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver to site, store, and protect products at site.

B. Sod:
C. Cut sod with approved sod cutters to minimum depth of 2-1/2 inches in satisfactory and uniform widths and convenient lengths for handling.
D. Place cut sod flat, grass side up, on boards and haul to site with soil intact.
E. Sod shall not hang over the edges of the boards.

F. Fertilizer: Deliver in waterproof bags showing weight, chemical analysis, and name of manufacturer.

PART 2. PRODUCTS

2.1 SLAB SODDING

A. Type: Common Bermuda.

B. Certified nursery grade cultivated grass sod, 95 percent weed free.

C. Sod shall be live, fresh, and uninjured at time of placing.

2.2 FERTILIZER

A. FS O-F-241, Type and Grade as recommended for grass, with fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil to the proportions of nitrogen, phosphoric acid, and soluble potash as recommended by County Extension Agent and/or seed manufacturer, subject to Engineer's approval.

2.3 WATER

A. Clean, fresh, and free of substances or matter which could inhibit vigorous growth of grass.

2.4 HERBICIDES

A. As recommended by sod producer and as approved by Engineer.

PART 3. EXECUTION

3.1 PREPARATION

A. Fine grade to eliminate uneven areas and low spots. Allow for thickness of topsoil and sod.

B. Spread topsoil to minimum 6-inch depth and rake smooth.

3.2 FERTILIZING

A. Apply approximately 90 percent over entire area to receive slab sodding.

B. Apply remaining 10 percent over sod after placing and rolling.

3.3 SODDING

A. Upon delivery to site transfer sod from boards to soil surface.

B. Place slabs closely, leaving a minimum amount of space between slabs.

C. Use appropriate tools to pull together slabs that do not fit closely.

D. Do not handle sod by hand except when filling small cracks or at locations where it would be impractical to use boards.

3.4 ROLLING

A. Roll slab sod as soon after planting as practicable with plain rollers or cultipackers.

B. Tamp sod with approved hand methods where rolling is impractical.

3.5 MAINTENANCE

A. Water to prevent grass and soil from drying out.

B. Control growth of weeds.

C. Apply herbicides in accordance with manufacturer's instructions.

D. Remedy damage resulting from improper use of herbicides.

E. Immediately re-sod areas which show bare spots.

F. Protect sodded areas with warning signs during maintenance period.

END OF SECTION