SECTION 32 05 23
TRENCHLESS UTILITY INSTALLATION

PART 1 GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. The work of this Section includes all labor, machinery, material, construction equipment, dewatering, and appurtenances required to install casings by jacking and boring under public roadways at the locations shown on the Drawings. The work shall be in strict accordance with the requirements of the Alabama Department of Transportation (ALDOT) or any other highway entity having jurisdiction as shown on the Drawings and as specified herein.

2. The Contractor shall continuously keep the pits free from ground and surface waters during the operation and shall be prepared to implement additional groundwater control on short notice as required by inspectors from ALDOT or the highway entity having jurisdiction. Observed water levels prior to construction shall be below the invert elevation of the pits.

3. The Contractor is fully responsible for inspecting the locations where the casings are to be installed and shall be fully familiar with the conditions under which the work will be performed and with all necessary details required for orderly prosecution of the work. The omission of any details needed for the satisfactory installation of the work in its entirety which may not appear on the Drawings or herein shall not relieve the Contractor of full responsibility.

4. The Contractor shall be prepared to work at night and on Saturday and Sunday, if required to complete the work. After the jacking and boring operation has begun, work continuously (24 hours a day) until the complete length of casing has been installed.

5. If any movement or settlement occurs which causes or might cause damage to existing structures or roadways over, along or adjacent to the work, immediately stop any or all work except that which assists in making the work secure and in preventing further movement, settlement or damage. Resume jacking and boring only after all necessary precautions have been taken to prevent further movement, settlement or damage and immediately repair the damage. All repairs shall be to the satisfaction of ALDOT or the highway entity having jurisdiction. The costs of all repairs shall be borne by the Contractor.

6. Work Included in This Section.
   a. Jacking and boring of a steel casing at designated locations.
   b. Installations of carrier pipe within casing.

7. Related Work Described Elsewhere:
   a. Excavation, Subgrade Preparation, Backfilling, and Compacting: Division 31.

1.02 REFERENCE STANDARDS

A. American Water Works Association (AWWA)

1. AWWA C200 – Steel Water Pipe 6-inches (150 mm) and Larger.

2. AWWA C203 – Coal Tar Protective Coatings and Linings for Steel Water Pipelines, Enamel and Tape, Hot Applied.

3. AWWA C206 – Field Welding of Steel Water Pipe

B. American Welding Society (AWS)

C. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.03 SUBMITTALS

A. At least 30 working days prior to the scheduled start of any jacking and boring operations the Contractor shall submit in accordance with Section 01 33 00 the proposed materials and sequence of operations for review by the Engineer. Approval by the Owner's representative or Engineer does not relieve the Contractor of responsibility to adhere to the Drawings and Specifications and to meet regulatory agency requirements. The Contractor shall be fully responsible for adequacy and safety of construction means, methods and techniques.

B. Submit certificates of inspection from the pipe manufacturer certifying that steel casing pipe supplied meets the requirements of these Specifications.

C. Submit shop drawings of steel casings, carrier pipes, and appurtenances for approval by the Engineer.

D. Before starting excavation the Contractor shall submit drawings of pit bracing, casing (or conduit), and jacking head proposed to be used. Also, the Contractor shall submit to the Engineer for review and record purposes six (6) copies of drawings, design details, and calculations for support blocks, bracing to prevent pipe shifting or flotation, and pressure cement mortar mix design, placement

method, and equipment. Submittals shall be prepared by a licensed professional engineer, registered in the State of Alabama, having a minimum of five (5) years of professional experience in the design and construction of related excavation and boring systems.

E. If welding of casing pipe is required, submit welder's certification.

1.04 REQUIREMENTS

A. Unless otherwise specified, the methods and equipment used in jacking and boring casing or conduit shall be optional with the Contractor, provided that the proposed method is approved by the Engineer and meets all ALDOT requirements or the requirements of the highway entity having jurisdiction. Such approval shall in no way relieve the Contractor of the responsibility for making a satisfactory installation meeting the criteria set forth herein. Only workmen experienced in jacking operations shall be used in performing the work.

B. Only a certified welder shall perform welding operations on the casing pipe. Welder's certification shall be submitted to Engineer.

C. Prior to commencement of jack and bore operation, the Contractor must notify the Owner and Engineer.

PART 2 - PRODUCTS

2.01 PIPE CASING

A. Steel casings shall be new and unused Grade B steel pipe, minimum yield strength 35,000 psi, conforming to ALDOT standards, with an allowance for corrosion, and shall conform to ASTM A 139 or AWWA C 200, latest editions, for fabricated pipe. Wall thicknesses shall be at least 0.500 inch for 60-inch casings and 0.625 inch for 66-inch casings. Joints shall be electro-fusion (arc) welded by operators qualified in accordance with the American Welding Society Standard Procedure. Steel casing sizes shown are minimum required diameters.

2.02 CARRIER PIPE

A. Carrier pipes shall be ductile iron with restrained joints meeting the requirements of Section 40 27 00.01.

2.03 JOINTS

A. The joints of sections of casing pipe shall be welded with a continuous circumferential weld by a certified welder. It shall be the Contractor's responsibility to provide stress transfer across the joints which is capable of

resisting the jacking forces involved. Welds shall be ground smooth on the side of the casing to provide a smooth bore surface and shall not extend more than ¾ inch beyond pipe outside diameter. Field welds shall be complete penetration, single-level groove type joints. Welds shall be airtight and continuous.

2.04 BRACING

A. The pipe shall be braced to prevent shifting or flotation. The details of bracing and blocking of the pipe are subject to the approval of the Engineer.

2.05 STAINLESS STEEL CASING SPACERS

A. Carrier pipes inside of steel casings shall be supported by casing spacers at an on-center spacing not exceeding 10 feet. Shorter spacing shall be provided per the carrier pipe or casing spacer manufacturer's recommendations. Each spacer shall be a minimum 8-inches wide for pipe 12-inch diameter or less or minimum 12 inches wide for pipe 16-inch or greater. Spacers shall be manufactured of minimum 14-gauge Type 304 stainless steel. All nuts, bolts and washers shall be Type 304 stainless steel and compatible with the respective Type 304 stainless steel shell/band. Each spacer shall have a minimum of four runner supports manufactured of an ultra high molecular weight polyethylene or glass reinforced polymer. The runner supports shall be of adequate height to position the carrier pipe in the center of casing with a minimum top clearance of 1-1/2-inch. Casing spacers shall be manufactured by Cascade Waterworks Mfg. or an approved equal.

2.06 CASING END SEALS

A. Casing ends shall be sealed. The end seals shall be pull on (seamless) or wrap around type with stainless steel straps for securing the carrier pipe and the casing. End seals shall be constructed of specially compounded synthetic rubber with a minimum thickness of 1/8-inch. Casing end seals shall be manufactured by Cascade Waterworks Mfg. or an approved equal.

PART 3 - EXECUTION

3.01 GENERAL

A. The installation of pipeline casings under public highways shall be in accordance with all the requirements of encroachment permits issued by the governing agency.

B. Once the jacking and boring operation has commenced, it shall be continued uninterrupted around the clock until the casing has been installed between the specified limits.

C. Steel casing pipe sizes and wall thickness shown on the Drawings and specified herein are minimum values. Larger pipe or thicker walls may be provided to facilitate the installation at no additional cost to the Owner. The wall thickness of steel casing pipe and strength of the steel must be sufficient to withstand the forces encountered during the jacking process. Steel casing pipe shall be of the minimum length as shown on the Drawings.

3.02 SOIL REMOVAL DURING JACKING AND BORING

A. Every effort shall be made to avoid any loss of earth outside the casing by employing the following safeguards:

1. The Contractor shall prevent the rear of the cutting head from advancing in front of the leading edge of the casing by more than 1/3 times the casing diameter. In stable cohesive conditions this value shall not to exceed 8 inches.

2. In unstable conditions, such as granular soil, loose or flowable materials, the cutting head shall be retracted into the casing a distance that permits a balance between pushing pressure, pipe advancement and soil conditions.

3. A log of the volume of spoil material removed relative to the advancement of the casing shall be maintained and continuously evaluated.

B. Excavated material shall be removed from the casing as casing installation progresses, and no accumulation of such material within the casing will be permitted

3.03 GROUTING AND FILL

A. In the event of ground loss voids outside of the casing shall be backfilled with cement grout. The grout shall be a mixture of Portland cement, sand, and water prepared in proportions specifically for use with injection pumps in the particular application.

B. After subsurface grouting is complete surficial voids shall be filled with grout, crushed stone, or granular soils as directed by ALDOT or the highway entity having jurisdiction.

C. All costs associated with correction of ground loss or voids shall be borne by the Contractor.

3.05 TOLERANCES

A. Extreme care shall be exercised by the Contractor to maintain line and grade during jacking operations, and the Contractor may be required to modify the manner in which the jacking operation is conducted to correct any deviation when deemed necessary by the Engineer. A maximum deviation from grade of 0.12 foot per 100 linear feet of casing is permitted.

3.06 RESPONSIBILITY

A. The Contractor shall be fully responsible for the structural sufficiency of the casing and the placement thereof.

3.07 CASING ABANDONMENT

A. Casing not completed and abandoned shall be left in a safe condition. Abandoned casings shall be filled Portland cement grout specifically proportioned for the intended application.

3.08 INSTALLATION OF CARRIER PIPE

A. Carrier pipes installed inside of steel casing shall be supported casing spacers as specified herein.

B. Adjust the pipe grade as required by changing the dimension of the casing spacers to compensate for any grade variations of the casing and to maintain carrier pipe lines, grades, and dimensions shown on the Drawings.

C. If the alignment of the casing is such that the carrier pipe grade cannot be met the casing shall be abandoned. The abandoned casing shall be filled with grout as specified above and a new casing shall be installed. Costs associated with casing abandonment and installation of a new casing shall be borne by the Contractor.

D. All carrier pipes installed in a casing must be restrained for the entire length of the casing.

END OF SECTION

SECTION 32 31 13
CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.01 GENERAL

A. Furnish all labor, materials, equipment and incidentals required and install the chain link fence and gates as shown on the Drawings and as specified herein.

1.02 REFERENCES

A. The following is a list of standards which may be referenced in this Section:

1. ASTM International (ASTM):
   a. A121, Standard Specification for Metallic-Coated Carbon Steel Barbed Wire.
   b. A313/A313M, Standard Specification for Stainless Steel Spring Wire.
   c. A392, Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric.
   d. A491, Standard Specification for Aluminum-Coated Steel Chain-Link Fence Fabric.
   e. A497/A497M, Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.
   f. A615/A615M, Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
   g. A780, Standard Specification for Repair of Damaged and Uncoated Areas of Hot-Dipped Galvanized Coatings.
   h. A824, Standard Specification for Metallic-Coated Steel Marcelled Tension Wire for Use with Chain Link Fence.
   i. Al011/Al011M, Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
   j. C94/C94M, Standard Specification for Ready-Mixed Concrete.
   k. C150, Standard Specification for Portland Cement.
   1. C387, Standard Specifications for Packaged, Dry, Combined Materials for Mortar and Concrete.
   m. F552, Standard Terminology Relating to Chain Link Fencing.
   n. F567, Standard Practice for Installation of Chain-Link Fence.
   o. F626, Standard Specification for Fence Fittings.
   p. F668, Standard Specification for Polyvinyl Chloride (PVC) and Other Organic Polymer-Coated Steel Chain-Link Fence Fabric.
   q. F900, Standard Specification for Industrial and Commercial Swing Gates.

r. F934, Standard Specification for Standard Colors for Polymer-Coated Chain Link Fence Materials.
s. F1043, Standard Specification for Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework.
t. F1083, Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.
u. F1183, Standard Specifications for Aluminum Alloy Chain Link Fence Fabric.
v. F1184, Standard Specifications for Industrial and Commercial Horizontal Slide Gates.
w. F1379, Standard Terminology Relating to Barbed Tape.
x. F1911, Standard Practice for Installation of Barbed Tape.
y. F1916, Standard Specification for Selecting Chain Link Barrier Systems with Coated Chain Link Fence Fabric and Round Posts for Detention Applications.

1.03 DEFINITIONS

A. Terms as defined in ASTM F552.

1.04 SUBMITTALS

A. Action Submittals:

1. Shop Drawings:
   a. Product Data: Include construction details, material descriptions, dimensions of individual components, and finishes for chain link fences and gates.
      1) Fence, gate posts, rails, and fittings.
      2) Chain link fabric.
      3) Gates and hardware.
      4) Operators.

2. Samples:
   a. Chain Link Fabric: Approximately 6 inches square.
   b. Posts, Rails, Braces, Wire, and Ties: Approximately 6 inches long.
   c. Fittings: 1 each.
   d. Color charts accurately illustrating the full range of standard colors available from the manufacturer.

3. Scale layout of fencing, gates and accessories. Drawings shall show fence height, post layout, including sizes and sections; post setting and bracing configuration, details of gates and corner construction, barbed wire support arms; and other accessories which may be necessary.

4. Test Reports: Field test result for compliance of installation of chain link fence, gates, and gate operators.

B. Informational Submittals:

1. Manufacturer's recommended installation instructions.

2. Evidence of supplier and installer qualifications.

3. Operation and Maintenance Data as specified in Section 01 78 23, Operation and Maintenance Data.

1.05 QUALITY ASSURANCE

A. Qualifications:

1. Automatic Gate Operator System Supplier: Five (5) years experience in gate operator systems.

2. Automatic Gate Operator System Installer: Experienced installer who has completed chain link fences and gates similar in material, design, and extent to those indicated for project and whose work has resulted with a record of successful in-service performance with a minimum three (3) years experience.

B. Design, supply of equipment and components, installation, and on-call service shall be product of individual company with record of installations meeting requirements specified.

C. Preinstallation Conference: Conduct conference at project site with gate installer to verify layout and operations of automatic gate operating system.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to site in undamaged condition. Store materials off the ground to provide protection against oxidation caused by ground contact.

1.07 SCHEDULING AND SEQUENCING

A. Complete necessary Site preparation and grading before installing chain link fence and gates.

B. Interruption of Existing Utility Service: Notify owner of utility 72 hours prior to interruption of utility services. Do not proceed with interruption of utility service without written permission from utility owner.

1.08 SPECIAL GUARANTEE

A. Provide manufacturer's extended guarantee or warranty, with Owner named as beneficiary, in writing, as special guarantee. Special guarantee shall provide for correction, or at the option of the Owner, removal and replacement of the following items found defective during a period of five (5) years after the date of final completion. Duties and obligations for correction or removal and replacement of defective work shall be as specified in the General Conditions.

1. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Deflection of fence fabric beyond limits.

PART 2 PRODUCTS

2.01 GENERAL

A. Match style, finish, and color of each fence component with that of other fence components used at the Owner's other facilities.

2.02 CHAIN LINK FENCE FABRIC

A. Galvanized fabric conforming to ASTM A392, Type IT, Class 1, 1.2 ounces per square foot.

B. Height: 72 inches.

C. Core Wire Gauge: No. 9.

D. Pattern: 2-inch diamond-mesh.

E. Diamond Count: Manufacturer's standard and consistent for fabric furnished of same height.

F. Loops of Knuckled Selvages: Closed or nearly closed with space not exceeding diameter of wire.

G. Wires of Twisted Selvages:

1. Twisted in a closed helix three full turns.

2. Cut at an angle to provide sharp barbs that extend minimum ¼ inch beyond twist.

2.03 POSTS

A. General:

1. Strength and Stiffness Requirements: ASTM F1043, heavy industrial fence, except as modified in this Section.

2. Round Steel Pipe, Schedule 40: ASTM F1083.

3. Roll-Formed Steel Shapes: Roll-formed from ASTM AlOll/AlOllM, Grade 45, High-Strength Low-Alloy steel.

4. Lengths: Manufacturer's standard with allowance for minimum embedment below finished grade of 34 inches.

5. Protective Coatings:
   a. Zinc Coating: ASTM F1043, Type A external and internal coating.

B. Line Posts:

1. Round Steel Pipe:
   a. Outside Diameter: 2.375 inches.
   b. Weight: 3.65 pounds per foot.
   c. Shall be spaced no more than 10-feet on center

C. End, Corner, Angle, and Pull Posts:

1. Round Steel Pipe:
   a. Outside Diameter: 2.875 inches.
   b. Weight: 5.79 pounds per foot.

D. Posts for Removable Fence Panels: As specified for end, corner, angle, and pull posts.

E. Posts for Swing Gates 8 Feet High and Under:

1. ASTMF900.

2. Round Steel Pipe:
   a. Outside Diameter: 2.875 inches.
   b. Weight: 4.64 pounds per foot.

3. Framed members spaced no greater than 8 feet apart vertically and horizontally. Welded joints protected by applying zinc-rich paint in accordance with ASTM Practice A780. Positive locking gate latch, pressed steel galvanized after fabrication.

F. Posts for Swing Gates Over 8 Feet High: As recommended by fence manufacturer.

G. Posts for Horizontal Sliding Gates:

1. ASTM F1184, Type II, Class 1.

2. Round Steel Pipe:
   a. Outside Diameter: 2.375 inches.
   B. Vertical and internal members, 1.900 inches O.D.
   C. Weight: 4.64 pounds per foot.

3. Guide posts for Class 1 horizontal-slide gates, equal gate post height, one size smaller, but weight is not less than 3.11 pounds per foot, installed adjacent to gate post to permit gate to slide in space between.

4. Welded joints are to be protected by applying zinc-rich pain in accordance with ASTM Practice A780.

2.04 TOP AND BRACE RAILS

A. Galvanized Round Steel Pipe:

1. ASTM F1083.

2. Outside Diameter: 1.66 inches.

3. Weight: 2.27 pounds per foot.

B. Protective Coatings: As specified for posts.

C. Strength and Stiffness Requirements: ASTM FI043, top rail, heavy industrial fence.

D. Top railing shall be provided in manufacturer's longest lengths, with expansion type couplings, approximately 6-inches long, for each joint. Fence design shall provide positive, secure attachment of top rail to each gate post, corner post, pull post and end post.

2.05 FENCE FITTINGS

A. General: In conformance with ASTM F626, except as modified by this Section. Galvanize all components.

B. Post and Line Caps: Designed to accommodate passage of top rail through

cap, where top rail required. One cap shall be provided for each post.

C. Tension and Brace Bands: Galvanized pressed steel complying with ASTM F626, minimum steel thickness of 12-gauge, minimum width of ¾-in. and minimum zinc coating of 1.2 oz/ft^2.

D. Tension Bars:

1. One-piece galvanized.

2. Length not less than 2 inches shorter than full height of chain link fabric.

3. Provide one bar for each gate and end post, and two for each corner and pull post.

E. Truss Rod Assembly: 3/8-inch diameter, steel, hot-dip galvanized after threading rod and turnbuckle or other means of adjustment.

F. Tie Wires, Clips, and Fasteners: According to ASTM F626.

2.06 TENSION WIRE

A. Tension wire shall be located at the bottom of the fabric and shall consist of No. 7 gauge coated coil spring wire of metal and finish to match fabric. Tension wire shall be interlaced with the fabric or attached to the fabric along the extreme bottom of the fence. Tension wire attachment shall be with fabric tie wires at a spacing of no more than 24-inches apart.

2.07 BARBED WIRE SUPPORTING ARMS

A. Supporting arms shall be manufacturer's standard fabrication, of metal and finish to match fence framework, with provision for anchorage to each post and attachment of three rows of barbed wire to each arm. Supporting arms may be either attached to posts or integral with post top weather cap. Supporting arm shall be single 45-degree arm type and shall be capable of withstanding 250 pounds of downward pull at outermost end.

2.08 BARBED WIRE

A. Barbed wire shall be 2 strand, No. 12-1/2 gauge zinc-coated steel or iron wire with four-point, 14 gauge barbs spaced no more than 5-inches apart.

2.09 GATES

A. General:

1. Gate Operation: Opened and closed easily by one person.

2. Coating: Galvanize all members in a manner consistent with items provided for fence.

3. Metal Pipe and Tubing: Galvanized steel. Comply with ASTM F1043 and ASTM F1083 for materials and protective coatings.

4. Frames and Bracing: Fabricate members from round galvanized steel tubing with outside dimension and weight according to ASTM F900.

5. Gate leaves more than 8-feet wide shall have intermediate tubular members and diagonal truss rods to provide rigid construction, free from sag or twist.

6. Gate Fabric Height: Same as for adjacent fence height.

7. Welded Steel Joints: Paint with zinc-based paint.

8. Chain Link Fabric: Attached securely to gate frame at intervals not exceeding 15 inches.

9. Positive locking gate latch, pressed steel galvanized after fabrication.

10. Galvanized malleable iron or heavy gauge pressed steel post and frame hinges.

B. Swing Gates: Comply with ASTM F900 for single and double swing gate types.

1. Leaf Width: As shown.

2. Hinges: Offset type, malleable iron.
   a. Furnished with large bearing surfaces for clamping in position.
   b. Designed to swing either 180 degrees outward, 180 degrees inward, or 90 degrees in or out, as shown, and not twist or turn under action of gate.
   c. Two hinges shall be provided for each leaf less than 8 feet in height.

3. Latches: Forked type or plunger bar type arranged to engage stop, except single gates of openings less than 10 feet wide may each have forked latch.

4. Gate Stops: Mushroom type or flush plate with anchors, suitable for setting in concrete.

5. Locking Device and Padlock Eyes: Integral part of latch, requiring one padlock for locking both leaves of double gate.

6. Hold-Open Keepers: Designed to automatically engage gate leaf and hold it in open position until manually released.

7. Double Gates: Gate stops shall be provided for double gates, consisting of mushroom type flush plate with anchors, set in concrete, and designed to engage center drop rod or plunger bar. Locking device and padlock eyes shall be provided as an integral part of the latch, permitting both gate leaves to be locked with a single padlock.

C. Cantilever Gates:

1. Fabricate cantilever gate perimeter frames of tubular members. Provide additional horizontal and vertical members to ensure proper gate operation and for attachment of fabric, hardware, and accessories. Provide upright and diagonal bracing rails as required for gate leaf 8 feet and wider. Fabricate as follows:

   a. Horizontal top and bottom frame members:

      2.375 inches OD Schedule 40 pipe weighing 3.65 lbs. per linear foot,
      2 inches square tubing weighing 4.32 lbs. per linear foot

   b. For gates over 6 feet high, or leaf width exceeding 8 feet, interior upright bracing:

      1.90 inches OD Schedule 40 pipe weighing 2.72 lbs. per linear foot or 1.50 inches square tubing weighing 2.60 lbs. per linear foot.

   c. Interior diagonal bracing:

      1.66 inches OD Schedule 40 pipe weighing 2.27 lbs. per linear foot or 1.50 inches square tubing weighing 1.90 lbs. per linear foot.

2. Assemble gate frames by welding or with special malleable or pressed steel fittings and rivets for rigid connections. Use same fabric as for

fence, unless otherwise indicated. Install fabric with stretcher bars at vertical edges. Bars may also be used at top and bottom edges. Attach stretchers to gate frame on all sides at not more than 15 inches on center. Attach hardware with rivets or by other means which will provide security against removal or breakage.

3. Install diagonal cross-bracing consisting of 3/8-inch diameter adjustable length truss rods on gates where necessary to ensure frame rigidity without sag or twist.

4. Provide manufacturer's standard heavy-duty track, ball-bearing hanger sheaves, overhead framing and supports, guides, stays, bracing, and accessories as required.

5. Galvanize all members in a manner consistent with the fencing.

6. Gate Operators:

   a. For on-command opening of the cantilever gate, furnish and install a heavy-duty motorized gate drive as manufactured by Doorking, Inc. or an approved equal. The gate operator shall be in compliance with Underwriter Laboratories, Inc. Standards 325 and 991. Gate drive size shall be as recommended by the gate manufacturer for the intended service. Operator motor shall operate on a 120 volt, single phase, 60 Hz power supply. Unit motor and controls shall be provided with electric overload protection and entrapment protection and the unit shall be designed for ground level mounting on a concrete pad. The cover for the operator unit shall be galvanized steel with an enamel finish. The operator shall include controls and loop detection devices to interface with all appurtenances.

   b. For controlled access to the site, furnish and install one (1) telephone entry device, suitable for exterior mounting. The entry device shall provide full duplex voice communication from the entry location to the telephone in the operations building and shall open the gate by using a four digit code on a touch-pad. The entry device shall be capable of storing at least 1,000 4-digit directory codes. In addition to the entry codes, the device shall allow personnel in the operations building to open the gate via telephone at their discretion. Following opening of the gate, the operator shall close the gate automatically after an adjustable time delay. Inside the plant site, the gate shall be provided with a free exit electric gate control loop embedded in the asphalt to sense a vehicle and open the gate, and upon exiting, and after a time delay, the gate shall automatically close. Embedded reverse loops shall

also be provided on both sides of the gate to provide signals for closing the gate. The telephone entry device shall be Doorking Model 1802 or an approved equal. The device shall be mounted on a heavy-duty steel pedestal with a height of 64 inches. The pedestal shall be Doorking Model 1200-038 or an approved equal.

c. Cantilever gates shall be provided with a reversing edge wired to the gate closing controls. The edge shall be padded and mount to the leading edge of the cantilever gate frame. The device shall deliver a reverse signal to the operator when the gate hits an obstruction during closing.

d. Gate shall be provided with an electric gate lock. The electric lock mechanism shall be wired into the gate controls such that the gate lock will unlatch when the correct security code is input into the electronic combination key lock for the gate. A time delay circuit shall be built into the gate lock/gate operator motor/access key pad controls such that the gate operator motor will not energize until the gate lock is unlatched.

2.10 CONCRETE

A. Provide as specified in Section 03 30 00, Cast-in-Place Concrete.

2.11 FENCE GROUNDING

A. Conductors: Bare, solid wire for No. 6 AWG and smaller; stranded wire for No. 4 AWG and larger.

1. Material above Finished Grade: Copper.
2. Material on or below Finished Grade: Copper.
3. Bonding Jumpers: Braided copper tape, l-inch wide, woven of No. 30 AWG bare copper wire, terminated with copper ferrules.

B. Connectors and Grounding Rods: Comply with UL 467.

1. Connectors for Below-Grade Use: Exothermic welded type.
2. Grounding Rods: Copper-clad steel.

PART 3 EXECUTION

3.01 GENERAL

A. Install chain link fences and gates in accordance with ASTM F567, except as modified in this Section, and in accordance with fence manufacturer's recommendations, as approved by Engineer. Erect fencing in straight lines between angle points.

B. Provide necessary hardware for a complete fence and gate installation.

C. Any damage to galvanized surfaces, including welding, shall be repaired with paint containing zinc dust in accordance with ASTM A780.

D. Drainage Crossings: Where the chain-link fence must cross drainage ditches or swales, the main fence shall be carried across a ditch or swale with additional fence added below.

1. Frames and Bracing: The fence added below shall be fabricated with galvanized round steel pipe conforming to the requirements for top and brace rails.

2. The construction of the frame shall be welded or assembled with corner fittings. The frame shall be rigid and to the extent necessary to maintain a 2-inch clearance between bottom of the frame and finish grade. If necessary to maintain rigidity, attach to the frame a series of 3/8-inch diameter galvanized steel pipe stakes that are embedded a minimum of 2 feet to the sides and bottom of the ditch.

3. Attach chain link fabric securely to frame at intervals not exceeding 12 inches.

3.02 PREPARATION

A. Clear area on either side of fence to the extent specified in Section 31 10 00, Site Clearing. Eliminate ground surface irregularities along fence line to the extent necessary to maintain a 2-inch clearance between bottom of fabric and finish grade.

B. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

C. Embedment Coating: Coat portion of galvanized or aluminum-coated steel posts that will be embedded in concrete as specified in Section 09 90 00, Painting and Coating. Extend coating 1 inch above top of concrete.

3.03 POST SETTING

A. Drill or hand-excavate holes for posts to diameters and spacing indicated, in firm, undisturbed soil. Driven posts are not acceptable. Postholes shall be clear of loose materials. Waste materials from postholes shall be removed from site or regraded into slopes on site.

B. Posthole Depth:

1. Minimum 3 feet below finished grade.
2. 2 inches deeper than post embedment depth below finish grade.

C. Set posts with minimum embedment below finished grade of 30 inches and with top rail at proper height above finished grade. Verify posts are set plumb, aligned, and at correct height and spacing. Brace posts, as necessary, to maintain correct position and plumbness until concrete sets.

D. Backfill postholes with concrete to 1-1/2 inches above finished grade. Vibrate or tamp concrete for consolidation. Protect above-ground portion of posts from concrete splatter.

E. Before concrete sets, crown and finish top of concrete to readily shed water.

F. Terminal Posts: Locate terminal end, corner, and gate posts per ASTM F567 and terminal pull posts at changes in horizontal or vertical alignment of 15 degrees or more.

G. Line Posts: Space line posts uniformly at 10 feet on centers between terminal end, corner, and gate posts.

3.04 POST BRACING

A. Install according to ASTM F567, maintaining plumb position, and alignment of fencing. Install braces at gate, end, pull, and corner posts diagonally to adjacent line posts to ensure stability. Install braces on both sides of corner and pull posts.

1. Locate horizontal braces at mid-height of fabric or higher, on fences with top rail, and 2/3-fabric height on fences without top rail. Install so posts are plumb when diagonal truss rod assembly is under proper tension.

3.05 TOP RAILS

A. Install according to ASTM F567, maintaining plumb position and alignment of fencing. Run rail continuously through line post caps and terminating into rail end attached to posts or posts caps fabricated to receive rail at terminal posts. Install top rail sleeves with springs at 105 feet maximum spacing to permit expansion in rail.

3.06 TENSION WIRE

A. Install according to ASTM F567 and ASTM F1916, maintaining plumb position and alignment of fencing. Pull wire taut, without sags. Fasten fabric to tension wire with tie wires at a maximum spacing of 24 inches on center.

B. Install tension wire within 6 inches of bottom of fabric and tie to each post with not less than same diameter and type of wire.

3.07 CHAIN LINK FABRIC

A. Do not install fabric until concrete has cured minimum 7 days.

B. Apply fabric to outside of enclosing framework. Pull fabric taut to provide a smooth and uniform appearance free from sag, without permanently distorting fabric diamond or reducing fabric height. Tie fabric to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.

C. Splicing shall be accomplished according to ASTM F1916 by weaving a single picket into the ends of the rolls to be joined.

D. Leave 2 inches between finish grade or surface and bottom selvage, unless otherwise indicated.

E. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts with tension bands spaced not more than 15 inches on center.

F. Tie Wires: Fasten ties to wrap a full 360 degrees around rail or post and a minimum of one complete diamond of fabric. Twist ends of tie wire three full twists, and cut off protruding ends to preclude untwisting by hand.

1. Maximum Spacing: Tie fabric to line posts at 12 inches on center and to brace and top rails at 24 inches on center.

3.08 GATES

A. Swing Gates: Install gates according to manufacturer's written instructions, level, plumb and secure for full opening without interference. Attach fabric and hardware to gate using tamper-resistant or concealed means. Adjust hardware for smooth operation and lubricate where necessary so gates operate satisfactorily from open or closed position. Gates shall be plumb in the closed position having a bottom clearance of 3 inches, grade permitting. Hinge and latch offset opening space shall be no greater than 3 inches in the closed position.

B. Horizontal Slide Gates: Installation varies by design and manufacturer. Install according to manufacturer's instructions and in accordance with ASTM F567. Gates shall be plum in the closed position, installed to slide with an initial pull force no greater than 40 lbs. Roller guards and guide posts must be installed on Type I external roller cantilever slide gate in compliance with ASTM F1184. Ground clearance shall be 3 inches, grade permitting. Electrically operated gate installation must conform to ASTM F220, UL 325 and the manufacturer's recommendations.

C. Set gate stops in concrete to engage center drop rod or plunger bar.

3.09 ELECTRICAL GROUNDING

A. Ground fences at a maximum interval of 1,000 feet in accordance with applicable requirements of IEEE C2, National Electrical Safety Code.

B. Protection at Crossings of Overhead Electrical Power Lines: Ground fence at location of crossing and at a maximum distance of 150 feet on each side of crossing.

C. Grounding Method: At each grounding location, drive a grounding rod vertically until top is 6 inches below finished grade. Connect rod to fence with No.6 AWG conductor. Connect conductor to each fence component at grounding location.

3.10 FIELD QUALITY CONTROL

A. Post and Fabric Testing: Test fabric tension and line post rigidity according to ASTM F1916.

B. Gate Tests:

1. Prior to acceptance of installed gates, demonstrate proper operation of gates under each possible open and close condition specified.

2. Adjust gate to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range.
3. Confirm that latches and locks engage accurately and securely without forcing and binding.

3.11 MANUFACTURER'S SERVICES

A. Provide manufacturer's representative at Site in accordance with Section 01 43 33, Manufacturers' Field Services, to train Owner's personnel to adjust, operate, and maintain gates.

3.12 CLEANUP

A. Remove excess fencing materials and other debris from Site.

END OF SECTION

SECTION 32 92 20
SEEDING AND SODDING

PART 1 - GENERAL

1.01 GENERAL

The Contractor shall furnish all labor, materials, and equipment to spread topsoil, fertilize and lime, and seed and mulch or sod, to establish a healthy stand of grass as shown on the Drawings and specified herein.

PART 2 - PRODUCTS

2.01 LIME AND FERTILIZER

Two (2) tons of agricultural limestone per acre and 400 pounds per acre of fertilizer with a 8-24-24 analysis shall be uniformly applied.

2.02 SEED

State-certified common Bermuda grass shall be sowed at the rate of 20 pounds per acre. The seed shall have a minimum of eighty percent (80%) germination and a maximum of one percent (1%) weeds.

2.03 SOD

Sod shall be common Bermuda grass.

2.04 TOPSOIL

Topsoil shall be fertile, natural soil, typical of the locality, free from large stones, roots, sticks, peat, weeds, and sod, and obtained from naturally well-drained areas. It shall not be excessively acid or alkaline nor contain other toxic material harmful to plant growth. Topsoil stockpiled under other Sections or Divisions may be used, but the Contractor shall furnish additional topsoil at his own expense, if required.

2.05 MULCH

Mulch shall be clean small-grain straw.

PART 3 - EXECUTION

3.01 GRADING

A. Upon completion of backfill, the construction area shall be regraded roughly to original or regrade contours. The top four (4) inches of the regrade must be free from rocks and other deleterious material. All rock shall be picked up and disposed of at a designated place approved by Owner.

B. Any and all settled areas must be brought to grade and restored to as near original conditions as possible prior to final acceptance of the project by the Owner.

3.02 TOPSOIL APPLICATION

A. Topsoil shall be spread and lightly compacted to finished grade. Compacted topsoil shall have a depth of 6 inches. No topsoil shall be spread in water or while frozen or muddy.

3.03 SEEDING AND SODDING

A. Preparation of Seed Bed: Where the area to be seeded is not sufficiently pulverized to provide a good seedbed, the seedbed shall be prepared by pulverizing the soil to a depth of four (4) inches with a disk harrow, drag harrow, spike toothed harrow or similar tool immediately prior to seeding. Lime and fertilizer shall be applied prior to preparing seedbed

B. Seeding: The seed shall be raked into the ground to a depth of approximately ¼ inch.

C. Mulching: All seeded areas shall be mulched with clean small-grain straw at a rate of 1½ to 2 tons per acre and adhering to the general requirements of the Standard Specifications for Highway Construction of the Alabama Department of Transportation.

D. Sodding: The sod bed shall be prepared, fertilized and limed similar to those areas to be seeded. Subsequently the sod shall be placed in accordance with the Standard Specifications for Highway Construction of the Alabama Department of Transportation.

E. Watering: The Contractor shall keep all seeded and sodded areas watered and in good condition, reseeding or resodding if, and when, necessary, until a good, healthy, uniform growth is established over the entire area. Subsequently, the Contractor shall maintain these areas in good condition until final acceptance of the Contract.

F. Washouts: On slopes, the Contractor shall provide against washouts by an approved method. Any washout which occurs shall be regraded and reseeded or resodded at the Contractor's expense until a healthy stand of grass is established.

G. Maintenance: The Contractor shall maintain the areas in grass in a neat manner by watering, mowing, and raking clippings and leaves until the project is completed. All areas that fail to maintain sustained growth shall be reestablished by the Contractor at no additional cost to the Owner

END OF SECTION