Subsection 10.01
Mobilization

I. Scope: This subsection includes the mobilization of personnel, equipment and supplies at the project site in preparation for beginning work. Mobilization includes, but is not limited to the movement of equipment, personnel, material, and supplies to the project site; the establishment of other project facilities; and documented performance and payment bond costs necessary prior to beginning work.

II. Measurement: Measurement of the Item, "Mobilization" as specified herein will be by the "Lump Sum". Each project shall be evaluated prior to advertisement for bids whether the project warrants a mobilization bid item.

III. Payment

A. Partial payments of the "Lump Sum" bid for mobilization will be as follows. The adjusted contract amount for construction items as used below is defined as the total contract amount less the lump sum bid for Mobilization.

1. When 5% of the adjusted contract amount for construction items is earned, 75% of the mobilization lump sum bid or 10%of the total contract amount, whichever is less, will be paid. Previous payment under this item will be deducted from the above amount.

2. When 10% of the adjusted contract amount for construction items is earned, 90% of the mobilization lump sum bid or 15% of the total contract amount, whichever is less, will be paid. Previous payments under this item will be deducted from the above amount.

3. When bond payments are requested, a maximum of 50% of mobilization will be paid.

4. Upon completion of all work under this contract, payment for the remainder of the lump sum bid for "Mobilization" will be made.

ONLY PAGE OF THIS SUBSECTION

Subsection 10.02
Air and Water Pollution,
Soil Erosion and Siltation Control

I. Scope

This subsection includes control measures as shown on the plans, Section 9, Sediment, Erosion Control, and Water Quality of the Design Criteria Manual of the City of Amarillo Stormwater Master Plan or as ordered by the Engineer or in the Contractor's opinion to mitigate pollution during a project. The Contractor shall install, maintain and remove erosion, sedimentation, and environmental control measures to prevent or reduce the discharge of pollutants in accordance with the Storm Water Pollution Prevention Plan (SW3P) submitted by the Contractor and the Texas Pollutant Discharge Elimination System (TPDES) General Permit TXR 150000. Projects over 5 acres in area shall comply with their Pollution Prevention Plans and Notices of Intent as required by the EPA General NPDES Permit for Texas. The measures shall control water pollution, soil erosion, and siltation by using sandbags, temporary sediment control fence, hay bales, soil retention blankets, construction exits, soil erosion logs, and other erosion control devices or methods.

The temporary erosion control measures shall coordinate with the permanent erosion control measures to assure economical, effective, and continuous erosion control throughout the construction period and warranty period.

Temporary control may include work outside the construction limits such as borrow pit operations, equipment and material storage sites, disposal areas, and temporary plant sites. Contractor shall obtain permission to implement temporary erosion control measures on property not owned by him.

Control measures are defined as Best Management Practices used to prevent or reduce the discharge of pollutants. Perform work in a manner to prevent degradation of receiving waters, facilitate project construction, and comply with applicable federal, state, and local regulations. Ensure the installation and maintenance control measure is performed in accordance with the manufacturer's or designer's specifications.

II. Materials

A. Sandbags: Furnish sandbags made out of polypropylene, polyethylene, or polyamide woven fabric with a minimum unit weight of 4 ounces per square yard, a Mullen burst strength exceeding 300 psi, and an ultraviolet stability exceeding 70%.

Use natural coarse sand or manufactured sand meeting the gradation given in Table 1 to fill sandbags. Filled sand bags must be 24 to 30 inches long, 16 to 18 inches wide, and 6 to 8 inches thick.

Table 1
Sand Gradation

Sieve Size	**Retained (% by Weight)**
#4	Maximum 3%
#100	Minimum 80%
#200	Minimum 95%

Aggregate may be used instead of sand for situations where sandbags are not adjacent to traffic. The aggregate size must not exceed 3/8 inch.

B. Rock Filter Dams

1. Aggregate: Furnish aggregate with approved hardness, durability, cleanliness, and resistance to crumbling, flaking, and eroding. Provide the following:

a) Type 1, rock filter dams, use 3 to 6 inch aggregate.

b) Type 2 rock filter dams, use 4 to 8 inch aggregate.

2. Wire: Provide minimum 20 gauge galvanized wire for the steel mesh and ties wires for rock filter dams.

C. Baled Hay: Provide hay bales weighing at least 50 pounds, composed entirely of vegetable matter, measuring 30 inches or longer and bound by wire, nylon, or polypropylene string.

D. Temporary Sediment Control Fence

1. Fabric: Provide fabric materials in accordance with TxDOT's DMS-6230, "Temporary Sediment Control Fence Fabric."

2. Net Reinforcement: Provide net reinforcement of at least 12.5 gauge galvanized welded wire mesh, with a maximum opening size of 2 x 4 inches, and at least 24 inches wide.

3. Posts: Provide straight wood or steel posts with a minimum length of 48 inches. Furnish soft wood posts at least 3 inches in diameter, or use nominal 2 x 4 inch boards. Furnish hard wood posts with a minimum cross section of 1-1/2 x 1-1/2 inches. Furnish T shaped steel posts with a minimum weight of 1.25 pounds per foot.

4. Staples: Provide staples with a crown at least ¾ inch wide and legs ½ inch long.

E. Soil Retention Blankets: Provide soil retention blankets that meet the requirements of TxDOT's DMS-6370, "Soil Retention Blankets", and are on TxDOT's Approved Producers List. Use material of the following type as shown on the plans and provide a copy of the manufacturer's label for the selected product.

1. Type A: Slopes 3:1 or flatter, clay soils,

2. Type B: Slopes 3:1 or flatter, sandy soils,

3. Type C: Slopes steeper than 3:1, clay soils, and

4. Type D: Slopes greater than 3:1, sandy soils.

F. Construction Exits: Provide crushed aggregates that are clean, hard, durable, and free from adherent coatings such as salt, alkali, dirt, clay, loam, shale, soft or flaky materials, and organic and injurious matter. Use 4 to 8 inch aggregate sizes.

G. Biodegradable Erosion Control Logs

1. Core Material: Furnish core material that is biodegradable or recyclable. Use mulch, aspen excelsior wood fibers, chipped site vegetation, agricultural rice, wheat straw, coconut fiber, 100% recyclable fibers, or any other acceptable material unless specifically called out on the plans. Permit no more than 5% of the material to escape from the containment mesh. Stuff core material densely so logs do not deform.

2. Containment Mesh: Furnish containment mesh that is 100% biodegradable, photodegradable, or recyclable such as burlap, twine, UV photodegradable plastic, polyester, or any other acceptable material.

H. Other: All other materials shall meet commercial grade standards and shall be approved by the Engineer before being incorporated into the project.

III. Equipment: Contractor shall provide whatever equipment is necessary to complete this subsection.

IV. Construction Methods

A. General: Any conflict between these requirements and pollution control laws, rules, or regulations of other Federal, state, or local agencies causes the more restrictive laws, rules, or regulations to apply.

The Contractor shall be responsible for compliance for construction practices, construction operations, and construction work.

B. Schedule: Prior to the start of construction, the Contractor shall submit in writing schedules for accomplishment of temporary and permanent erosion control work, as are applicable for clearing and grubbing, grading, construction, paving, and structures at watercourses. The Contractor shall also submit a proposed method of erosion and dust control on haul roads and borrow pits and a plan for disposal of objectionable materials. Work shall not be started until the erosion control schedules and methods of operation for the applicable construction have been accepted by the Engineer.

The Contractor shall incorporate the following methods, where practicable, in his erosion control plan: exposing the minimum area of erodible earth; applying temporary mulch with or without seeding; using water sprinkler trucks; using covered haul trucks; using dust palliatives or penetration asphalt on haul roads; and using plastic sheet coverings.

C. Authority of Engineer: The Engineer has the authority to limit the surface area of erodible earth material exposed by clearing and grubbing, to limit the surface area of erodible earth material exposed by excavation, borrow and fill operations, and to direct the Contractor to provide immediate permanent or temporary pollution control measures to minimize contamination of adjacent streams or other watercourses, lakes, ponds, or other areas of water impoundment.

D. Construction Details: The Contractor will be required to incorporate all permanent erosion control features into the project at the earliest practicable time. Except where future construction operations will damage slopes, the Contractor shall perform the permanent seeding and mulching and other specified slope protection work in stages, as soon as substantial areas of exposed slopes can be made available. Temporary erosion and pollution control measures will be used to correct conditions that develop during construction that were not foreseen during the design stage; that are needed prior to installation of permanent control features; or that are needed temporarily to control erosion that develops during normal construction practices, but are not associated with permanent control features on the project.

Where erosion is likely to be a problem, clearing and grubbing operations should be scheduled and performed so that grading operations and permanent erosion control features can follow immediately thereafter if the project conditions permit; otherwise, temporary erosion control measures may be required between successive construction stages.

The Engineer will limit the area of clearing and grubbing, excavation, borrow, and embankment operations in progress, commensurate with the Contractor's capability and progress in keeping the finish grading, mulching, seeding, and other such permanent control measures current in accordance with the accepted schedule. Should seasonal limitations make such coordination unrealistic, temporary erosion control measures shall be taken immediately to the extent feasible and justified.

In the event that temporary erosion and pollution control measures are required due to the Contractor's negligence, carelessness, or failure to install permanent controls as a part of the work as scheduled or are ordered by the Engineer, such work shall be performed at the Contractor's expense. The Engineer may increase or decrease the area of erodible earth material to be exposed at one time as determined by analysis of project conditions.

The erosion control features installed by the Contractor shall be acceptably maintained by the Contractor during the construction period.

Whenever construction equipment must cross watercourses at frequent intervals, and such crossings will adversely affect the sediment levels, temporary structures should be provided.

Pollutants such as fuels, lubricants, bitumen, raw sewage, wash water from concrete mixing operations, and other harmful materials shall not be discharged into or near rivers, streams, and impoundments or into natural or manmade channels leading thereto.

E. Stabilization: Initiate stabilization for disturbed areas no more than 14 days after the construction activities in the portion of the site have temporarily or permanently ceased.

F. Installation, Maintenance and Removal Work: Perform work in accordance with the SWP3, according to manufacturer's guidelines, and in accordance with the TPDES General Permit TXR 150000. Install and maintain the integrity of temporary erosion and sedimentation control devices to accumulate silt and debris until soil disturbing activities are completed and permanent erosion control features are in place or the disturbed area has been adequately stabilized as approved.

Remove devices upon approval or as directed. Finish grade and dress the area upon removal. The Contractor will retain ownership of materials and shall remove them from the project when no longer needed.

G. Rock Filter Dams for Erosion Control: Remove trees, brush, stumps, and other objectionable material that may interfere with the construction of rock filter dams. Place sandbags as a foundation when required or at the Contractor's option.

Place the aggregate to the lines, height, and slopes specified, without undue voids. Place the aggregate on the mesh and then fold the mesh at the upstream side over the aggregate and secure it to itself on the downstream side with wire ties or hog rings. Place rock filter dams perpendicular to the flow of the stream or channel. Rock filter dams will be of the type shown below.

1. **Type 1:** 18 inches tall and base width at least 2 foot wide.

2. **Type 2:** 36 inches tall and a base width at least 2 foot wide.

H. Construction Exits: Prevent traffic from exiting the construction site without using construction exits. Construct using crushed aggregate of at least 8 inches. Construction exits must be at least 14 foot wide and 20 feet long.

I. Soil Retention Blankets: Provide a copy of the manufacturer's installation instructions to the Engineer or ODR before placement of the material. Place the soil retention blankets within 24 hours after seeding. Install and anchor the soil retention blankets in strict accordance with the recommendations contained within the manufacturer's published literature. Installation includes the repair of ruts, reseeding and the removal of rocks, clods and other foreign materials which may prevent contact of the blanket with the soil.

J. Sandbags for Erosion Control: Construct a berm or dam of sandbags that will intercept sediment-laden storm water runoff from disturbed areas, create a retention pond, detain sediment, and release water in sheet flow. When stacking sandbags, offset sandbags by half the length of the sandbags on each row. Sandbags placed at inlets need to be secured so they are not allowed to enter the inlet.

K. Temporary Sediment Control Fence: Provide temporary sediment control fence near the downstream perimeter of a disturbed area to intercept sediment from sheet flow. Incorporate the fence into erosion control measures used to control sediment in areas of higher flow. Install the fence as shown on the plans or as directed.

1. **Installation of posts:** Embed posts at least 18 inches deep, or adequately anchor, if in rock, with a spacing of 6 to 8 feet and install on a slight angle toward the runoff source.

2. **Fabric and Net Reinforcement Attachment:** Attach the reinforcement to wooden posts with staples, or to steel posts with T-clips, in at least 4 places equally spaced unless otherwise directed. Fasten the fabric to the top strand of the reinforcement by hog rings or cord every 15 inches or less.

3. **Fabric Anchoring:** Dig trenches along the uphill side of the fence to anchor 6 to 8 inches of fabric. Provide a minimum trench across section of 6 by 6 inches. Place the fabric against the side of the trench and align approximately 2 inches of fabric along the bottom in the upstream direction. Backfill the trench and hand tamp.

4. **Fabric and Net Splices:** Locate splices at a fence post with a minimum lap of 6 inches attached in at least 6 places equally spaced unless otherwise shown in the plans. Do not splice in concentrated flow areas.

L. Biodegradable Erosion Logs: Install biodegradable erosion logs near the downstream perimeter of a disturbed area to intercept sediment from sheet flow. Incorporate the biodegradable erosion control logs into the erosion measures used to control sediment in areas of higher flow. Install, align, and locate the biodegradable erosion logs as specified below or shown on the plans.

Secure biodegradable erosion logs in a method adequate to prevent displacement as a result of normal rain events, prevent damage to the logs, and as approved, such that flow is not allowed under the logs. Temporarily removing and replacing biodegradable erosion logs as to facilitate daily work is allowed at the Contractor's expense.

M. Hay Bales: Install hay bales at locations shown on the plans by embedding in the soil at least 4 inches, fill gaps between the bales with hay.

V. Measurement

A. Temporary erosion and pollution control work required which is not attributed to the Contractor's negligence, carelessness, or failure to install permanent controls will be performed as scheduled or ordered by the ODR or Engineer. Completed and accepted work will be measured as follows:

1. Rock filter dams will be measured by the linear foot.

2. Construction exits will be measured by the square yard.

3. Erosion control fence will be measured for by the linear foot.

4. Biodegradable erosion control logs will be measured by the linear foot.

5. Sandbags used for erosion control shall be measured by the each.

6. Soil retention blanket shall be measured by the square yard.

B. Temporary control measures at construction areas outside the project limits, such as borrow and disposal areas, haul roads, equipment and material storage sites, and temporary plant sites, will not be measured and paid for directly but shall be considered as a subsidiary obligation of the Contractor with costs included in the contract prices bid for the items to which they apply.

VI. Payment: Where other directed work falls within the specifications for a work subsection that has a contract price, the units of work shall be measured and paid for at the contract unit price bid for the various items.

Temporary control measures not covered by contract items that are ordered by the Engineer will be paid for in accordance with the extra work provisions of the general conditions of the contract.

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Subsection 10.03
Fence

I. Scope: This item includes chain link and barbed wire fencing. The Contractor shall furnish all material, labor, superintendence, tools, equipment, shop drawings, and incidentals necessary to complete this construction in accordance with the drawings and these specifications.

II. Materials

A. Chain Link Fence:

1. Wire Fabric: The chain link fabric shall be Type I, zinc coated steel fabric. Zinc coating shall have a minimum weight of 0.5 ounces per square foot of uncoated wire surface. The fabric shall be 72 inches high and shall be No. 11 gauge with 2 -3/8 inch mesh. The fabric shall be knuckled at bottom selvage and twisted and bared at top selvage.

2. Point of Intersection, Cross Member & End Posts: Points of intersections (P.I.), cross member and end posts shall be 3 inch O.D. pipe, 10 feet total length, with a 0.16 inch wall thickness, weighing 4.64 pounds per linear foot. Posts shall be hot-dip galvanized.

3. Gate Posts: Gate posts shall be 4 inch O.D. pipe, 10 feet total length, with a 0.16 inch wall thickness, weighing 6.56 pounds per linear foot. Posts shall be hot-dip galvanized.

4. Line Posts: Line posts shall be 2 3/8 inch O.D. pipe weighing 3.12 pounds per linear foot with a wall thickness of 0.13 inches. Line posts shall be a minimum length of 9 feet and shall be hot-dip galvanized.

5. Top and Bottom Rails: All top and bottom rails shall be 1 5/8 inch O.D. pipe weighing 1.84 pounds per linear foot with a wall thickness of 0.11 inches. Top and bottom rails shall be hot-dip galvanized and shall be provided with approved couplings and connections. The fabric shall be tied to the rail with No. 11 gauge tie wires on a maximum spacing of 12 inches.

6. Guy Wire: All guy wires shall be appropriate tensile strength cable, coated as specified for the wire fabric, and shall be installed at all cross members, end posts, and P.I. posts. All guy wires shall be installed to the top of posts and anchored to the ground at a distance of 6 feet from the fence using a standard mobile home anchoring system. End posts shall be anchored in line with the fence. Cross members shall be anchored at a 90° angle to the fence toward the center. P.I. posts shall be anchored at a 90° angle to the fences

away from the center.

7. Fittings: All fittings shall be steel of adequate size as approved.

8. Gates: Gates shall be installed as shown on the plans. The fabric covering shall be the same as the fence. All gates shall be furnished complete with the fittings. Gate frames shall be 1-5/8 inch O.D., hot-dip galvanized pipe weighing 1.84 pounds per linear foot with a wall thickness of 0.13 inches.

9. Man Gates: Man gates shall be installed as shown on the plans and per manufacturer's recommendation.

10. Cross Members: At a maximum spacing of 500 feet intervals, cross members shall be installed. The cross members shall be constructed from 3 inches O.D. pipe weighing 4.64 pounds per linear foot with a wall thickness of 0.16 inches. Spacing between posts for cross members shall be 6 feet. Cross members shall be constructed in accordance with these specifications and the detailed drawing on the plans. A guy wire shall be installed at each cross member as specified.

11. Extension Arms: The 16 inch extension arms shall be steel with provisions for 5 wires, and shall extend at a 45° angle west or south from the line posts.

12. Wire: Each wire shall be of a smooth pattern with two strands of No. 12-1/2 gauge. Each strand shall be coated as specified for the fabric. A total of 5 wires shall be installed along the entire length of the fence.

13. Barbed Wire: Barbed wire on the top of the fence to be 3 strands high and have 4-point barbs.

14. Concrete: Shall conform to Subsection 4.08, “Concrete”, and shall have a minimum 28 day compressive strength of 3000 pounds.

B. Barbed Wire Fence

1. Metal Posts and Braces: Steep pipe used for posts and braces shall conform to the specifications of ASTM A 120. Steel sections used for posts and braces shall be a good commercial quality weldable steel. All material shall be new and no used, rerolled or open seam material will be acceptable. All posts and braces shall meet the weight and length requirements shown on the plans. Galvanized steel sections shall conform to ASTM A 123. All posts and braces, except galvanized products, shall be painted with an approved anti-corrosive paint and after installation all areas where the paint coat has been damaged shall be spot-coated with paint of the same color as the shop coat. No other painting will be required. All fittings required for posts and braces shall be pressed or rolled steel, forged steel, malleable iron or wrought iron of good commercial

quality and shall conform to the details shown on the plans.

a) Metal Line Posts, Pull Posts and Braces for Pull Posts: Metal posts and braces shall be "H" column, tubular or any other approved shape and shall be properly adapted to provide means for attaching the fencing to the posts in a manner that will not damage the posts nor fencing material. Metal line posts, pull posts and braces for pull posts shall each be of the weight and dimensions shown on the plans. Line posts shall be provided with tapered anchor plates securely attached thereto. The anchor plates shall be of the area, size and weight shown on the plans. The anchor plate may be omitted provided the post is set in a concrete footing as shown on the plans.

b) Metal Corner, End and Gate Posts: Metal corner, end and gate posts and braces shall be any one of the shapes specified for line posts. Metal posts shall each be of the weight and dimensions shown on the plans**.**

2. Untreated Wood Posts and Braces: Untreated wood posts and braces shall be pine, cedar or mesquite of the length and size shown on the plans and shall be cut from sound timber. Posts shall have a minimum diameter as indicated on the plans and shall be approximately round, shall be trimmed of all knots and knobs and shall be straight and relatively smooth. The posts shall be free from defects such as injurious ring shakes, unsound or loose knots, splits or other defects that might impair their strength and durability. Sound knots will be permitted provided they are not in clusters and do not exceed 1/3 of the small diameter or least dimension of the posts. A line drawn from the center of each end of the post shall not fall outside the center of the post at any point more than 2 inches.

3. Treated Wood Posts and Braces: Treated wood posts and braces shall be pine or fir timber of the size and dimensions shown on the plans. The timber shall be sound and free from all decay, shakes, splits or any other defects which would weaken the posts or braces or otherwise make them structurally unsuitable for the purposes intended**.**

The posts and braces shall be round, square or sawed rectangular shape. The slope of grain in sawed, square or rectangular posts for the full length shall not exceed one in ten and knots shall be sound, tight, well spaced and shall not exceed one-third of the small diameter or least dimension of the post. A line drawn from the center of each end of the post shall not fall outside the center of the post at any point more than 2 inches. All braces shall have a creosote, pentachlorophenol, ACA or CCA treatment. Posts shall be inspected at time of treatment. Round posts and braces shall be peeled to remove all outer bark and all inner cambium bark, except that occasional strips of bark may remain if not over 1/2 inch wide or over 3 inches long. All knots shall be trimmed flush with the sides, spurs and splinters removed and the ends cut square. The

allowable taper from end to end of round posts and braces shall not exceed 1 1/2 inches.

4. Gates and Gate Posts: Gates and gate posts shall be of the materials and to the dimensions detailed on the plans.

5. Barbed wire: Barbed wire shall conform to ASTM A 121, Class 1. The barbed wire shall consist of two strands of 12-1/2-gauge wire, twisted with two-point 14-gauge barbs spaced not more than 5 inches apart, or may be as specified on the plans for high tensile wire.

6. Wire Mesh: Wire mesh fabric shall conform to ASTM A 116, Class 1. The wire mesh shall be of the height and design shown on the plans. The top and bottom wires shall be 10-gauge minimum and the intermediate wires and vertical stays shall be 12-1/2-gauge minimum**.**

7. Miscellaneous: Galvanized bolts and nuts for attaching braces and straps to metal posts and suitable galvanized devices for holding barbed wire and wire mesh firmly in position shall be of good commercial quality and design.

Staples used to secure barbed wire and wire mesh fabric to wood posts shall be not less than 1 1/2 inches long and the wire from which they are made shall be galvanized.

III. Equipment: The Contractor shall use proper equipment to install the proposed fence.

IV. Construction Methods

A. Chain Link Fence: Line posts shall be spaced a maximum of 10 feet apart. Gate posts shall be spaced to fit the gates furnished. All line, gate and P.I. posts shall be set at least 36 inches deep. All line posts shall be set in holes not less than 9 inches in diameter, and all gate, end and P.I. posts shall be set in holes not less than 12 inches in diameter, and filled with concrete. Concrete shall extend one 1 inch above finished grade and be sloped away from the post in all directions such that water shall not pond around the post. Fabric shall be stretched taut and securely attached to the line posts with clips spaced 12 inches apart. Suitable stretcher bars and bands shall be used at all end posts, P.I. posts, and gate posts. The guy wires shall be tightly stretched and securely attached to the top of cross member posts. The fence shall be installed in accordance with the manufacturer's instructions, in a neat and workmanship like manner.

B. Barbed Wire Fence: Fence posts shall be spaced at the intervals and set to the depth shown on the plans. Posts shall be set in a vertical position. Corner and pull posts shall be braced in two directions. End and gate posts shall be braced in one direction. Where alignment changes 30° or more, a corner post shall be installed. At alignment angles varying from 15° to less than 30°, the angle post shall be braced to

adjacent line posts by diagonal tension wires. Where steel posts are specified, a pull post assembly shall be installed at approximately 500 foot intervals and where wood posts are specified the spacing of pull post assemblies shall be approximately 1000 feet, unless otherwise shown on the plans. Metal line posts may be driven in place providing such driving does not damage the posts. Metal corner, end, pull posts and braces shall be set in Portland cement concrete footings crowned at the top to shed water. All posts shall be placed the minimum depth below ground as shown on the plans or as directed by the Engineer. Posts shall be set plumb and firm to the line and grade shown on the plans. Backfilling shall be thoroughly tamped in 4 inch layers. The timber post braces shall be notched as shown on plans.

The corner, end or angle post assembly shall be installed before stretching the wire between line posts. At all grade depressions where stresses tend to pull the posts out of the ground, the fencing shall be snubbed or guyed at the critical point by means of a double 9-gauge galvanized wire connected to each horizontal line of barbed wire or to the top and bottom wire or wire mesh fabric, and to a deadman weighing not less than 100 pounds, buried in the ground as shown on plans. The fencing shall be stretched before being snubbed and guyed. Existing cross-fences shall be connected to the new fences and corner posts with braces which shall be connected to the new fences and corner posts with braces which shall be placed at junctions with existing fences. The barbed wire and wire fabric shall be drawn taut and fastened to posts with galvanized ties or staples as specified on the plans.

V. Measurement: The fence as constructed shall be measured as shown on the project plans and detailed in the project proposal.

VI. Payment: The cost of furnishing and installing the fence complete as specified shall be included in the price bid per lineal foot for the fence installation.

LAST PAGE OF THIS SUBSECTION

Subsection 10.04
Seed, Sod, Top Soil and Vegeatative Watering of Right Of Way

I. Scope: This subsection includes preparing the ground surface for topsoil application, removing topsoil from designated stockpiles or areas to be stripped on the site or from approved sources off the site, placing and spreading the topsoil on prepared areas of soil preparation, seeding, sodding, fertilizing and watering in accordance with this subsection at the locations shown on the plans or as directed by the Engineer.

II. Materials

A. Seed

1. Native Grass Areas: The species and application rates of grass, legume, and cover crop seed furnished shall be those stipulated herein. Seed shall conform to the requirements of Fed. Spec. JJJ-S-181.

Seed shall be furnished separately or in mixtures in standard containers with the seed name, lot number, and net weight, percentages of purity and of germination and hard seed, and percentage of maximum weed seed content clearly marked for each kind of seed. The Contractor shall furnish the Engineer duplicate signed copies of a statement by the vendor certifying that each lot of seed has been tested by a recognized laboratory for seed testing within 6 months of date of delivery. This statement shall include: name and address of laboratory, date of test, lot number for each kind of seed, and the results of tests as to name, percentages of purity and of germination, and percentage of weed content for each kind of seed furnished, and in case of a mixture, the proportions of each kind of seed.

Seeds shall be applied at a minimum rate as shown in Table 1:

Table1
Minimum Application Rate

Seed Type	Pure Live Seed pounds/acre
Green Sprangletop	3.6
Sideoats Grama (El Reno)	1.5
Blue Grama	7.2
Buffalograss	3.6

Seeding shall be performed during the period between January 15 and June 15, inclusive.
Cool weather seeding shall be at a minimum rate as shown in Table 2:

Table 2
Minimum Application Rate

Seed Type	Pure Live Seed pounds/acre
Tall Fescue	4.5
Western Wheatgrass	5.6
Wheat (Red, Winter)	34.0

Seeding cool season shall be performed during the period between September 1 and November 30 inclusive.

2. Developed Areas with Bluegrass, Fescue, or Hybrid Bermuda: Seed as designated on the plans shall be furnished.

B. Sod: Sod shall be type specified on the plans. Use block sod or rolled sod free from noxious weeds or any matter deleterious to the growth and substance of the sod.

C. Lime: Lime shall be ground limestone containing not less than 85% of total carbonates, and shall be ground to such fineness that 90% will pass through a No. 20 mesh sieve and 50% will pass through a No. 100 mesh sieve. Coarser material will be acceptable, providing the rates of application are increased to provide not less than the minimum quantities and depth specified in the special provisions on the basis of the two sieve requirements above.

D. Fertilizer: Fertilizer shall be standard commercial fertilizers supplied separately or in mixtures containing the percentages of total nitrogen, available phosphoric acid, and water-soluble potash. They shall be applied at the rate and to the depth specified herein, and shall meet the requirements of Fed. Spec. O-F-241 and applicable state laws. They shall be furnished in standard containers with name, weight, and guaranteed analysis of contents clearly marked thereon. No cyanamide compounds or hydrated lime shall be permitted in mixed fertilizers.

The fertilizers may be supplied in one of the following forms:

1. A dry, free flowing fertilizer suitable for application by a common fertilizer spreader;

2. A finely ground fertilizer soluble in water, suitable for application by power sprayers; or

3. A granular or pellet form suitable for application by blower equipment.

Fertilizers shall be 16-20-0 or 16-8-8 commercial fertilizer and shall be spread uniformly at the rate of 400 pounds per acre.

E. Topsoil: Topsoil shall be the surface layer of soil with no admixture of refuse or any material toxic to plant growth, and it shall be reasonably free from subsoil and stumps, roots, brush, stones (2 inches or more in diameter), clay lumps or similar

objects. Brush and other vegetation which will not be incorporated with the soil during handling operations shall be cut and removed. Ordinary sods and herbaceous growth such as grass and weeds are not to be removed but shall be thoroughly broken up and intermixed with the soil during handling operations. The topsoil or soil mixture, unless otherwise specified or approved, shall have a pH range of approximately 5.5 pH to 7.6 pH, when tested in accordance with the methods of testing of the association of official agricultural chemists in effect on the date of invitation of bids. The organic content shall be not less than 3% nor more than 20% as determined by the wet combustion method (chromic acid reduction). There shall be not less than 20% nor more than 80% of the material passing the 200 mesh sieve as determined by the wash test in accordance with ASTM C 117.

The soil for fill and topsoiling of areas to be repaired shall be at least of equal quality to that which exists in areas adjacent to the area to be repaired. The soil shall be relatively free from large stones, roots, stumps, or other materials that will interfere with subsequent sowing of seed, compacting, and establishing turf, and shall be approved by the Engineer before being placed.

Natural topsoil may be amended by the Contractor with approved materials and methods to meet the above specifications.

F. Water: Water usage shall conform to Subsection 3.04, "Requirements for Water Usage."

III. Construction Methods

A. Advance Preparation and Cleanup for Seeding: After grading of areas has been completed and before applying fertilizer and ground limestone, areas to be seeded shall be raked or otherwise cleared of stones larger than 2 inches in any diameter, sticks, stumps, and other debris which might interfere with sowing of seed, growth of grasses, or subsequent maintenance of grass covered areas. If any damage by erosion or other causes has occurred after the completion of grading and before beginning the application of fertilizer and ground limestone, the Contractor shall repair such damage. This may include filling gullies, smoothing irregularities, and repairing other incidental damage.

An area to be seeded shall be considered a satisfactory seedbed without additional treatment if it has recently been thoroughly loosened and worked to a depth of not less than 5 inches as a result of grading operations and, if immediately prior to seeding, the top 3 inches of soil is loose, friable, reasonably free from large clods, rocks, large roots, or other undesirable matter, and if shaped to the required grade.

However, when the area to be seeded is sparsely sodded, weedy, barren and unworked, or packed and hard, any grass and weeds shall first be cut or otherwise satisfactorily disposed of, and the soil then scarified or otherwise loosened to a depth not less than 5 inches. Clods shall be broken and the top 3 inches of soil shall be worked into a satisfactory seedbed by discing, or by use of cultipackers, rollers, drags, harrows, or other appropriate means.

1. Dry Application Method for Seeding:

a) Liming: Lime shall be applied separately and prior to the application of any fertilizer or seed and only on seedbeds which have previously been prepared as described above. The lime shall then be worked into the top 3 inches of soil after which the seedbed shall again be properly graded and dressed to a smooth finish.

b) Fertilizing: Following advance preparations and cleanup fertilizer shall be uniformly spread at the rate which will provide not less than the minimum quantity stated.

c) Seeding: Grass seed shall be sown at the rate specified immediately after fertilizing, and the fertilizer and seed shall be raked within the depth range stated in the special provisions. Seeds of legumes, either alone or in mixtures, shall be inoculated before mixing or sowing, in accordance with the instructions of the manufacturer of the inoculant. When seeding is required at other than the seasons shown on the plans or in the special provisions, a cover crop shall be sown by the same methods required for grass and legume seeding.

d) Rolling: After the seed has been properly covered, the seedbed shall be immediately compacted by means of an approved lawnroller, weighing 40 to 65 pounds per foot of width for clay soil or any soil having a tendency to pack, and weighing 150 to 200 pounds per foot of width for sandy or light soils.

2. Wet Application Method for Seeding:

a) General: The Contractor may elect to apply seed and fertilizer by spraying them on the previously prepared seedbed in the form of an aqueous mixture and by using the methods and equipment described herein. The rates of application shall be as specified in the special provisions.

b) Spraying Equipment: The spraying equipment shall have a container or water tank equipped with a liquid level gauge calibrated to read in increments not larger than 50 gallons over the entire range of the tank capacity, mounted so as to be visible to the nozzle operator. The container or tank shall also be equipped with a mechanical power-driven agitator capable of keeping all the solids in the mixture in complete suspension at all times until used.

The unit shall also be equipped with a pressure pump capable of delivering 100 gallons per minute at a pressure of 100 pounds per square inch. The pump shall be mounted in a line which will recirculate the

mixture through the tank whenever it is not being sprayed from the nozzle. All pump passages and pipe lines shall be capable of providing clearance for 5/8 inch solids. The power unit for the pump and agitator shall have controls mounted so as to be accessible to the nozzle operator. There shall be an indicating pressure gauge connected and mounted immediately at the back of the nozzle.

The nozzle pipe shall be mounted on an elevated supporting stand in such a manner that it can be rotated through 360° horizontally and inclined vertically from at least 20° below to at least 60° above the horizontal. There shall be a quick acting, three-way control valve connecting the recirculating line to the nozzle pipe and mounted so that the nozzle operator can control and regulate the amount of flow of mixture delivered to the nozzle. At least three different types of nozzles shall be supplied so that mixtures may be properly sprayed over distance varying from 20 to 100 feet. One shall be a close range ribbon nozzle, one a medium range ribbon nozzle, and one a long-range jet nozzle. For removal and cleaning, all nozzles shall be connected to the nozzle pipe by means of quick release couplings.

In order to reach areas inaccessible to the regular equipment, an extension hose at least 50 feet in length shall be provided to which the nozzles may be connected.

c) Mixtures: Lime, if required, shall be applied separately, in the quantity specified, prior to the fertilizing and seeding operations. Not more than 220 pounds of lime shall be added to and mixed with each 100 gallons of water. Seed and fertilizer shall be mixed together in the relative proportions specified, but not more than a total of 220 pounds of these combined solids shall be added to and mixed with each 100 gallons of water.

All mixtures shall be constantly agitated from the time they are mixed until they are finally applied to the seedbed. All such mixtures shall be used within 2 hours from the time they were mixed or they shall be wasted and disposed of at locations acceptable to the Engineer.

d) Spraying: Lime, if required, shall be sprayed only upon previously prepared seedbeds. After the applied lime mixture has dried, the lime shall be worked into the top 3 inches, after which the seedbed shall again be properly graded and dressed to a smooth finish.

Mixtures of seed and fertilizer shall only be sprayed upon previously prepared seedbeds on which the lime, if required, shall already have been worked in. The mixtures shall be applied by means of a high-pressure spray which shall always be directed upward into the air so that the mixtures will fall to the ground like rain in a uniform spray. Nozzles or sprays shall never be directed

toward the ground in such a manner as might produce erosion or runoff.

Particular care shall be exercised to insure that the application is made uniformly and at the prescribed rate and to guard against misses and overlapped areas. Proper predetermined quantities of the mixture in accordance with specifications shall be used to cover specified sections of known area. Checks on the rate and uniformity of application may be made by observing the degree of wetting of the ground or by distributing test sheets of paper or pans over the area at intervals and observing the quantity of material deposited thereon.

On surfaces which are to be mulched as indicated by the plans or designated by the Engineer, seed and fertilizer applied by the spray method need not be raked into the soil or rolled. However, on surfaces on which mulch is not to be used, the raking and rolling operations will be required after the soil has dried.

3. Maintenance of Seeded Areas: The Contractor shall protect seeded areas against traffic or other use by warning signs or barricades, as approved by the Engineer. Surfaces gullied or otherwise damaged following seeding shall be repaired by regrading and reseeding as directed. The Contractor shall mow, water as directed, and otherwise maintain seeded areas in a satisfactory condition until final inspection and acceptance of the project.

When either the dry or wet application method outlined above is used for work done out of season, it will be required that the Contractor establish a good stand of grass of uniform color and density to the satisfaction of the Engineer. If at the time when the contract has been otherwise completed it is not possible to make an adequate determination of the color, density, and uniformity of such stand of grass, payment for the unaccepted portions of the areas seeded out of season will be withheld until such time as these requirements have been met.

B. Sod

1. Preparing Soil for Sod: Cultivate the area to a depth of 4 inches before placing sod.

2. Placing Sod: Plant sod between the average date of the last freeze in the spring and 6 weeks before the average first freeze in the fall according to the Texas Almanac. Sod shall be tamped after placement to form a thoroughly compacted area free of voids. Spot sod as needed.

C. Advance Preparation for Topsoil: Areas to be topsoiled shall be shown on the plans. If topsoil is available on the site, the location of the stockpiles or areas to be

stripped of topsoil and the stripping depths shall be shown on the plans.

Suitable equipment necessary for proper preparation and treatment of the ground surface, stripping of topsoil, and for the handling and placing of all required materials shall be on hand, in good condition, and approved by the Engineer before the various operations are started.

Immediately prior to dumping and spreading the topsoil on any area, the surface shall be loosened by discs or spike tooth harrows, or by other means approved by the Engineer, to a minimum depth of 2 inches to facilitate bonding of the topsoil to the covered subgrade soil. The surface of the area to be topsoiled shall be cleared of all stones larger than 2 inches in any diameter and all litter or other material which may be detrimental to proper bonding, the rise of capillary moisture, or the proper growth of the desired planting. Limited areas, as shown on the plans, which are too compact to respond to these operations, shall receive special scarification.

Grades on the area to be topsoiled, which have been established by others as shown on the plans, shall be maintained in a true and even condition. Where grades have not been established, the areas shall be smooth graded and the surface left at the prescribed grades in an even and properly compacted condition to prevent, insofar as practical, the formation of low places or pockets where water will stand.

1. Obtaining Topsoil: Prior to the stripping of topsoil from designated areas, any vegetation, briars, stumps and large roots, rubbish or stones found on such areas, which may interfere with subsequent operations, shall be removed using methods approved by the Engineer. Heavy sod or other cover, which cannot be incorporated into the topsoil by discing or other means, shall be removed.

When suitable topsoil is available on the site, the Contractor shall remove this material from the designated areas and to the depth as directed by the Engineer. The topsoil shall be spread on areas already tilled and smooth graded, or stockpiled in areas approved by the Engineer. Any topsoil stockpiled by the Contractor shall be rehandled and placed without additional compensation. Any topsoil that has been stockpiled on the site by others, and is required for topsoiling purposes, shall be moved and placed by the Contractor. The sites of all stockpiles and areas adjacent thereto which have been disturbed by the Contractor shall be graded if required and put into a condition acceptable for seeding.

When suitable topsoil is secured off the site, the Contractor shall locate and obtain the supply, subject to the approval of the Engineer. The Contractor shall notify the Engineer sufficiently in advance of operations in order that necessary measurements and tests can be made. The Contractor shall remove the topsoil from approved areas and to the depth as directed. The topsoil shall be hauled to the site of the work and placed for spreading, or spread as required. Any topsoil hauled to the site of the work and stockpiled shall be rehandled and placed without additional compensation.

2. Placing Topsoil: The topsoil shall be evenly spread on the prepared areas to a uniform depth of 4 inches after compaction, unless otherwise shown on the plans. Spreading shall not be done when the ground or topsoil is frozen, excessively wet, or otherwise in a condition detrimental to the work. Spreading shall be carried on so that turfing operations can proceed with a minimum of soil preparation or tilling.

After spreading, any large, stiff clods and hard lumps shall be broken with a pulverizer or by other effective means, and all stones or rocks (2 inches or more in diameter), roots, litter, or any foreign matter shall be raked up and disposed of by the Contractor. After spreading is completed, the topsoil shall be satisfactorily compacted by rolling with a cultipacker or by other means approved by the Engineer. The compacted topsoil surface shall conform to the required lines, grades, and cross sections. Any topsoil or other dirt falling upon pavements as a result of hauling or handling of topsoil shall be promptly removed.

3. Inspection and Tests: The Engineer shall be notified of the source of topsoil to be furnished by the Contractor when required by the proposal. The topsoil shall be inspected to determine if the selected soil meets the requirements specified and to determine the depth to which stripping will be permitted. At this time, the Contractor may be required to take representative soil samples from several locations within the area under consideration and to the proposed stripping depths, for testing purposes as specified.

D. Vegetative Watering: Apply when directed or shown in the plans. Apply water at a uniform and controllable rate. Ensure that watering does not erode soil**.**

IV. Measurement

Areas outside the designated area that are damaged by the Contractor shall be prepared and seeded or sodded by the Contractor at his expense.

The quantity of seeding to be measured shall be the number of acres measured on the ground surface, completed and accepted.

The quantity of sod will be measured the square yard of sod placed and accepted.

Vegetative watering shall be measured by the 1,000 gallons applied.

Topsoil obtained on or off the site shall be measured by the number of square yards of topsoil measured in its final position.

V. Payment

Payment shall be made at the contract unit price measured and payment shall be full compensation for furnishing and placing all seeding material, fertilizer, grass seed, sod,

vegetative watering and for all labor, equipment, tools, and incidentals necessary to complete the work prescribed in this item.

Payment will be made at the contract unit price per square yard of topsoil obtained on or off the site. This price shall be full compensation for furnishing all materials and for all preparation, placing, and spreading of the materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

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Subsection 10.05
Jacking, Boring or Tunneling Pipe

I. Scope: This subsection shall govern for furnishing and installing of pipe by the methods of jacking, boring or tunneling as shown on the plans and in accordance with this subsection.

II. Materials: Pipe may be either corrugated metal pipe of the size, type, design and dimension shown on the plans, or reinforced concrete pipe, conforming to the special requirements for jacking, boring or tunneling Reinforced Concrete Pipe, Corrugated Metal Pipe or ¼ inch steel casing, of the size, strength and dimension shown on the plans, or other types as may be specified by the Engineer or shown on the plans.

III. Construction Methods:

A. General: If the grade of the pipe at the jacking, boring, or tunneling end is below the ground surface, suitable pits or trenches shall be excavated for the purpose of conducting the jacking, boring or tunneling operations and for placing end joints of the pipe. Excavations greater than 5 feet in depth shall be protected as specified in Subsection 5.08, "Trench Protection."

Where pipe is required to be installed under railroad embankments, highways, streets, or other facilities by jacking, boring or tunneling methods, construction shall be made in such a manner that will not interfere with the operation of the railroad, street, highway, or other facility, and shall not weaken or damage any embankment or structure.

Pipe damaged in jacking, boring or tunneling operations shall be repaired in place to the satisfaction of the Engineer. Pipe damaged beyond repair will be removed and replaced. Repair or removal and replacement of damaged pipe will be done at the Contractor's expense.

The pits or trenches excavated to facilitate jacking, boring or tunneling operations shall be backfilled immediately after the installation of the pipe has been completed.

B. Jacking: Heavy duty jacks suitable for forcing the pipe through the embankment shall be provided. In operating jacks, even pressure shall be applied to all jacks used. A suitable jacking head and suitable bracing between the jacks and the jacking head shall be provided so that pressure will be applied to the pipe uniformly around the ring of the pipe. Joint cushioning material of plywood or other material may be used as approved by the Engineer. Plywood cushioning material shall be 1/2 inch minimum thickness for pipe diameters 30 inches and less and 3/4 inch minimum thickness for pipe diameters greater than 30 inches. Cushioning rings may be made up of single or multiple pieces. A suitable jacking frame or back stop shall be provided. The pipe or casing to be jacked shall be set on guides, properly braced together, to support the section of the pipe and to direct the pipe in the proper line and

grade. The whole jacking assembly shall be placed so as to line up with the direction and grade of the pipe. In general, the embankment material shall be excavated just ahead of the pipe, the material removed through the pipe, and the pipe forced through the embankment with jacks, into the space thus provided.

The Contractor shall furnish for the Engineer's approval, a plan showing the proposed method of jacking. The plan shall include the design for the jacking head, jacking support or back stop, arrangement and position of jacks, pipe guides, etc., complete in the assembled position.

The excavation for the underside of the pipe, for at least one-third of the circumference of the pipe, shall conform to the contour and grade of the pipe. Over-excavation to provide not more than 2 inches of clearance may be provided for the upper half of the pipe. This clearance shall be tapered to zero at the point where the excavation conforms to the contour of the pipe. Over-excavation in excess of 1 inch shall be pressure grouted the entire length of the installation.

The distance that the excavation shall extend beyond the end of the pipe depends on the character of the material, but shall not exceed 2 feet. This distance shall be decreased when directed by the Engineer.

Preferably, the pipe shall be jacked from the low or downstream end. The final position of the pipe shall not vary from the line and grade shown on the plans, or established by the Engineer, by more than 1 inch in 10 feet. The variation shall be regular and in one direction and the final flow line shall be in the direction shown on the plans.

The Contractor may use a cutting edge of steel plate around the head end of the pipe extending a short distance beyond the end of the pipe with inside angles or lugs to keep the cutting edge from slipping back onto the pipe.

When jacking of pipe has begun, the operation shall be carried on without interruption, insofar as practicable, to prevent the pipe from becoming firmly set in the embankment.

C. Boring: The boring shall proceed from a pit provided for the boring equipment and workers. The location of the pit shall be approved by the Engineer. The boring shall be done mechanically either using a pilot hole or by the auger method.

When the pilot hole method is used an approximate 2 inch pilot hole shall be bored the entire length of the crossing and shall be checked for line and grade on the opposite end of the bore from the work pit. This pilot hole shall serve as the centerline of the larger diameter hole to be bored.

When the auger method is used, a steel encasement pipe of the appropriate diameter equipped with a cutter head to mechanically perform the excavation shall be used. Augers shall be of sufficient diameter to convey the excavated material to the work pit.

Excavated material shall be disposed of by the Contractor, as approved by the Engineer. The use of water or other fluids in connection with the boring operation will be permitted only to the extent necessary to lubricate cuttings; jetting will not be permitted.

In unconsolidated soil formations, a gel-forming colloidal drilling fluid consisting of at least 10% of high grade carefully processed bentonite may be used to consolidate cuttings of the bit, seal the walls of the hole, and furnish lubrication for subsequent removal of cuttings and immediate installation of the pipe.

Allowable variation from line and grade shall be as specified in Section III.B. "Jacking." Overcutting in excess of 1 inch shall be remedied by pressure grouting the entire length of the installation.

D. Tunneling: Where the characteristics of the soil, the size of the proposed pipe, casing or the use of monolithic sewer would make the use of tunneling more satisfactory than jacking or boring; or when shown on the plans, a tunneling method may be used, with the approval of the Engineer.

When tunneling is permitted, the lining of the tunnel shall be of sufficient strength to support the overburden. The Contractor shall submit the proposed liner method to the Engineer for approval. Approval by the Engineer shall not relieve the Contractor of the responsibility for the adequacy of the liner method.

The space between the liner plate and the limits of excavation shall be pressure-grouted or mud-jacked.

Access holes for placing concrete shall be spaced at maximum intervals of 10 feet.

E. Joints:

1. If corrugated metal pipe is used, joints may be made by field bolting or by connecting bands in accordance with Subsection 5.03, “Corrugated Metal Storm Sewer Pipe.”

2. If reinforced concrete pipe is used, the joints shall be in accordance with Subsection 5.01, “Reinforced Concrete Storm Sewer Pipe.” and

3. If steel casing is the joints will be welded and inspected.

IV. Measurement: This subsection will be measured by the linear foot between the ends of the pipe along the flow line.

V. Payment

The work performed and materials furnished in accordance with this Subsection and measured as provided under "Measurement" will be paid for at the unit price bid for "Jacking or Boring Pipe", or "Jacking, Boring or Tunneling Pipe" of the type, size, and strength or design specified.

This price shall be full compensation for excavation, grouting, backfilling and disposal of surplus material; for furnishing all materials, including pipe liner materials required for tunnel operations; for all preparation, hauling and installing of pipe and pipe liner materials; and for all labor, tools, equipment and incidentals necessary to complete the work except that protection methods for excavations greater than 5 feet in depth shall be measured and paid for as required under Subsection 5.08,"Trench Excavation Protection."

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