

SECTION 31 25 13 - EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. This Section pertains to the provisions for the control of erosion in the construction area and in stockpile areas including seeding, the construction of temporary swales and sedimentation basins as required and shown on the drawings. All areas where existing vegetation and grass cover have been bared by construction activities shall be protected from erosion.
- B. Contractor is responsible for meeting all local, state and federal regulations regarding erosion control including the applicable provisions of the National Pollution Discharge Elimination System, Phase II, regulations from the Clean Water Act.
- C. This project shall be designed to meet LEED Silver design criteria. Construction activity pollution prevention is a mandatory requirement.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Drawings and general provisions of the Contract, including A-Procurement and Contracting Requirements, Division 00 and Division 01 apply to this section.
- B. Section 31 11 00 Clearing and Grubbing
- C. Section 31 22 13 Site Grading
- D. Section 31 23 33 Trenching, Backfilling and Compaction
- E. Section 33 40 00 Drainage
- F. Texas Department of Transportation's Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges (2004)
- G. Harris County Public Infrastructure Department Engineering Division Specifications for the Construction of Roads and Bridges within Harris County, TX – latest printing October 2003.

1.3 PERMITS (NOT USED)

1.4 APPLICABLE PUBLICATIONS (NOT USED)

1.5 PROTECTION OF ADJACENT WORK (NOT USED)

1.6 DEFINITIONS

- A. Best Management Practices (BMP's) means physical facilities schedules of activities, prohibition of practices, maintenance procedures, and other management practices , when properly designed, installed, and maintained, will be effective to prevent or reduce the discharge of pollution associated with construction activities. BMP's also include treatment requirements, operating procedures, and practices to control site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

- B. Block Sodding: Sodding for erosion control and for final stabilization shall consist of providing and planting Bermuda grass, San Augustine grass, or other acceptable sod along or across such areas as are designated on the drawings and in accordance with the specification requirements herein outlined.
- C. Hydromulch Seeding: Seeding, followed by the application of a mulch erosion control blanket shall consist of preparing the ground, sowing of seeds, application of a fertilizer, and stabilization with mulch consisting of a biodegradable fiber along and across such areas as are designated on the plans and in accordance with these specifications
- D. Silt Fence: The reinforced filter fabric barrier consists of geotextile fabric supported by a net reinforced fence stretched across and attached to supporting posts or frame and entrenched. Work shall be performed during construction operations and prior to final stabilization to control erosion and sedimentation as designated on the plans and in accordance with these specifications.
- E. Inlet Protection Barriers: The inlet protection barrier consists of a geotextile fabric (filter fabric) supported by a net reinforced fence structure and constructed around a storm drain inlet, catch basin, or culvert. An alternative design of the inlet protection barrier, as approved by the Engineer, consists of fiber rolls placed around a frame, staked in place (or weighted down with clean gravel bags), and constructed around a storm drain inlet, catch basin or culvert. This work shall be performed during construction operations and prior to final stabilization to control erosion and sedimentation. As designated on the plans and in accordance with these specifications.
- F. Sediment Basins: A sediment basin is a temporary basin or dam constructed across a waterway or excavated location to intercept sediment-laden runoff and to trap and retain the sediment. A sediment basin is usually installed at points of discharge from drainage areas greater than 5 acres. Work shall be performed during construction operations and prior to final stabilization to control erosion and sedimentation as designated on the plans and in accordance with these specifications.
- G. Stabilized Construction Access: This work shall consist of the installation of temporary erosion protection and sediment control stabilized construction access - type I, rock, utilized during construction operations and prior to final stabilization, in accordance with these specifications and construction drawings
- H. Rock Filter Dams: Rock filter dams are temporary berms constructed of stone to intercept and slow storm water runoff to retain sediment on the construction site.
 - 1. Depending upon the type of rock filter dam specified in the construction plans as Type 1, 2, 3, or 4, the aggregate fill may be unwrapped, wrapped in twisted hexagonal wire mesh, or confined in a gabion wire basket. Applications of RockFilter Dams are as follows:
 - a. Type 1 dams may be used at toe of slopes, around inlets, in small ditches, and at dike or swale outlets. Type 1 dams are recommended for erosion and sediment control from a drainage area of 5 acres or less.
 - b. Type 2 dams may be used in ditches and at dike or swale outlets.
 - c. Type 3 dams may be used in stream flow.

- d. Type 4 sack gabions may be used in ditches and smaller channels to form an erosion and sediment control dam

1.7 QUALITY ASSURANCE

- A. Codes and Standards: Install and maintain erosion control systems in compliance with all authorities having jurisdiction.

1.8 PROJECT/SITE CONDITIONS (NOT USED)

1.9 SUBMITTALS (NOT USED)

PART 2 - PRODUCTS

2.1 SUSTAINABLE MATERIALS

- A. Contractor shall strive to utilize sustainable materials, which include rapidly renewable materials, regional materials, regionally manufactured materials, regionally extracted materials, recycled contents.
- B. This project is intended to meet LEED silver criteria.

2.2 GRASS

- A. Materials for erosion control seeding shall conform to TxDOT Item 164.
- B. Materials for erosion control sodding shall conform to TxDOT Item 162.

2.3 FERTILIZER

- A. Materials for fertilizing erosion control seeding and/or sodding shall conform to TxDOT Item 166.2

2.4 WATER

- A. Use clean potable water for maintaining the grass developed after erosion control seeding and/or sodding. ***[REVIEWER CAN ENTERTAIN GREEN OPTIONS OF USING OTHER WATER SOURCES BESIDES POTABLE WATER. EXPAND DESCRIPTIONS HERE]** Water shall be reasonably clean and free of oil, salt, acid, alkali, sugar, vegetable matter or other substances injurious to the finished product.
- B. Water sources other than the local municipal domestic water supply must be approved by the Owner.
- C. If onsite reclaimed water sources are used, tanks and appertices must be clearly marked with the words "non-potable" water.

2.5 SILT FENCE

- A. Geotextile fabric for Silt Fences must meet the TxDOT Departmental Material Specifications DMS 6230 Temporary Sediment Control Fence Fabric.

2.6 STRAW BALES

- A. Standard rectangular hay bales bound by baling wire, clean and dry

2.7 INLET PROTECTION BARRIERS

- A. Geotextile per 2.5 Silt Fence above.
- B. Hardwood Posts shall be 2x2 minimum length 4 feet.
- C. Net reinforced fence shall be 2 inch by 4 inch welded wire fabric mesh. The mesh support height shall be the equivalent height, or greater, of the geotextile fabric to be attached.

2.8 STABILIZED CONSTRUCTION ACCESS

- A. Materials to be per TxDOT spec section 506.2.E.1 for Type 1

2.9 ROCK FILTER DAM

- A. Materials. Geotextile fabric shall consist of a woven monofilament or spunbond nonwoven fibers consisting of long-chain synthetic polymers composed of at least 95 percent by weight of polyolefins. Geotextile fabric shall equal or exceed the following average roll values or as directed by the Engineer:
 - 1. Minimum average roll value.
 - a. Elongation ³ 50 percent.
 - b. Grab Strength – 200 pounds.
 - c. Puncture Strength – 75 pounds.
 - d. UV Stability (retained strength) – 50 percent after 500 hours of exposure.
 - 2. Maximum average roll value.
 - a. Apparent Opening Size (AOS) – 0.6 mm/#30 US sieve.
- B. Geotextile fabric shall be resistant to commonly encountered soil chemicals, mildew, rot, insects, and deterioration resulting from exposure to sunlight or heat. Geotextile fabric shall provide an expected useable life comparable to the anticipated construction period.
- C. Aggregate for the rock filter dams shall consist of crushed stone. Aggregate particles shall be composed of clean, hard, durable materials free from adherent coatings, salt, alkali, dirt, clay, loam, shale, soft or flaky materials or organic and injurious matter. Aggregate shall be cubic or rounded form, not elongated, flat, shapes. Spalls, fragments, and chips shall not exceed 5 percent by weight. Crushed concrete shall not be substituted for the crushed stone unless as approved by the Engineer. ***[NOTE THAT CRUSHED CONCRETE IS TYPICALLY A PREFERRED OPTION FOR PROJECTS WANTING LEED ACCREDITATION. MODIFY THIS PREVIOUS SENTENCE ACCORDINGLY FOR LEED PROJECTS]** Aggregate size shall depend upon the type of

rock filter dam specified in the construction plans. Aggregate size based on type of rock filter dam is as follows:

1. Type 1: 3 inches to 5 inches, open-graded.
 2. Type 2: 3 inches to 5 inches, open-graded.
 3. Type 3: 4 inches to 8 inches, open-graded.
 4. Type 4: 3 inches to 5 inches, open-graded.
- D. Mesh is required for reinforced type rock filter dams. Mesh shall be 20 gauge galvanized double twisted hexagonal wire mesh with 1-inch diameter hexagonal openings. Mesh wire shall be zinc coated prior to being double twisted. Reinforcing spiral binders, lacing wire, and stiffeners shall be made of wire having the same coating material and same wire size as the wire mesh. Gabion wire baskets shall equal or exceed the requirements of the wire mesh.

PART 3 - EXECUTION

3.1 GENERAL

- A. Protection
1. Protect benchmarks, monuments, existing structures, existing fences, existing roads, existing sidewalks, existing paving, existing curbs, and other features indicated on Drawings to remain, or not indicated to be removed, from damage and displacement. If damaged or displaced, notify Engineer and correct defects as directed.
 2. Protect above and below grade utilities which are to remain.
- B. Preparation:
1. Use all means necessary to control dust on and near the work, and on and near off-site storage, and spoil areas, if such dust is caused by performance of the work of this Section, or if resulting from the condition in which Project Site is left by Contractor.
 2. Moisten surfaces, as required, to prevent dust from being a nuisance to the public, neighbors, and concurrent performance of other work on Project Site.
- C. Install erosion control systems at the site's boundary at locations where stormwater runoff will leave the site prior to starting any clearing, stripping, or earthwork operations
- D. Minimize the time areas are to be exposed without vegetative cover.
- E. Properly dispose of solid waste, paints, solvents, cleaning compounds, etc.
- F. Store construction materials in designated areas away from drainageways and low areas.
- G. Provide portable toilets and properly dispose of sanitary sewage.
- H. Construct containment berms and utilize drip pans at fuel and liquid storage tanks and containers.

3.2 INSTALLATION OF EROSION CONTROL DEVICES

- A. Install erosion control devices to protect adjacent and downstream properties from damage and pollution resulting from erosion caused by the work of this Contract.
 - 1. Implement erosion control measures indicated on drawings and additional erosion control measures necessary to prevent damage to adjacent and downstream properties.
- B. Install silt fence located along perimeter of site or grading limits immediately following site clearing operations specified under Division 31 Section 31 11 00 Clearing and Grubbing.
 - 1. Install silt fence fabric from a continuous roll for the length of the silt fence whenever possible to minimize the number of joints.
 - a. Create joints in fabric by securely fastening fabric at the support post with overlap extending to the next post.
 - 2. Drive support post into ground not less than 18 inches.
 - 3. Excavate a 4 inch wide by 4 inch deep trench on up-slope side of silt fence.
 - a. Line trench with silt fence fabric material.
 - b. Backfill trench with soil or gravel.
- C. Install straw bale fence at completion of grading operations in affected area as indicated on drawings.
 - 1. Install erosion control devices at storm sewer inlets immediately after completion of the storm sewer.
 - 2. Place straw bales in a single row, lengthwise on the contour, and embedded 4 inches into soil.
 - 3. Secure each individual bale in place by stakes or reinforcement bars driven through bales into the ground to a depth of not less than 18 inches.
- D. Install inlet protection barriers at curb inlets and at area inlets.
- E. Install straw bale fences as ditch checks in drainage ditches.
- F. Install Stabilized Construction Access per TxDOT specification 506.4.C.5.
- G. Rock filter dams shall be installed so as to prevent downstream deposition of sediment and debris from the construction site. Rock filter dams shall be constructed to meet the following criteria:
 - 1. Type 1:
 - a. Non-reinforced.

- b. Height: 18-24 inches
 - c. Top width: 2 feet minimum.
 - d. Upstream and downstream side slope of dam: 2:1 maximum.
 - e. Open graded aggregate 3-5 inches.
2. Type 2:
 - a. Reinforced with wire mesh.
 - b. Height: 18-36 inches.\
 - c. Top width: 2 feet minimum.
 - d. Upstream and downstream side slope of dam: 2:1 maximum.
 - e. Open graded aggregate 3-5 inches.
3. Type 3:
 - a. Reinforced with wire mesh.
 - b. Height: 36-48 inches.
 - c. Top width: 2 feet minimum.
 - d. Upstream and downstream side slope of dam: 3:1 maximum.
 - e. Open graded aggregate 4-8 inches.
4. Type 4:
 - a. Reinforced in a gabion wire basket.
 - b. Height: 30 inches minimum.
 - c. Top width: 2 feet minimum.
 - d. Upstream and downstream side slopes of dam: none specified.
 - e. Open graded aggregate 3-5 inches.
5. The separation geotextile fabric and wire mesh shall be sized and placed in accordance with the rock filter dam detail and as specified by the type of rock filter dam shown in the construction plans. The separation geotextile fabric may be omitted only as approved by the Engineer. The separation geotextile fabric and wire mesh shall be securely staked with wooden or metal stakes to the bottom and side slopes of the ditch or channel prior to aggregate placement. Sack gabions for Type 4 rock filter dams

shall be securely staked with wooden or metal stakes to the bottom and side slopes of the ditch or channel, as well.

6. Aggregate fill shall be placed to the width, length, height and slopes in accordance with this specification and the rock filter dam detail and as specified by the type of rock filter dam shown in the construction plans. The height of the dam shall be measured vertically from the existing ground to the top of the filter dam. The length of the dam shall be measured across the top centerline of the dam from embankment to embankment and includes the additional length embedded into the embankment. Width of the dam shall be measured along the top face of the dam.
7. Wire mesh shall be folded upstream side over the aggregate fill and tightly secured to itself on the downstream side using wire ties. Hog rings may be substituted for wire ties.
8. Additional aggregate fill or gravel bags shall be placed and secured at the embedded section to prevent low flows from short circuiting the dam at the adjacent dirt embankment area.
9. The Contractor shall be responsible for periodic reshaping, repairing, and maintaining of rock filter dams as directed by the Engineer.
10. The Contractor is responsible for removal and proper disposal of sediment and debris from the rock filter dam. Removed sediment and debris shall not be allowed to flush into the storm sewer system, waterways, jurisdictional wetlands, or onto adjacent properties. Sediment deposits shall be removed before they reach one-third of the height of the dam. Uncontaminated sediment can be placed at the project spoil site or, if properly handled, spread out to supplement fill requirements. If sediment has been contaminated, then it shall be disposed of in accordance with the applicable federal, state, and local regulations. Offsite disposal shall be the responsibility of the Contractor. Contractor is encouraged to reuse aggregate and wire mesh if remaining materials meet original spec requirements.

3.3 EROSION CONTROL SEEDING

- A. Exposed fill and stockpile areas shall be protected from windborne erosion if the phasing of the construction operations is anticipated to leave the exposed fill and stockpile areas unattended for 6 weeks or more. At completion of stockpiling operations, stockpiles shall be shaped and graded to drain. Provide a layer of mulch to all sides of the stockpile to protect the stockpile from windborne erosion.
- B. Areas designated on the drawings to be seeded shall be seeded in accordance to the Texas Department of Transportation Standard Specifications, Item 164, titled "Seeding for Erosion Control". Broadcast seeding method shall be used as described in TxDOT, Item 164.4 unless otherwise instructed.
- C. Areas to be seeded with slopes steeper than 10H:1V shall also utilize a soil retention blanket as specified in TxDOT Item 169 Soil Retention Blanket.

3.4 TEMPORARY SWALES

- A. Temporary drainage swales shall be provided as required to carry drainage away from the work area to an approved outfall point.
- B. Unless otherwise shown on the drawings, swales shall be earthen "V" shaped channels graded to a sufficient depth and slope to carry the anticipated runoff, but at least two (2) feet deep with a slope of 0.1%.
- C. Swales not designated to remain in place at the completion of the contract shall be cleaned of any muck, debris and other unsuitable material and filled with approved fill before final grading operations begin.
- D. Swales shall have erosion control barriers as required in these specifications.

3.5 FILL AND CUT SLOPES

- A. Fill slopes in all cases shall be no steeper than 3:1 unless specifically stated on the plans or approved by the Owner's Geotechnical engineer.
- B. When cut slopes exceed 2:1 for depths over three (3) feet, proper bracing and shoring per OSHA requirements shall be used and maintained.
- C. For permanent slopes, cut or fill, between 2:1 and 10:1, erosion protection shall be provided with hydromulching seeding, sodding, or other method as approved.
- D. Where cut slopes of more than 5 feet deep, extend more than 100 feet in length, contractor shall provide a backfill drain at the top of the slope to ease in drainage and erosion control.

3.6 SEDIMENTATION BASINS

- A. Sedimentation ponds shall be provided when designated on the plans.
- B. All drainage from cleared areas shall be routed through the sedimentation basin.
- C. Contractor will be responsible for the operation and maintenance of the pond during construction.

3.7 MAINTENANCE

- A. Check all erosion control measures after each rainfall event to ensure that they are in proper working order.
 - 1. Immediately restore all measures to installed condition.
 - 2. During the course of construction all temporary swales constructed for this contract shall be maintained so as to allow proper drainage from the construction area. Before Contractor leaves the site at the end of construction, all temporary swales must be reworked to meet final conditions as set forth in the drawings and specifications.
 - 3. The Contractor shall assure that all subwork with other contractors at the site understand the importance of the erosion control features. The Contractor shall require all subcontractors to respect the function of the erosion control features and enlist their coordination in maintaining existing swales and ditches.

- B. Inspect silt and straw bale fences at least once a week.
 - 1. Immediately replace damaged portions of the silt fences, including portions which have collapsed, contain tears, have decomposed, or have become ineffective.
 - 2. Remove sediment deposits, as necessary, to provide adequate sediment storage and to maintain the integrity of fences. Dispose of accumulated sediment by spreading over upland areas of the site.
- C. Maintain erosion control devices in place, as specified, until completion of the work of this Contract.
 - 1. At completion of work, inspect all systems, make necessary repairs, remove and dispose of all accumulated sediment, and turn completely operable systems over to Owner for continued maintenance.
- D. Where necessary for equipment and vehicular access to the work areas, adequately sized culverts shall be installed and maintained to provide the access without disturbing the site drainage.
- E. Sedimentation Basins.
 - 1. Contractor shall be responsible for maintaining the pond and the outfall and sediment retarding structure in good working condition throughout the time the pond is to be in operation.
 - 2. When sediment and debris fill the pond to over one third (1/3) its designed capacity, the pond shall be cleaned out.
 - 3. The sediment from the clearing operation shall be stockpiled with like materials per Specification 31 11 00 Clearing and Grubbing. If the material is found to not meet the stockpiling requirements listed in 31 11 00, they must be removed from the site as described in 31 11 00.

3.8 INSPECTIONS

- A. Inspect all erosion control systems and devices at least once every seven calendar days.
- B. Inspect all erosion control systems and devices within 24 hours of the end of any storm which results in precipitation of 1/2 inch or more.
- C. During inspections, locations where stormwater leaves the site shall be inspected for evidence of erosion or sediment deposition.
- D. Correct deficiencies within three calendar days.
- E. Complete a report of each inspection. Report shall contain the following minimum information:
 - 1. Inspector's name

2. Inspection date
3. Observations of the effectiveness of erosion control systems
4. Actions taken if necessary to correct deficiencies
5. Listing of areas where construction operations have permanently or temporarily stopped
6. Authorized signature

END OF SECTION