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| <b>SUPERSEDED BY</b><br><b>EB 15-031</b><br><b>EFFECTIVE 9/28/15</b>                                                                                                                                                                                                                                                                                  |  | New York State<br>Department of<br>Transportation<br><b>ENGINEERING<br/>         INSTRUCTION</b>                                    | <b>EI</b><br><b>09-035</b> |
| <b>Title: REVISED SPECIFICATION SECTION 209- SOIL EROSION AND SEDIMENT CONTROL</b>                                                                                                                                                                                                                                                                    |                                                                                   |                                                                                                                                     |                            |
| <b>Distribution:</b><br><input checked="" type="checkbox"/> Manufacturers (18) <input checked="" type="checkbox"/> Main Office<br><input checked="" type="checkbox"/> Local Govt. (31) <input checked="" type="checkbox"/> Consultants (34)<br><input checked="" type="checkbox"/> Agencies (32) <input checked="" type="checkbox"/> Contractors (39) |                                                                                   | <b>Approved:</b><br><br>/s/Richard W. Lee for _____ <u>2/9/10</u><br>Daniel D'Angelo, PE      Date<br>Deputy Chief Engineer, Design |                            |

#### ADMINISTRATIVE INFORMATION:

- Effective Date: This Engineering Instruction (EI) is effective with projects submitted for the letting of 9/02/10.
- This EI supersedes EI 05-022, EI 06-004, EI 06-005, EI 07-013, and modifies EI 08-006.

#### PURPOSE:

To supersede the entire Section 209-SOIL EROSION AND SEDIMENT CONTROL of the Standard Specifications of May 4, 2006 & May 1, 2008.

#### TECHNICAL INFORMATION:

The intention of soil erosion and sediment control measures is to provide control of erosion and sedimentation during construction by minimizing unintended soil disturbance and the transportation and unwanted deposition of sediment.

Major changes to the specification are:

- Added a pay item for Permanent Check Dams-Item No. 209.1106.
- Added a pay item for just Temporary Seed-Item No. 209.100102.
- Incorporated revisions to Turbidity Curtain.
- Deleted pay item No. 209.1004, Seed and Straw/Wood Fiber Mulch-Temp.
- Deleted Pipe Inlet/Outlet Protection, Silt Fence from Spec.-pay item No. 209.23.
- Added material to allow Excavated Drop Inlet Protection-pay item No. 209.1705 and added Stone & Block Inlet Protection-pay item No. 209.1704.

#### IMPLEMENTATION:

Main Office Design Quality Assurance Bureau will insert a copy of the Standard Specification shelf note beginning with projects submitted for the letting of September 2, 2010.

#### TRANSMITTED MATERIAL:

Attached is a copy of the revised Section 209-SOIL EROSION AND SEDIMENT CONTROL of the Standard Specifications, both US Customary and Metric versions.

#### BACKGROUND:

The most recent Section 209-SOIL EROSION AND SEDIMENT CONTROL of the Standard Specifications was issued on November 1, 2002 with EI 02-037. Since then several improvements have been identified through visits to the Regional Offices and numerous discussions with Designers, Construction Personnel, Regulators and Contractors.

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**CONTACT:**

Direct questions regarding this issuance to Gary Glath of the Design Quality Assurance Bureau, Specifications and Standards Section at 518-457-5286 or [gglath@dot.state.ny.us](mailto:gglath@dot.state.ny.us).

Make the following changes to the Standard Specifications of May 4, 2006.

Replace SECTION 209-EROSION AND SEDIMENT CONTROL in its entirety with:

## **SECTION 209 - SOIL EROSION AND SEDIMENT CONTROL**

**209-1 DESCRIPTION.** This work shall consist of furnishing, installing, inspecting, maintaining, and removing soil erosion and sediment control measures as shown on the contract documents or as ordered by the Engineer during the life of the contract. This work shall be coordinated with other items of work specified elsewhere in the contract documents to the extent practical to assure effective and continuous soil erosion and sediment control throughout the construction and post construction period.

**209-1.01 Erosion Control.** See §101-02 *Definitions of Terms*, Erosion and Sediment Control, for the definition of Erosion Control. The following items of work are provided in this section to address soil erosion control - mulch, straw/wood fiber mulch, seed and mulch, seed and straw/wood fiber mulch, all rolled erosion control products, and soil stabilizers. Other items may be included in the contract documents to provide soil erosion control (e.g., turf establishment, bank and channel protection, etc.).

**209-1.02 Sediment Control.** Sediment control is any action taken or item used as part of a project or as a separate action to minimize suspended solid material transport by water. The following items of work are provided in this section to address sediment control: strawbale dike, sediment trap, turbidity curtain, and silt fence.

### **209-2 MATERIALS.**

**209-2.01 Mulch-Temporary.** Mulch shall be §713-19 *Straw*, or §713-11 *Wood Fiber Mulch*.

**209-2.02 Seed-Temporary.** Seed shall be ryegrasses (annual or perennial) or cereal grasses suitable to the area and as a temporary cover which will not compete with the grasses sown later for permanent cover.

**209-2.03 Stone.** Stone filling shall meet the requirements of §620-2.02 Stone Filling, Light and #1 or #2 stone meeting the requirements of Section 703-02 *Coarse Aggregate*.

**209-2.04 Strawbale Dike-Temporary.** Strawbales shall meet the requirements of §713-19 *Straw*. All bales shall be tightly bound; loose or broken bales will not be accepted. Hardwood stakes shall be at least 32 mm x 32 mm and a minimum of 0.6 m long.

**209-2.05 Geotextiles.** Geotextiles shall meet the requirements of §737-01 Geotextiles. UV sensitive geotextiles shall be protected from exposure to sunlight during transport and storage.

**209-2.06 Silt Fence-Temporary.** Silt fence shall meet the requirements of §737-01 G. Silt Fence and be listed in the Approved List. A silt fence assembly shall consist of silt fence geotextile, posts, and fasteners and may include mesh support consistent with the Approved List.

**A. Posts.** Posts shall meet the following requirements:

1. Wood, metal, or synthetic posts may be used. Softwood post shall be 38 mm x 89 mm, hardwood post shall be at least 32 mm x 32 mm, steel post shall be "T" or "L" shaped in cross section, with a minimum weight of 2 kg/m.

2. Posts shall be a minimum of 1.2 m long and shall be spaced consistent with the material selected and as indicated in the Approved List.

**B. Mesh Support.** For those silt fence assemblies on the Approved List that require a mesh support, the support shall consist of 14 gauge (min) welded wire mesh with a max. 150 mm x 150 mm, opening or polymeric mesh. All mesh support shall be a minimum of 750 mm in height.

**C. Fasteners.** Fasteners shall be heavy duty staples, hog rings, tie wires, or any other fastener compatible with the post material.

**209-2.07 Sediment Trap-Temporary.** The materials used shall be as indicated on the Standard Sheets. The impervious embankment material shall have the following gradation:

| IMPERVIOUS EMBANKMENT GRADATION |                           |
|---------------------------------|---------------------------|
| SIEVE SIZE                      | PERCENT PASSING BY WEIGHT |
| 150 mm                          | 90 - 100                  |
| 19.0 mm                         | 50 - 100                  |
| 4.75 mm                         | 40 - 90                   |
| 425 $\mu$ m                     | 30 - 85                   |
| 75 $\mu$ m                      | 25 - 75                   |

**209-2.08 Pipe Slope Drain - Temporary.** Pipe slope drain materials may consist of new or used material in satisfactory condition and suitable for the intended use. The Engineer will reject used materials determined to be unsatisfactory. Pipe couplings shall be appropriate for the pipe and as recommended by the Manufacturer. End sections may be steel, aluminum, or polyethylene.

**209-2.09 Prefabricated Check Dams and Drainage Structure Inlet Protection.** The materials used for prefabricated check dams and drainage structure inlet protection shall be triangular shaped in cross section, and have a height of at least 200 mm x 250 mm in the center with two equal sides and a 450 mm x 610 mm base. The triangular-shaped inner material shall be foam. The outer cover shall be a woven bedding type geotextile placed around the inner triangle and extend 610 mm x 910 mm beyond each side of the triangle base. Concrete block with holes used for inlet protection shall conform to the requirements of C 90 ASTM. Other materials may be proposed by the Contractor who shall be solely responsible for their performance.

**209-2.10 Rolled Erosion Control Products and Soil Stabilizers.** These materials shall meet the requirements of §713-07 Rolled Erosion Control Products and Soil Stabilizers and shall be of the Type and Class specified in the contract documents.

**209-2.11 Construction Entrance-Temporary.** Construction entrances shall consist of a geotextile, crushed stone or gravel and, if necessary, a drainage pipe to maintain ditch flow.

**A. Geotextile.** Geotextiles shall meet the requirements of §737-01 E. Geotextile Stabilization, Strength Class 1.

**B. Crushed Stone or Gravel.** Crushed stone or gravel shall have a thickness of not less than 150 mm of coarse aggregate material meeting the gradation requirements of size designation #3 on Table 703-4.

**C. Drainage Pipe.** The Contractor shall provide a drainage pipe sized with sufficient capacity to carry ditch flow. The pipe dimension shall be consistent with the modified soil erosion and sediment control plan approved by the Engineer. The drainage pipe may consist of new or used material in satisfactory condition and suitable for the intended use. The Engineer will reject any materials determined to be unsatisfactory.

**209-2.12 Gravel Bag.** Bags shall be fabricated from reinforced woven geotextile and shall include ties. No burlap bags shall be allowed. Coarse aggregate shall meet the gradation requirements of size designation #1 or #2 of Table 703-4 and shall be used as the fill material. Each gravel bag shall be individually tied and double bagged. The bag with fill material shall be inversely inserted into the second bag in order to prevent leakage.

**209-2.13 Sand Bag.** Sand bags shall meet the requirements of §209-2.13 *Gravel Bag* except that sand meeting the gradation requirements of §703-06 *Cushion Sand* shall be used as the fill material.

**209-2.14 Turbidity Curtain-Temporary.** The Turbidity Curtain shall be a commercially available, pre-assembled system, including a geotextile, flotation system, bottom weight, and anchoring and securing mechanism. If assembled in panels, it shall include a secure mechanism for joining panels together.

Geotextiles shall conform to the requirements specified in §737-01F. *Turbidity Curtain.*

Hemmed pockets shall be sewn or heat bonded to contain flotation material, bottom weights, and for anchor lines. The flotation material shall maintain buoyancy if punctured or cut. The bottom weight shall be sufficient to hold the curtain in a vertical position. For sites not subject to tidal or heavy wave action, the curtain shall be capable of molding to conform to bottom contours so that suspended sediment is prevented from escaping underneath the curtain.

Anchorage lines shall be provided of sufficient strength and number to support the curtain and maintain it in position under normally expected conditions. End anchors shall be provided, with intermediate anchor points (for stakes or anchors) such that unanchored spans do not exceed 30 m, sufficient to maintain the turbidity curtain in place. Where the turbidity curtain is constructed in panels, anchor-line and shackle connections securing the panels together shall be sufficient for normally expected current, wind, or wave conditions.

### **209-3 CONSTRUCTION DETAILS.**

**209-3.01 General.** In the event of conflict between these specification requirements and pollution control laws, rules, regulations or permit conditions by other federal or state agencies, the more restrictive shall apply.

Soil Erosion and Sediment Control shall be performed consistent with §107-12 *Water Quality Protection* and included as part of the construction schedule submitted by the Contractor in accordance with §108-01 *Start and Progress of Work*. The Contractor's schedules and methods shall be consistent with the soil erosion and sediment control plan included in the contract documents or the modified plan approved by the Engineer. The Contractor shall begin earthwork only after receiving written approval from the Engineer for the schedule.

The Contractor shall designate to the Engineer an Erosion and Sediment Control Supervisor with adequate training, experience, and authority to implement and maintain all erosion and sediment control measures. The Erosion and Sediment Control Supervisor must demonstrate evidence of having taken a 4- hour course in the principles and practices of erosion and sediment control by April 30, 2010. Subsequent training is required at 3 years intervals for maintaining training certification.

Perimeter sediment controls shall be installed prior to, or simultaneously with, performing grubbing, excavation, and borrow or fill operations. The Contractor shall limit the area of clearing and grubbing, excavation, borrow and embankment operations in progress, commensurate with their capability and progress in keeping the finish grading, mulching, seeding and other temporary and/or permanent control measures current in accordance with the approved schedule. Under no condition shall earth material exposed by grubbing, excavation, borrow or fill or other work be left without application of temporary or permanent erosion controls for a period of greater than 7 days. The Engineer may determine that a potential for erosion or sediment transport exists and order the Contractor to install temporary erosion controls earlier. When permanent soil erosion and sediment control measures can not be installed due to seasonal or other limitations, temporary soil erosion and sediment control measures shall be installed. Prior to removing or disturbing any erosion or sediment control measure that may be required to be reestablished due to continual grading operations, the Contractor shall verify the proposed progression of operations and the reestablishment of control measures with the Engineer to ensure the continuity of erosion and sediment control.

Sediment control measures shall not be removed without the Engineer's approval.

**A. Inspection and Maintenance.** Soil erosion and sediment control measures shall be inspected and maintained by the Contractor during the life of the project, including winter shutdown, etc. Such inspection and maintenance shall continue until after the permanent stabilization measures are in place and the temporary control measures are ordered to be removed by the Engineer. The remaining disturbed area shall be permanently stabilized as indicated in the contract documents.

All temporary controls shall be inspected by the Contractor every seven calendar days and after each rainfall of 12.5 mm or more within a 24 hour period to determine if the measure is functioning as intended. All inspections shall be completed within one calendar day.

Within 3 calendar days from completion of the inspection, the Contractor shall:

- Repair or rebuild the control measure to function as originally intended.
- Remove sediment deposition which reaches one half the height of the control measure. All sediment deposits shall be considered unsuitable material and disposed of in accordance with §203-3.08 *Disposal of Surplus Excavated Materials*. Material shall be disposed of away from wetlands, water courses or other bodies of water.

Torn or punctured silt fence fabric may be repaired by the placement of a patch, on the upstream side, consisting of an additional layer of fabric over the damaged area, or replacement of the damaged section.

Where erosion control materials have been used on final grade that have been permanently seeded, the Contractor shall care for the areas until acceptance of the Contract or acceptance of the turf, whichever is later. Where necessary, such care may include, but is not limited to providing warning signs or barricades for protection against traffic. Any surfaces that have settled, become gullied, or otherwise damaged due to the Contractor's operations shall be repaired at no additional expense to the state to reestablish the grade and soil conditions that existed prior to placing erosion control materials.

**209-3.02 Mulch-Temporary.** The Contractor shall have the capability to mulch any disturbed areas on any given day (e.g., those areas where earthwork operations are ongoing, etc.). The Contractor shall apply mulch on disturbed areas consistent with the approved project schedule.

Mulch shall be spread uniformly in a continuous blanket at an approximate rate of 4t/ha. Mulch may be spread by hand, mechanical spreaders, or blowers.

**209-3.03 Seed and Mulch-Temporary.** The Contractor shall apply seed and mulch on disturbed areas consistent with the approved project schedule.

Prior to the application of seed, all areas where compaction has occurred shall be scarified. The seed bed shall be loose and friable for positive seed retention.

Ryegrasses shall be spread at a rate of 3.5g/m<sup>2</sup> to uniformly cover the ground. Cereal grasses shall be spread at a rate of 11.2g/m<sup>2</sup> to uniformly cover the ground. Seeds shall be evenly distributed by any method of sowing that does not injure the seeds in the process of spreading.

Mulch shall be spread immediately following application of seed. Mulch shall be spread uniformly in a continuous blanket at an approximate rate of 4t/ha. Mulch may be spread by hand, mechanical spreaders, or blowers. Mulch and seed shall not be placed simultaneously, except in the case of hydroseeding.

**209-3.04 Strawbale Dike-Temporary.** Bales shall be placed with the cut ends vertical as shown in the contract documents. Each bale shall be embedded into the soil a minimum of 100 mm, and be securely anchored. Hardwood stakes shall be installed a minimum of 300 mm into the ground below the bale. The first stake in each bale shall be driven at an angle toward the previously laid bale to force the bales together.

**209-3.05 Check Dam.** Check dams shall be constructed where shown in the contract documents and in accordance with the standard sheets. A bedding type geotextile or stone scour protection shall be placed as indicated in the contract documents.

**A. Prefabricated Check Dam.** The length of each prefabricated check dam shall be as indicated in the contract documents. The dam shall be attached to the ground with wire staples. The staples shall be No. 11 gauge wire and be 150 mm x 210 mm long. Staples shall be placed as indicated in the contract documents.

The geotextile filter material shall be attached to the triangular frame by using wire ties or staples.

The ties shall be placed evenly 300 mm on center.

**209-3.06 Silt Fence-Temporary.** Silt fence shall be installed as follows:

1. Excavate at proposed location of silt fence.
2. Posts shall be driven into the ground.
3. Geotextile and any mesh support (if applicable) shall be placed on the upstream side of the posts. Mesh shall be placed between the geotextile and the post.
4. The geotextile shall be fastened to each post in no less than 4 locations with approved fasteners.
5. The mesh support shall be fastened to each post at the top, bottom, and two additional evenly spaced locations, or by a continuous corded attachment along the top of the assembly.
6. Any geotextile or mesh splices necessary for fence erection shall be continuous between two post sections.
7. Geotextile at the bottom of the fence shall be buried in a trench to a depth of 150 mm. The trench shall be back filled with the excavated soil and the soil compacted by tamping.

**209-3.07 Sediment Trap-Temporary.** Sediment traps shall be constructed where shown in the contract documents and in accordance with the standard sheets.

**A. Sand Bag Berm and Earth Berm.**

1. The area under which the sand bag berm or earth berm will be constructed shall be cleared, grubbed and stripped of any vegetation and root mat. The pool area shall be cleared. All work shall be performed consistent with the requirements of Section 201 *Clearing and Grubbing*.
2. The earth berm embankment shall be constructed consistent with the requirements of Section 203 *Excavation & Embankment*, except as herein modified. Immediately prior to placement of the impervious embankment material, the entire earth surface on or against which fill is to be placed, shall be thoroughly scarified to a depth of 150 mm and compacted to not less than 95 percent of Standard Proctor Maximum Density. Impervious embankment material shall then be deposited in horizontal layers not exceeding 200 mm in thickness prior to compaction. Each layer shall be compacted to not less than 95 percent of Standard Proctor Maximum Density. The moisture content of all impervious embankment material shall not be greater than 2 percent above Optimum Moisture Content as determined by A.A.S.H.T.O Designation: T-99, Method C at the time of compaction. Sand bag and ditch dam sediment traps shall be constructed as shown on the Standard Sheets.
3. All fill slopes shall be 2:1 or flatter. Cut slopes shall be 1:1 or flatter.
4. Temporary seed and mulch. Rolled erosion control product shall be applied to earth berm side slopes.
5. Excavate and install light stone at emergency spillway.

**B. Riser and Outlet Pipe.** The section of the riser above the embedment shall be perforated with 25 mm diameter holes or slits spaced 150 mm vertically and horizontally and placed in the concave portion of the riser pipe. No holes shall be made within 150 mm of the outlet pipe.

The riser shall be wrapped with 6 mm to 12 mm hardware cloth wire then wrapped with Class A Geotextile Drainage Fabric. The geotextile shall extend 150 mm above the highest hole and 150 mm below the lowest hole. Where ends of geotextile come together, they shall be overlapped, folded and stapled to prevent bypass.

Straps or connecting bands shall be used to hold the geotextile and wire fabric in place. They shall be placed at the top and bottom of the cloth.

The riser shall be anchored with a steel plate base to prevent floatation. A 7 mm minimum thickness steel plate shall be attached and sealed to the riser by a continuous weld around the bottom to form a watertight connection. 600 mm of suitable material shall be placed on the plate and tamped.

Fill material around the outlet pipe shall be hand compacted in four 100 mm layers. A minimum of 600 mm of hand compacted backfill shall be placed over the outlet pipe before crossing it with construction equipment.

All outlet pipe connections shall be watertight.

**C. Sediment Removal.** Sediment shall be removed and trap restored to its original dimensions when the sediment has accumulated to ½ the design depth of the trap.

**209-3.08 Pipe Slope Drain-Temporary.** Pipe slope drain shall be placed where shown in the contract documents and constructed in accordance with the standard sheets.

**209-3.09 Drainage Structure Inlet Protection-Temporary.** Drainage structure inlet protection shall be placed where shown in the contract documents and constructed in accordance with the standard sheets.

**209-3.10 Rolled Erosion Control Products and Soil Stabilizers.** The time and method of placement shall be as specified in the contract documents and/or according to Manufacturer's instructions.

For areas at final grade, all loose stones, clods, sticks, or other undesirable material shall be removed in accordance with the manufacturer's recommendations or as specified elsewhere in the contract documents. In addition, those areas at final grade shall be scarified to a minimum depth of 25 mm immediately prior to installation, unless topsoil is being placed and the erosion control material will be installed within 2 work days of topsoil placement.

**A. Rolled Erosion Control Products.**

**1. Class II, Type A, Jute Mesh.** Jute mesh shall be placed without stretching on the freshly prepared surface so that it lays loosely on the soil and in contact with the soil at all points; and then it shall be rolled or tamped firmly into the soil surface. The upper end of each roll shall be turned down and buried to a depth of 150 mm with the soil firmly tamped against it. Unless otherwise specified in the contract documents, check slots shall be constructed at 15 m intervals down the slope. The construction procedure shall consist of placing a fold of material 150 mm vertically into the ground and tamping soil firmly against it. Jute mesh shall be placed so that all edges shall have a minimum overlap of 150 mm. The ends of rolls shall be placed with the upgrade section on top. Jute mesh shall be held tightly to the soil by anchors driven firmly into the ground. Anchors shall be spaced not more than 1 m apart on the sides and along the centerline of all drainage ways. Jute mesh ends and check slots shall have anchors spaced at 300 mm intervals.

**2. Class I and Other Class II, Rolled Erosion Control Products.** These products shall be placed and firmly anchored as stated in the manufacturer's instructions.

**3. Class III Turf Reinforcement Mat (TRM).** Type A and Type B TRMs shall be completely filled with topsoil immediately after installation. Type C and Type D TRMs, which contain a composite, do not need to be filled with topsoil unless recommended by the manufacturer.

To prevent initial soil loss, Type A and Type B TRMs shall be covered with one of the following materials during installation. (These materials will be paid for separately.)

For Slope application:

1. Class IV-Soil Stabilizer
2. An approved RECP (Class I or II)
3. Mulch

For Channels:

1. An approved RECP (Class I or II)

**B. Class IV Soil Stabilizers.** These materials shall be applied as recommended by the Manufacturer. Type A & B are intended to be applied with hydroseeding equipment. Type B may also be placed through dry spreading. When dry spreading method is used, the Contractor shall apply the material uniformly. Where applied, Type A shall be minimum of 6 mm thick. When Type A is used in conjunction with turf establishment, seeds must be sown separately and prior to the application of the soil stabilizer.



**209-3.11 Construction Entrance-Temporary.** Construction entrances shall be placed where shown in the contract documents and constructed in accordance with the standard sheets, or as otherwise approved by the Engineer.

The Contractor shall grade, including excavating or placing fill, to prepare the original ground surface for the placement of a stabilized pad of at least 150 mm of coarse aggregate material, underlain by a geotextile. If necessary, a drainage pipe shall be installed to maintain the capacity of the ditch. The pipe dimension shall be consistent with the modified soil erosion and sediment control plan approved by the Engineer. All areas cut or filled and not stabilized by the construction entrance material shall be covered with an erosion control treatment (temporary mulch, temporary seed and mulch, etc.) and shall be included in this pay item.

When washing is performed, the washing area within the construction entrance shall be located in an area which will drain into an approved sediment control measure(s).

The construction entrance shall be maintained in a condition which will prevent tracking or flowing of sediment onto a paved public roadway. All sediment spilled, dropped, washed or tracked onto paved public roadway shall be removed immediately. In the event the entrance is no longer performing properly (i.e. the entrance aggregate becomes clogged with sediment), the Contractor shall top-dress the entrance with additional coarse aggregate material.

### **209-3.12 Turbidity Curtain-Temporary.**

#### **A. Systems Requirements.**

1. For sites not subject to tidal or heavy wave action, the curtain height shall provide sufficient slack to allow the top of the curtain to rise to the maximum expected high-water level (including waves), while the bottom maintains continuous contact with the bottom of the water body. The bottom edge of the curtain shall have a weight system capable of holding the bottom of the curtain down and conforming to the water body, so as to prohibit escape of turbid water under the curtain.
2. For sites subject to tidal or heavy wave action, the curtain height shall provide sufficient slack to allow the top of the curtain to rise to the maximum expected high-water level (including waves), while the bottom remains 300 mm above the bottom. The weight system shall hold the lower edge of the curtain in place so as to allow 300 mm of clearance above the bottom at mean low water, so that the curtain does not stir up sediment by repeatedly striking the bottom.
3. If constructed in panels, panels shall be connected in such a manner as to prevent suspended particles passing through joints. Load lines shall be connected so as to develop the full strength of the line across the joint.
4. Flotation material shall be arranged so as to be flexible and to provide continuous support.
5. The flotation and curtain top shall be such as to provide a minimum of 100 mm of freeboard along the entire length of the curtain, to prohibit escape of turbid water over the top.

#### **B. Installation**

1. The turbidity curtain shall be installed as shown in the contract documents in accordance with the manufacturer's instructions. It shall be placed as close to the site of disturbance as possible without interfering with construction activity.
2. Turbidity curtain shall be installed and maintained in a manner that precludes entry of equipment, other than hand-held equipment or boats, to the water body outside the protected area.
3. The fully assembled turbidity curtain shall be prepared for installation by being furled and tied at intervals of 1.5 m for the length of the curtain. It shall be placed and secured in the furled condition, then released to allow the bottom edge to sink.
4. At sites subject to tidal or heavy wave action, adjustment lines may be used to achieve the required height of the curtain.
5. At sites not subject to tidal or heavy wave action, excess curtain material shall lay on the bottom, away from construction activity.
6. Turbidity curtain shall be placed as nearly as possible parallel to current flow. It shall not be deployed across a flowing water course.
7. The ends of the installation shall be anchored securely well up the bank. Intermediate anchors of a type and number sufficient to hold the curtain in place under expected conditions shall be placed, and

firmly fastened to the top of the curtain assembly. Maximum spacing between anchorage points shall not exceed 30 m.

8. In situations with flow velocities that exceed 1.5m/second, use a redirection barrier. The redirection barrier shall be installed prior to installation of the turbidity curtain wherever possible, and care should be exercised in order to minimize disturbance of the bottom of the water body during installation of the redirection barrier.

#### **C. Inspection and Maintenance**

1. The turbidity curtain shall be inspected daily, with additional monitoring of performance during storms or significant flow events.
2. Any visible plume of cloudy water passing beyond the curtain from the enclosed construction area shall constitute inadequate performance of the turbidity curtain. The Contractor shall immediately modify, adjust, or repair any portion of the turbidity curtain to correct inadequate performance.
3. The turbidity curtain shall remain in place until the protected construction activities have ceased and there is no visible contrast between the water being contained and the water body being protected.

#### **D. Removal**

1. The turbidity curtain shall be removed in such a way so as to minimize release of sediment.
2. Sediment behind the curtain may be removed before removal of the curtain, if directed by the Engineer. If so, any resulting turbidity must be allowed to settle before removal proceeds.

**209-4 METHOD OF MEASUREMENT.** Measurement will be made for installation or reinstallation of temporary soil erosion and sediment controls shown in the contract documents.

**209-4.01 Mulch-Temporary.** Measurement will only be made for work directed or approved by the Engineer. This work will be measured as the number of square meters of mulch to the nearest whole square meter.

**209-4.02 Seed and Mulch-Temporary.** Measurement will only be made for work directed or approved by the Engineer. This work will be measured in square meters to the nearest whole square meter.

**209-4.03 Strawbale Dike-Temporary.** Bales will be measured in meters of length to the nearest whole meter.

**209-4.04 Check Dam.** Stone, gravel, and sand bag check dams will be measured by the number of check dams. All other check dams will be measured in meters to the nearest whole meter.

**209-4.05 Silt Fence-Temporary.** Silt fence will be measured in meters of silt fence to the nearest meter. No measurement will be made for seams or overlaps.

**209-4.06 Sediment Trap-Temporary.** Sediment traps will be measured by the number of traps.

**209-4.07 Pipe Slope Drain-Temporary.** Pipe slope drain will be measured by the number of drains.

**209-4.08 Drainage Structure Inlet Protection-Temporary.** Silt fence geotextile, prefabricated drainage structure, inlet protection measures, and concrete block will be measured by the number of meters to the nearest meter of the perimeter of the drainage structure, as placed. Gravel bag measures will be measured by the number of cubic meters to the nearest cubic meter.

**209-4.09 Rolled Erosion Control Products and Soil Stabilizers.** Rolled erosion control products and soil stabilizers will be measured as the number of square meters to the nearest square meter.

**209-4.10 Construction Entrance-Temporary.** Construction entrances shown in the contract documents will be measured by the number of square meters to the nearest square meter. Measurement will not be made for construction entrances associated with the contractor's facilities (e.g., staging areas, storage yards, borrow sites, etc.).

**209-4.11 Turbidity Curtain-Temporary.** This work will be measured in meters, measured to the nearest whole meter, for turbidity curtain satisfactorily installed or reinstalled.

## **209-5 BASIS OF PAYMENT.**

**209-5.01 General.** The unit price bid for all work items shall include the cost of furnishing all labor, equipment, and materials necessary to satisfactorily complete the work, including the cost of excavation associated with the removal of accumulated sediment and the installation of erosion and sediment control measures covered by this Section.

Progress payments will be made for all control measures. Fifty percent of the price bid will be paid after installation. The remaining percentage will be paid when the temporary control measure is removed and the remaining area is permanently stabilized.

Payment will not be made for work which is attributed to the Contractor's negligence, carelessness or failure to install temporary or permanent controls in accordance with the contract documents.

**209-5.02 Mulch-Temporary.** The unit price bid for all work items shall include the cost of furnishing all labor, equipment, and materials necessary to satisfactorily complete the work including the cost of excavation associated with the removal of accumulated sediment. Mulching will only be paid for when directed or approved by the Engineer.

**209-5.03 Seed and Mulch-Temporary.** The unit price bid for all work items shall include the cost of furnishing all labor, equipment, and materials necessary to satisfactorily complete the work including the cost of excavation associated with the removal of accumulated sediment. Seed and mulch will only be paid for when directed or approved by the Engineer. In addition to the provisions of §209-5.01, the unit price bid for this item shall include water.

**209-5.04 Strawbale Dike-Temporary.** The unit price bid for all work items shall include the cost of furnishing all labor, equipment, and materials necessary to satisfactorily complete the work including the cost of excavation associated with the removal of accumulated sediment. The unit price bid shall include all bales, posts, and excavation of soil for bale embedment.

**209-5.05 Check Dam.** Progress payments will be made at fifty percent of the price bid after installation. The remaining percentage will be paid when the temporary control measure is removed and the remaining area is permanently stabilized. The unit price bid shall include stone, gravel bags, sand bags, geotextile bedding, staples, and excavation of cutoff trench.

**209-5.06 Silt Fence-Temporary.** Progress payments will be made at fifty percent of the price bid after installation. The remaining percentage will be paid when the temporary control measure is removed and the remaining area is permanently stabilized. The unit price bid shall include the silt fence geotextile, posts, mesh reinforcement, and excavation for geotextile embedment.

**209-5.07 Sediment Trap-Temporary.** Progress payments will be made at fifty percent of the price bid after installation. The remaining percentage will be paid when the temporary control measure is removed and the remaining area is permanently stabilized. The unit price bid shall include bags, excavation, impervious embankment material, outlet pipe, riser assembly, light stone filling, and geotextile bedding. Temporary mulch and rolled erosion control product will be paid for under their respective items.

**209-5.08 Pipe Slope Drain-Temporary.** The unit price bid shall include bales, pipe, pipe end sections, stone, and geotextile bedding.

**209-5.09 Drainage Structure Inlet Protection-Temporary.** The unit price bid shall include silt fence geotextile, posts, staples, concrete blocks, gravel bags and prefabricated geotextile and foam assembly.

**209-5.10 Rolled Erosion Control Products and Soil Stabilizers.** The unit price bid shall include all rolled erosion control products, staples, excavation, and soil stabilizers.

**209-5.11 Construction Entrance-Temporary.** The unit price bid shall include stone, geotextile stabilization, pipe, excavation, fill, and any erosion control treatments (temporary mulch, temporary seed and mulch, etc.) required to stabilize an erodible surface produced by the installation of the construction entrance, periodic top-dressing with additional coarse aggregate material, and washing station provisions.

Additional sediment control measures (silt fence, strawbale, sediment trap, etc.) required to control a washing area will be paid for under their respective item(s).

**209-5.12 Turbidity Curtain-Temporary.** The unit price bid shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily complete the work, including redirection barrier and the cost of removal associated with the removal of accumulated sediment.

*Payment will be made under:*

| Item No.   | Item                                                               | Pay Unit     |
|------------|--------------------------------------------------------------------|--------------|
| 209.100101 | Mulch-Temporary                                                    | Square Meter |
| 209.100102 | Seed-Temporary                                                     | Square Meter |
| 209.1003   | Seed and Mulch-Temporary                                           | Square Meter |
| 209.110101 | Check Dam (Ditch Bottom Width 0.0 to 1.0 m), Stone-Temporary       | Each         |
| 209.110102 | Check Dam (Ditch Bottom Width >1.0 to 2.0 m), Stone-Temporary      | Each         |
| 209.110103 | Check Dam (Ditch Bottom Width >2.0 to 3.0 m), Stone-Temporary      | Each         |
| 209.110104 | Check Dam (Ditch Bottom Width >3.0 m), Stone-Temporary             | Each         |
| 209.110201 | Check Dam (Ditch Bottom Width 0.0 to 1.0 m), Gravel Bag-Temporary  | Each         |
| 209.110202 | Check Dam (Ditch Bottom Width >1.0 to 2.0 m), Gravel Bag-Temporary | Each         |
| 209.110203 | Check Dam (Ditch Bottom Width >2.0 to 3.0 m), Gravel Bag-Temporary | Each         |
| 209.110204 | Check Dam (Ditch Bottom Width >3.0 m), Gravel Bag-Temporary        | Each         |
| 209.110301 | Check Dam (Ditch Bottom Width 0.0 to 1.0 m), Sand Bag-Temporary    | Each         |
| 209.110302 | Check Dam (Ditch Bottom Width >1.0 to 2.0 m), Sand Bag-Temporary   | Each         |
| 209.110303 | Check Dam (Ditch Bottom Width >2.0 to 3.0 m), Sand Bag-Temporary   | Each         |
| 209.110304 | Check Dam (Ditch Bottom Width >3.0 m), Sand Bag-Temporary          | Each         |
| 209.1105   | Check Dam, Prefabricated-Temporary                                 | Meter        |
| 209.1106   | Check Dam, Stone-Permanent                                         | Each         |
| 209.1202   | Strawbale Dike-Temporary                                           | Meter        |
| 209.13     | Silt Fence-Temporary                                               | Meter        |
| 209.1401nn | Sediment Trap, Earth Berm-Temporary                                | Each         |
| 209.1402nn | Sediment Trap, Sand Bag-Temporary                                  | Each         |
| 209.1403nn | Sediment Trap, Ditch Dam-Temporary                                 | Each         |
| 209.1501   | Turbidity Curtain - Temporary                                      | Meter        |
| 209.160101 | Pipe Slope Drain, 150 mm -Temporary                                | Meter        |
| 209.160102 | Pipe Slope Drain, 200 mm -Temporary                                | Meter        |
| 209.160103 | Pipe Slope Drain, 300 mm -Temporary                                | Meter        |
| 209.160104 | Pipe Slope Drain, 375 mm -Temporary                                | Meter        |
| 209.160105 | Pipe Slope Drain, 450 mm -Temporary                                | Meter        |
| 209.160106 | Pipe Slope Drain, 600 mm -Temporary                                | Meter        |
| 209.160107 | Pipe Slope Drain, 750 mm -Temporary                                | Meter        |
| 209.1701   | Drainage Structure Inlet Protection, Silt Fence-Temporary          | Meter        |
| 209.1702   | Drainage Structure Inlet Protection, Gravel Bag-Temporary          | Cubic Meter  |
| 209.1703   | Drainage Structure Inlet Protection, Prefabricated-Temporary       | Meter        |
| 209.1704   | Drainage Structure Inlet Protection, Concrete Block-Temporary      | Meter        |
| 209.1705   | Drainage Structure Inlet Protection, Excavated-Temporary           | Meter        |
| 209.1801   | Rolled Erosion Control Product, Class I Type A, Short Term         | Square Meter |
| 209.1802   | Rolled Erosion Control Product, Class I Type B, Short Term         | Square Meter |
| 209.1803   | Rolled Erosion Control Product, Class I Type C, Short Term         | Square Meter |
| 209.1901   | Rolled Erosion Control Product, Class II Type A, Intermediate      | Square Meter |

|            |                                                               |              |
|------------|---------------------------------------------------------------|--------------|
| 209.190201 | Rolled Erosion Control Product, Class II Type B, Intermediate | Square Meter |
| 209.190301 | Rolled Erosion Control Product, Class II Type C, Intermediate | Square Meter |
| 209.1904   | Rolled Erosion Control Product, Class II Type D, Intermediate | Square Meter |
| 209.200101 | Turf Reinforcement Mats, Class III Type A, Permanent          | Square Meter |
| 209.200201 | Turf Reinforcement Mats, Class III Type B, Permanent          | Square Meter |
| 209.200301 | Turf Reinforcement Mats, Class III Type C, Permanent          | Square Meter |
| 209.200401 | Turf Reinforcement Mats, Class III Type D, Permanent          | Square Meter |
| 209.2101   | Soil Stabilizers, Class IV Type A                             | Square Meter |
| 209.2102   | Soil Stabilizers, Class IV Type B                             | Square Meter |
| 209.2103   | Soil Stabilizers, Class IV Type C                             | Square Meter |
| 209.22     | Construction Entrance                                         | Square Meter |

NOTE: nn denotes serialized pay item. These items will be paid for within established size groups.

Make the following changes to the Standard Specifications of May 1, 2008.

**Replace** SECTION 209-EROSION AND SEDIMENT CONTROL in its entirety with:

## **SECTION 209 - SOIL EROSION AND SEDIMENT CONTROL**

**209-1 DESCRIPTION.** This work shall consist of furnishing, installing, inspecting, maintaining, and removing soil erosion and sediment control measures as shown on the contract documents or as ordered by the Engineer during the life of the contract. This work shall be coordinated with other items of work specified elsewhere in the contract documents to the extent practical to assure effective and continuous soil erosion and sediment control throughout the construction and post construction period.

**209-1.01 Erosion Control.** See §101-02 *Definitions of Terms*, Erosion and Sediment Control, for the definition of Erosion Control. The following items of work are provided in this section to address soil erosion control - mulch, straw/wood fiber mulch, seed and mulch, seed and straw/wood fiber mulch, all rolled erosion control products, and soil stabilizers. Other items may be included in the contract documents to provide soil erosion control (e.g., turf establishment, bank and channel protection, etc.).

**209-1.02 Sediment Control.** Sediment control is any action taken or item used as part of a project or as a separate action to minimize suspended solid material transport by water. The following items of work are provided in this section to address sediment control: strawbale dike, sediment trap, turbidity curtain, and silt fence.

### **209-2 MATERIALS.**

**209-2.01 Mulch-Temporary.** Mulch shall be §713-19 *Straw*, or §713-11 *Wood Fiber Mulch*.

**209-2.02 Seed-Temporary.** Seed shall be ryegrasses (annual or perennial) or cereal grasses suitable to the area and as a temporary cover which will not compete with the grasses sown later for permanent cover.

**209-2.03 Stone.** Stone filling shall meet the requirements of §620-2.02 Stone Filling, Light and #1 or #2 stone meeting the requirements of Section 703-02 *Coarse Aggregate*.

**209-2.04 Strawbale Dike-Temporary.** Strawbales shall meet the requirements of §713-19 *Straw*. All bales shall be tightly bound; loose or broken bales will not be accepted. Hardwood stakes shall be at least 1¼" x 1¼" and a minimum of 2' long.

**209-2.05 Geotextiles.** Geotextiles shall meet the requirements of §737-01 Geotextiles. UV sensitive geotextiles shall be protected from exposure to sunlight during transport and storage.

**209-2.06 Silt Fence-Temporary.** Silt fence shall meet the requirements of §737-01 G. Silt Fence and be listed in the Approved List. A silt fence assembly shall consist of silt fence geotextile, posts, and fasteners and may include mesh support consistent with the Approved List.

**A. Posts.** Posts shall meet the following requirements:

1. Wood, metal, or synthetic posts may be used. Softwood post shall be 1½" x 3½", hardwood post shall be at least 1¼" x 1¼", steel post shall be "T" or "L" shaped in cross section, with a minimum weight of 1.33lbs./ft.
2. Posts shall be a minimum of 4' long and shall be spaced consistent with the material selected and as indicated in the Approved List.

**B. Mesh Support.** For those silt fence assemblies on the Approved List that require a mesh support, the support shall consist of 14 gauge (min) welded wire mesh with a max. 6" x 6" opening or polymeric mesh. All mesh support shall be a minimum of 30" in height.

**C. Fasteners.** Fasteners shall be heavy duty staples, hog rings, tie wires, or any other fastener compatible with the post material.

**209-2.07 Sediment Trap-Temporary.** The materials used shall be as indicated on the Standard Sheets. The impervious embankment material shall have the following gradation:

| IMPERVIOUS EMBANKMENT GRADATION |                           |
|---------------------------------|---------------------------|
| SIEVE SIZE                      | PERCENT PASSING BY WEIGHT |
| 6"                              | 90 - 100                  |
| 3/4"                            | 50 - 100                  |
| 1/4"                            | 40 - 90                   |
| 40                              | 30 - 85                   |
| 200                             | 25 - 75                   |

**209-2.08 Pipe Slope Drain - Temporary.** Pipe slope drain materials may consist of new or used material in satisfactory condition and suitable for the intended use. The Engineer will reject used materials determined to be unsatisfactory. Pipe couplings shall be appropriate for the pipe and as recommended by the Manufacturer. End sections may be steel, aluminum, or polyethylene.

**209-2.09 Prefabricated Check Dams and Drainage Structure Inlet Protection.** The materials used for prefabricated check dams and drainage structure inlet protection shall be triangular shaped in cross section, and have a height of at least 8" - 10" in the center with two equal sides and a 18" - 24" base. The triangular-shaped inner material shall be foam. The outer cover shall be a woven bedding type geotextile placed around the inner triangle and extend 24"-36" beyond each side of the triangle base. Concrete block with holes used for inlet protection shall conform to the requirements of C 90 ASTM. Other materials may be proposed by the Contractor who shall be solely responsible for their performance.

**209-2.10 Rolled Erosion Control Products and Soil Stabilizers.** These materials shall meet the requirements of §713-07 Rolled Erosion Control Products and Soil Stabilizers and shall be of the Type and Class specified in the contract documents.

**209-2.11 Construction Entrance-Temporary.** Construction entrances shall consist of a geotextile, crushed stone or gravel and, if necessary, a drainage pipe to maintain ditch flow.

**A. Geotextile.** Geotextiles shall meet the requirements of §737-01 E. Geotextile Stabilization, Strength Class 1.

**B. Crushed Stone or Gravel.** Crushed stone or gravel shall have a thickness of not less than 6" of coarse aggregate material meeting the gradation requirements of size designation #3 on Table 703-4.

**C. Drainage Pipe.** The Contractor shall provide a drainage pipe sized with sufficient capacity to carry ditch flow. The pipe dimension shall be consistent with the modified soil erosion and sediment control plan approved by the Engineer. The drainage pipe may consist of new or used material in satisfactory condition and suitable for the intended use. The Engineer will reject any materials determined to be unsatisfactory.

**209-2.12 Gravel Bag.** Bags shall be fabricated from reinforced woven geotextile and shall include ties. No burlap bags shall be allowed. Coarse aggregate shall meet the gradation requirements of size designation #1 or #2 of Table 703-4 and shall be used as the fill material. Each gravel bag shall be individually tied and double bagged. The bag with fill material shall be inversely inserted into the second bag in order to prevent leakage.

**209-2.13 Sand Bag.** Sand bags shall meet the requirements of §209-2.13 *Gravel Bag* except that sand meeting the gradation requirements of §703-06 *Cushion Sand* shall be used as the fill material.

**209-2.14 Turbidity Curtain-Temporary.** The Turbidity Curtain shall be a commercially available, pre-assembled system, including a geotextile, flotation system, bottom weight, and anchoring and securing mechanism. If assembled in panels, it shall include a secure mechanism for joining panels together.

Geotextiles shall conform to the requirements specified in §737-01F. *Turbidity Curtain.*

Hemmed pockets shall be sewn or heat bonded to contain flotation material, bottom weights, and for anchor lines. The flotation material shall maintain buoyancy if punctured or cut. The bottom weight shall be sufficient to hold the curtain in a vertical position. For sites not subject to tidal or heavy wave action, the curtain shall be capable of molding to conform to bottom contours so that suspended sediment is prevented from escaping underneath the curtain.

Anchorage lines shall be provided of sufficient strength and number to support the curtain and maintain it in position under normally expected conditions. End anchors shall be provided, with intermediate anchor points (for stakes or anchors) such that unanchored spans do not exceed 100', sufficient to maintain the turbidity curtain in place. Where the turbidity curtain is constructed in panels, anchor-line and shackle connections securing the panels together shall be sufficient for normally expected current, wind, or wave conditions.

### **209-3 CONSTRUCTION DETAILS.**

**209-3.01 General.** In the event of conflict between these specification requirements and pollution control laws, rules, regulations or permit conditions by other federal or state agencies, the more restrictive shall apply.

Soil Erosion and Sediment Control shall be performed consistent with §107-12 *Water Quality Protection* and included as part of the construction schedule submitted by the Contractor in accordance with §108-01 *Start and Progress of Work*. The Contractor's schedules and methods shall be consistent with the soil erosion and sediment control plan included in the contract documents or the modified plan approved by the Engineer. The Contractor shall begin earthwork only after receiving written approval from the Engineer for the schedule.

The Contractor shall designate to the Engineer an Erosion and Sediment Control Supervisor with adequate training, experience, and authority to implement and maintain all erosion and sediment control measures. The Erosion and Sediment Control Supervisor must demonstrate evidence of having taken a 4- hour course in the principles and practices of erosion and sediment control by April 30, 2010. Subsequent training is required at 3 years intervals for maintaining training certification.

Perimeter sediment controls shall be installed prior to, or simultaneously with, performing grubbing, excavation, and borrow or fill operations. The Contractor shall limit the area of clearing and grubbing, excavation, borrow and embankment operations in progress, commensurate with their capability and progress in keeping the finish grading, mulching, seeding and other temporary and/or permanent control measures current in accordance with the approved schedule. Under no condition shall earth material exposed by grubbing, excavation, borrow or fill or other work be left without application of temporary or permanent erosion controls for a period of greater than 7 days. The Engineer may determine that a potential for erosion or sediment transport exists and order the Contractor to install temporary erosion controls earlier. When permanent soil erosion and sediment control measures can not be installed due to seasonal or other limitations, temporary soil erosion and sediment control measures shall be installed. Prior to removing or disturbing any erosion or sediment control measure that may be



required to be reestablished due to continual grading operations, the Contractor shall verify the proposed progression of operations and the reestablishment of control measures with the Engineer to ensure the continuity of erosion and sediment control.

Sediment control measures shall not be removed without the Engineer's approval.

**A. Inspection and Maintenance.** Soil erosion and sediment control measures shall be inspected and maintained by the Contractor during the life of the project, including winter shutdown, etc. Such inspection and maintenance shall continue until after the permanent stabilization measures are in place and the temporary control measures are ordered to be removed by the Engineer. The remaining disturbed area shall be permanently stabilized as indicated in the contract documents.

All temporary controls shall be inspected by the Contractor every seven calendar days and after each rainfall of 1/2" or more within a 24 hour period to determine if the measure is functioning as intended. All inspections shall be completed within one calendar day.

Within 3 calendar days from completion of the inspection, the Contractor shall:

- Repair or rebuild the control measure to function as originally intended.
- Remove sediment deposition which reaches one half the height of the control measure. All sediment deposits shall be considered unsuitable material and disposed of in accordance with §203-3.08 *Disposal of Surplus Excavated Materials*. Material shall be disposed of away from wetlands, water courses or other bodies of water.

Torn or punctured silt fence fabric may be repaired by the placement of a patch, on the upstream side, consisting of an additional layer of fabric over the damaged area, or replacement of the damaged section.

Where erosion control materials have been used on final grade that have been permanently seeded, the Contractor shall care for the areas until acceptance of the Contract or acceptance of the turf, whichever is later. Where necessary, such care may include, but is not limited to providing warning signs or barricades for protection against traffic. Any surfaces that have settled, become gullied, or otherwise damaged due to the Contractor's operations shall be repaired at no additional expense to the state to reestablish the grade and soil conditions that existed prior to placing erosion control materials.

**209-3.02 Mulch-Temporary.** The Contractor shall have the capability to mulch any disturbed areas on any given day (e.g., those areas where earthwork operations are ongoing, etc.). The Contractor shall apply mulch on disturbed areas consistent with the approved project schedule.

Mulch shall be spread uniformly in a continuous blanket at an approximate rate of 2 tons/acre. Mulch may be spread by hand, mechanical spreaders, or blowers.

**209-3.03 Seed and Mulch-Temporary.** The Contractor shall apply seed and mulch on disturbed areas consistent with the approved project schedule.

Prior to the application of seed, all areas where compaction has occurred shall be scarified. The seed bed shall be loose and friable for positive seed retention.

Ryegrasses shall be spread at a rate of 30lbs./acre to uniformly cover the ground. Cereal grasses shall be spread at a rate of 100lbs./acre to uniformly cover the ground. Seeds shall be evenly distributed by any method of sowing that does not injure the seeds in the process of spreading.

Mulch shall be spread immediately following application of seed. Mulch shall be spread uniformly in a continuous blanket at an approximate rate of 2 tons/acre. Mulch may be spread by hand, mechanical spreaders, or blowers. Mulch and seed shall not be placed simultaneously, except in the case of hydroseeding.

**209-3.04 Strawbale Dike-Temporary.** Bales shall be placed with the cut ends vertical as shown in the contract documents. Each bale shall be embedded into the soil a minimum of 4", and be securely anchored. Hardwood stakes shall be installed a minimum of 12" into the ground below the bale. The first stake in each bale shall be driven at an angle toward the previously laid bale to force the bales together.

**209-3.05 Check Dam.** Check dams shall be constructed where shown in the contract documents and in accordance with the standard sheets. A bedding type geotextile or stone scour protection shall be placed as indicated in the contract documents.

**A. Prefabricated Check Dam.** The length of each prefabricated check dam shall be as indicated in the contract documents. The dam shall be attached to the ground with wire staples. The staples shall be No. 11 gauge wire and be 6"-8" long. Staples shall be placed as indicated in the contract documents.

The geotextile filter material shall be attached to the triangular frame by using wire ties or staples.

The ties shall be placed evenly 12" on center.

**209-3.06 Silt Fence-Temporary.** Silt fence shall be installed as follows:

1. Excavate at proposed location of silt fence.
2. Posts shall be driven into the ground.
3. Geotextile and any mesh support (if applicable) shall be placed on the upstream side of the posts. Mesh shall be placed between the geotextile and the post.
4. The geotextile shall be fastened to each post in no less than 4 locations with approved fasteners.
5. The mesh support shall be fastened to each post at the top, bottom, and two additional evenly spaced locations, or by a continuous corded attachment along the top of the assembly.
6. Any geotextile or mesh splices necessary for fence erection shall be continuous between two post sections.
7. Geotextile at the bottom of the fence shall be buried in a trench to a depth of 6". The trench shall be back filled with the excavated soil and the soil compacted by tamping.

**209-3.07 Sediment Trap-Temporary.** Sediment traps shall be constructed where shown in the contract documents and in accordance with the standard sheets.

**A. Sand Bag Berm and Earth Berm.**

1. The area under which the sand bag berm or earth berm will be constructed shall be cleared, grubbed and stripped of any vegetation and root mat. The pool area shall be cleared. All work shall be performed consistent with the requirements of Section 201 *Clearing and Grubbing*.
2. The earth berm embankment shall be constructed consistent with the requirements of Section 203 *Excavation & Embankment*, except as herein modified. Immediately prior to placement of the impervious embankment material, the entire earth surface on or against which fill is to be placed, shall be thoroughly scarified to a depth of 6" and compacted to not less than 95 percent of Standard Proctor Maximum Density. Impervious embankment material shall then be deposited in horizontal layers not exceeding 8" in thickness prior to compaction. Each layer shall be compacted to not less than 95 percent of Standard Proctor Maximum Density. The moisture content of all impervious embankment material shall not be greater than 2 percent above Optimum Moisture Content as determined by A.A.S.H.T.O Designation: T-99, Method C at the time of compaction. Sand bag and ditch dam sediment traps shall be constructed as shown on the Standard Sheets.
3. All fill slopes shall be 2:1 or flatter. Cut slopes shall be 1:1 or flatter.
4. Temporary seed and mulch. Rolled erosion control product shall be applied to earth berm side slopes.
5. Excavate and install light stone at emergency spillway.

**B. Riser and Outlet Pipe.** The section of the riser above the embedment shall be perforated with 1" diameter holes or slits spaced 6" vertically and horizontally and placed in the concave portion of the riser pipe. No holes shall be made within 6" of the outlet pipe.

The riser shall be wrapped with 1/4" to 1/2" hardware cloth wire then wrapped with Class A Geotextile Drainage Fabric. The geotextile shall extend 6" above the highest hole and 6" below the lowest hole. Where ends of geotextile come together, they shall be overlapped, folded and stapled to prevent bypass.

Straps or connecting bands shall be used to hold the geotextile and wire fabric in place. They shall be placed at the top and bottom of the cloth.

The riser shall be anchored with a steel plate base to prevent floatation. A 1/4" minimum thickness steel plate shall be attached and sealed to the riser by a continuous weld around the bottom to form a watertight connection. 24" of suitable material shall be placed on the plate and tamped.

Fill material around the outlet pipe shall be hand compacted in four 6" layers. A minimum of 24" of hand compacted backfill shall be placed over the outlet pipe before crossing it with construction equipment.

All outlet pipe connections shall be watertight.

**C. Sediment Removal.** Sediment shall be removed and trap restored to its original dimensions when the sediment has accumulated to 1/2 the design depth of the trap.

**209-3.08 Pipe Slope Drain-Temporary.** Pipe slope drain shall be placed where shown in the contract documents and constructed in accordance with the standard sheets.

**209-3.09 Drainage Structure Inlet Protection-Temporary.** Drainage structure inlet protection shall be placed where shown in the contract documents and constructed in accordance with the standard sheets.

**209-3.10 Rolled Erosion Control Products and Soil Stabilizers.** The time and method of placement shall be as specified in the contract documents and/or according to Manufacturer's instructions.

For areas at final grade, all loose stones, clods, sticks, or other undesirable material shall be removed in accordance with the manufacturer's recommendations or as specified elsewhere in the contract documents. In addition, those areas at final grade shall be scarified to a minimum depth of 1" immediately prior to installation, unless topsoil is being placed and the erosion control material will be installed within 2 work days of topsoil placement.

**A. Rolled Erosion Control Products.**

**1. Class II, Type A, Jute Mesh.** Jute mesh shall be placed without stretching on the freshly prepared surface so that it lays loosely on the soil and in contact with the soil at all points; and then it shall be rolled or tamped firmly into the soil surface. The upper end of each roll shall be turned down and buried to a depth of 6" with the soil firmly tamped against it. Unless otherwise specified in the contract documents, check slots shall be constructed at 50' intervals down the slope. The construction procedure shall consist of placing a fold of material 6" vertically into the ground and tamping soil firmly against it. Jute mesh shall be placed so that all edges shall have a minimum overlap of 6". The ends of rolls shall be placed with the upgrade section on top. Jute mesh shall be held tightly to the soil by anchors driven firmly into the ground. Anchors shall be spaced not more than 40" apart on the sides and along the centerline of all drainage ways. Jute mesh ends and check slots shall have anchors spaced at 24" intervals.

**2. Class I and Other Class II, Rolled Erosion Control Products.** These products shall be placed and firmly anchored as stated in the manufacturer's instructions.

**3. Class III Turf Reinforcement Mat (TRM).** Type A and Type B TRMs shall be completely filled with topsoil immediately after installation. Type C and Type D TRMs, which contain a composite, do not need to be filled with topsoil unless recommended by the manufacturer.

To prevent initial soil loss, Type A and Type B TRMs shall be covered with one of the following materials during installation. (These materials will be paid for separately.)

For Slope application:

1. Class IV-Soil Stabilizer
2. An approved RECP (Class I or II)
3. Mulch

For Channels:

1. An approved RECP (Class I or II)

**B. Class IV Soil Stabilizers.** These materials shall be applied as recommended by the Manufacturer. Type A & B are intended to be applied with hydroseeding equipment. Type B may also be placed through dry spreading. When dry spreading method is used, the Contractor shall apply the material uniformly. Where applied, Type A shall be minimum of 1/4" thick. When Type A is used in conjunction with turf establishment, seeds must be sown separately and prior to the application of the soil stabilizer.

**209-3.11 Construction Entrance-Temporary.** Construction entrances shall be placed where shown in the contract documents and constructed in accordance with the standard sheets, or as otherwise approved by the Engineer.

The Contractor shall grade, including excavating or placing fill, to prepare the original ground surface for the placement of a stabilized pad of at least 6" of coarse aggregate material, underlain by a geotextile. If necessary, a drainage pipe shall be installed to maintain the capacity of the ditch. The pipe dimension shall be consistent with the modified soil erosion and sediment control plan approved by the Engineer. All areas cut or filled and not stabilized by the construction entrance material shall be covered with an erosion control treatment (temporary mulch, temporary seed and mulch, etc.) and shall be included in this pay item.

When washing is performed, the washing area within the construction entrance shall be located in an area which will drain into an approved sediment control measure(s).

The construction entrance shall be maintained in a condition which will prevent tracking or flowing of sediment onto a paved public roadway. All sediment spilled, dropped, washed or tracked onto paved public roadway shall be removed immediately. In the event the entrance is no longer performing properly (i.e. the entrance aggregate becomes clogged with sediment), the Contractor shall top-dress the entrance with additional coarse aggregate material.

#### **209-3.12 Turbidity Curtain-Temporary.**

##### **A. Systems Requirements.**

1. For sites not subject to tidal or heavy wave action, the curtain height shall provide sufficient slack to allow the top of the curtain to rise to the maximum expected high-water level (including waves), while the bottom maintains continuous contact with the bottom of the water body. The bottom edge of the curtain shall have a weight system capable of holding the bottom of the curtain down and conforming to the water body, so as to prohibit escape of turbid water under the curtain.
2. For sites subject to tidal or heavy wave action, the curtain height shall provide sufficient slack to allow the top of the curtain to rise to the maximum expected high-water level (including waves), while the bottom remains 24" above the bottom. The weight system shall hold the lower edge of the curtain in place so as to allow 24" of clearance above the bottom at mean low water, so that the curtain does not stir up sediment by repeatedly striking the bottom.
3. If constructed in panels, panels shall be connected in such a manner as to prevent suspended particles passing through joints. Load lines shall be connected so as to develop the full strength of the line across the joint.
4. Flotation material shall be arranged so as to be flexible and to provide continuous support.
5. The flotation and curtain top shall be such as to provide a minimum of 4" of freeboard along the entire length of the curtain, to prohibit escape of turbid water over the top.

##### **B. Installation**

1. The turbidity curtain shall be installed as shown in the contract documents in accordance with the manufacturer's instructions. It shall be placed as close to the site of disturbance as possible without interfering with construction activity.
2. Turbidity curtain shall be installed and maintained in a manner that precludes entry of equipment, other than hand-held equipment or boats, to the water body outside the protected area.
3. The fully assembled turbidity curtain shall be prepared for installation by being furled and tied at intervals of 5' for the length of the curtain. It shall be placed and secured in the furled condition, then released to allow the bottom edge to sink.