### CITY OF LINCOLN NEBRASKA, STANDARD SPECIFICATIONS

#### CHAPTER 32

**EROSION AND SEDIMENT CONTROL**

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CHAPTER 32

EROSION AND SEDIMENT CONTROL

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CHAPTER 32

EROSION AND SEDIMENT CONTROL

32.00 GENERAL

This Work shall consist of constructing, maintaining, and removing erosion control measures that are used to minimize erosion and sedimentation during construction. This Work shall be performed at locations shown on the plans or as directed by the City’s Project Manager.

32.01 NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT

A. GENERAL

The Contractor shall understand the terms and conditions of the general National Pollutant Discharge Elimination System (NPDES) permit that authorizes the stormwater discharges associated with the industrial activity from the construction site. For reference the general permit is posted on the City’s web site, www.lincoln.ne.gov; keyword: NPDES.

Additionally, the Contractor, as evidenced by their signature on this proposal, agrees and understands that, if awarded the contract on this project, he/she:

- shall obtain authorization of a CSW-NOI (Notice of Intent) Permit from the Nebraska Department of Environment and Energy; and
- is legally bound to comply with the Clean Water Act to ensure compliance with the terms and conditions of the stormwater pollution prevention plan as developed under the NPDES permit and the terms of the NPDES permit; and
- will hold owners harmless for damages and fines arising as a result of noncompliance with the terms of the stormwater permits and authorizations associated with the work on this project; and
- shall be responsible for the maintenance of the sediment control measures until permanent stabilization and cover crop is established; and
- shall complete permanent or temporary stabilization within 7 calendar days of soil disturbance to the surface of all perimeter controls, topsoil stockpiles, and any other disturbed or graded areas on the project site which are not being used for material storage, or on which actual earth moving activities are not being performed; and
- shall complete the approved inspection forms and inspect/maintain all sediment or erosion control practices required under this contract at least once every 14 calendar days and after any storm event of greater than 0.5” of precipitation, on the site, during any 24-hour period; any necessary repairs or cleanup to maintain the effectiveness of the best management practices shall be made by contractor immediately; and
- shall update the approved SWPPP plan immediately following any changes or additions to the plan. Copies of all inspection forms and modifications to the SWPPP plan should be made available online at https://ecmp.nebraska.gov/DEQ-CSW/Account/Login?ReturnUrl=%2fDEQ-CSW within 48 hours of inspection.

- shall complete a Notice of Termination (NOT) upon completion of all construction activities and final site stabilization requirements. Final stabilization shall be defined as 70% native background perennial vegetation on the entire project and all sediment and erosion control Best Management Practices (BMP’s) have been removed.
32.01 NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT
(Continued)

B. BASIS OF PAYMENT

Payment for updating the approved SWPPP, performing the required inspections, and maintaining the appropriate documentation shall be paid for at the contract unit price bid per each (EA), per occurrence for SWPPP UPDATING. This price shall be full compensation for any and all labor, tools, equipment and incidentals necessary to complete the inspection, updating and documentation activities listed above.

Payment for maintenance of the sediment and erosion control devices will be as given below in the individual sections.

32.02 SYNTHETIC FABRIC SEDIMENT FENCE

A. GENERAL

Sediment fence is a temporary linear sediment filter barrier constructed of synthetic filter fabric and posts. Sediment fence shall be used for detaining small amounts of sediment and decreasing flow velocities.

B. MATERIALS

1. Sediment fence shall be a pervious sheet of propylene, nylon, polyester or ethylene fabric and shall conform to the Standard Specifications defined in the following table:

<table>
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<tr>
<th>Fabric Properties</th>
<th>Minimum Requirements</th>
<th>Test Method</th>
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<tr>
<td>Filtering Efficiency</td>
<td>70%</td>
<td>ASTM 5141</td>
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<tr>
<td>Tensile Strength at 20% (max.) elongation:</td>
<td>30 lb./linear inch</td>
<td>ASTM 4632</td>
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<tr>
<td>Standard Strength</td>
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<tr>
<td>High Strength</td>
<td>50 lb./linear inch</td>
<td>ASTM 4632</td>
</tr>
<tr>
<td>Flow Rate</td>
<td>.2 gal./SF/minute</td>
<td>ASTM 5141</td>
</tr>
<tr>
<td>Ultraviolet Radiation Stability</td>
<td>90%</td>
<td>ASTM-G-26</td>
</tr>
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2. Posts and stakes shall be standard “T” steel posts and be a minimum of 40" in length.
C. INSTALLATION

Sediment fence shall be placed the same day excavating and/or fill is placed and prior to any site disturbing activities upstream of the fence.

Sediment fence can be installed either by trenching or by utilizing a sediment fence installation machine. If trenching is used sediment fence can be entrenched by excavating a 4" wide trench along the line of the fence posts, with the filter fabric being entrenched to a depth of no less than 8". The trench must be backfilled and compacted on both sides of the sediment fence.

If a sediment fence installation machine is utilized the sediment fence must be installed at a minimum depth of 10" into the ground.

Maximum drainage area for overland flow to a silt fence shall not exceed one-quarter acre per one hundred feet of fence.

J Hooks shall be installed at a minimum of 100' intervals that may run along silt fence sections to intercept and trap flows and reduce parallel erosion failures.

Posts shall be driven into the ground to a minimum depth of 16" below the original ground level and at approximately a 20° incline toward the upslope side. The posts shall be spaced a maximum of 6' apart for filter fabric not supported by wire mesh and a maximum of 10' apart for filter fabric supported by wire mesh.

When using steel T posts, the “nubbed” side of the post needs to be on the surface side of the fence post.

When joints are necessary, sediment fence shall be spliced together only at a support post, with a minimum 6" overlap. The overlap shall be secured as necessary.

These requirements represent minimum installation requirements and do not replace the sediment fence manufacturer installation recommendations that may exceed these requirements.

For details see LSP 175.

D. MAINTENANCE AND REMOVAL

Sediment deposits shall be removed when the level of deposition reaches 1/2 of the sediment fence height. Removed sediment shall be placed in a suitable location and in a manner that minimizes further erosion.

If, during required inspections, damage to the sediment fence is observed the necessary repairs shall be completed within 24 hours of the inspection.

The sediment fence shall not be removed until the up-slope area has been permanently stabilized and/or directed by the City’s Project Manager. All materials shall be completely removed from the site and stored or disposed of properly.
32.02 SYNTHETIC FABRIC SEDIMENT FENCE (Continued)

E. BASIS OF PAYMENT

Installation shall be paid for at the contract unit price per linear foot (LF) for SYNTHETIC FABRIC SEDIMENT FENCE INST. This price shall be full compensation for furnishing, preparing, transporting, delivering, excavating, and placing the materials, and for all labor, tools, equipment and incidentals necessary to complete the Work.

Maintenance shall be paid for at the contract unit price bid per linear foot (LF), per occurrence for SYNTHETIC FABRIC SEDIMENT FENCE MAINT. This price shall be full compensation for any and all labor, tools, equipment and incidentals necessary to complete the maintenance activities listed in these Standard Specifications.

Removal shall be paid for at the contract unit price bid per linear foot (LF), per occurrence for SYNTHETIC FABRIC SEDIMENT FENCE REM. This price shall be full compensation for any and all labor, tools, equipment and incidentals necessary to complete the removal activities listed in these Standard Specifications.

32.03 CONSTRUCTION ENTRANCE

A. GENERAL

A construction entrance is a stabilized aggregate pad with a filter fabric underline located at any point where vehicular traffic will be entering or leaving a construction site to or from a public right-of-way, street, alley, sidewalk or parking area. Its purpose is to reduce or eliminate the tracking of sediment onto public rights-of-way or streets. It should be used wherever traffic will be leaving a construction site and moving directly onto a public street or other paved area.

B. MATERIALS

1. The aggregate shall be 2" to 3 1/2" diameter, clean crushed rock. Crushed concrete is unacceptable per the Drainage Criteria Manual Chapter 9.

2. Filter fabric shall be resistant to commonly encountered chemicals, hydrocarbons, mildew, rot-resistant, and conform as a minimum to the fabric properties shown in the following table:

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<th>Fabric Properties</th>
<th>Testing Method</th>
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<td>Grab Tensile Strength (lbs)</td>
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<td>60 ASTM D4632</td>
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<td>Mullen Burst Strength (psi)</td>
<td>380 ASTM D3786</td>
</tr>
<tr>
<td>Puncture Strength (lbs)</td>
<td>125 ASTM D4833</td>
</tr>
<tr>
<td>Apparent Opening Size (mm)</td>
<td>.20 ASTM D4751</td>
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Fabrics not meeting these Standard Specifications may be used only when design procedure and supporting documentation are supplied to determine aggregate depth and fabric strength.
C. INSTALLATION

The minimum width of the entrance shall be 12' for sites with multiple access points and 24' for sites with a single access point. The minimum length of the entrance shall be 70'.

The area of the construction entrance shall be excavated a minimum of 3” and shall be cleared of all vegetation, roots, and other objectionable material. The filter fabric shall be placed the full length and width of the construction entrance.

Following the placement of the filter fabric, the aggregate shall be placed over the entire length and width of the construction entrance at a thickness not less than 6". A 3' wide by 6" high mountable berm of additional aggregate may be placed across the entire width of the construction entrance at the connection to the existing street or paved area.

For application, design, and dimension details refer to LSP 176.

D. MAINTENANCE AND REMOVAL

The entrance shall be maintained in a condition which will prevent tracking or flow of sediment onto public right-of-way. This may require periodic top dressing with additional aggregate or the washing and reworking of existing aggregate as conditions demand and repair and/or cleanout of any structures used to trap sediment.

All materials spilled, dropped, washed, or tracked from vehicles onto streets or into storm drains must be removed immediately. The use of water trucks to remove materials dropped, washed, or tracked onto streets will not be permitted under any circumstances.

The construction entrance shall not be removed from the site and maintenance shall not cease until the site construction is sufficiently complete such that exiting traffic will no longer track material onto the public street or paved area. All filter fabric, aggregate, and any other materials used in the construction of the entrance shall be completely removed from the site and disposed of properly.

E. BASIS OF PAYMENT

Installation of the construction entrance shall be paid for at the contract unit price per ton for CONSTRUCTION ENTRANCE SURFACING. The filter fabric shall be subsidiary to the construction of the entrance. This price shall be full compensation for furnishing, preparing, transporting, delivering, excavating, and placing the materials, and for installation, maintenance, and removal of the Work.

32.04 INLET PROTECTION

A. GENERAL

Inlet protection is a temporary filter installed around inlets, ponding water and thereby reducing the sediment passing through into the storm sewer. Its purpose is to minimize the amount of sediment entering storm drainage systems prior to permanent stabilization of the disturbed area.
B. MATERIALS

1. Filter Fabric Inlet Protection shall be constructed of a pervious sheet of propylene, nylon, polyester or ethylene fabric as specified above for Synthetic Fabric Sediment Fence. Posts and framing material shall be wooden posts with a minimum height of 30", and framing boards with a cross sectional area of 5 1/4 square inches (standard 2" x 4") or larger. Metal posts shall be standard steel “T” post with a minimum height of 40", or approved equivalent.

2. Curb Inlet Protection shall be made of permeable, durable, high strength geotextile filled with filtering media, of sufficient size to accommodate the inlet, and permeable enough to pass high flow rates of storm water.

C. INSTALLATION

1. Installation of Filter Fabric Inlet Protection (Types II and III) around inlet vaults and grate inlets shall consist of stakes spaced evenly with a maximum spacing of 3’ around the entire perimeter of the inlet and placed no closer than 12" to the nearest face of the inlet. Stakes shall be securely driven into the ground to a minimum depth of 12" for wooden stakes and 16" for metal stakes. Stakes shall extend a minimum of 18" above the ground for wooden stakes and 24" for metal stakes.

Where wooden stakes are used, wooden frames shall be constructed and securely attached to the stakes. One frame shall be flush with the top of the stakes and one frame shall be located approximately 4" above the ground.

The filter fabric shall be cut from a continuous roll to minimize weakness at joints. The bottom of the filter fabric shall be placed in a trench at a minimum depth of 6" and backfilled completely with compacted soil. Filter fabric shall be securely attached to the stakes and frames by staples or wire. The joint shall be overlapped to the next stake.

A temporary dike shall be placed on the down slope side of the structure in locations that are subject to bypass flow.

The storm drain inlet protection shall be constructed and complete as soon as the storm drain inlet might accept runoff.

2. Installation of the Curb Inlet Protection (Type I) shall be as per plan or manufacturer’s recommendation in a manner that ponds water and filters sediment from the water entering the curb inlet, but not in a manner that completely plugs the inlet, causes flooding outside of public right-of-way, or unsafe driving conditions. This may include but not be limited to:

a. installation in front of the curb inlet opening in a manner that blocks sediment laden water from directly entering the storm sewer system while allowing for ponded water to overflow into the storm sewer system during large rain events to prevent localized flooding. A spacer is required in order to keep the Curb Inlet Protection directly away from the drain opening.

b. inlet protection is not to be installed on motoring streets that are open to through traffic, and/or if necessary, must be removed at the end of each day of construction.
D. MAINTENANCE AND REMOVAL

If during required inspections damage to the structure is observed, the necessary repairs shall be completed within 24 hours of the inspection. Sediment deposits shall be removed when the level of deposition reaches 1/3 of the structure height. Removed sediment shall be placed in a suitable location and in a manner that minimizes further erosion. If the curb inlet protection device becomes clogged with debris and sediment, they shall be maintained so as to assure proper drainage and water flow into the storm drain. The structure shall not be removed until the up-slope area has been permanently stabilized, or as directed by the City’s Project Manager. All materials shall be completely removed from the site and stored or disposed of properly.

E. BASIS OF PAYMENT

Payment for the Installation, Maintenance and Removal of Filter Fabric Inlet Protection shall be subsidiary to the construction of the inlet and shall be full compensation for furnishing, preparing, transporting, delivering, excavating, and placing the materials, and for all labor, tools, equipment and incidentals necessary to complete the installation, maintenance and removal Work.

Payment for the installation of Curb Inlet Protection shall be paid for at the contract unit price per each (EA), per occurrence for CURB INLET PROTECTION INST. This price shall be full compensation for furnishing, preparing, transporting, delivering, excavating, and placing the materials, and for all labor, tools, equipment and incidentals necessary to complete the Work.

Payment for the maintenance of Curb Inlet Protection shall be paid for at the contract unit price bid per each (EA), per occurrence for CURB INLET PROTECTION MAINT. This price shall be full compensation for any and all labor, tools, equipment and incidentals necessary to complete the maintenance activities listed above.

Payment for the removal of the Curb Inlet Protection shall be paid for at the contract unit price bid per each (EA), per occurrence for CURB INLET PROTECTION REM. This price shall be full compensation for any and all labor, tools, equipment and incidentals necessary to complete the removal activities listed above.

32.05 EROSION CONTROL BLANKET (ECB)

A. GENERAL

Erosion Control Blankets are a temporary, degradable rolled erosion control product composed of natural or polymer yarns woven into a matrix, used to provide erosion control and facilitate vegetation establishment.

B. MATERIALS

1. Erosion Control Blanket, Type I shall be constructed of 100% agricultural straw evenly distributed across the entire blanket, covered with a photodegradable polypropylene net having an approximate 0.5" x 0.5" net opening, a mass per unit area of 0.40 lbs/sy, and a functional longevity of 12 months.
B. MATERIALS (Continued)

2. Erosion Control Blanket, Type II shall be constructed with 70% agricultural straw and 30% coconut fiber evenly distributed across the entire blanket, stitched with degradable thread between a heavy weight UV stabilized polypropylene top net with an approximate 0.63" x 0.63" net opening, and a lightweight photodegradable polypropylene bottom net, having an approximate 0.5" x 0.5" net opening, a mass per unit area of 0.5 lbs/sy and a functional longevity of 24 months.

3. BD Erosion Control Blanket, Type I shall be constructed with 100% biodegradable materials containing a 100% agricultural straw fiber matrix evenly distributed across the entire blanket, covered with a biodegradable natural organic fiber netting having an approximate 0.5" x 1.0" net opening, a mass per unit area of 0.47 lbs/sy, and a functional longevity of 12 months.

4. BD Erosion Control Blanket, Type II shall be constructed with 100% biodegradable materials containing 70% agricultural straw and 30% coconut fiber matrix evenly distributed across the entire blanket, covered on the top and bottom with biodegradable natural organic fiber netting having an approximate 0.5" x 1.0" net opening, a mass per unit area of 0.6 lbs/sy and a functional longevity of 18 months.

5. Metal staples for installation shall be No. 11 gauge wire and at least 6" long.

6. 100% natural fasteners shall be at least 6" long.

C. INSTALLATION

Installation shall occur as soon as possible after finish grading operations and/or seeding have been complete, or as directed by the City’s Project Manager. On shallow slopes, less than 4H:1V, the blankets may be installed parallel across the slope. On steep slopes, 4H:1V or greater, the blankets shall be installed perpendicular down the slope. In ditches and drainage channels the blankets shall be installed parallel to the direction of flow and in such a manner as to avoid seams along the channel bottom. Entrenchment and overlap shall be as recommended by the manufacturer.

Staples or fasteners will be placed according to the manufacturer. The installation procedures shall ensure that the Erosion Control Blanket will remain in intimate contact with the soil for its period of functional longevity or until such time as full growth of the vegetation occurs. In loose soils, staples or fasteners of greater than 6" may be required to properly secure the blanket. 100% natural fasteners will be required when securing biodegradable blankets.

For application and design details see LSP 179.

D. MAINTENANCE

If, during required inspections, erosion or undermining beneath the blanket is observed, the blanket shall be pulled back and any lost soil shall be replaced and the area shall be reseeded. After reseeding, the blanket shall be reinstalled as detailed above. Maintenance shall be completed within 24 hours of inspection if site conditions are conducive.
32.05 EROSION CONTROL BLANKET (ECB) (Continued)

E. BASIS OF PAYMENT

Erosion Control Blanket shall be paid for at the contract unit price bid per square yard (SY) for ECB, Type I and ECB, Type II and BD ECB, Type I and BD ECB, Type II as measured by the visible surface area after installation is complete. This price shall be full compensation for furnishing, preparing, transporting, delivering and placing the materials, and for all labor, tools, equipment and incidentals necessary to complete the installation and maintenance of the Work.

32.06 TURF REINFORCEMENT MAT (TRM)

A. GENERAL

Turf Reinforcement Mat is a rolled erosion control product composed of non-degradable synthetic fibers, filaments, nets, wire mesh, and/or other elements, processed into a permanent, three-dimensional matrix of sufficient thickness. TRMs may be supplemented with degradable components. They provide long-term functionality by permanently reinforcing vegetation during and after maturation.

B. MATERIALS

1. Turf Reinforcement Mat, Type I shall be constructed of 100% coconut fiber matrix with a mass per unit area of 0.5 lbs/sy and a functional longevity of 36 months, incorporated into a permanent three-dimensional matting. The matrix shall be stitch bonded, with a UV stabilized polypropylene thread, between a super heavy-duty UV stabilized bottom net with an approximate 0.5” x 0.5” net opening, an ultra duty UV stabilized, dramatically crimped intermediate netting with an approximate 0.5” x 0.5” net opening, and covered by a super heavy-duty UV stabilized top net with an approximate 0.5” x 0.5” net opening. The crimped netting shall form prominent closely spaced ridges across the entire width of the mat.

2. Turf Reinforcement Mat, Type II shall be constructed of 100% UV stabilized polypropylene fiber matrix incorporated into a permanent 3-dimensional turf reinforcing matting. The matrix shall be evenly distributed across the entire mat with a mass per unit area of 0.5 lbs/sy. The matrix shall be stitch bonded, with a UV stabilized polypropylene thread, between ultra heavy-duty UV stabilized bottom, intermediate and top nettings with approximate 0.5” x 0.5” net opening. The intermediate netting shall be dramatically crimped and shall form prominent closely spaced ridges across the entire width of the mat.

3. Staples for installation shall be No. 11 gauge wire and at least 6" long.

C. INSTALLATION

Installation shall occur as soon as possible after finish grading operations and/or seeding have been complete, or as directed by the City’s Project Manager. On shallow slopes, less than 4H:1V, the mats may be installed parallel across the slope.

On steep slopes, 4H:1V or greater, the mats shall be installed perpendicular down the slope. In ditches and drainage channels the mats shall be installed parallel to the direction of flow and in such a manner as to avoid seams along the channel bottom. Entrenchment and overlap shall be as recommended by the manufacturer.
32.06 TURF REINFORCEMENT MAT (TRM) (Continued)

C. INSTALLATION (Continued)

Staples will be placed according to the manufacturer. The installation procedures shall ensure that the Turf Reinforcement Mat will remain in intimate contact with the soil for its period of functional longevity or until such time as full growth of the vegetation occurs. In loose soils, staples of greater than 6” may be required to properly secure the mat.

For application and design details see LSP 179.

D. MAINTENANCE

If, during required inspections, erosion or undermining beneath the mat is observed, the mat shall be pulled back and any lost soil shall be replaced and the area shall be reseeded. After reseeding, the mat shall be reinstalled as detailed above. Maintenance shall be completed within 24 hours of inspection if site conditions are conducive.

E. BASIS OF PAYMENT

Turf Reinforcement Mat shall be paid for at the contract unit price per square yard (SY) for TRM, TYPE I and TRM, TYPE II as measured by the visible surface area after installation is complete. This price shall be full compensation for furnishing, preparing, transporting, delivering and placing the materials, and for all labor, tools, equipment and incidentals necessary to complete the installation and maintenance of the Work.

32.07 SEDIMENT BARRIERS

A. GENERAL

Sediment barriers function by intercepting and ponding sediment-laden runoff. Ponding the water reduces the velocity of the incoming flow and allows most of the suspended sediment to settle out. Water exits the check by flowing over the top or through the filter medium. Sediment barriers can be used as ditch checks or continuous sediment barriers.

B. MATERIALS

1. Flexible Triangular Sediment Barriers shall be triangular in shape, having a height of at least 9” in the center with equal sides and at least a 16” wide base. The triangular-shaped inner material shall be urethane foam. The outer cover shall be a woven geotextile fabric placed around the inner material and allowed to extend beyond both sides of the triangle at least 30”. Standard length of each barrier will be 7’ unless otherwise indicated on the plans.

Staples shall be No. 11 gauge wire and be at least 8” long or per manufacturers Specifications, whichever is greater.

2. Permeable A-Shaped Sediment Barrier is a permeable, high porosity A-Shaped rigid plastic berm with basic dimensions of 9” in height and 3’ in length. The permeable A-shaped barrier shall be installed on top of a turf reinforcement meeting specifications given above for TRM, Type I.

The permeable A-shaped berm shall be installed with galvanized ardox spikes 10” long using galvanized washers at intervals or per manufacturers Specifications, whichever is greater.

3. Temporary Earth/Soil Berms can consist of excavated soil material on site.
B. MATERIALS (Continued)

4. Earth-Slash Mulch Check can consist of onsite waste material from clearing and grubbing. Material shall consist of coarse pieces with a minimum length of 3".

C. INSTALLATION

Sediment barriers shall be installed in locations and configuration as shown on the approved erosion and sediment control plan or as directed by the City’s Project Manager.

1. For installation of flexible triangular sediment barriers, a 4" wide by 4" deep trench shall be excavated perpendicular to the storm water flow. The trench shall extend in a straight line along the entire length of the proposed triangular sediment barrier installation.

The triangular sediment barrier shall be installed such that the elevation of the ground at both ends of the barrier is higher than the elevation of the top of the barrier at the center of the ditch. This prevents the storm water from flowing around the barrier.

Triangular sediment barriers shall be constructed prior to or the same day that land disturbance activities are performed up slope of the triangular sediment barriers.

Each triangular sediment barrier has two aprons: one upstream and one downstream. The upstream apron is the shorter of the two. Place the triangular sediment barrier on the downstream side of the trench. Conform the flexible triangular sediment barrier to the contour of the ground or the geometry of the ditch so that no space exists between the barrier and the ditch bottom. Place the first 4" to 6" of the upstream apron in the trench and anchor it with one row of staples on 18" centers at the bottom of the trench angled slightly toward the downstream side. Place an additional row of staples on 18" centers and at changes in grade along the full length of the barrier at the upstream edge of triangular portion of the barrier. The downstream apron, (which folds under the base of the triangular sediment barrier) should terminate freely on the downstream side of the triangular silt barrier. No trench is needed for the downstream apron. The downstream apron shall be anchored with two rows of staples placed on 18" centers.

One row shall be placed where the downstream apron meets the base of the barrier on the downstream side, and the other row should be placed at the downstream edge of the apron.

At joints between sections of the barriers, the ends of the barrier sections shall be placed such that there is no space between the foam materials. The excess fabric at the ends of the barrier sections shall be extended over the adjoining sections and stapled together along the full length of the joint.

When all the sections have been anchored with staples accordingly the trench shall be backfilled with compacted soil.
C. INSTALLATION (Continued)

2. For installation of permeable A-shaped sediment barriers, grade surface in preparation for seeding, removing all debris and large clumps of dirt and seed in locations where indicated on the plans. Install erosion control blanket at sediment barrier locations. Install erosion control blanket 3’ wide, perpendicular to the direction of flow, centered under the barrier location. Allow 4” slack across the blanket width for folding over upstream foot of the barrier.

Trench in and staple the upstream edge of the blanket, recompact soil into the trench. Place sediment barrier units perpendicular to the flow, centered over the erosion control blanket, overlap units by 2”. Secure using spikes and washers through the folded erosion control blanket and the foot of the unit. The pins shall be spaced across the entire width of the panel at 10” on center for the upstream leg and 20” on center for the downstream leg.

The permeable A-shaped berm shall be installed with galvanized Ardox spikes 10” long using galvanized washers at intervals or per manufactures Specifications, whichever is greater.

3. For installation of a temporary earth/soil berm, the berm shall have a minimum height of 18" and should be twice as wide it is high. Berms must be substantial enough to maintain their structural integrity while handling incoming flows. Install berms on the contour perpendicular to sheet flow with the ends turned upslope to prevent runoff from bypassing the berm.

4. For installation of an earth-slash mulch check, the berm shall have a minimum width of 4’ and a minimum height of 1’ 6”.

For application and design details see LSP 180.

D. MAINTENANCE AND REMOVAL

The Contractor shall inspect all sediment barriers after each rainfall event of at least 0.5 inches or greater. Any deficiencies or damage shall be repaired by the Contractor. If the barriers are damaged or inadvertently moved during the silt removal process, the contractor shall immediately replace the barriers after damage occurs.

Sediment deposits shall be removed when the level of deposition reaches 1/2 of the structure height. Removed sediment shall be placed in a suitable location and in a manner that minimizes further erosion.

If, during required inspections, damage to the structure is observed the necessary repairs shall be completed within 24 hours of the inspection.

The structure shall not be removed until the up-slope area has been permanently stabilized and/or directed by the City’s Project Manager. All materials shall be completely removed from the site and stored or disposed of properly, unless the engineer approves a suitable disposal area within the project limits.

All ground disturbed by the removal of the structure shall be graded flush with the surrounding ground and stabilized with vegetative cover.
E. BASIS OF PAYMENT

Installation shall be paid for at the contract unit price per linear foot (LF) for TRIANGULAR SEDIMENT BARRIER INSTALL, PERMEABLE A-SHAPED SEDIMENT BARRIERS INSTALL, TEMPORARY EARTH/SOIL BERM INSTALL AND EARTH-SLASH MULCH CHECK INSTALL. This price shall be full compensation for furnishing, preparing, transporting, delivering, excavating, and placing the materials, and for all labor, tools, equipment and incidentals necessary to complete the Work.

Maintenance shall be paid for at the contract unit price bid per linear foot (LF) for TRIANGULAR SEDIMENT BARRIER MAINT., PERMEABLE A-SHAPED SEDIMENT BARRIER MAINT., TEMPORARY EARTH/SOIL BERM MAINT. AND EARTH-SLASH MULCH CHECK MAINT. This price shall be full compensation for any and all labor, tools, equipment, and incidentals necessary to complete the maintenance activities listed in these Standard Specifications.

Removal shall be paid for at the contract unit price bid per linear foot (LF) for TRIANGULAR SEDIMENT BARRIER REM., PERMEABLE A-SHAPED SEDIMENT REM., TEMPORARY EARTH/SOIL BERM REM AND EARTH-SLASH MULCH CHECK REM. This price shall be full compensation for removal, disposal of structures and any trapped sediment, cleaning the site, and any and all labor, tools, equipment, and incidentals necessary to complete the Work.
32.08 ROCK DITCH CHECK

A. GENERAL

Rock ditch checks are small temporary dams constructed across a swale or drainage ditch for the purpose of reducing velocity of concentrated stormwater flows and to pond water, thereby reducing erosion of the swale or ditch and promoting settling of suspended solids behind the ditch check.

B. MATERIALS

Rock ditch checks shall typically be a maximum of 3’ in height, have a minimum top width of 2’ measured in the direction of flow with maximum side slopes of 2:1. The upstream half of the rock check dam should be constructed of 2” to 3” stone (breaker run) placed against Type A rock rip-rap for the downstream half of the check. Stone ditch checks shall be underlain with geotextile filter fabric. An erosion control blanket shall be placed at the base of the ditch check, extending 6’ downstream to prevent scour and washing out the toe of the check.

C. INSTALLATION

Rock ditch checks shall be installed in locations and configuration as shown on the approved erosion and sediment control plan or as directed by the City’s Project Manager.

For installation of ditch checks, finish grading ditch or channel to final shape and grades, removing all debris and large clumps of dirt. Dig a 6” deep trench at the location of the check to key it into the soil. Install geotextile fabric at the location of the check.

Install erosion control blanket so that it overlaps the geotextile fabric by 1’ and will be held in place by rock. Staple fabric to soil as per manufacturer’s Specifications. Install rock rip-rap for the downstream half of rock check. Install 2” to 3” breaker run stone for the upstream half of the rock check.

Ditch checks shall be utilized during rough grading and shall be removed once final grading and channel stabilization is applied, unless intended to be part of a permanent stormwater management plan.

Rock checks shall be installed such that the elevation of the ground at both ends of the check is higher than the elevation of the top of the check at the center of the ditch. This prevents the storm water from flowing around the barrier.

Rock checks shall be constructed prior to or the same day that land disturbance activities are performed up slope of the triangular sediment barriers.
D. MAINTENANCE AND REMOVAL

Sediment deposits shall be removed when the level of deposition reaches 1/2 of the structure height. Removed sediment shall be placed in a suitable location and in a manner that minimizes further erosion.

If, during required inspections, damage to the structure is observed the necessary repairs shall be completed within 24 hours of the inspection.

The structure shall not be removed until the up-slope area has been permanently stabilized. All materials shall be completely removed from the site and stored or disposed of properly. All ground disturbed by the removal of the structure shall be graded flush with the surrounding ground and stabilized with vegetative cover.

E. BASIS OF PAYMENT

Installation shall be paid for at the contract unit price per linear foot (LF) for ROCK DITCH CHECK INST. This price shall be full compensation for furnishing, preparing, transporting, delivering, excavating, and placing the materials, and for all labor, tools, equipment and incidentals necessary to complete the Work.

Maintenance shall be paid for at the contract unit price bid per linear foot (LF) for ROCK DITCH CHECK MAINT. This price shall be full compensation for any and all labor, tools, equipment, and incidentals necessary to complete the maintenance activities listed in these Standard Specifications.

Removal shall be paid for at the contract unit price bid per linear foot (LF) for ROCK DITCH CHECK REM. This price shall be full compensation for removal, disposal of structures and any trapped sediment, cleaning the site, and any and all labor, tools, equipment, and incidentals necessary to complete the Work.
COMPOST FILTER SOCK

A. GENERAL

A compost filter sock is a type of contained compost filter berm. It is a mesh tube filled with composted material that is placed perpendicular to sheet-flow runoff to control erosion and retain sediment in disturbed areas.

Compost filter socks are generally placed along the perimeter of a site, or at intervals along a slope, to capture and treat stormwater that runs off as sheet flow. Additionally, they can be laid adjacent to each other, perpendicular to stormwater flow, to reduce flow velocity and soil erosion. Filter socks can also be used on pavement as inlet protection for storm drains and to slow water flow in small ditches.

B. MATERIALS

1. The compost filter sock is oval to round in cross section and provides a three-dimensional filter that retains sediment and other pollutants. They are assembled by tying a knot in one end of the mesh sock, filling the sock with the composted material (usually using a pneumatic blower), and then knotting the other end once the desired length is reached. Filter socks used for erosion control are typically 12" in diameter. Filter socks used for stormwater inlet protection on pavement are typically 8" in diameter, but compressed so that the top of the filter sock is lower than the top of the curb. See the following table for minimum sock diameters based on slope and slope length:

<table>
<thead>
<tr>
<th>Slope</th>
<th>Slope Length</th>
<th>Sock Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;50:1</td>
<td>250'</td>
<td>12&quot;</td>
</tr>
<tr>
<td>50:1-10:1</td>
<td>125'</td>
<td>12&quot;</td>
</tr>
<tr>
<td>10:1-5:1</td>
<td>100'</td>
<td>12&quot;</td>
</tr>
<tr>
<td>3:1-2:1</td>
<td>50'</td>
<td>18&quot;</td>
</tr>
<tr>
<td>&gt;2:1</td>
<td>25'</td>
<td>18&quot;</td>
</tr>
</tbody>
</table>

2. Composts used shall be weed free and derived from a well-decomposed source of organic matter. The compost shall be produced using an aerobic composting process meeting CFR 503 regulations, and meet all local, state, and Federal quality requirements. The compost shall be free of any refuse, contaminants or other materials toxic to plant growth, in addition to meeting the following:
   a. pH of 5.0 – 8.0.
   b. Particle size with 99% passing a 2" sieve and 30% passing the 3/8" sieve.
   c. Moisture content of less than 60%.
   d. Material shall be relatively free (<1% by dry weight) of inert or foreign man-made materials.

3. Wood Stakes shall be a minimum of 2" x 2" long non-treated hard wood.

C. INSTALLATION

Compost filter socks shall be placed at locations indicated on the plans and as directed by the City’s Project Manager. They should be placed parallel to the base of the slope or other affected area, perpendicular to the sheet flow, and as frequently as is necessary to break-up the slope length. No trenching is required, but the compost sock should be uniformly contacting the ground surface. This may require cutting or removing heavy vegetation, and or leveling uneven surfaces. Once the filter sock is filled and put in place, it should be anchored to the slope by driving 2" x 2" wooden stakes through the center of the sock at regular intervals or placing stakes on the downstream side of the filter sock.
32.09 COMPOST FILTER SOCK (Continued)

C. INSTALLATION (Continued)

The stakes shall be placed at no greater than 10’ lineal spacing. The stake should be driven into solid ground a minimum of 12”. The top of the stake should be at least 3” above the top of the filter sock. The ends of the filter sock should be directed upslope to prevent stormwater from running around the end of the sock.

If used as curb inlet protection, the compost filter sock shall be installed as given in the Curb Inlet Section of these Standard Specifications.

D. MAINTENANCE AND REMOVAL

If during required inspections damage to the structure is observed, the necessary repairs shall be completed within 24 hours of the inspection.

Sediment deposits shall be removed when the level of deposition reaches 1/2 of the structure height. Removed sediment shall be placed in a suitable location and in a manner that minimizes further erosion. Alternatively, the City’s Project Manager may approve the placement of an additional filter sock placed immediately on top of the existing sediment laden filter sock. If the filter sock becomes clogged with debris and sediment, they shall be maintained so as to assure proper drainage. The structure shall not be removed until the up-slope area has been permanently stabilized. All materials shall be completely removed from the site and stored or disposed of properly. The compost may be dispersed of on-site at locations approved by the City’s Project Manager.

E. BASIS OF PAYMENT

Payment for the installation of Compost Filter Sock shall be paid for at the contract unit price per linear foot (LF) for COMPOST FILTER SOCK INST. This price shall be full compensation for furnishing, preparing, transporting, delivering, excavating, and placing the materials, and for all labor, tools, equipment and incidentals necessary to complete the Work.

Payment for the maintenance of Compost Filter Sock shall be paid for at the contract unit price bid per liner foot (LF) for COMPOST FILTER SOCK MAINT. This price shall be full compensation for any and all labor, tools, equipment and incidentals necessary to complete the maintenance activities listed above.

Payment for the removal of the Compost Filter Sock shall be paid for at the contract unit price bid per liner foot (LF) for COMPOST FILTER SOCK REM. This price shall be full compensation for any and all labor, tools, equipment and incidentals necessary to complete the removal activities listed above.

32.10 BIODEGRADABLE LOG (WATTLE) DITCH CHECK

A. GENERAL

Erosion control fiber rolls commonly known as Wattles, are elongated tubes of compacted straw and/or other fibers that are installed along contours or at the base of the slopes to help reduce soil erosion and retain sediment. They function by shortening slope length, reducing runoff water velocity, trapping dislodged soil particles and ameliorating the effects of slope steepness.
32.10 BIODEGRADABLE LOG (WATTLE) DITCH CHECK (Continued)

A. GENERAL (Continued)

Wattles are used as water flow dissipaters trapping sediment when located prior to Drain Inlets, etc. Wattles are highly effective when they are used in combination with other surface soil erosion/re-vegetation practices such as surface roughening, straw mulching, erosion control blankets, hydraulic mulching and application of bonded fiber matrix or other hydraulic soil stabilizers.

B. MATERIALS

Wattles shall be a straw-filled tube of flexible netting material exhibiting the following properties. It shall be a machine-produced tube of compacted straw, rice or wheat straw, excelsior, coir, or coconut that is Certified Weed Free Forage, by a manufacturer whose principle business is wattle manufacturing. The netting shall consist of seamless, high-density polyethylene and ethyl vinyl acetate and contain ultra violet inhibitors.

The Wattle shall meet the minimum performance requirements of Table 1. The product must be guaranteed to meet all numeric performance values in Table 1 under the specific conditions as stated.

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Units</th>
<th>Min. Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mass per Unit Weight</td>
<td>Field Measured</td>
<td>(lbs/ft)</td>
<td>1.6</td>
</tr>
<tr>
<td>Dimension</td>
<td>Field Measured</td>
<td>(Dia/Inches)</td>
<td>8.0 - 9.0</td>
</tr>
<tr>
<td>Net Strand Thickness</td>
<td>Field Measured</td>
<td>(Inches)</td>
<td>0.030</td>
</tr>
<tr>
<td>Net Knot Thickness</td>
<td>Field Measured</td>
<td>(Inches)</td>
<td>0.055</td>
</tr>
<tr>
<td>Netting Unit Weight</td>
<td>Certified</td>
<td>(Ounces/ft)</td>
<td>0.35</td>
</tr>
<tr>
<td>Installed Free-Board Ht.</td>
<td>Field Measured</td>
<td>(Height/Inches)</td>
<td>6.0 - 7.0</td>
</tr>
<tr>
<td>Straw Fiber</td>
<td>Field Measured</td>
<td>Avg. Length (in)</td>
<td>3.0</td>
</tr>
<tr>
<td>Fiber Content</td>
<td>Certified</td>
<td>% Straw</td>
<td>100</td>
</tr>
</tbody>
</table>

C. PREPARATION

Proper site preparation is essential to ensure complete contact of the sediment retention device (Wattle) with the soil. The slope should be prepared to receive the surface mulching/re-vegetation treatment prior to installation of the erosion control and sediment Retention Wattles. Remove all rocks, clods, vegetation or other obstructions so that the installed Wattles will have direct contact with the soil.

A small trench 2" - 3" in depth should be excavated on the slope contour and perpendicular to water flow. Soil from the excavation should be placed down-slope next to the trench.

D. INSTALLATION

Install the Wattles in the trench, insuring that no gaps exist between the soil and the bottom of the Wattle. The ends of adjacent Wattles should be tightly abutted so that no opening exists for water or sediment to pass through. Alternately, Wattles may be lapped, 6" minimum to prevent sediment passing through the field joint.

Wooden stakes should be used to fasten the Wattles to the soil. When conditions warrant, a straight metal bar can be used to drive a pilot hole-through the Wattle and into the soil.
32.10 BIODEGRADABLE LOG (WATTLE) DITCH CHECK (Continued)

D. INSTALLATION (Continued)

Wooden stakes should be placed 6" from the Wattle end angled towards the adjacent Wattle and spaced at 2' leaving less than 1"-2" of stake exposed above the Wattle. Alternately, stakes may be placed on each side of the Wattle tying across with a natural fiber twine or staking in a crossing manner ensuring direct soil contact at all times.

Terminal ends of wattles may be dog legged up slope to ensure containment and prevent channeling of sedimentation.

Backfill the upslope length of the Wattle with the excavated soil and compact.

Care shall be taken during installation so as to avoid damage occurring to the Wattle as a result of the installation process. Should the Wattle be damaged during installation, a wooden stake shall be placed either side of the damaged area terminating the log segment.

Field monitoring shall be performed to verify that the placement does not damage the Wattle. Any Wattle damaged during placement shall be replaced as directed by the City’s Project Manager, at the Contractor’s expense.

E. MAINTENANCE AND REMOVAL

The Wattles shall be inspected after installation to ensure that they are trenched-in and that no gaps exist under the wattles or between adjacent ends of the wattles.

Sediment deposits that impair the filtration capability of the wattle shall be removed when the sediment reaches one-third of the wattle’s functional freeboard height. Removed sediment shall be deposited within the project in such a way that the sediment is not subject to erosion by wind or water, or as directed by the City’s Project Manager.

Installed Wattles shall be removed and-or replaced as required to adapt to changing conditions.

When no longer required for the intended purpose, as determined by the City’s Project Manager, temporary wattles shall be removed from the site. As an option, the straw wattles may be slit down the length of the netting, and the straw may be used on-site as directed by the City’s Project Manager. The netting and stakes shall be gathered and disposed of in regular means as it is non-hazardous, inert material.

Trenches, depressions or any other ground disturbances caused by the removal of the temporary straw wattles shall be backfilled and repaired with the excess sediment captured by the wattle, prior to spreading the straw or other final erosion control protection.

F. BASIS OF PAYMENT

Installation shall be paid for at the contract unit price per linear foot (LF) for BIODEGRADABLE LOG DITCH CHECK INST. This price shall be full compensation for furnishing, preparing, transporting, delivering, excavating, and placing the materials, and for all labor, tools, equipment and incidentals necessary to complete the Work.
32.10 BIODEGRADABLE LOG (WATTLE) DITCH CHECK (Continued)

F. BASIS OF PAYMENT (Continued)

Maintenance shall be paid for at the contract unit price bid per linear foot (LF) for BIODEGRADABLE LOG DITCH CHECK MAINT. This price shall be full compensation for any and all labor, tools, equipment, and incidentals necessary to complete the maintenance activities listed in these Standard Specifications.

Removal shall be paid for at the contract unit price bid per linear foot (LF) for BIODEGRADABLE LOG DITCH CHECK REM. This price shall be full compensation for removal, disposal of structures and any trapped sediment, cleaning the site, and any and all labor, tools, equipment, and incidentals necessary to complete the Work.

32.11 COIR FIBER LOG REVETMENTS

A. GENERAL

Coir Fiber Logs are installed along the toe of the streambank in order to effectively manage changes in stream flow velocity, providing channel stabilization until vegetation has established. Coir fiber logs are biodegradable and once installed, will remain in place until they decompose.

B. MATERIALS

1. Coir Fiber Logs shall be BioLog, BioD-Roll or approved equal. Coir Fiber Logs shall be made of 100 percent coconut (coir) fiber fill and bound by high strength coir netting with outer net openings of 2” x 2”. Logs shall be 12” in diameter with an average weight of 5 lbs/ft and density of 7 lbs/cubic foot.

2. Wood Stakes shall be a minimum of 2” x 2” x 36” long non-treated hard wood.

C. INSTALLATION

Coir Fiber Logs shall be installed along the toe of the streambank, trenched in 3” and staked at 2' on center or as per the manufactures recommended installation, whichever is more stringent.

When used in conjunction with an erosion control blanket or turf reinforcement mat, the blanket or mat shall be installed under the coir log, within the 3” trench and staked into place with the installation of the coir logs. The remaining portion of the blanket or mat shall be installed and stapled per plans or Standard Specifications

D. MAINTENANCE

If, during required inspections, erosion and undermining beneath the log is observed, the log shall be pulled up and any lost soil shall be replaced and the log shall be reinstalled.
32.11 COIR FIBER LOG REVETMENTS (Continued)

E. BASIS OF PAYMENT

Coir Fiber Logs, constructed in conformance with the plans and these Standard Specifications and accepted by the City’s Project Manager, shall be measured and paid for at the contract unit price bid per linear foot for COIR FIBER LOG. Measurement shall not include overlapping sections. Such payment shall be full compensation for all coir logs, wood stakes, excavation, slope preparation, fine grading, equipment, materials, tools, labor, and incidentals necessary to complete the Work.

Maintenance shall be paid for at the contract unit price bid per linear foot (LF) for COIR FIBER LOG MAINT. This price shall be full compensation for any and all labor, tools, equipment, and incidentals necessary to complete the maintenance activities listed in these Standard Specifications.

32.12 SWPPP SIGN

A. GENERAL

The permittee shall conspicuously post and maintain a notice about the permit and SWPPP near the main entrance of the site prior to engaging in any construction activity. The sign must be maintained and remain in place throughout the duration of the project until a Notice of Termination approval has been obtained.

The sign must include the following information:

- The project’s permit number;
- The name and phone number of a local contact;
- A brief description of the project; and
- The location of the SWPPP, if not kept on site.

B. MATERIALS

The sign shall be constructed of a rigid material, such as plywood or outdoor sign board. Sign must be constructed in such a manner as to protect documents from damage due to weather (wind, sun, moisture, etc.).

C. INSTALLATION

The sign must be located near the entrance of the site such that it is accessible/viewable by the general public, but not obstructing views as to cause a safety hazard. If there is a perimeter fence or adjacent work trailer, it is acceptable to mount the sign on these permanent structures as long as they are visible from the construction site entrance.

D. MAINTENANCE

The information relative to the site shall be updated (i.e. contact information, location of SWPPP documents, etc.) and the sign shall be kept in good condition throughout the life of the project or until a Notice of Termination has been approved.
32.12  SWPPP SIGN (Continued)

E. BASIS OF PAYMENT

Payment for the installation of the SWPPP Sign shall be paid for at the contract unit price per each (EA), per occurrence for SWPPP SIGN INST. This price shall be full compensation for furnishing, preparing, transporting, delivering, excavating, and placing the materials, and for all labor, tools, equipment and incidentals necessary to complete the work.

Payment for the maintenance of the SWPPP Sign shall be paid for at the contract unit price bid per each (EA), per occurrence for SWPPP SIGN MAINT. This price shall be full compensation for any and all labor, tools, equipment and incidentals necessary to complete the maintenance activities listed above.

Payment for the removal of the SWPPP Sign shall be paid for at the contract unit price bid per each (EA), per occurrence for SWPPP SIGN REM. This price shall be full compensation for any and all labor, tools, equipment and incidentals necessary to complete the removal activities listed above.