***NOTE TO SECTION EDITOR*: Edit any text in this section that appears in bold and italics based on site conditions and the particular requirements of your project, then turn off the bold and italics for the final review version. (*Remove this Note*).**

PART 1 - GENERAL

1.01 SECTION INCLUDES:

A. This Section describes work consisting of the furnishing, installing, maintaining, removing, and disposing of Construction Stormwater Controls (CSC, referred to the TESC in the General Conditions).

B. The CSC shall be designed and implemented to prevent erosion and scour, to treat sediment laden water for acceptable discharge, and to prevent the conveyance of sediment into surface waters, drainage systems, and environmentally critical areas.

C. Guidelines and requirements are defined in Ch 25.09 SMC.

D. At the end of this Section two forms are attached and are intended for use by the Contractor during the execution of the Work. They include the CSC Monitoring & Maintenance Checksheet and the CSC-BMP Construction Change Tracking Form.

E. City of Seattle Standard Plans or Standard Specifications sections referenced in this Section may be obtained on line at:

www.seattle.gov/UTIL/Engineering/Standard_Plans_&_Specs/index.asp.

1.02 GENERAL:

A. During construction, the Contractor shall incorporate practices that prevent erosion, or control erosion when prevention is unavoidable, and shall make every effort to maintain effective erosion and sediment controls throughout the Work including implementing timely corrective actions as may be necessary. Sediment shall be prevented from entering any surface water, drainage facility, and natural drainage system, and shall be prevented from transport to beyond the Project Site. Work shall comply with Director's Rules based on SMC Chapters 22.800 through 22.808 and other codes addressing grading, stormwater control, ground water control, and other construction controls.

B. The Contractor shall, submit to the Engineer for review, a Construction Stormwater Control Plan prepared in accordance with the above regulations and as specified in this Section. The CSC Plan shall name and confirm qualifications for the Contractor's Certified On-Site Construction Erosion Control Lead (see subparagraph 1.03.M.3 of Section 00 72 00 - General Conditions). The plan shall be compatible with and shall be coordinated with the Work and Work phasing ensuring a continuance of protection.

1.03 SUBMITTALS:

A. Construction Stormwater Control (CSC):

1. At the preconstruction conference, the Contractor shall be prepared to discuss temporary erosion and sedimentation controls. Following the outcome of these discussions, the Certified On-Site Construction Erosion Control Lead (ECL) shall

prepare and submit a CSC Plan as indicated in the subparagraph 3 table following, or unless agreed to otherwise at the preconstruction conference.

2. In the subparagraph 3 Table, NTPD = Notice to Proceed Date.

3. Time Allowed For CSC Plan Submittal and Engineer Review:

Contract Time (Working Days)	**First CSC Plan Submittal**	**Final CSC Plan Submittal**	**Comment**
≤ 30	See Final CSC Plan Submittal	CSC Plan for all Work is due on NTPD	Allow 5 Working Days for Engineer Review
30 < and ≤ 100	CSC Plan for first 15 Working Days is due within 5 Working Days of NTPD	CSC Plan for all Work is due within 10 Working Days of NTPD	Allow 10 Working Days for Engineer Review
100 <	CSC Plan for first 30 Working Days is due within 10 Working Days of NTPD	CSC Plan for all Work is due within 30 Calendar Days of NTPD	Allow 15 Working Days for Engineer Review

4. Content of CSC Plan:

   a. The CSC Plan shall show, as it relates to the Contractor's critical path schedule, the scheduling of installation, maintenance, phasing, and removal of erosion and sedimentation controls as it relates to the Work. Work areas to be addressed in this plan include as applicable:

      1) The Project Site identifying staging, storage, stockpiling, non-Work boundaries, and other construction related areas;

      2) Areas beyond the Project Site;

      3) Transportation facilities including construction traffic routes and access/exit control areas on and off the Project Site;

      4) Environmental Critical Areas (ECA), as defined in Ch 25.09 SMC, within or near the Project Site, such as geologic hazard areas, flood prone areas, riparian corridors, wetlands, fish and wildlife habitat conservation areas, and abandoned landfills;

      5) Inlets, catch basins, ditches and channels whether dry or water filled, and other surface drainage facilities;

      6) Surface waters such as streams, lakes, and other bodies of water; and

      7) Identify areas of erodible soil not being worked that may be exposed that may exceed 4,000 square feet, or may be unprotected or uncovered for more than 2 calendar days.

b. The CSC Plan submittal shall include, but not be limited to, one or more of the following as the Contract may require, as the Work may require, and as the Work is scheduled:

1) Describe with Shop Drawings of sufficient scale and detail showing the Project Site, and the locations and types of temporary erosion and sediment controls. As necessary, show by a series of time sequence Shop Drawings, how CSC controls are to be installed, maintained, removed and coordinated with the Work and the progress schedule;

2) Describe how non-work areas will be identified and protected;

3) Describe the details and continuing maintenance of entrance and exit equipment wash areas;

4) Show locations with cross-sections as applicable and describe control details of existing and proposed ditch, berm, Culvert, pipe, sediment basin, basin outfall, scour control, inlet, catch basin, drain, bypass, subsurface drain and related feature;

5) Describe treatment processes for, controls of, and the disposal of waters resulting from dewatering, surfacing groundwater, and rainfall;

6) Describe protections and covering practices for stockpile, muck, and related deposits;

7) Describe the controls to prevent sediment, debris, and other pollutants from entering surface waters and drainage features;

8) Provide Manufacturer's Certificate of Compliance, certified laboratory test reports, catalog cuts, samples, and other information providing adequate description of Supplies and Material proposed for CSC applications;

9) The name of the Certified On-Site ECL, qualifications, experience, and certifications directly related to temporary erosion and sediment control, and other information as the Contract and the Work may require, including how to timely contact. If the Work is of such a magnitude that requires additional help, describe the qualifications of additional help, any on-site training that may be necessary, and frequency and type of reporting to the ECL;

10) A schedule of typical inspections ensuring timely maintenance and repair;

11) Identify and provide timelines for submitting permit required or related documentation;

12) Provide details of seed mix, amendment, mulch, and protections for placing and establishing temporary seeded erosion control areas;

13) In areas where exposed erodible soil exceeds 4000 square feet or that may be unprotected for more than 2 calendar days, describe the controls and the proposed monitoring ensuring erosion and sedimentation shall not become non-compliant; and

14) Provide details of other CSC measures indicated in this Section as may be used in the Work.

c. The Contractor shall have at a designated location at the Project Site, and the ECL shall have immediately available, copies of the current CSC Plan.

5. Maintaining CSC Plan Current:

a. During the course of the Work, the Contractor and Certified On-Site ECL shall be prepared to discuss with the Engineer the status of CSC controls in-progress and to come as they relate to the Work, to the progress schedule, to permits, to Change Order, and as may be required in the Contract.

b. When revisions to the current CSC Plan are required by the Engineer, the Contractor and ECL shall be prepared to update the CSC Plan as discussed and shall submit the updated CSC Plan to the Engineer within 5 Working Days unless the Engineer agrees to other arrangements.

6. Authority of Certified On-Site CSC.

a. See Section 00 72 00 - General Conditions, subparagraph 1.03.M.3.

PART 2 - PRODUCTS

(EDIT THE FOLLOWING AS REQUIRED)

2.01 RIPRAP AND QUARRY SPALLS:

A. General:

1. The stone for riprap and quarry spalls shall be hard, sound and durable. It shall be free from segregation, seams, cracks, and other defects tending to destroy its resistance to weather.

2. Loose riprap shall be free of rock fines, soil, or other extraneous material.

3. Should the riprap contain insufficient 4" to 8" spalls, as defined in Paragraph 2.01.F, the Contractor shall furnish and place supplementary spall material from a source approved by the Engineer, at the Contractor's sole expense.

4. The grading of the riprap will be determined by the Engineer by visual inspection of the load before it is dumped into place, or, if so ordered by the Engineer, by dumping individual loads on a flat surface and sorting and measuring the individual rocks contained in the load.

B. Heavy Loose Riprap:

1. Heavy loose riprap shall meet the following requirements for grading:

	Minimum Size	***Maximum Size***
40% to 90%	***1 ton (1/2 cubic yd.)***	
70% to 90%	***300 lbs. (2 cu. ft.)***	
10% to 30%	***3 inch***	***50 lbs. (spalls)***

C. Light Loose Riprap:

1. Light loose riprap shall meet the following requirements for grading:

	Size Range	*Maximum Size*
20% to 90%	*300 lbs. to 1 ton (2 cu. ft. to ½ cu. yd.)*	
15% to 80%	*50 lbs. to 1 ton (1/3 cu. ft. to ½ cu. Yd.)*	
10% to 20%	*3 inch*	*50 lbs. (spalls)*

D. Hand Placed Riprap:

1. Hand placed riprap shall be as nearly rectangular as possible, 60 percent shall have a volume of not less than 1 cubic foot. No stone shall be used which is less than 6 inches thick, nor which does not extend through the wall.

E. Sack Riprap:

1. Sack riprap shall consist of concrete placed in sacks made of at least 10 ounce burlap and having a capacity of approximately 2.5 cubic feet. Each sack shall be filled with approximately 1 cubic foot of concrete having a consistency in conformance with Seattle Standard Specifications Section 6-02.3(3)D for non-vibrated concrete.

2. For sack riprap exposed to fresh water, the concrete shall be 28-day minimum compressive strength of 2,300 psi and for sack riprap exposed to saltwater; the concrete shall be 28-day minimum compressive strength of 3,000 psi as specified in Seattle Standard Specifications Section 6-02.3.

3. The Portland cement and fine and coarse aggregates shall conform to the requirements for Portland cement and fine and coarse aggregate of Seattle Standard Specifications Sections 9-01 and 9-03.1, respectively.

F. Quarry Spalls:

1. The spall shall be hard, sound, and durable. It shall be free from fracture, seams, cracks, and other discontinuities tending to adversely impact its resistance to weathering.

2. The quarry spall shall meet the following test requirements:

Specific Gravity	*ASTM C 127*	*Minimum 2.65*
Soundness	*AASHTO T 104 (section 5.2.2)*	*Not greater than 5 % loss*
Accelerated Expansion	*CRD-C-148*	*Not greater than 15% breakdown*
Absorption	*ASTM C 127*	*Not greater than 2%*
L. A. Abrasion	*ASTM C 131*	*Maximum 20% loss @ 500 revolutions*

3. Quarry spalls shall meet the following gradation requirements:

a. 2 Inch to 4 Inch Quarry Spalls

Sieve Size	*Percent Passing*
4 inch	*100*
2 inch	*40 max.*
1-1/4 inch	*5 max.*

b. 4 Inch to 8 Inch Quarry Spalls

Sieve Size	*Percent Passing*
8 inch	*100*
4 inch	*40 max.*
2 inch	*5 max.*

2.02 EROSION CONTROL MATERIALS:

A. Mulches and Amendments:

1. Straw Mulch:

a. All straw mulch Material shall be in an air-dried condition free of noxious weeds and other materials detrimental to plant life. Straw shall be seasoned before baling or loading and shall be suitable for spreading with mulch blower Equipment.

2. Arborist's Wood Chip Mulch:

a.. Wood chips salvaged from clearing and grubbing activity may be approved as a substitute for bark mulch, if found acceptable by the Engineer prior to application.

3 Compost Amendments:

a. Composted Organic Material (Compost), shall be comprised entirely of recycled organic Materials that have been sorted, ground, aerated and aged for a minimum of one year and of which 100% passes a 7/16 inch sieve. The mulch shall have a pH between 5.5 and 7.0 and shall have a carbon to nitrogen (C:N) ratio between 20:1 and 40:1 with a maximum electrical conductivity of 3 ohms/cm. The product shall be tested by a Contractor provided accredited laboratory acceptable to the Engineer. The Contractor shall submit at least 2 Working Days in advance, a Manufacturer's Certificate of Compliance stating all test requirements meet the specified requirements. The product shall be certified free of all plant parasitic organisms, viable weed seeds, heavy metals or parasitic residues.

b. Decomposed organic mulch quantities for Projects requiring more than 35 cubic yards shall be tested before incorporation per Seattle Standard Specifications Section 8-02.3(4) with testing procedure and correction of deficiencies as described in sub-item C. of either Seattle Standard Specifications Sections 9-14.1(4)A or 9-14.1(4)B as applicable to the plants needs.

c. Decomposed organic mulch for Projects requiring 35 cubic yards or less (of the mulch) shall be delivered to the Project Site with a soil fertility and micronutrient analysis from an approved independent laboratory. Amendments shall be incorporated at the Project Site to provide optimum conditions for plant establishment and early growth. The planting area preparation, if applicable to this project, shall conform to the requirements of Seattle Standard Specifications Section 8-02.3 (4).

4. Other Composted Materials:

a. Composted material shall be derived from a Type 1 feedstock and produced by a facility in compliance with WAC 173-350-220. The compost shall meet Grade AA Compost as defined by the Washington State Department of Ecology's Interim Guidelines for Compost Quality (Publication #94-38, Revised November 1994). Compost material shall have 100 % passing a ½-inch screen. The carbon to nitrogen ratio (C:N) of the compost shall be in the range of 20:1 to 35:1. Organic matter of the composted Material shall be in the range 4% and 10%, and the moisture content shall be in the range of 35% to 50% as determined by ASTM D 2974. The pH of the compost shall be within the range of 5.5 to 7.0 as determined by ASTM D 2976. The maximum electrical conductivity of composted Material shall be 6 ohms/cm. Decomposed Organic Compost shall be mature as determined by US Composting Council stability test ratings referred to in the Ch 173-350 WAC.

b. The product shall be tested within 6 months of proposed use, and the test results shall ensure compliance with subparagraph 2.02.D.9 requirements. The Contractor shall submit a Manufacturer's certificate of Compliance indicating the test results, a one-gallon sample, the Supplier's name and contact information, to the Engineer a minimum of 5 Working Days in advance of use.

c. The compost shall have a Solvita Compost Maturity Test performed at the Project Site, and shall score a number 6 or above to be accepted.

B. Matting and Stakes:

1. Jute Matting:

a. Jute Matting For Non-Stream Applications:

1) Jute matting shall be of a uniform open plain weave of unbleached, single jute yarn treated with a fire retardant chemical. The yarn shall be of a loosely twisted construction and shall not vary in thickness by more than 1/2 of its nominal diameter. Jute matting shall be furnished in rolled strips approximately 50 yards in length.

Matting width shall be 48 inches with an average weight of 0.92 pound per square yard. A tolerance of ±1 inch in roll width and ±5 percent in weight per square yard will be allowed.

b. Jute Matting For In-Stream Applications:

1) Jute matting shall be of a uniform open plain weave of unbleached 100% jute yarn. Plastic or any geo-synthetic netting shall not be used for stream bank construction or restoration.

2) The following table specifies acceptable product applications:

Slope	*Minimum Criteria*	*Test Method*
Slope ≥ 1:1	*25 oz/sy* *<40% open area*	*ASTM D-3776* *Corp of Engineers COE CW002215*
3:1 < slope < 1:1	*14 oz/sy* *<60% open area*	*ASTM D-3776* *Corp of Engineers COE CW002215*
4:1 < slope < 3:1	*9 oz/sy* *<65% open area*	*ASTM D-3776* *Corp of Engineers COE CW002215*
Slope < 4:1	*No matting required unless otherwise specified in the Contract*	

2. Koir Matting for In-Stream Applications

a. Koir matting shall be of a uniform open plain weave of unbleached 100% coir fabric from coconut husk. Plastic or any geo-synthetic netting shall not be used for stream bank construction or restoration.

b. When choir matting is specified in the Contract, the matting shall meet and be installed in accordance with the following table:

Slope Application	*Minimum Criteria*	*Test Method*	*Recommended Products*
Slope ≥ 1:1	*25 oz/sy <40% open area*	*ASTM D-3776 Corp of Engineers COE CW002215*	*"Geocoir/Dekowe 900" "Koir Mat 900" or approved equal*
3:1 < slope < 1:1	*14 oz/sy <60% open area*	*ASTM D-3776 Corp of Engineers COE CW002215*	*"Geocoir/Dekowe 700" "Koir Mat 700" or approved equal*
4:1 < slope < 3:1	*9 oz/sy <65% open area*	*ASTM D-3776 Corp of Engineers COE CW002215*	*"Geocoir/Dekowe 400" "Koir Mat 400" or approved equal*
Slope < 4:1	*No matting required unless otherwise specified in the Contract*		

Slope Application	*Minimum Criteria*	*Test Method*	*Recommended Products*
Slope ≥ 1:1	*25 oz/sy <40% open area*	*ASTM D-3776 Corp of Engineers COE CW002215*	*"Geocoir/Dekowe 900" "Koir Mat 900" or approved equal*
3:1 < slope < 1:1	*14 oz/sy <60% open area*	*ASTM D-3776 Corp of Engineers COE CW002215*	*"Geocoir/Dekowe 700" "Koir Mat 700" or approved equal*
4:1 < slope < 3:1	*9 oz/sy <65% open area*	*ASTM D-3776 Corp of Engineers COE CW002215*	*"Geocoir/Dekowe 400" "Koir Mat 400" or approved equal*
Slope < 4:1	*No matting required unless otherwise specified in the Contract*		

3. ***Excelsior Matting:***

   a. ***Excelsior matting shall be a machine produced mat of wood excelsior covered on one side with a biodegradable plastic netting or twisted paper composition. The Contractor shall submit to the Engineer for approval at least 10 Working Days in advance of proposed Material application, Manufacturer's Certificate of Compliance stating that the excelsior matting is environmentally safe and acceptable. This submittal shall be accompanied by a sample at least 3 square feet in area.***

   b. ***The excelsior matting shall have a wood fiber minimum dry weight of 0.8 pound per square yard ±5 %, and shall be of uniform thickness with the fiber evenly distributed over the entire area of the mat.***

   c. ***The width of a single roll of matting and net shall be a minimum 36 inches, and the length of the roll shall be approximately 150 feet.***

4. Clear and Black Plastic Covering:

a. Plastic covering shall meet the requirements of the NIST Voluntary Product Standard, PS 17-69, for polyethylene sheeting having a minimum thickness of 6 mils.

5. Stakes for Erosion Control Matting:

a. Stakes for securing erosion control matting to earth surfaces shall be a minimum 12 inches in length, and shall have sufficient strength to withstand pounding the stakes into soil flush with the surface. Stake Materials may be one or more of wire staples, steel pins, steel spikes, and wooden stakes.

E. Shear boards:

1. Shear boards shall be 2 inch x 8 inch x 8 foot, non-treated, rough finished lumber. When conditions require a length less than 8 feet, the Contractor shall plan the layout so that no individual length of cut shear board is less than 4 feet.

F. Wattles:

1. Wattles shall act as a screen or filter and shall consist of biodegradable plant material such as any combination of twigs, wicker, bamboo, other withes, straw, coir, and wood shavings in the shape of cylinders typically ranging from 10 inches to 16 inches diameter and of any length.

2. The wattle shall be encased within biodegradable netting.

2.03 CONSTRUCTION GEO-TEXTILES:

A. General Properties for Geo-textile and Thread for Sewing:

1. The material shall be a geo-textile consisting only of long chain polymeric fibers or yarns formed into a stable network such that the fibers or yarns retain their position relative to each other during handling, placement, and design service life.

2. At least 95 percent by weight of the material shall be polyolefins or polyesters.

3. The material shall be free from defects or tears.

4. The geo-textile shall be free of any treatment or coating which might adversely alter its hydraulic or physical properties after installation.

5. Erosion control geo-textile shall be permanent erosion control, high survivability.

6. The thread used for sewing shall consist of high strength polypropylene, polyester, or polyamide. Nylon threads will not be allowed. The thread used to sew permanent erosion control geo-textiles shall be resistant to ultraviolet radiation. The thread shall be of contrasting color to that of the geo-textile itself.

7. The geo-textile shall conform to the properties as indicated in Tables 1 through 6, Paragraphs 2.03.B through 2.03.H below, for each use specified in the Contract.

a. All geo-textile properties in Tables 1 through 6 are minimum average roll values (i.e., the test result for any sampled roll in a lot shall meet or exceed the values shown in the table).

b. ***The test procedures used are essentially in conformance with the most recently approved ASTM geo-textile test procedures, except for geo-textile sampling and specimen conditioning, which are in accordance with WSDOT Test Methods 914 and 915, respectively.***

c. ***The seam breaking strength test in Tables 1, 3, and 4 are with seam located in the center of 8-inch long specimen oriented parallel to grip faces.***

8. ***Specifically, the geo-textile uses included in this Article 2.03 and their associated tables of properties are as follows:***

Geo-textile Application	***Applicable Property Tables***
Underground Drainage, Low Survivability, Classes A, B, and C	***Tables 1 and 2***
Underground Drainage, Moderate Survivability, Classes A, B, and C	***Tables 1 and 2***
Separation	***Table 3***
Soil Stabilization	***Table 3***
Permanent Erosion Control, Moderate Survivability, Classes A, B, and C	***Tables 4 and 5***
Permanent Erosion Control, High Survivability, Classes A, B, and C	***Tables 4 and 5***
Ditch Lining	***Table 4***
Temporary Silt Fence	***Table 6***

B. Table 1 - Geo-textile for Underground Drainage Strength Properties for Survivability:

		Geo-textile Property Requirements	
Geo-textile Property	***Test Method***	***Low Survivability Woven / Nonwoven***	***Moderate Survivability Woven / Nonwoven***
Grab Tensile Strength, min. in machine and x-machine direction	***ASTM D 4632***	***180 lbs. / 115 lbs. min.***	***250 lbs. / 160 lbs. Min***
Grab Failure Strain, in machine and x-machine direction	***ASTM D 4632***	***<50% / /50%***	***<50% / /50%***
Seam Breaking Strength	***ASTM D 4632***	***160 lbs. / 100 lbs. min.***	***220 lbs. / 140 lbs. Min.***
Puncture Resistance	***ASTM D 4833***	***67 lbs. / 40 lbs. min.***	***80 lbs. / 50 lbs. Min.***
Tear Strength, min. in machine and x-machine direction	***ASTM D 4533***	***67 lbs. / 40 lbs. min***	***80 lbs. / 50 lbs. Min.***
Ultraviolet (UV) Radiation stability	***ASTM D 4355***	***50% strength retained min., after 500 hrs. in weatherometer***	***50% strength retained min., after 500 hrs. in weatherometer***

C. Table 2 - Geo-textile for underground drainage filtration properties:

		Geo-textile Property Requirements		
Geo-textile Property	***Test Method***	***Class A***	***Class B***	***Class C***
AOS	***ASTM D 4751***	***0.43 mm max. (No. 40 sieve)***	***0.25 mm max. (No.60 sieve)***	***0.18 mm max. (No.80 sieve)***
Water Permittivity	***ASTM D 4491***	***0.5 sec^{-1} min.***	***0.4 sec^{-1} min.***	***0.3 sec^{-1} min.***

D. Table 3 - Geo-textile for separation or soil stabilization including for the construction entrance:

		Geo-textile Property Requirements	
Geo-textile Property	***Test Method***	***Separation Woven / Nonwoven***	***Soil Stabilization Woven / Nonwoven***
AOS	***ASTM D 4751***	***0.60 mm max. (No. 30 sieve)***	***0.43 mm max. (No. 40 sieve)***
Water Permittivity	***ASTM D 4491***	***0.02 sec^{-1} min.***	***0.10 sec^{-1} min.***
Grab Tensile Strength, min. in machine and x-machine direction	***ASTM D 4632***	***250 lbs. / 160 lbs. min.***	***315 lbs./200 lbs. Min.***
Grab Failure Strain, in machine and x-machine direction	***ASTM D 4632***	***<50% / /50%***	***<50% / /50%***
Seam Breaking Strength	***ASTM D 4632***	***220 lbs. / 140 lbs. min.***	***270 lbs./180 lbs. Min.***
Puncture Resistance	***ASTM D 4833***	***80 lbs. / 50 lbs. min.***	***112 lbs./79 lbs. Min.***
Tear Strength, min. in machine and x-machine direction	***ASTM D 4533***	***80 lbs. / 50 lbs. min.***	***112 lbs./79 lbs. Min.***
Ultraviolet (UV) Radiation stability	***ASTM D 4355***	***50% strength retained min., after 500 hrs. in weatherometer***	***50% strength retained min., after 500 hrs. in weatherometer***

E. Table 4 - Geo-textile for permanent erosion and ditch lining:

		Geo-textile Property Requirements		
		Permanent Erosion Control		*Ditch Lining*
Geo-textile Property	*Test Method*	*Moderate Survivability* *Woven / Nonwoven*	*High Survivability* *Woven / Nonwoven*	*Woven / Nonwoven*
AOS	*ASTM D 4751*	*See Table 5*	*See Table 5*	*0.60 mm max (No. 30 sieve)*
Water Permittivity	*ASTM D 4491*	*See Table 5*	*See Table 5*	*0.02 sec^{-1} min.*
Grab Tensile Strength, min. in machine and x-machine direction	*ASTM D 4632*	*250 lbs. / 160 lbs. min*	*315 lbs. / 200lbs.min.*	*250 lbs. / 160 lbs. min.*
Grab Failure Strain, in machine and x-machine direction	*ASTM D 4632*	*15%- 50% / > 50%*	*15%- 50% / > 50%*	*<50% / ≥50%*
Seam Breaking Strength	*ASTM D 4632*	*220 lbs./ 140 lbs. min.*	*270 lbs. / 180 lbs. min.*	*220 lbs. / 140 lbs. min.*
Burst Strength	*ASTM D 3786*	*400 psi/ 190 psi min.*	*500 psi / 320 psi min.*	*----------*
Puncture Resistance	*ASTM D 4833*	*80 lbs./ 50 lbs. min.*	*112 lbs. / 79 lbs. min.*	*80 lbs. / 50 lbs. min.*
Tear Strength, min. in machine and x-machine direction	*ASTM D 4533*	*80 lbs./ 50 lbs. min.*	*112 lbs. / 79 lbs. min.*	*80 lbs. / 50 lbs. min.*
Ultraviolet (UV) Radiation stability	*ASTM D 4355*	*70% strength retained min., after 500 hrs. in weatherometer*	*70% strength retained min., after 500 hrs. in weatherometer*	*70% strength retained min., after 500 hrs. in weatherometer*

F. Table 5 - Filtration properties for Geo-textile for permanent erosion control:

		Geo-textile Property Requirements		
Geo-textile Property	*Test Method*	*Class A*	*Class B*	*Class C*
AOS	*ASTM D 4751*	*0.43 mm max. (No.40 sieve)*	*0.25 mm max. (No.60 sieve)*	*0.22 mm max. (No.70 sieve)*
Water Permittivity	*ASTM D 4491*	*0.7 sec^{-1} min.*	*0.4 sec^{-1} min.*	*0.2 sec^{-1} min.*

G. Table 6 – Geo-textile for temporary silt fence:

		Geo-textile Property Requirements	
Geo-textile Property	*Test Method*	*Unsupported Between Posts*	*Supported Between Posts with Wire or Polymeric Mesh*
AOS	*ASTM D 4751*	*for slit film wovens 0.60 mm max. (No. 30 sieve)* *for all other geo-textile types 0.30 mm max. (No. 50 sieve) 0.15 mm min.(No. 100 sieve)*	*for slit film wovens 0.60 mm max. (No. 30 sieve)* *for all other geo-textile types 0.30 mm max. (No. 50 sieve) 0.15 mm min.(No. 100 sieve)*
Water Permittivity	*ASTM D 4491*	*0.02 sec^{-1} min.*	*0.02 sec^{-1} min.*
Grab Tensile Strength, min. in machine and x-machine direction	*ASTM D 4632*	*180 lbs. min. in machine direction, 100 lbs. min. in x-machine direction*	*100 lbs. Min*
Grab Failure Strain, min. in machine direction only	*ASTM D 4632*	*30% max. at 180 lbs. or more*	
Ultraviolet (UV) Radiation Stability	*ASTM D 4355*	*70% Strength retained min., after 500 hrs. in weatherometer*	*70% Strength retained min., after 500 hrs. in weatherometer*

H. Aggregate Cushion for Permanent Erosion Control Geo-textile:

1. Aggregate cushion for permanent erosion control geo-textile, Class A shall meet the requirements of Seattle Standard Specifications Section 9-03.9(2).

2. Aggregate cushion for permanent erosion control geo-textile, Class B or Class C, shall meet the requirements of Seattle Standard Specifications Section 9-03.9(3) and 9-03.9(2).

I. Geo-textile Approval and Acceptance:

1. Source Approval:

a. For each geo-textile application, the Contractor shall submit to the Engineer for approval, the manufacturer's name, address, the geo-textile full product name, and the geo-textile structure including fiber/yarn type.

b. If the geo-textile source has not been previously evaluated, a sample of each proposed geo-textile shall be submitted to the Engineer for evaluation. After the sample and required information for each geo-textile type has been received by the Engineer, a maximum of 14 calendar Days will be required for this testing. Source approval will be based on conformance to the applicable values from Tables 1 through 6 in Paragraphs 2.03.B through 2.03.G.

c. Source approval shall not be the basis of acceptance of specific lots of Material unless the lot sampled can be clearly identified and the number of samples tested and approved meets the requirements of WSDOT Test Method 914.

2. Geo-textile Samples for Source Approval and Engineer Testing:

a. Each sample shall have minimum dimensions of 5 feet by the full roll width and shall be a minimum 6 square yards. The machine direction shall be marked clearly on each sample and is defined as the direction perpendicular to the axis of the geo-textile roll. Source approval for temporary silt fences will be by Manufacturer's Certificate of Compliance (Section 00 72 00 – General Conditions, Paragraph 1.03.T).

b. Samples shall be cut from the geo-textile roll by a suitable method that produces a smooth geo-textile edge without edge ripping or tearing. The samples shall not be taken from the outer wrap of the roll -or the inner wrap of the core.

3. Acceptance Samples:

a. Samples will be taken by the Engineer at the Project Site to confirm the geo-textile meets the specified properties.

b. Approval will be based on testing of samples from each lot.

1) A "lot" shall be defined for the purposes of this Specification as all geo-textile rolls within the consignment (i.e., all rolls sent to the Project Site) which were produced by the same manufacturer during

a continuous period of production at the same manufacturing plant and have the same product name.

2) *After receipt of the samples by the Engineer, a maximum of 14 calendar Days will be required for testing.*

3) *If the results of the testing show that a geo-textile lot, as defined, does not meet the properties required for the specified use as indicated in Tables 1 through 6 in this Article 2.03, the roll or rolls which were sampled will be rejected.*

4) *Two additional rolls for each roll found defective from the lot tested will then be sampled at random by the Engineer for retesting.*

5) *If retesting shows that any of the additional rolls tested do not meet the required properties, the entire lot will be rejected.*

6) *If the test results from all the rolls retested meet the required properties, the entire lot minus the roll(s) which failed will be accepted.*

7) *All geo-textile with defects, deterioration, or damage will be rejected and shall be replaced shall be replaced at no expense to the Owner.*

4. *Acceptance by Certificate of Compliance:*

a. *When the quantities of geo-textile proposed for use in each geo-textile application are less than or equal to the following amounts, acceptance shall be by Manufacturer's Certificate of Compliance:*

Application	*Geo-textile Quantity*
Underground Drainage	*600 sq. yards*
Soil Stabilization and Separation	*1,800 sq. yards*
Permanent Erosion Control	*1,200 sq. yards*
Temporary Silt Fence	*All quantities*

b. *The Manufacturer's Certificate of Compliance shall include the manufacturer's name, current address, full product name, geo-textile structure including fiber/yarn type, geo-textile roll number, proposed use(s), and certified test results.*

5. *Approval of Seams:*

a. *If the geo-textile seams are to be sewn in the field, the Contractor shall provide a section of sewn seam which can be sampled by the Engineer before the geo-textile is installed.*

b. *The seam sewn for sampling shall be sewn using the same Equipment and procedures as are to be used to sew the production seams. If production seams are to be sewn in both the machine and cross-machine directions,*

the Contractor shall provide sewn seams for sampling which are oriented in both the machine and cross-machine directions.

c. The seams sewn for sampling shall be at least 2 yards in length in each geo-textile direction.

d. If the seams are sewn in the factory, the Engineer will obtain samples of the factory seam at random from any of the rolls to be used. The seam assembly description shall be submitted by the Contractor to the Engineer and are to be included with the seam sample obtained for testing. This description shall include the seam type, stitch type, sewing thread type(s), and stitch density.

PART 3 - EXECUTION

3.01 GENERAL CONSTRUCTION REQUIREMENTS:

A. Guiding Regulations, Codes, and Rules:

1. In general, Work involving erosion and sedimentation control within The City of Seattle limits shall comply with Article 1.02 of this Section 01 57 13.

2. Work involving erosion and sedimentation control within Seattle's Rights-of-Way not within The City of Seattle limits shall also comply with the requirements of the local jurisdiction.

B. General Guidelines and Measures for Doing the Work:

1. In general, in doing the Work, the Contractor shall address measures that:

a. Prevent and control erosion and sedimentation processes,

b. Prevent and control scour and scour processes in water bearing channels,

c. Prevent transport of sediment,

d. Protect surface waters and drainage systems from entry of sediment and other construction byproduct,

e. Prevent erosion and sedimentation impacts to areas not designated for Work and

f. Coordinate erosion and sedimentation controls with scheduling of the Work.

2. Such measures may include, but not be limited to, one or more of the following:

a. Installing temporary ditches, berms, culverts, and other measures to control and redirect surface waters;

b. Installing temporary dams, settling basins, energy dissipaters, and other measures to detain water, prevent scour, and allow for sediment drop and controlled removal;

c. Installing measures controlling surfacing groundwater and dewatering discharges;

d. Installing temporary covers or otherwise protecting slopes, stockpiles, and exposed or disturbed soils from erosion and sediment producing processes;

e. Installing temporary work area perimeter and sediment transport prevention measures, such as silt fence, wattle, filter, and berm;

f. Treating sediment laden waters, and removing and disposing of sediment,

g. Installing sediment and debris removal controls for equipment entering and leaving designated Work areas, and

h. Installing temporary fencing, flagging, and other markings at boundaries of areas identified as not part of the Work.

3.02 EROSION CONTROL MULCHING:

A. General:

1. When the CSC Plan indicates a separate mulch application for an area in addition to seeding, this mulching shall immediately follow the seeding.

2. Areas not accessible by mulching Equipment shall be mulched by approved hand methods.

B. Straw Mulch:

1. Straw mulch erosion control application shall be with a forced air mulch spreader. In spreading straw mulch, the spreader shall not cut or break the straw stalks into lengths less than 2 inches. Straw mulch coverage shall have a minimum thickness of 2 inches. Where a forced air Equipment mulch application is indicated as providing unacceptable results, the Contractor shall employ manual or other application methods such as hand spreading and raking.

2. Should the straw mulch coverage expose at any time bare ground of more than 50% in any 100 square foot area, then the Contractor shall promptly remulch the exposed area to full coverage of the thickness required.

C. Wood Chip Mulch:

1. Wood chip mulch erosion control application shall be with a forced air mulch spreader and provide a 2 inch minimum thickness coverage. Where a forced air Equipment mulch application is indicated as providing unacceptable results, the Contractor shall employ manual or other application methods such as hand spreading and raking.

2. Should the wood chip mulch coverage expose at any time bare ground of more than 50% in any 100 square foot area, then the Contractor shall promptly remulch the exposed area to full coverage of the thickness required.

D. Compost:

1. Compost erosion control application shall be with a forced air mulch spreader. Coverage applications shall have a minimum thickness of one and one half inches (1-1/2 inches). Where a forced air mulch spreader application is indicated as providing unacceptable results, the Contractor shall employ manual or other methods such as hand spreading and raking.

2. *Should the Compost coverage expose bare ground of more than 50% in any 100 square foot area, and then the Contractor shall promptly remulch the exposed area to full coverage of the thickness required.*

3.04 EROSION CONTROL MATTING:

A. General:

1. *Erosion control matting may consist of one or more applications of coir, jute, or excelsior matting.*
2. *Erosion control matting shall be installed and secured in accordance with the manufacturer's recommendations.*
3. *Unless the matting manufacturer recommends otherwise, seeding, with or without amendment or mulch, shall be applied before the placement of matting.*
4. *Staking shall be driven flush with grade and shall penetrate the earth by a minimum 12 inches.*
5. *The Contractor shall timely maintain the integrity of the matting by repairing or replacing as necessary all improperly anchored, torn, uplifted, and missing matting. Torn or missing matting shall be covered with additional matting overlapping the tear or the exposed area with a minimum 24-inch overlap of all surrounding matting. This patch shall be staked at each corner 3 inches from the edge of patch and along all edges with a spacing not exceeding 12 inches. Uplifted and improperly anchored matting shall be repaired by replacing failed anchors, or by increasing the density of anchors as applicable.*
6. *Temporary matting and stakes shall be completely removed at the time of permanent restoration.*

B. Non-Ditch and Non-Channel Matting Installation:

1. *In general, the matting shall be placed flush with the soil surface with the first matting installed at the lowest elevation. Additional upper elevation matting shall be installed over lower elevation matting with a minimum 6 inch overlap. Matting shall be installed with the long axis of matting parallel to the contour. Overlap of matting ends installed along a contour shall be with the "upstream" matting being installed over the "downstream" matting with a minimum 6 inch overlap with the "upstream" direction indicated by the grade in the swale at the base of the slope.*
2. *Unless the matting manufacturer recommends otherwise, the higher elevation edge of matting shall be buried in an anchor trench 6-inches-deep by 12-inches wide with soil firmly tamped against the matting. Upper elevation matting shall be installed over lower elevation matting with an overlap the full width of anchor trench. Before backfilling the anchor trench, staking shall penetrate the matting in the center of the anchor trench. Spacing of staking within the trench shall not exceed three (3) feet except that at each end of the matting strip, a stake shall be placed through the mat fabric six (6) inches from edges at the corner including if overlapped by another mat. Backfill in the trench shall be tamped firm.*
3. *When placing matting within the drip line area of tree, anchor trench shall not be constructed. Rather, the upper elevation edge of the upmost matting shall be*

staked approximately 3 inches from the edge. Spacing of the stakes shall not exceed three (3) feet, except at ends where the stake shall be installed through the mat fabric 6 inches from all edges including when overlapped. Upper elevation fabric installed over lower elevation fabric shall have a minimum 12 inch overlap with staking placed in the overlapping area 3 inches from the upper edge of fabric.

4. For all width matting fabrics, spacing of stakes within a row shall not be less than three feet and spacing between rows of stakes shall not be less than three (3) feet. Each long edge of the matting fabric, whether overlapped or not, shall be staked three (3) inches from the long edge with stake spacing not exceeding three (3) feet. The fabric ends, the short edge, shall be staked three (3) inches from the end whether overlapped or not, with a minimum 3 stakes along the short edge.

C. Ditch and Channel Matting Installation:

1. Matting installed in ditches and channels shall have the long axis of the matting parallel to the direction of water flow. The first matting installation shall be at the invert of the ditch or channel. Additional matting installation shall be installed overlapping the upper edge of previously placed fabric by at least 12 inches. In the direction of flow, upstream matting shall overlap downstream matting by 12 inches. Matting shall be held in place with ballast by other means capable of withstanding peak flows.

3.05 PLASTIC COVERING:

A. Stockpiles, areas with no vegetative growth, areas where vegetative growth is to inhibited, and areas with disturbed soil may be covered with black plastic covering. Sandbag or similar ballast shall be placed on the cover in a grid with no less than 5 foot spacing in two right angle directions. At all ends without overlap, ballast shall be placed within 12 inches of the edge and spaced no more than 5 feet along the perimeter.

B. Clear plastic covering shall cover areas where the growth of vegetation is not to be inhibited.

C. With the exception of stockpiles, plastic covering sheets shall be installed with the long axis parallel with slope contours. The upper edge of the fabric shall be placed into a 12-inch wide by 6-inch deep anchor trench and backfilled with native soils tamped into place. Upper slope fabric shall overlap down slope fabric in the anchor trench a minimum of 12 inches. Along the same contour, the ends of new fabric shall overlap in-place fabric a minimum of 24 inches.

D. In general, ballast shall be placed on the cover using sandbags or similar ballast distributed over the cover in a manner to prevent uplift, slippage, and any other movement of the cover. Spacing of ballast shall be not more than a 10-foot grid in line with and against the long axis of the sheet. All overlaps, edges, and corners shall be ballasted.

E. On steep slopes and where slippage of ballast or ballasted fabric is indicated, the ballast shall be secured in-place by rope tied to upslope anchors firmly set in the earth.

F. Within the drip line of trees, excavation of anchor trenches will not be allowed. Rather, ballast shall be placed on the fabric and on the overlaps secured by rope tied to anchor stakes upslope of the drip line area.

G. Rips and tears shall be timely repaired by placing additional covering over the defect with a minimum 24 inch overlap in all directions from the defect. The repair shall be ballasted with spacing in any direction of no more than 5 feet and along all edges and at all corners. Ballast shall be anchored to upslope stakes.

H. Uplifted areas shall receive additional ballast resulting in reduced ballast spacing.

I. Areas where covering has slipped and the underlying surface becomes exposed shall be timely repaired in the same manner as rips and tears.

J. Clear plastic covering intended to cover a vegetated surface without long term inhibiting effects shall require frequent monitoring ensuring permanent damage is not occurring. Should vegetative degradation be indicated, the Contractor shall amend the cover practice to a condition not detrimental to the vegetation.

3.06 STRUCTURAL AND BIOMECHANICAL EROSION CONTROLS:

A. Equipment Wash Area:

1. Where Equipment and vehicular traffic may contribute to the transport of sediment and other debris beyond a work area within a Project Site, and beyond the Project Site, the Contractor shall have in place a stabilized construction wash area at a location or locations to remove sediment, mud, and other debris from tires and the entire piece of Equipment and vehicle.

2. Stabilized construction wash areas shall be in place and ready for operation before the potential for transporting such material occurs.

3. The wash area shall consist of one or more of the following as the Work requires and as the Contract may require:

   a. graded entrance and exit water trough all Equipment and vehicles must go through. The Contractor may require a water trough for each direction. The depth of water in the trough shall be maintained at a level adequate for the size of Equipment and vehicle expected. The length and width of the trough shall be sized to ensure all length and width Equipment and vehicle can be acceptably cleaned.

   b. hose, hose brush, long handled brush, and similar Supplies, and adequately labor to acceptably handle the size and volume of traffic.

   c. adequate source of water and means to contain the water within the designated wash area.

   d. regular removal and disposal of sediment and debris.

   e. removal and disposal of non-debris and non-sediment pollutants and contaminants.

   f. a drain as may be necessary with controls in place to discharge water complying with regulation, law, permit, and as the Contract may require.

   g. as may be necessary, an area before and after the wash area of sufficient size with quarry spall or other coarse aggregate to allow for after-wash drip collection.

B. Road Stabilization:

1. Temporary road stabilization measures may be required in areas within and beyond the Project Site, such as access roads, haul roads, subdivision roads, parking areas, staging areas, and other vehicular and Equipment traffic routes. The stabilization required shall be adequate for the Equipment and vehicular traffic and for the Project Site local conditions, local climate, and weather typical for the Contract Time.

2. Temporary road stabilization measures may consist of placing and compacting a thickness of quarry spall, a thickness of Mineral Aggregate Type 2 or Type 13 (See Seattle Standard Specifications Section 9-03.16, if applicable), other aggregate, or a combination of these and other Material.

3. Where temporary road construction cannot be aligned to avoid areas within the dripline of trees not identified for removal, the Contractor shall comply with the requirements of Article 1.05 of Section 01 76 00 - Protecting Existing Facilities.

4. Temporary road stabilization measures shall be maintained by repairing ruts, tracks, settling, and other failing areas. Such repairs may include placing and compacting additional aggregate. Settled, broken, rutted, and otherwise damaged timber, mulch, and other material within the drip lines of trees shall be repaired by increasing the thickness of material.

5. Upon completion of the Work, or as may be required to accommodate the Work, temporary road stabilization measures shall be removed and disposed of. Within the dripline of tree, the removal shall be conducted to prevent damage to feeder and surface roots and minimize compaction of soils.

3.07 TEMPORARY SEDIMENT CONTROLS:

A. Silt Fence (Sediment Fence or Filter Fence):

1. Silt fences shall act as a filter to both allow the passage of water through the fence and also to prevent the passage of sediment through, under, or over the fence. Silt fences shall be either in-place before the area is disturbed, or shall be coordinated with beginning soil disturbance activity.

2. Silt fence(s) shall be constructed at locations downstream or down slope of surface runoff areas and upstream or upslope of surface bodies of waters. Silt fences shall be spaced to account for grade of slope, runoff flow rate and velocity, sheeting and rilling, type and relative density of soil(s), rate of sediment loading, expected maintenance type and frequency, and other factors as the site and Work require. Silt fences shall not be placed across or in streams, channels and ditches.

3. Silt fences shall be located along contours with the ends turned uphill to capture runoff and prevent flow around the end of the fence. Where the installation requires crossing of contours in areas other than at the ends, gravel check dams shall be placed perpendicular to the uphill face of the fence to minimize concentrated flow and erosion along the fence. The gravel check dams shall be approximately 1 foot deep at the fence and shall continue perpendicular to the fence at the same elevation until the top of the check dam intercepts the ground surface. The gravel check dams shall consist of crushed surfacing base course gravel backfill for walls, or shoulder ballast. The gravel check dams shall be spaced at intervals not exceeding 10 feet

along the fence where the fence crosses contours. The slope of the fence line where contours are crossed shall not be steeper than 3H: 1V.

4. The height of the fence fabric, the geo-textile, above ground surface shall be 30 inches minimum and 36 inches maximum.

5. Posts shall be of a length to be installed to a depth and with a spacing to withstand maximum loading for the durations estimated between sediment removals. Unless the Contractor can justify otherwise to the Engineer, posts shall be installed to a minimum 30 inch depth, except as specified below within the drip line of tree, and shall be spaced within a fence line of not greater than six (6) feet. Where required post depth penetration cannot be obtained, the posts shall be adequately secured on the upslope side by bracing or guying to an adequately installed anchor to prevent overturning. Posts shall be either wood or steel. Wood posts shall have minimum dimensions of 1-1/4 inches by 1-1/4 inches and shall be white oak or other hardwood resistant to rot, and with no defects. Steel posts shall consist of U, T, L, or C shape posts with a minimum weight of 1.33 pounds per foot, or other steel posts having equivalent or greater strength and bending resistance than those listed in this paragraph.

6. The fence fabric and support backing systems shall be attached on the up-slope side of the posts with staples, wire, hog rings, or other connection device as recommended by the manufacturer, in a manner that does not tear or damage the fabric. At the bottom of the fence, the fabric and support backing system shall be buried at least 6 inches below the ground surface, and then backfilled with native soils compacted by tamping or other appropriate compaction methods.

7. Excavation for installation of silt fence within the drip line of trees, and around other vegetation to be retained, shall be without damage to roots. Roots that are exposed shall not be damaged and shall be promptly covered with earth. Where the bottom of fabric and support backing cannot be installed to a 6 inch depth due to interference with roots, the fabric and backing shall be placed flat on the upside of fence for a minimum 12 inch width and then covered with a minimum 6 inch depth of large size aggregate ballast. In non-trench fabric bottom installations, post penetrations into the earth shall be increased and the height of fence above the top of ballast shall not exceed three (3) feet.

8. Fence support backing system, in the form of wire or plastic mesh with maximum mesh spacing of 2 inches by 4 inches and of adequate strength to withstand maximum loading, shall be attached to posts and fabric as recommended by the Supplier. Plastic mesh shall have the same or greater ultraviolet (UV) resistance as the geo-textile fabric. All geo-textile fabric shall have backing whether exposed or buried.

9. Fence fabric shall be continuous along any single length of filter fence. Continuous fence is defined as follows:

    a. The geo-textile fabric may be sewn together at the point of manufacture or by the Supplier to form a single length of geo-textile for a continuous fence application. All sewn seams shall be located at a support post.

b. Separate geo-textile fabric may installed across posts with a minimum 10 foot overlap where the overlap is supported by no less than three (3) posts with spacing between any posts not greater than 4 feet. Overlapped fabric shall always be secured to support backing.

c. The Contractor may place 2 posts, one on each side of the overlapped fabric and backing, and twist the overlapped fabric at least 2 complete revolutions before driving the posts into the earth. The overlaps shall extend a minimum one (1) foot beyond the 2 posts before twisting.

10. Lapped or twisted fabric and backing that slip shall be considered defective and shall be replaced with sewn geo-textile. For pre-staked silt fence, laps may be performed in accordance with the manufacturer's written recommendations.

B. Sediment Removal:

1. Sediment shall be removed and disposed of when the sediment build-up reaches a height of 10 inches to 12 inches, and in no case shall exceed one third (1/3) the height of fence.

C. Damaged Fence Repair:

1. Damaged or improperly functioning silt fence shall be promptly repaired or replaced.

2. Rips, tears, holes, and other defects in the geo-textile fabric or the backing or both shall be promptly repaired by placing new material(s) over the damaged materials the full width and height of fence including buried or covered fabric and backing, and shall overlap existing fence material(s) a minimum 5 feet each side of the defect. The repaired fence shall be supported by and securely tied to 5 evenly spaced posts.

3. Broken posts shall be replaced with 2 posts spaced 1 foot on each side of the broken post driven to 30 inches into the soil, or braced to upslope anchors. The fabric and backing shall be securely tied to each new post.

4. Posts that lean greater than 1H: 4V shall be replumbed and shall be supported at the top with bracing or guying to an adequately installed upslope anchor.

5. Water or sediment escaping beneath the silt fence shall be repaired by installing new fabric and backing over the existing material extending 3 feet upslope with a minimum 3 foot overlap on both sides. Ballast shall be placed over the on- surface repair with a minimum 6 inch depth large aggregate ballast. A new post or posts shall be installed along the leak with spacing not exceeding 2 feet.

6. Any other conditions that reduce the effectiveness of the silt fence shall require immediate repair and/or replacement.

3.08 SHEAR BOARDS:

A. Shear boards shall be spaced horizontally to allow not greater than a six (6) foot vertical change of grade between boards. Shear board shall be securely nailed to four (4) 2 inch x 4 inch stakes – 1 stake at each end and the remaining stakes spaced evenly between. Stakes shall be driven a minimum 24 inches into the earth and shall extend full height of shear board.

B. The Contractor shall timely repair or replace shear boards and stakes exhibiting decay, structural failure, or leaning more than 1H: 4V. Frequency of removal of sediment build-up against the board shall be such that build-up does not exceed 1/3 the height of the shear board.

3.09 DRAINAGE AND SEWER SYSTEM PROTECTION:

A. The Contractor shall take measures to prevent the introduction of pollutants, contaminants, sediment, and other material from entering Storm Drain, combined Sewer, and other drainage system via any entrance vehicle. Sediment prevention for drainage Structures may require one or more of a sediment sump, a cover filter, or an outlet pipe cover filter.

B. Filters shall allow the passage of water into or from the drainage Structure without unreasonable backup or ponding, and shall prevent the passage of sediment and other debris.

C. Filters shall be secured to the opening being protected to withstand all loadings and to resist movement including sediment and debris build-up, flows typical for the drainage Structure and the local drainage conditions, and the potential for disturbance from construction and traffic activity.

D. Filters covering large areas not having adequate structural support shall be reinforced with and secured to a plastic or wire mesh support backing system.

E. Where filters are expected to be in place for a considerable period of exposure, UV resistance and other climate and environmental strengths shall be adequate.

F. Frequency of maintenance shall include removal of sediment and other debris when either the sump build-up reaches approximately 1/3 capacity, or when obstructed filtration or the allowance for the passage of water is causing water back up.

G. Sediment and debris removal shall require additional care to prevent the escape of these materials into the drainage system.

3.10 WATTLES:

A. Wattles shall be installed within shallow trenches parallel with the contour and perpendicular to runoff or other flow. A sequence of wattles shall begin at the base of the slope and proceed uphill. Excavated material shall be spread evenly along the upslope side and shall be compacted using hand tamping or similar method. On gradually sloped or on clay and plastic silt type soils, trenches shall be 2 to 3 inches deep. On loose granular soils, in high rainfall areas, or on steep slopes, trenches shall be 3 to 5 inches deep or half the thickness of the wattle, whichever is greater.

B. Wattles shall be spaced horizontally to allow not greater than a six (6) foot vertical change of elevation between wattle rows.

C. The wattle shall be installed snugly into the trench, abutting adjacent wattles tightly end to end with minimal overlapping of ends. Wattles shall be staked at each end, and in between at 4-foot maximum centers. Where trench conditions require, pilot holes for the stakes shall be driven through the wattle and into the soil using a straight bar. Stakes shall be driven through the center of the wattle at least 6 inches into the earth leaving 2 to 3 inches of the stake protruding above the wattle.

D. Wattles shall be maintained in contact with the soil in the trench, and shall be inspected immediately after a runoff producing rainfall verifying soil contact.

3.11 CONSTRUCTION STORMWATER CONTROL MAINTENANCE:

A. The Contractor shall keep a record of the CSC-BMP measures using the forms attached to the end of this section during the entire duration of the Work. Construction Stormwater Control measures shall also be inspected at regular intervals and immediately following significant runoff producing rainfall events. The individual functions and the whole shall be verified performing acceptably and shall be maintained until they are no longer needed, or are to be converted as part of a permanent erosion and sediment control when specified in the Contract. The various devices shall be inspected for damage, bypass, undercutting, and non- performance, and shall be promptly repaired. Sediment buildup shall be removed as specified or more frequent intervals when performance becomes questionable. Debris and contaminated sediment shall be properly disposed of. Clean sediments may be stabilized on-site as the CSC plan indicates.

3.12 REMOVAL AND REUSE OF CONSTRUCTION STORMWATER CONTROLS:

A. When a temporary erosion or sediment control feature is no longer required, the Contractor shall remove the measure or measures.

B. Reuse of a control measure may be acceptable if:

1. The measure or device has been thoroughly cleaned of all debris;
2. The measure or device is free of tears, holes, or other damage; and
3. The measure is verified it can perform as intended.

3.13 SWEEPING AND WASHING:

A. The Contractor shall ensure that soil, debris, or other material tracked and deposited are removed by sweeping or by washing and properly disposed of. In particular, when wet weather is forecast, the Certified On-Site ECL shall verify that all measures are in-place and are functioning effectively and acceptably.

END OF SECTION