

2573

**Storm Water Management**

**2573.1 DESCRIPTION**

This work consists of: 1) managing storm water runoff and project related water discharges in order to minimize sediment pollution during construction and over the life of the contract and 2) managing the discharges associated with dewatering and basin draining activities as set forth in the NPDES permit. The work includes furnishing, installing, maintaining and utilizing storm water best management practices and any work specified in conjunction therewith as well as removing temporary sediment control devices when no longer necessary.

**2573.2 MATERIALS**

<b>A</b>	<b>Bale Barriers, as specified for Type 1 Mulch.....</b>	<b>3882</b>
<b>B</b>	<b>Silt Fence .....</b>	<b>3886</b>
<b>C</b>	<b>Flotation Silt Curtain .....</b>	<b>3887</b>
<b>D</b>	<b>Temporary Ditch Checks.....</b>	<b>3889</b>
<b>E</b>	<b>Storm Drain Inlet Protection.....</b>	<b>3891</b>
<b>F</b>	<b>Temporary Downdrain .....</b>	<b>3892</b>
<b>G</b>	<b>Sandbags.....</b>	<b>3893</b>
<b>H</b>	<b>Sediment Mat .....</b>	<b>3894</b>
<b>I</b>	<b>BLANK</b>	
<b>J</b>	<b>Filter Logs .....</b>	<b>3897</b>
<b>K</b>	<b>Flocculants.....</b>	<b>3898</b>

**2573.3 CONSTRUCTION REQUIREMENTS**

**A General ..... Also refer to: 1701, 1716, 1717, 2105.5, 2575**

In accordance with 1716 the Contractor has responsibility for charge and care of the Project and shall take necessary precautions against injury or damage to the Project by action of the elements. In addition, the Contractor shall take necessary precautions to prevent off site damage resulting from work conducted on the Project or Project related storm water runoff.

The Contractor is responsible for preventing or minimizing sediment loss from the Project by directing storm water runoff to constructed ponds and sediment traps as well as installing temporary sediment control devices in drainage locations where runoff can leave the Project limits and/or enter into environmentally sensitive areas.

The Contractor shall schedule, construct and/or install temporary sediment control and storm water management measures as required by the Contract and as stated in the permits required for the Project without having to obtain prior approval or having to be so directed by the Engineer. In the case of errors or omissions, the Contractor shall inform the Engineer upon immediate discovery.

The Contractor shall install temporary storm water management and sediment control devices in conformity with the details, typical sections, and elevation controls shown in the Contract. The actual installation location of temporary storm water management and sediment control devices may be slightly adjusted from that indicated in the Plan to better accommodate the actual field conditions and increase the effectiveness of a device. The Department will not conduct location staking unless requested by the Contractor. Errors, omissions, and changed site conditions affecting the location or placement of the temporary storm water management or sediment control devices shall be brought to the attention of the Engineer by the Contractor.

A1 Erosion Control Supervisor

The Contractor shall provide an Erosion Control Supervisor with a valid certification to direct the Contractor and subcontractor(s) operations and insure compliance with Federal, State and Local ordinances and regulations. The certification is obtained by completing a two (2) day Erosion/Sediment Control Site Management training class and passing the required test, from a Mn/DOT approved provider as listed in the Mn/DOT certification schedule.

The Erosion Control Supervisor shall implement the SWPPP and conduct the Contractor's erosion and sediment quality control program. In addition, the Erosion Control Supervisor shall be available to be on the Project within 24 hours at all times from initial disturbance to final stabilization as well as perform the following duties:

1. Coordinate and schedule the work of subcontractors such that erosion and sediment control measures are fully executed for each operation and in a timely manner over the duration of the Contract.
2. Oversee the work of subcontractors so that appropriate erosion and sediment preventive measures are undertaken at each stage of the work.
3. Prepare the required weekly erosion control schedules and present it to the Engineer.
4. Attend all weekly construction meetings to discuss the findings of the NPDES inspection log and other related issues.
5. Prepare the erosion/sediment control site plans requested by the Engineer.
6. Provide for erosion/sediment control methods for Contractor's temporary work not shown on the plans, such as work platforms, temporary construction, pumping operations, plant and storage yards, and cofferdams.
7. Ensure that applicable permits are acquired and complied with for borrow pits, dewatering and any temporary work conducted by the Contractor in rivers, lakes and stream

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8. Ensure that all erosion/sediment control work is conducted in a timely manner.
9. Ensure that erosion/sediment control work is installed to the fullest extent prior to suspension of the work.
10. Coordinate with Federal, State and Local Regulatory agencies on resolution of erosion/sediment control issues due to the Contractor's operations.
11. Ensure that proper cleanup occurs from vehicle tracking on paved surfaces and/or any location where sediment leaves the Right-of-Way.

If the Contractor fails to provide a certified Erosion Control Supervisor for the Project, the Engineer shall issue a written order to the Contractor. The Contractor shall respond within 24 hours and provide the required Erosion Control Supervisor or be subject to a \$1000 per calendar day deduct for noncompliance.

#### A2 Construction of Temporary Storm Water Basins

Temporary storm water basins shall be constructed concurrently with the start of soil disturbing activities whenever possible. The basins must be made fully functional and have storm water runoff from the localized watershed directed to the basins. The exposed sideslopes of the basins must be mulched and/or seeded within the time periods as set forth in 1717, or as directed by the Engineer.

#### A3 Temporary Sediment Control Measures

Sediment control measures must be installed down gradient prior to or in conjunction with soil disturbing activities. The Contractor shall schedule, install and maintain temporary sediment control measures as an ongoing effort on a site-by-site basis over the life of the Contract. The Contractor is responsible for minimizing the potential for sedimentation after temporary sediment control devices have been installed by implementing a good quality erosion control program and staging construction as needed. If the Engineer determines that the Contractor has not followed good erosion control practices that result in sedimentation outside of the Right of Way, the Contractor shall retrieve all sediment that has left the Right of Way and restore the property to the pre-existing condition, to the fullest extent possible at the Contractor's expense.

#### A4 Dewatering and Pumping

If dewatering or pumping of water is necessary, the Contractor is responsible for obtaining any necessary permits in accordance with 1701 and 1702. If the discharge from the dewatering or pumping process is turbid or contains sediment-laden water, it must be treated through use of sediment traps, vegetative filter strips, flocculants, or other sediment reducing measures such that the discharge is not visibly

different from the receiving water. The discharge location of the dewatering process must also be protected from excess erosion. Unless otherwise provided in the Contract, the best management practices used to control erosion and suspended sediment during the dewatering or pumping operation shall be furnished by the Contractor. The Contractor shall submit a dewatering plan to the Engineer prior to initiating dewatering activities.

**A5 Vehicle Tracking onto Paved Surfaces**

The Contractor shall use wood chip pads, temporary paving, or other appropriate Best Management Practices (BMPs) at major vehicle exit locations to minimize vehicle tracking of sediment from the Project onto paved surfaces. BMPs to protect vehicle exit sites shall be furnished by the Contractor and shall be incidental to the Project for which no direct compensation will be made.

The Contractor is responsible for insuring paved streets are clean at the end of each working day. Tracked sediment on paved surfaces must be removed by the Contractor within 24 hours of discovery, in accordance with 1717.2. Payment for street sweeping to provide safe conditions for the traveling public, environmental reasons or regulatory requirements shall be as provided in accordance with 1514.

**A6 Infiltration Areas**

Infiltration areas and constructed infiltration systems should not be constructed until the contributing drainage area and/or adjacent construction site have been completely stabilized. When this timing of construction is not possible, the Contractor shall insure sediment from exposed soil areas of the Project does not enter into the infiltration area or system. Payment for constructing infiltration areas shall be as provided for in the Contract.

**A7 Critical Resources**

The Contractor shall schedule and phase construction in critical resource areas to the best of his ability in order to minimize the potential of sediment entering into a critical resource. Critical resources include but are not limited to, protected wetlands, surface waters, trout streams, Special Waters, impaired waters, rivers, and endangered species habitat. Measures to minimize sediment potential include practices such as hand clearing and grubbing, limited bare soil exposure time, and immediate final establishment of vegetation.

**B Installation of Bale Barriers**

Bales shall be trenched into the ground 100 mm (**4 inches**) and staked with two 50 mm x 50 mm (**2 inch x 2 inch**) wood stakes. The stakes shall be of sufficient length such that at a minimum the top of the stakes are flush with the top of the bale and are also embedded into the ground a minimum of 250 mm (**10 inches**).

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#### C Silt Fence Installation

##### C1 Machine Sliced

The geotextile shall be inserted by a machine in a slit in the soil 200-300 mm (**8-12 inches**) deep with the salvaged edge on top. The slit shall be created such that a soil-slicing blade slightly disrupts soil upward as the blade slices through the soil. Directly behind the soil-slicing blade, the geotextile shall be mechanically inserted down into the soil slit such that 200-300 mm (**8-12 inches**) of the geotextile is below the ground surface. Soil slicing and installation is a simultaneous operation, achieving consistent placement and depth. No turning over (plowing) of soil is allowed for the slicing method. Compact the soil immediately next to the geotextile by operating the wheels of a tractor or skid steer on each side of the geotextile a minimum of 2 times. Posts shall be installed adjacent to the back face of the geotextile with the nipples facing away from the geotextile fabric. Posts shall be embedded a minimum of 0.6 m (**2 feet**) into the ground and installed a maximum of 1.8 m (**6 feet**) apart for general use and 1.2 m (**4 feet**) apart in ditch check applications. Secured at each post, three plastic zip ties shall be inserted through the geotextile within the top 200 mm (**8 inches**) of the fabric, puncturing holes vertically a minimum of 25 mm (**1 inch**) apart.

##### C2 Heavy Duty

The heavy duty silt fence system shall be hand installed with the salvaged edge on top. The bottom edge of the geotextile shall be placed into a 150 mm (**6 inch**) deep by 100 mm (**4 inch**) wide trench with the bottom edge of the geotextile wrapping back up to the soil surface. The trench shall be backfilled and tamped for compaction. Posts shall be installed adjacent to the back face of the geotextile with the nipples facing away from the geotextile fabric. Post shall be embedded a minimum of 0.6 m (**2 feet**) into the ground and installed a maximum of 1.8 m (**6 feet**) apart. Secured at each post, three plastic zip ties shall be inserted through the geotextile within the top 200 mm (**8 inches**) of the fabric, puncturing holes vertically a minimum of 25 mm (**1 inch**) apart.

##### C3 Super Duty

The bottom edge of the geotextile shall be placed 100-150 mm (**4 to 6 inches**) underneath the face of the median barrier exposed to direct storm water runoff. The median barriers shall be placed end to end in such a way to minimize the gap between each barrier. The geotextile shall be attached to the face of the barrier with wire or plastic zip tie inserted into the top 200 mm (**8 inches**) of the geotextile and tied to each eyelet on the barrier.

C4        Preassembled

The geotextile shall be installed with the salvaged edge on top. The bottom edge of the geotextile shall be placed into a 150 mm (**6 inch**) deep by 150 mm (**6 inch**) wide trench. The trench shall be backfilled and tamped for compaction. Post shall be embedded a minimum of 450 mm (**18 inches**) into the ground and installed a maximum of 1.8 m (**6 feet**) apart.

**D        Flotation Silt Curtain Installation**

The curtain shall be constructed with connecting devices at each end so that sections can be joined together. Connecting devices shall be designed to prevent silt from permeating through the connection and at the specified strength to prevent ripping out. The depth of the curtain shall be a minimum of 0.6 m (**2 feet**) to a maximum of 3.0 m (**10 feet**). Unless otherwise specified in the Contract, the depth of curtain shall be 1.2 m (**4 feet**). Installation shall typically be on the bottom of the water body.

D1        Still Water

The curtain shall be anchored along its length with enough weight to hold it in place. Both ends of the curtain shall be secured to land.

D2        Moving Water

The curtain shall be anchored out in the waterway in a herring bone configuration. The curtain shall be placed at an approximate 30 degree angle from shore, pointing up stream. Curtains shall not be placed across flowing water courses. Anchors shall be 136 kg (**300 pounds**) and located a maximum of 14.2 m (**50 feet**) spacing along the curtain. Each anchor shall be marked by a buoy. One end of the curtain shall be secured to land.

D3        Work Area

The curtain shall extend at a 45 degree angle from both ends secured to shore to enclose the work area. The work area shall extend a maximum of  $\frac{1}{4}$  of the stream width. The curtain shall extend a maximum of  $\frac{1}{3}$  of the stream width. The curtain shall be anchored out in the waterway with a minimum of 18 kg (**40 pounds**) at a maximum of 30 m (**100 feet**) intervals along the length of the curtain.

**E        Temporary Ditch Check Installation**

All ditch checks shall be sufficiently long perpendicular to the ditch gradient such that the top of the device in the middle of the ditch is lower in elevation than the bottom of the terminating points on the ditch sideslopes.

E1        Type 1- Sliced in Silt Fence

Installation procedures are in accordance with 2573.3 C1. Maximum post spacing shall be 1.2 m (**4 feet**).

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#### E2 Type 2- Bioroll

The bioroll shall be installed and anchored with wood stakes. The stakes shall be at a minimum nominally 13 mm x 50 mm (**½ inch x 2 inch**) and a minimum of 400 mm (**16 inches**) long with a pointed end.

The stakes shall be driven through the back half of the bioroll at an angle of approximately 45 degrees with the top of the stake pointing upstream. The maximum spacing between stakes shall be 0.3 m (**1 foot**). When more than one bioroll is needed for length, the ends shall be overlapped 150 mm (**6 inches**) with both ends staked.

#### E3 Type 3- Bioroll Blanket System

The blanket shall be rolled out on bare soils and across the ditch with the leading edge that is subject to flow buried in a 100 mm (**4 inch**) deep by 100 mm (**4 inch**) wide trench. The trench shall be backfilled and compacted. The blanket shall form a minimum width of 3.7 m (**12 feet**) perpendicular to the ditch gradient. The blanket shall be stapled with either U shaped, 11 gage or heavier steel wire having a span width of 25 mm (**1 inch**) and a length of 150 mm to 200 mm (**6 to 8 inches**) at a maximum spacing of 3 m (**1 foot**) on center.

The bioroll shall be installed on top of the blanket and anchored with wood stakes. The stakes shall be at a minimum nominally 13 mm x 50 mm (**½ inch x 2 inch**) and a minimum of 400 mm (**16 inches**) long with a pointed end. The stakes shall be driven through the back half of the bioroll at an approximate angle of 45 degrees with the top of the stake pointing upstream. The maximum spacing between stakes shall be 0.3 m (**1 foot**). When more than one bioroll is needed for length, the ends shall be overlapped 150 mm (**6 inches**) with both ends staked.

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#### E5 Type 5- Rock Weeper

A Type IV geotextile (3733) shall line the bottom of the rock weeper. The rock weeper shall be created such that the side profile forms a triangle with 1:6 (V:H) slopes on both the front and back slopes.

Coarse concrete aggregate shall be installed on the front half of the triangle with a 1:6 slope to a height of ½ m (**1 ½ feet**). The riprap shall be installed on the back half of the triangular section. The center cross-section of the weeper shall be constructed such that center point of the rock weeper is approximately 100 mm (**4 inches**) lower than the end points of the weeper at the ditch side slopes.

#### E6 Type 6- Geotextile triangular dike

The leading edge subject to flow of the geotextile apron shall be buried in a 100 mm (**4 inch**) deep by 100 mm (**4 inch**) wide trench. The trench shall be backfilled and compacted. The flat geotextile portion shall be stapled with U shaped, 11 gage or heavier steel wire having a

span width of 25 mm (**1 inch**) and a length of 150 mm to 200 mm (**6 to 8 inches**) at a maximum spacing of 300 mm (**1 foot**) on center.

E7 Type 7- Rock check

Riprap shall be installed on top of a Type IV geotextile liner (3733). Class II crushed riprap shall be used in the absence of a specified class. Rock shall be configured in a trapezoidal shaped berm with respect to the side profile such that the bottom of the berm is approximately 1.5 m (**5 feet**) wide, the top of the berm is approximately ½ m (**1 ½ feet**) wide, and the depth of the berm is approximately ½ m (**1 ½ feet**) deep. The center cross-section shall be constructed such that the center point of the rock check is approximately 100 mm (**4 inches**) lower than the end points of the rock check at the ditch side slopes.

**F Storm Drain Inlet Protection**

Storm drain inlet protection shall consist of the best management practices and devices for preventing sedimentation into and through underground drainage systems. Storm drain inlet protection applies to manholes, catch basins, curb inlets and other drop type inlets constructed for the ingress of surface water runoff into underground drainage systems. Storm drain inlet protection as described herein, will not include practices to protect culverts. See Section G for culvert protection.

The Contractor must protect storm drain inlets with sediment capture devices prior to soil disturbing activities that would result in sediment laden storm water runoff entering the inlet. The Contractor shall provide effective storm drain inlet protection over the life of the Contract until all sources with potential for discharging to an inlet have been paved or stabilized. As the Contractor's operations change, the storm drain inlet Best Management Practice for sediment control must be modified by the Contractor to ensure proper effectiveness for sediment capture.

The Contractor is responsible for preventing or minimizing the potential for unsafe, flooding, or siltations problems. For example, devices must be regularly cleaned out and emergency overflow must be an integral part of the device to reduce the flooding potential; and devices must be placed such that driving hazards or obstructions are not created. Sediment deposited in and/or plugging drainage systems will be the responsibility of the Contractor and shall be removed at no expense to the Department.

**G Culvert Protection**

Methods to protect the various types of culverts both at the inlet and/or outlet shall be as indicated in the Plan. Unless otherwise provided for in the Contract, materials and/or devices used shall be paid for separately.

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#### **H Sediment Mat Installation**

Mats shall be laid flat on the bottom of the streambed and anchored with wood stakes. The stakes shall be nominally 50 mm x 50 mm (**2 inch x 2 inch**) with a pointed end. Stakes shall be of sufficient length to be embedded a minimum of 0.45 m (**18 inches**) into the streambed and also appear above the water surface. The maximum spacing between stakes shall be 0.6 m (**2 feet**) along all edges of the mat. When more than one mat is necessary, the upstream mat edge shall overlap the downstream mat a minimum of 0.15 m (**6 inches**). The sides of adjoining mats shall overlap a minimum of 0.15 m (**6 inches**).

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#### **J Filter Log Installation**

Filter logs shall be placed in accordance with the Plan. Straw and wood fiber filter logs shall be staked in place with wood stakes. Wood stakes shall be at a minimum 13 x 51 mm (**1/2 x 2 inch**) nominal size by 400 mm (**16 inches**) long. The stakes shall be driven through the back half of the log at an angle of approximately 45 degrees with the top of the stake pointing upstream. When more than one log is needed for length, the ends shall be overlapped 150 mm (**6 inches**) with both ends staked. Staking shall be every 0.3 m (**1 foot**) along the log unless precluded by paved surface or rock.

#### **K Flocculants**

Flocculants shall not be applied directly to surface waters unless regulatory approval has been obtained. Flocculants shall be applied within containment areas such as temporary storm water ponds, temporary sediment traps, and containment systems. Before applying a flocculant, the pH and temperature of the storm water must be tested and be within the manufacturer's specified ranges. Adequate retention time for chemical reaction (approximately 15-20 minutes) for clay-sized particles to settle must be achieved such that the discharge of the treated water is visually the same as the receiving water.

##### **K1 Liquid Flocc**

Liquid Flocculant shall be hydraulically applied over the surface of the water to be treated. The liquid flocculant concentrate shall be diluted to form a stock solution. The stock solution shall be applied at the appropriate rate to yield 1ppm in the final treated water volume.

##### **K2 Flocculant Log**

The flocculant log shall be securely anchored in an area where the water to be treated will flow over the flocculant log. Flocculant logs are not to be left in standing, stagnant water.

**K3 Granular Flocc**

Granular based flocculant shall be mixed with water in a tank to form a stock solution. The stock solution shall be hydraulically applied at the appropriate rate to yield 1ppm in the final treated water volume.

**L BLANK****M Maintenance****M1 General**

The Contractor shall maintain all temporary sediment control devices until they are no longer necessary and are removed. Maintenance consists of keeping the devices functioning properly. The Contractor shall repair or replace plugged, torn, displaced, damaged, or nonfunctioning devices to the satisfaction of the Engineer.

**M2 Temporary Sediment Control Devices**

The Contractor shall remove sediment from devices such as bale barriers, silt fences, ditch checks and storm water filter logs when the sediment reaches one-third of the height of the device and reshape the area to the Plan specifications. If sediment removal causes damage to a device or the device is non-functional, the Contractor shall replace the device. Sediment removal shall occur within 24 hours of discovery or as soon as field conditions allow access. Removal of sediment shall be incidental to the Project for which no direct compensation will be made.

**M3 Sediment Basins and Traps**

When the depth of sediment collected in the basin reaches 50 percent of the height of the riser, or 50 percent of the storage volume, the basin shall be drained and the sediment removed. Drainage and removal shall be completed within 72 hours of discovery, or as soon as field conditions allow access. Removal of sediment shall be paid for separately.

After the entire Project has undergone final stabilization, all temporary sedimentation basins to be used as permanent water quality management basins must be cleaned out and shaped by the Contractor to the Plan's specifications.

**M4 Storm Drain Inlet Protection Devices**

The Contractor shall clean, remove sediment or replace storm drain inlet protection devices on a routine basis such that the devices are fully functional for the next rainstorm event. Removal and disposal of trapped sediment in inlet protection devices shall be incidental to the Project. Sediment deposited in and/or plugging drainage systems is the responsibility of the Contractor and shall be removed at no expense to the Department.

**N Sediment Removal**

The Contractor shall remove sediment deposited in sediment basins and traps once the sediment reaches 50 percent of the basin or trap's

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sediment storage capacity within 72 hours of discovery. Sediment removal shall consist of excavating and other associated operations to remove sediment and restore the capacity of the temporary sediment control device. Sediment shall be removed to the original grade or as necessary to restore the function of the device. Sediment removed shall be spread or disposed of to the satisfaction of the Engineer. The Contractor will be compensated for sediment removal on an equipment rental hourly basis in accordance with 2123. Spreading, hauling, and disposing of material shall be at no expense to the Department.

Sediment removal shall be accomplished with a backhoe or other suitable equipment capable of reaching out and excavating semi-solid material. The backhoe shall be of the full-revolving crawler type and shall have a minimum bucket size  $0.4 \text{ m}^3$  ( $\frac{1}{2}$  cubic yard). Size of the boom and the power unit shall be as recommended by the manufacturer for use with the bucket size. Depending on site conditions, the Engineer may allow a rubber tired tractor type backhoe to be used. Payment for the rubber tired tractor backhoe will be prorated based on rated capacity of the machine.

#### **O Removal of Temporary Devices**

The Contractor shall remove all temporary sediment control devices upon completion of the Contract work unless otherwise specified in the Contract or directed by the Engineer. All removed materials become the property of the Contractor.

The Contractor shall spread accumulated sediment to form a suitable surface for turf establishment or dispose of the sediment elsewhere. The Contractor shall shape the area to permit natural drainage. All work shall be done to the satisfaction of the Engineer.

#### **P Workmanship and Quality Control**

The Contractor is responsible for maintaining quality control on the project by ensuring that all work performed and all materials furnished are in conformance with the dimensions, installation requirements and material specifications shown in the Plans or indicated in the Specifications. Quality workmanship shall be used in all aspects of the work and shall be uniform in character throughout the project.

##### **P1 Certified Installers**

When erosion or sediment control practices are installed, a certified installer shall be on the Project to install the practices or direct the installation. Certified installer requirements shall apply to the following operations:

- Seeding

- Sodding

- Mulching

- Silt fence or other perimeter sediment control device installations

Erosion control blanket installation  
 Hydraulic Soil Stabilizer installation  
 Silt curtain installation  
 Ditch check installation  
 Compost installation  
 Erosion Stabilization Mat installation

Each Contractor or subcontractor installing erosion or sediment control practices shall provide at least one certified installer at the time of installation. The certification is obtained by completing and passing an Erosion/Sediment Control Inspector/Installer training course that is taught by a Mn/DOT approved provider as listed in the Mn/DOT certification schedule.

If the Contractor or subcontractor(s) fails to provide the required certified installer(s), the Erosion Control Supervisor shall notify the Engineer. If either the Erosion Control Supervisor or the Engineer determines that one or more required certified installers have not been provided, the Contractor shall respond to the Engineer's notification within 2 days with the appropriately certified or provisionally certified person(s), or be subject to a \$500.00 per required installer per calendar day deduction for noncompliance.

**Q Workmanship Rework Schedule**

Performance of the work shall be controlled by the Contractor so that the materials installed and the workmanship practices are of good quality. When the quality falls below the threshold level defined in Table 2573-1, the Contractor shall take immediate action to correct the situation and prevent it from reoccurring. As indicated in the table, the Contractor shall correct unacceptable workmanship to qualify for payment.

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**TABLE 2573-1  
Temporary Erosion Control: Corrective Action**

<b>Item</b>	<b>Corrective action required when</b>
Silt Fence	Improper geotextile used
	Insufficient geotextile embedment
	Insufficient compaction of soil
	Soil turned over and/or loosened due to inadequate equipment for sliced type
	Inadequate fastening of geotextile, posts, etc.
	Incorrect post spacing
Bale Barriers	Not notched in
	Not properly staked into the ground
Floation Silt Curtain	Curtain not anchored on land
	Curtain not weighted sufficiently in water
Ditch Checks	Not trenched in for silt fence, blanket or triangular dike
	Not stapled properly for blanket or triangular dike
	Water flows around the end rather than over the middle
	Incorrect post spacing for silt fence or bioroll/blanket system
	Biorolls not staked properly
	No geotextile used for Type 5 or 7
Storm Drain Inlet Protection	Inlet opening is not protected.
	Emergency overflow is not provided where required
	Device not cleaned out
Filter Logs	Not staked properly resulting in under mining or movement of logs
	Log ends not overlapped when more than one is needed in a line

The above table pertains to a threshold level of workmanship only and does not pertain to the use of nonconforming materials. The disposition of nonconforming materials shall be in accordance with 1503. The Contractor at no cost to the Department shall perform any corrective actions required for acceptance of the work.

**2573.4 METHOD OF MEASUREMENT****A Bale Barriers**

Bale barriers will be measured by the length furnished and acceptably installed.

**B Silt Fence**

Silt fence will be measured by length furnished and acceptably installed. Measurement will be along the base of the fence from outside to outside of the end posts for each section of fence.

**C Sandbag Barriers**

Sandbag barriers will be measured by surface area acceptably installed based on actual measurement taken along the length of the barrier times its height. When more than one thickness of bags is installed, the surface area of each layer of thickness will be measured and added to the quantity.

**D Flotation Silt Curtain**

Flotation silt curtain will be measured by length furnished and acceptably installed.

**E Sediment Traps**

Sediment trap quantities will be measured by volume for basin excavation and construction. Excavation will be measured by volume of the material in its original position. Quantities will be based on actual field measurement and increases or decreases to the estimated Plan quantity will not be considered as a basis of claim for adjusted unit prices. Materials used to provide an overflow will be measured and paid for separately.

**F Temporary Pipe Downdrains**

Temporary pipe downdrains will be measured by length finished and acceptably installed. Materials, such as riprap, used to provide an outlet will be measured and paid for separately.

**G Bituminous Lined Flumes**

Bituminous lined flumes will be measured by area on the basis of actual surface dimensions as placed without regard to the type of bituminous mixture used or number of courses placed. The type of bituminous used shall be as provided for in the Contract or as directed by the Engineer. Damaged areas restored, by order of the Engineer, will be added to the original quantity. Materials, such as riprap, used to provide an outlet will be measured and paid for separately.

**H Diversion Mounds**

Diversion mounds will be measured by volume after compaction and in its final configuration. Quantities will be based on actual field measurement.

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##### **K Sediment Removal**

Sediment removal will be measured by the number of hours of actual equipment working time in accordance with 2123.4. Sediment removed may be fluid or semi-solid and its consistency shall not be considered a basis of claim for adjusted unit prices.

##### **L Sediment Mats**

Sediment mats will be measured by the area furnished and acceptably installed.

##### **M Temporary Ditch Checks**

Types 1, 2, 3, 6 temporary ditch checks will be measured by length furnished and acceptably installed. Types 5 and 7 will be measured by volume based on field measurement.

##### **N Culvert Protection**

Culvert protection devices will be measured by the quantity of each device furnished and installed. Quantities for new devices to replace the original device installed will be measured and added to the total quantity.

##### **O Storm Drain Inlet Protection**

###### **O1 Each Storm Drain Inlet**

Storm drain inlet protection will be measured by the number of individual inlets properly protected over the life of the Contract without regard to the various types or number of devices used at each storm drain inlet.

###### **O2 Lump Sum**

Storm drain inlet protection will be measured by lump sum. Lump sum shall be considered to include all materials and labor as necessary to provide proper inlet protection over the life of the contract regardless of quantities required. Under this provision, no measurement will be made of any individual device or inlet location.

##### **P Filter Logs**

Filter logs will be measured by the length furnished and acceptably installed.

##### **Q BLANK**

##### **R Flocculants**

R1 Type A will be measured by the volume of liquid flocculant concentrate used and acceptably placed. No measurement will be made for the amount of water used to dilute the concentrate.

R2 Type B will be measured by each flocculant log furnished and acceptably placed.

R3 Type C will be measured by the mass of granular flocculant used and acceptably placed. No measurement will be made for the amount of water used to dissolve and dilute the granular flocculant.

**S Erosion Control Supervisor**

No direct measurement will be made of the various duties that the Erosion Control Supervisor performs or of the number of hours required, but all such work will be construed to be included in the single Lump Sum Payment. Upon satisfactory completion of either one-half the allowable Working Days for the Project, or one-half of the anticipated Project duration time, the Engineer may authorize partial payment not exceeding 50 percent of the Contract bid price. The remaining percentage will be paid upon satisfactory performance of duties at the Engineer's discretion and completion of the Project.

**2573.5 BASIS OF PAYMENT**

Payment for storm water management and sediment control items will be compensation in full for all labor, materials, equipment, and other incidentals necessary to complete the work as specified, including the costs of maintenance and removal as required by the Contract. The Contractor will receive compensation at the appropriate Contract prices, or in the absence of a Contract bid price, according to the following unit prices, or in the absence of a Contract price and unit price, as Extra Work.

**A General**

Upon satisfactory installation of temporary sediment control devices, the Engineer may authorize partial payment not exceeding 80 percent of the Contract bid price for that item, unless otherwise indicated in the Contract. The remaining percentage will be paid after the devices are removed.

**B Storm Drain Inlet Protection**

**B1 Partial Payments**

Storm drain inlet protection will be paid in partial payment amounts for satisfactory completion of the following work.

Initial Installation .....	25% payment
Maintenance during first half of Contract period .....	25% payment
Maintenance during last half of Contract period and removal of the devices .....	50% payment

**B2 Deductions**

If the Contractor fails to properly install, remove sediment, or maintain storm drain inlet protection, the Contractor shall be subject to a \$500.00 per calendar day deduction for noncompliance. The deduction shall apply to each inlet that is out of compliance and shall be deducted from monies owed to the Contractor.

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**2573.5**

**E Unit Prices**

The Department will pay the following unit prices for temporary sediment control items in the absence of a Contract bid price:

- (1) Bale Barrier ..... \$6.00/m (**\$1.85 per linear foot**)
- (2) Silt Fence, Heavy Duty..... \$10/m (**\$3.00 per linear foot**)
- (3) Flotation Silt Curtain, Type: Still Water, 1.2 m (**4 foot**) depth  
..... \$52/m (**\$16.00 per linear foot**)
- (4) Sediment Trap Excavation  
..... \$4/m<sup>3</sup> (**\$3.00 per cubic yard**)
- (5) Bituminous Lined Flume  
..... \$6/m<sup>2</sup> (**\$5.00 per square yard**)
- (6) Silt Fence, type Machine Sliced  
..... \$6.50/m (**\$2.00 per linear foot**)
- (7) Sediment Removal, Backhoe..... \$120 per hour
- (8) Filter Log, Type Straw Biolog ..... \$1.00/m (**\$3.00/foot**)
- (9) Filter Log, Type Rock Log..... \$0.55/m (**\$1.80/foot**)
- (10) Flocculant Sock..... \$200 each

**F Pay Items**

Payment for temporary erosion control items will be made on the basis of the following schedule:

<b>Item No.</b>	<b>Item</b>	<b>Unit</b>
2573.501	Bale Barrier .....	meter ( <b>linear foot</b> )
2573.502	Silt Fence, Type (1).....	meter ( <b>linear foot</b> )
2573.504	Sandbag Barrier .....	square meter ( <b>square foot</b> )
2573.505	Flotation Silt Curtain, Type (1).....	meter ( <b>linear foot</b> )
2573.506	Sediment Trap Excavation .....	cubic meter ( <b>cubic yard</b> )
2573.507	Temporary Pipe Downdrain .....	meter ( <b>linear foot</b> )
2573.508	Bituminous Lined Flume .....	square meter ( <b>square yard</b> )
2573.509	Diversion Mound .....	cubic meter ( <b>cubic yard</b> )
2573.511	Sediment Mat .....	square meter ( <b>square foot</b> )
2573.512	Temporary Ditch Check, Type (1).....	meter ( <b>linear foot</b> )
2573.513	Temporary Ditch Check, Type (1) .....	cubic meter ( <b>cubic yard</b> )
2573.520	Sediment Removal, Backhoe .....	hours
2573.530	Storm Drain Inlet Protection .....	each
2573.531	Storm Drain Inlet Protection .....	Lump Sum
2573.540	Filter Log, Type (1).....	meter ( <b>linear foot</b> )
2573.541	Liquid Floc.....	cubic meter ( <b>gallon</b> )
2573.542	Flocculant Sock.....	each
2573.543	Granular Floc .....	kg ( <b>lb</b> )
2573.550	Erosion Control Supervisor.....	Lump Sum

Note: (1) Specify Type

2575

**Controlling Erosion and Establishing Vegetation**

**2575.1 DESCRIPTION**

This work shall consist of reducing the risk of soil erosion by: 1) providing temporary shaping and grading; 2) applying temporary soil covers; and 3) establishing a perennial ground cover. Temporary shaping and grading includes measures such as shaping to temporarily direct water flow, smooth-rough grading to allow for adequate installation of temporary erosion control materials, cat-tracking and other measures effective at reducing the soil erosion potential. The use of temporary soil covers includes but is not limited to, mulch, establishment of an annual vegetative cover, erosion control blanket and hydraulic soil stabilizers. Establishment of a perennial vegetative cover shall include soil tilling, liming, fertilizing, seeding, sodding, mulching, and any other work specified in conjunction therewith.

**2575.2 MATERIALS**

<b>A</b>	<b>Seed, mix as specified.....</b>	<b>3876</b>
<b>B</b>	<b>Blank</b>	
<b>C</b>	<b>Sod .....</b>	<b>3878</b>
<b>D</b>	<b>Lime.....</b>	<b>3879</b>
<b>E</b>	<b>Fertilizer .....</b>	<b>3881</b>
<b>F</b>	<b>Mulch .....</b>	<b>3882</b>
<b>G</b>	<b>Erosion Control Netting .....</b>	<b>3883</b>
<b>H</b>	<b>Erosion Control Blanket.....</b>	<b>3885</b>
<b>I</b>	<b>Hydraulic Soil Stabilizer .....</b>	<b>3884</b>
<b>J</b>	<b>Compost .....</b>	<b>3890</b>
<b>K</b>	<b>Blank</b>	
<b>L</b>	<b>Erosion Stabilization Mat .....</b>	<b>3888</b>

**2575.3 CONSTRUCTION REQUIREMENTS**

**A General.....Also refer to: 1701, 1716, 1717, 2105.5, 2573**

The Contractor is responsible for minimizing soil erosion and preventing damage from sedimentation over the various stages of construction at all seasonal times during the year for the duration of the Contract by utilizing the best management practices established in 2573 in conjunction with the erosion control practices contained herein. The Contractor shall use other erosion control best management practices such as limiting the amount of exposed erodible soils, and providing horizontal cat track indentation to enhance the effectiveness of the sediment and erosion control devices. The Contractor shall protect slopes, ditch outlets, drainage outlets, and storm water discharge points from erosion in accordance with the time schedules established in the permit requirements.

**2575.3**

**A1 Concurrent Critical Area Stabilization**

The Contractor shall use the various methods provided in Section N-Rapid Stabilization, to temporarily stabilize disturbed areas within 61 m **(200 feet)** of surface waters as necessary for the duration of the Contract. The Contractor shall schedule, construct and/or install rapid stabilization measures in critical areas designated in the Contract or in accordance with permit requirements without having to obtain prior approval or having to be so directed by the Engineer.

**A2 Spring and Fall Growing Seasons**

The Contractor shall schedule and install temporary and permanent erosion control measures, finish earthwork operations, place topsoil, and establish turf in a continuous operation on an area by area basis to the fullest extent practical. The Contractor shall establish turf on the completed sections as required, without unnecessary delay and before weed growth or soil erosion occurs.

The dates for the season of planting for the various seed mixtures are listed in 2575-1. The Engineer may adjust a specified date by up to 10 days depending on prevailing weather conditions.

**TABLE 2575-1  
SEASON OF PLANTING**

<b>Seed Mixture Number</b>	<b>Spring</b>	<b>Fall</b>
100	---	Aug. 1 – Oct. 1
110	May 1 – Aug. 1	---
150, 190	April 1 - July 20.	July 20 – Oct. 20
240, 250, 260, 270	April 1 - June 1	July 20 - Sept. 20
280	April 1 – Sept. 1	---
310, 325, 328, 330, 340, 350	April 15 – July 20	Sept. 20 – Oct. 20

For the portion of Minnesota north of, and including TH 2, the Season of Planting for Mixtures 150 through 280 shall be April 15 through September 20.

**A3 Summer Season**

When the dates in the season of planting prohibit seeding of the specified seed mixture, the Engineer may specify an alternative seed mixture or temporary mulch may be placed and seeding be conducted at a later date.

**A4 Early Winter Season**

Early winter season work shall consist of the erosion control operations necessary to protect the site through the following spring snowmelt conditions. Early winter season is defined as the period where soil temperatures are such that seed will not germinate and normal plant rooting does not occur. The soil may be cold and friable, frozen or lightly snow covered.

#### A4a Dormant Seeding

Dormant seeding shall be defined as seeding done on exposed cold soils so that normal seed germination does not occur until the following spring. Dormant seeding shall occur after October 20 and when soil temperatures at a depth of 25 mm (**1 inch**) are at or below 4 °C (**40 °F**).

In wind swept areas, exposed sites, and areas where dormant seeding does not typically establish well, temporary mulch may be ordered by the Engineer in lieu of dormant seeding.

Snow seeding shall be defined as seeding over the top of snow so that the seed melts through the snow and germinates upon warm up in the spring. Snow seeding can be done during the thawing days in February and March.

#### A4b Winter Mulching

Snow mulching shall be defined as mulch material spread over the top of snow so that the mulch melts through the snow and sticks to the site. All mulch materials listed under specification 3882 may be placed as snow mulching.

Frozen ground mulching shall be defined as mulch material spread over frozen ground. Mulch materials Type 4, 5, 6 and 9 that do not require disc anchoring into the soil may be placed without modification. Mulch Types 1, 7 and 8 may be anchored with Type 1 or Type 6 hydraulic soil stabilizers or may be "frozen" to the soil by applying water over the mulch. Applying water at the rate of 19 m<sup>3</sup>/ha (**2000 gallons per acre**) can be used as a direct substitution for disc anchoring.

#### A4c Dormant Sodding

The Contractor may place sod at locations at least 3 m (**10 feet**) from the shoulder, on slopes, and in ditches as dormant sodding after November 1 when all of the following conditions are met:

- (a) The Engineer authorizes dormant sodding.
- (b) The soil is prepared for sodding, either frozen or unfrozen.
- (c) The sod on slopes and in ditches is pegged or stapled.
- (d) The sod is watered to saturation immediately after placement.
- (e) The sod is watered a second time, or receives 25 mm (**1 inch**) of rain, 7 to 10 days after placement. The Engineer may also accept a heavy snowfall instead of the second watering.

#### A4d Winter Erosion Control Blanket Installation

Erosion control blankets may be installed over frozen ground. However, 150 mm (**6 inch**) long nails with washers can be used to anchor the blanket in lieu of staples.

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#### A4e Application of Commercial Fertilizer

Commercial fertilizer shall not be placed over frozen ground or snow. The application of fertilizer shall occur after the runoff from spring snowmelt has ceased.

#### **B Grading Preparations Prior to Seeding**

All washouts on the areas to be permanently seeded, sodded or have temporary erosion control materials installed shall be filled prior to the soil loosening operations. Topsoil shall be placed to the depths indicated in the Plans. Fill material shall be compacted sufficiently to provide reasonably uniform density in the upper soil layer to resist erosion. Drainageways shall be shaped and the soil loosened prior to placing sod or erosion control blankets.

#### B1 Grading Prior to Temporary Seeding or Erosion Control Installation

When installing erosion control materials in locations where the final topsoil grade has not been established, the Contractor shall provide smooth-rough grading to allow for adequate installation of erosion control materials and/or temporary seeding. The smooth-rough grading shall remove large clods of soil greater than 75 mm (**3 inches**) in diameter and ruts deeper than 75 mm (**3 inches**) and shall be incidental to the Project for which no direction compensation will be made.

#### B2 Tillage

Immediately prior to sowing the seed or placing sod, the Contractor shall loosen the soil to a minimum depth of 75 mm (**3 inches**) on all areas except slopes steeper than 1 vertical to 2 horizontal, using disks, harrows, field diggers or other suitable cultivating equipment. All track imprints from wheeled or tracked equipment shall be tilled out of the soil surface. In compacted areas, the Contractor shall rip, use additional equipment, or other necessary measures to ensure proper soil loosening.

On slopes the cultivating equipment shall be operated in a general direction at right angles to the direction of surface drainage wherever practical. The soil surface shall be left in a roughened condition with clods, lumps, and tillage ridges approximately 75 mm (**3 inches**) high left in place for maximum resistance to erosion. No additional loosening of the soil will be required on slopes steeper than 1 vertical to 2 horizontal, other than that obtained with the equipment used in removing vegetation or performing the finishing operations. Vegetation other than undesirable weeds shall be disked into the soil, cleared, or chopped up with a rotary or flail mower.

On all areas to be sodded, the Contractor shall prepare the soil surface as necessary to provide a reasonably smooth, moist, and evenly textured foundation. The soil shall be loosened to a minimum depth of 75 mm (**3 inches**) prior to sodding.

**C Applying Fertilizer and Conditioners**

The Contractor shall apply fertilizers, compost, and liming materials, where specified, at the rates indicated in the Contract, using mechanical spreading devices to the fullest extent practical, and providing uniform distribution of the material over the designated areas. Lime application rates specified in the Contract are based on 500 kg ENP per metric ton (**1000 pounds ENP per ton**) of Agricultural Liming Material. The actual lime application rate shall be adjusted to supply 500 kg ENP per metric ton (**1000 pounds ENP per ton**) of liming material.

The Contractor shall apply fertilizer, lime or compost prior to the seeding or sodding. The soil shall be tilled at least once, within 24 hours, following the application of fertilizer, lime or compost and prior to the seeding or sodding. Where fertilizer is required on sodding areas, it shall be applied prior to placing the sod. Where fertilizer is required on seeded areas, the time between fertilizing and seeding shall not exceed 48 hours.

When approved by the Engineer, the Contractor may use Grade 1 compost at an equivalent nutrient application rate in lieu of commercial fertilizer.

**D Sowing Seed**

The Contractor shall ensure that the seed is stored properly between the time of purchase and installation. Industry standards for seed storage are **50 degrees Fahrenheit** and 50% humidity. The Contractor shall protect the seed from moisture until it is sown. Wet or moldy seed shall not be used.

The Contractor shall sow the seed uniformly at the rate of application specified in Table 2575-2.

2575.3

**TABLE 2575-2  
SEED MIXTURE APPLICATION RATES**

<b>Seed Mixture Number</b>	<b>Application Rate (kg/ha)</b>	<b>Application Rate (pounds/acre)</b>
100, 110	112	<b>100</b>
150	44.8	<b>40</b>
190	67.2	<b>60</b>
240	84	<b>75</b>
250	78.6	<b>70</b>
260	112	<b>100</b>
270	134.4	<b>120</b>
280	56	<b>50</b>
310	91.8	<b>82</b>
325	92.8	<b>84</b>
328	96.8	<b>88</b>
330, 340, 350	94.6	<b>84.5</b>

The Contractor shall sow seed on a prepared seedbed prior to applying mulch and as otherwise directed by the Plan or approved by the Engineer. The Contractor shall firm the seeded areas after seeding and prior to mulching. The soil firming shall be done with a drag, cultipacker, or other approved soil firming equipment. On slopes too steep to operate mechanical equipment, the seed shall be covered by hand raking or other approved means prior to mulching. Soil firming or seed covering shall be accomplished immediately after seeding.

On all seeding areas within 3 m (**10 feet**) of the shoulder, the Contractor shall seed and immediately firm the seedbed, mulch, and anchor the mulch as a continuous operation. Should the mulch application or mulch anchoring be delayed so that the seed or mulch becomes dislodged by traffic or wind, the affected areas shall be reseeded and remulched at no expense to the Department.

On areas outside 3 m (**10 feet**) of the shoulder, no more seed shall be sown on any day than can be mulched within 24 hours. Should the mulch application be delayed more than 24 hours, the Engineer may order the area reseeded and remulched at no expense to the Department.

The Contractor shall not broadcast seed or hydroseed when the wind velocity exceeds 25 km/h (**15 mph**) or during gusts that would affect seed placement.

#### D1 Temporary Seeding

Temporary seeding may be required on graded areas where the permanent seeding cannot be performed. For this purpose winter wheat, oats or other seed mixtures as determined by the Engineer will be used.

Topsoil covering may not be required for temporary seeding if the subsoil is reasonably suitable for plant growth, as determined by the Engineer. Soil preparation for temporary seeding shall be the same for permanent seeding except for areas such as stockpiles.

Temporary seeding shall be accomplished in accordance with Seeding of Traditional Mixes.

#### D2 Seeding Traditional Seed Mixes

Mixtures 100 through 280 inclusive shall be sown by means of mechanical or hydro spreading of the seeds at the specified rate of application. The use of hand operated mechanical spreaders will be permitted only on areas that are inaccessible to, or too small for, the specified equipment.

If a seed drill of the agricultural type is used, the drill shall be operated in a general direction at right angles to the direction of surface drainage, wherever practical, and the seed shall not be sown to a depth greater than 10 mm (**3/8 inch**). Small seed species such as timothy, alfalfa, white clover, red clover, etc., shall be sown through the grass seed attachment or by other approved means.

#### D3 Seeding Native Mixes

Native mixes (305-350) can be seeded with a native seed drill, a drop type seeder or a hydroseeder. The drill shall accurately meter the types of seed to be planted and keep all seeds uniformly mixed during drilling. The drill shall be equipped with disk furrow openers and packer assembly to compact the soil directly over the drill row. Maximum row spacing shall be 200 mm (**8 inches**). Depth of seed placement shall be such to obtain a final planting depth of 3 to 10 mm (**1/8 to 3/8 inch**). In lieu of a drill with disc openers, a drop type seeder that is equipped with a fluffy seed box and a "Brillion type" soil packer assembly may be used. All drill seeding shall be done at a right angle to surface drainage. The Engineer may allow the use of a cyclone or spinner type seeder on small areas (0.4 ha (**1 acre**) or less) or on areas that are inaccessible to other equipment. The rate of application must be adjusted according to the percent Pure Live Seed (PLS) in the mixture combined with the bulk portion of seed mixture. The bulk seeding rate for PLS species is determined by the following formula:

$$\text{Bulk Application (kg or lbs)} = (\text{kg or lbs. PLS}) / (\% \text{ PLS})$$

$$\% \text{ PLS} = \% \text{ Germination} \times \% \text{ Purity}$$

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#### D4 Hydroseeding

When a hydroseeder is used, every effort shall be taken to obtain a uniform distribution over the seeded area. A tracer, 22.5 kg (50 pounds) of 3884 Type 5 or 6, shall be added to each 1.9 m<sup>3</sup> (500 gallons) of water in the hydroseeder tank to visually inspect the uniformity of the seed application. The hydroseeder shall have continuous agitation action that keeps the seed mixed in the water slurry until pumped from the tank and the pump pressure shall be such that a continuous nonfluctuating stream is maintained. Flood type nozzles shall be used to the fullest extent possible along with sufficient water volume to obtain total ground coverage. During application the spray shall be directed to obtain a uniform material distribution as evidenced by a uniform wetting of the soil surface. If a non-uniform distribution results (such as skipped areas and saw tooth patterns), the affected areas shall be reseeded at no expense to the Department. The seed or seed/fertilizer mixture shall be emptied within 1 hour after the seed is added to the tank. Seed that is allowed to remain mixed with the fertilizer for a period longer than 1 hour will not be accepted for use and no compensation will be made for seed so rejected.

#### D5 Interseeding

Interseeding may be used for seeding into temporary mulched areas or for drilling additional seed into previously seeded areas. The interseeding drill shall contain trash rippers and at least two seed boxes, a fine seed box and a box for larger or fluffy seeds. The drill shall slice through the vegetative mat and make a 25 mm (1 inch) wide by 10 to 25 mm (3/8 to 1 inch) deep furrow into the underlying soil. The drill seed disk openings shall place seeds in the furrows. The drill shall drop the seed onto the ground surface from the fine seed box and place the large or fluffy seed to a final planting depth of 6 to 10 mm (1/4 to 3/8 inch).

#### D6 Permanent Seeding into Temporarily Mulched/Blanketed Areas

The Contractor shall permanently seed areas that have previously been temporarily mulched. Without additional tillage or site prep work, the Contractor may use an approved interseeding drill and drill seed directly into temporarily mulched or temporarily seeded areas. In lieu of using an interseeding drill, the Contractor may lightly disc the mulched areas and then conduct the seeding. Fertilizer shall be applied within 24 hours of interseeding or light disking. The Contractor shall leave existing cover in place as practical for its mulching value.

Seeding into previously placed erosion control blankets can be accomplished by attaching a hose to a hydroseeder and "blasting" a

seed/water solution into the blanket. Blasting the seed/water solution shall be done from a distance of approximately 2 m (**6 feet**) away.

**E Temporary Mulching**

Temporary mulching shall be defined as placing mulch over broad large areas, generally 0.8 ha (**2 acres**) or more, to protect the overall site during the period of time when seeding cannot be performed. Temporary mulching shall be used to supplement other erosion control best management practices of establishing permanent vegetation or the rapid stabilization of critical areas within 61 m (**200 feet**) of surface waters. The provisions for temporary mulching may be used where the provisions for rapid stabilization (Section N) do not apply. In areas where temporary mulch is placed, the Contractor shall shape the area, loosen the soil as necessary, mulch and anchor the mulch.

**F Applying Mulch**

The Contractor shall spread mulch by mechanical means to provide a uniform distribution at the target application rate specified. When poor mulch distribution occurs, the Contractor will be required to remulch areas where coverage is too light and remove the excess where coverage is too heavy as determined by the Engineer.

The Contractor shall not operate mulch-blowing equipment on slopes that are too steep for the equipment or that cause rutting of the soil surface (slopes 1:4 and steeper). Blower attachments shall be used such that the mulch can be applied without having to traverse the slopes.

The Contractor shall regrade, reseed and remulch slopes that are rutted up at the Contractor's expense.

F1 Type 1, 3, 7, and 8 Mulches

Wherever possible, Type 1, 3, 7, and 8 mulches shall be placed with blower equipment. The target rate of application shall be 4.5 metric tons (t) per hectare (**2 tons per acre**). The actual rate of application shall be as directed by the Engineer to match varying material or Project conditions so that approximately 10 percent of the soil surface is visible through the mulched areas.

F2 BLANK

F3 BLANK

F4 Type 4 Mulch

Type 4 mulch shall be applied as a dual operation with the Type 1 mulch blown on the soil surface at 3.4 metric tons per hectare (**1 ½ tons per acre**) and immediately over-sprayed with Type 5 hydraulic soil stabilizer at 840 kg/ha (**750 pounds per acre**). Seeding and fertilizing shall be done prior to mulching, not in conjunction with Type 5 hydraulic soil stabilizer placement. Disk anchoring will not be required.

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#### F5 Type 5 Mulch

Type 5 mulch shall be applied at a rate of 150 m<sup>3</sup>/ha (**80 cubic yards per acre**) when specified as an erosion control material.

#### F6 Type 6 Mulch

The rate and application procedure for Type 6 mulch shall be as specified in the Plans or Special Provisions.

#### F7 BLANK

#### F8 BLANK

#### F9 Type 9 Mulch

The Contractor shall apply Type 9 (aggregate) mulch at a rate of application as stated in the Contract. Prior to placing the mulch, the Contractor shall uniformly compact and smooth the foundation, cover the foundation with a 150 µm (**6 mil**) plastic sheeting, and then uniformly spread the aggregate mulch to the Plan thickness by a method that does not harm the foundation. The Contractor shall level the finished aggregate surface so that it is flush with adjacent areas. The plastic sheeting is an incidental cost to the completed work.

#### F10 Shoulder Mulch Overspray

Shoulder mulch overspraying shall consist of Type 1 Hydraulic Soil Stabilizer sprayed onto Type 1 mulch on a 1 meter (**yard**) wide strip immediately abutting a gravel or paved shoulder. During placement, the Contractor shall seed, firm the seedbed, place Type 1 mulch, immediately disk anchor the mulch (if provided for in the Contract), and then uniformly overspray with, Type 1 Hydraulic Soil Stabilizer as a continuous operation. Wherever possible, the Type 1 Hydraulic Soil Stabilizer shall be sprayed with a distributor spray bar. Application rate for the Type 1 Hydraulic Soil Stabilizer shall be 220 kg/ha (**200 pounds per acre**). Shoulder mulch overspray will be for those areas designated in the Plans and will be paid for under the Type 1 Hydraulic Soil Stabilizer pay item.

#### **G Disk Anchoring**

Where provided for in the Contract, the Contractor shall anchor Type 1, Type 3, Type 7, and Type 8 mulches with a disk anchoring tool. This equipment shall anchor the mulch by punching it into the soil to a depth of 50 to 75 mm (**2 to 3 inches**). Spacing between the blades or disks shall not exceed 200 mm (**8 inches**). The mulch shall be anchored immediately after placement unless otherwise authorized by the Engineer.

#### **H Hydraulic Soil Stabilizers**

##### H1 Type 1 Natural Tackifier

Natural tackifiers are added to water and applied by a hydrosprayer. Natural tackifiers can be used by themselves, as an additive to other soil stabilizers, or as an overspray on mulched areas. When used as an

additive to other soil stabilizers, they shall be added at the rate specified by the manufacturer. When used as an overspray on mulched areas, they shall be applied at the rate specified by the manufacturer. During placement, every effort shall be taken to obtain a uniform distribution over the target area.

H2 BLANK

H3 BLANK

H4 BLANK

H5 Type 5 and 6

Type 5 or 6 shall be applied with hydraulic spray equipment in a water-slurry at the rate of 2353 kg/ha (**2100 pounds per acre**). For planning purposes, the approximate water to bale ratio is 475 L of water per 22.7 kg bale (**100 gallons of water per 50 pound bale**); however the actual water to bale ratio shall be in accordance with the manufactures recommendations. Using the color of the material as a metering agent, the slurry shall be uniformly sprayed on the prepared seedbed. The Engineer may verify, by inspection of tank loading and spray application, that materials applied correspond with the application requirements within reasonable limitations.

H7 BLANK

H8 Type 8 Bonded Fiber Matrix (BFM)

Type 8 hydraulic soil stabilizer shall be applied with hydraulic spray equipment by a manufacturer's certified applicator. Seeding shall be done as a separate operation prior to the BFM application whenever possible. The combination of seed and BFM as a single operation will be allowed in small or inaccessible areas as determined by the Engineer. Installation rate shall be between 3300 and 4620 kg/ha (**3000 and 4200 pounds per acre**) depending on site characteristics as provided for in the plans. The general application rate shall be 3850 kg/ha (**3500 pounds per acre**). For planning purposes, the approximate water to bale ratio is 380 L/22.7 kg (**100 gallons per 50 pound**) bale; however the actual water to bale ratio shall be in accordance with the manufactures recommendations. In all cases 100% continuous ground coverage shall be obtained. Application shall be done on dry soils (field capacity or less) and at least 24 hours in advance of projected rainfall to allow adequate drying time. The BFM shall be applied from at least two alternate directions, preferably 90 degrees apart, to ensure all soil surfaces are covered. For application rates of 3850 kg/ha (**3500 pounds per acre**) and above, the BFM shall be applied in two stages (one half rate each) with ample time between stages for the first application to dewater. BFM shall not be used in water bearing soils or by itself in ditch bottoms carrying concentrated flow. After the BFM soil stabilizer is applied and dries for 24 to 48 hours, the Engineer may sample and

### 2575.3

quantify a portion of the installation to ensure the minimum specified rate has been applied. If it is found that the specified quantity per acre has not been achieved, the Contractor shall apply an additional amount to equal the specified rate within 48 hours of receiving the test results. The Contractor shall not be paid extra mobilization costs for spraying additional material.

#### **I Placing Sod**

Before sod is delivered to the work site, the Contractor shall have all necessary equipment and forces available and shall have prepared the sodding areas sufficiently in advance in accordance with 2575.3B to avoid delays in placing the sod. The Contractor shall place sod according to the Plan and these requirements.

The Contractor shall place sod strips with staggered end joints and without stretching, in such a manner that all edges will firmly abut the edges of adjoining strips. In no case shall the sod be placed so loosely or under such tension that it will cover an area larger than the area from which it was originally lifted.

Joints between the sod and in-place improvements such as curbs, walks, and existing turf, shall abut tightly and shall be such that drainage will be conducted over the surface. Elsewhere, the outside edges of the sodded areas shall be rolled in or banked flush with soil, thoroughly compacted to form a flush surface as directed by the Engineer. The Contractor shall place the sod in such a manner that surface drainage along the boundary of the sodded area will not erode or undermine the sod.

The Contractor shall water and compress the sod into the soil by rolling or tamping while laying the sod or immediately after completing the sod placement on each area. The initial watering and rolling or tamping shall be sufficient to provide a firm contact and bond between the sod and the underlying soil and provide a smooth, even surface free of humps and depressions, but in no case shall the rolling or tamping result in excessive compaction. The Engineer may require the watering of areas to be sodded prior to the sod placement.

The Contractor shall repair damaged areas within 5 working days after completing the sod placement and rolling or tamping operations. This repair work shall include reseeding and remulching of any seeded or mulched areas adjacent to the sod. All waste sod, together with any stones or other debris removed from the sodding areas, shall be disposed of in a manner satisfactory to the Engineer.

The Contractor is responsible for successful establishment of the sod and shall replace or repair displaced or damaged sod during the maintenance period. The Contractor may peg or staple sod to prevent displacement.

#### I1 Slopes

The Contractor shall carefully place sod strips from the bottom of the slope and progress upward. The sod shall be placed with the longitudinal axis of each strip at right angles to the slope. Staking or stapling may be required to prevent slumping or displacement of the sod. At the top of the slope, the sod must be trenched 75 mm (**3 inches**) into the topsoil on slopes steeper than 1V:4H.

#### I2 Ditch Bottoms

In ditch bottoms and other waterways where a concentrated flow of water is expected, the sod shall be placed so that the longitudinal axis of each strip is parallel to the direction of water flow in the main channel. The end of the strips will overlap a minimum of 100 mm (**4 inches**) with the upstream end on top of the downstream end. The sod will also be shingled and overlap a minimum of 75 mm (**3 inches**) on the sides of the strips. When shingled properly, the water will flow over, NOT under, from one roll of sod to the next. The uppermost strip of sod will have 75 mm (**3 inches**) of sod trenched into the topsoil on side-slopes steeper than 1:4.

The sod shall have netting material that is either incorporated into the rooting material of the sod during initial growth, or placed on the bottom of the sod mat at the time of harvest. Alternatively, Type 1 netting may first be secured in the ditch bottom followed by sod placement.

The sod shall be stapled once it has been put in place. All joints and outer edges of the sod shall be stapled at 0.9 m (**3 feet**) intervals or less. Staples shall be placed throughout the sod at a minimum spacing of 2 staples/m<sup>2</sup> (**square yard**). All staples shall be inserted flush with the ground surface.

### **J Placing Erosion Netting, and Blankets**

#### J1 Erosion Control Netting

Netting placed in ditch bottoms, flumes or water courses shall be rolled out flat, parallel to the direction of water flow. Netting placed on cut or fill slopes shall be rolled out flat, parallel or perpendicular to the direction of water flow. The edges of adjacent strips shall overlap a minimum of 50 mm (**2 inches**) and a maximum of 100 mm (**4 inches**), with the net on the upstream side of any lateral water flow being on the top.

The netting shall be secured in place by means of wire staples driven reasonably vertical into the soil. The netting shall not be stretched prior to stapling. Staples shall be placed 1 m (**3 feet**) apart along the ends and edges of each strip. Additional rows of staples shall be placed parallel to the edge row of staples so that the distance between adjacent rows does not exceed 1 m (**3 feet**). Staples shall be placed 1 m

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(**3 feet**) apart within these rows. Where possible, staples of adjacent rows shall be placed so as to form a sawtooth pattern.

#### J2 Erosion Control Blankets

The Contractor shall shape and prepare the site so it is free of large rocks, soil clumps or vehicle imprints that would prevent the blanket from lying flush to the surface contours. The Contractor shall place the blankets as specified in the Contract on the specified areas within 24 hours after sowing of the seed on that area.

The Contractor shall roll out or lay the blankets parallel to the direction of water flow, with the netting on top. For blankets with netting on two sides, the bottom side of the blanket shall show the majority of the thread stitching. The blankets shall be spread evenly without stretching, and so the fibers are in direct contact with the soil over the entire area. Adjacent strip edges shall overlap each other at least 102 mm (**4 inches**). Strip ends shall overlap each other at least 178 mm (**7 inches**). All overlaps shall be made with the upgrade strip placed over the down grade blanket strip. All overlaps for all Categories, excluding category 0, shall be stapled at ½ m (**1 ½ foot**) intervals.

At the top of slopes and the beginning of each blanket in ditch bottoms the Contractor shall bury the upgrade end of the blanket strip in a check slot. The check slot, or trench, shall be approximately 150 mm (**6 inches**) wide by 150 mm (**6 inches**) deep. The blanket end shall be inserted into the check slot such that the blanket is in contact with all three sides of the check slot. The blanket shall be stapled in the bottom of the trench every 0.3 m (**1 foot**). The check slot shall be backfilled and compacted. When a slope length is greater than 30 m (**100 feet**), a second check slot shall be dug perpendicular to the slope gradient one-third up from the bottom of the slope. The blanket shall follow the slope down into the check slot and back up to the slope gradient. This check slot shall also be stapled, backfilled and compacted.

Category 00 blankets shall be stapled on the edge of the blanket every 1 m (**3 feet**) and watered in to bond the blanket to the soil. All other blankets, excluding category 00, shall be anchored to the soil surface with evenly distributed staples through out the blanket at the rate specified in Table 2575-3. All staples shall be inserted flush with the ground surface.

**TABLE 2575-3  
STAPLING OF BLANKETS**

Slope (V:H)	Minimum Number of Staples per square meter ( <b>square yard</b> )
Flatter than 1:2	1 ( <b>1.2</b> )
1:2 – 1:1	1.4 ( <b>1.7</b> )
Channel or Ditch applications	2.9 ( <b>3.5</b> )

**K Placing Erosion Stabilization Mats**

The Contractor shall shape and prepare the site so it is free of large rocks, soil clumps or vehicle imprints that would prevent the Mat from lying flush to the surface contours. The erosion stabilization mat shall conform to the class shown in the Plan. All Erosion stabilization mats shall be soil filled.

The Contractor shall install the mat, seed, fertilize, place topsoil, and blanket all in one continuous operation. The Contractor shall roll out or lay the mat parallel to the direction of water flow. The mat shall be spread evenly without stretching, and so the fibers are in direct contact with the soil over the entire area. The beginning edge of each mat shall be buried and stapled in a check slot as described in K2. Adjacent strip edges shall overlap each other at least 102 mm (**4 inches**). The mat shall be stapled at a uniform density of 2.9 staples/m<sup>2</sup> (**3.5 staples per square yard**).

The mat shall be directly seeded and fertilized at ½ of the amounts specified in the Plan. On top of the seed and fertilizer, topsoil meeting the criteria of 3877 "Select Topsoil Borrow" that has been screened and pulverized shall be backfilled over the mat at a depth of 12-25 mm (½ - **1 inch**). A sample of the topsoil shall be provided to the Engineer prior to installation. The remaining ½ of the seed mix and fertilizer shall be spread on top of the topsoil. The soil filled mat shall have a Category 4 blanket, meeting 3885 installed in accordance with K2 on top of the seeded topsoil to prevent erosion of the topsoil. No tracked equipment or sharp turns shall be made on the mat.

**L Maintenance**

**L1 Sod**

After the sod is placed and until it is accepted, the Contractor shall water and maintain sod in a condition satisfactory to the Engineer. The sod shall be cared for on a timely day by day basis. Watering and replacement of sod shall be accomplished as the need arises and without the Engineer having to so order.

The Contractor shall maintain the sod for 30 calendar days. The Engineer will then make the final inspection and consider acceptance of the sod.

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During the maintenance period, the Contractor shall promptly replace all sod that dries out to the point where it is presumed dead, and all sod that has been damaged, displaced, or weakened to the point where its replacement is necessary, or has become heavily infected with weeds. Areas replaced with new sod shall be maintained by the Contractor for at least 20 calendar days after placement.

#### L2 **Erosion Control Blanket and Erosion Stabilization Mats**

The Contractor shall maintain the erosion control blanket installation for 30 days when specified in the Contract or when the Engineer allows erosion control blankets and seed to be substituted for sod. All Erosion Stabilization Mats shall be maintained by the Contractor for 30 calendar days. Maintenance consists of thoroughly watering the blankets and mat systems immediately after placement (28 m<sup>3</sup>/ha (**3000 gallons per acre**)), with additional watering performed as necessary. Until acceptance, the Contractor shall be responsible for controlling erosion and establishing a permanent vegetative cover to the satisfaction of the Engineer. In the event of seeding failure or erosion during the maintenance period, the Contractor shall restore such areas at no additional cost to the Department.

#### L3 Sod Alternatives

When other products and methods are used in lieu of sod, the area shall be maintained by the Contractor ensuring the same outcome as a sodded area. Weeds shall be controlled and the maintenance requirements of specification 2575.3L2 shall apply.

#### L4 Mulch

When so directed by the Engineer, the Contractor shall, at any time before completion of the Project, remulch any areas on which the original mulch has eroded, washed away, or blown off, and reseed any areas on which the original seed has failed to grow, using the project seed mixture or one prescribed by the Engineer.

#### L5 Mowing and Weed Spraying

When the Contract includes items for mowing or weed spraying, the Contractor shall perform the specified work one or more times, wherever and whenever the Engineer directs, either on the areas seeded or sodded under the Contract. The equipment used shall not be so heavy that it causes soil slips or ruts on the slopes or in the ditches.

The Engineer may order weed spraying wherever heavy weed growth exists within the Right of Way. The weed spray mixture to be furnished and used shall be as provided in the Plans. The Contractor shall be responsible for performing the work at such time and in such a manner that will avoid spray drift outside the areas designated for spraying.

L6 General

Until final inspection and acceptance of the work is made, the Contractor shall use due care to protect the site during the time vegetation is establishing. Additional seed and mulch material used for reseeding and remulching and repairing damaged areas beyond the Contractor's control will be measured and paid for at the Contract prices, provided the original work was performed satisfactorily in accordance with requirements.

**M Turf Establishment, Lump Sum**

Turf Establishment may be specified in the Plans as a lump sum bid item for establishing vegetation on small areas of 1 ha (**2 ½ acres**) or less per Contract. The lump sum item shall be considered to provide for restoring disturbed areas. Such work shall include tilling, fertilizing, mulching and establishment of vegetative cover. Under this provision the Contractor shall be responsible for controlling erosion and establishing a permanent vegetative cover to the satisfaction of the Engineer.

Unless otherwise specified in the Plans, the Contractor may establish vegetative cover by sodding or by seeding and mulching. If the Contractor elects to establish vegetative cover by seeding, seed furnished and placed shall consist of a mixture of desirable perennial grasses and legumes equivalent to that contained in 3876 for Mixture 250. Upon seeding, the areas shall be fertilized with 22-5-10 analysis slow release fertilizer (see 3881.2) at 330 kg/ha (**300 pounds per acre**) and mulch equivalent to 3882, Type 1 shall be furnished and placed to prevent erosion and siltation. Acceptance of the areas by the Engineer will not be made until it is evident that the seed so placed has germinated and will establish an adequate protective cover. In the event of seeding failures, the Contractor will be required to correct and reseed such areas at no expense to the Department until adequate turf is established. When sod is used, the placement, maintenance, and acceptance shall be as specified in 2575.3.

**N Rapid Stabilization**

This work shall consist of operations necessary to rapidly stabilize small critical areas within 61 m (**200 feet**) of Surface Waters, to prevent off site sedimentation and/or to comply with permit requirements. The work shall be performed numerous times during the Contract and will be conducted on several small areas that may or may not be accessible with normal equipment. This work shall be done in accordance with the applicable details and locations shown in the Plan. The methods may be conducted independently or in combination. One or several locations may be stabilized by the Contractor per site visit per calendar day. The

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number of locations stabilized per site visit or per calendar day will not justify an adjustment in the Contract unit price.

The materials required shall be as follows:

<b>Method 1</b>	Type 1 Mulch @ 4.5 metric ton/ha ( <b>2 tons per acre</b> ) Disc anchoring
<b>Method 2</b>	Type 1 Mulch @ 3.4 metric ton/ha ( <b>1.5 tons per acre</b> ) Type 5 Hydraulic Soil Stabilizer @ 840 kg/ha ( <b>750 pounds per acre</b> )
<b>Method 3</b>	Type 6 Hydraulic Soil Stabilizer @ 160 kg/ 3.8 m <sup>3</sup> of slurry mix ( <b>350 pounds per 1000 gallons of slurry mix</b> ) Seed mixture 190 @ 4.5 kg/3.8 m <sup>3</sup> of slurry mix ( <b>10 pounds per 1000 gallons of slurry mix</b> ) Fertilizer 10-10-20 @ 22.7 kg/ 3.8 m <sup>3</sup> of slurry mix ( <b>50 pounds per 1000 gallons of slurry mix</b> ) Water @ 3.3 m <sup>3</sup> /3.8 m <sup>3</sup> of slurry mix ( <b>875 gallons per 1000 gallons of slurry mix</b> )  <b>Note:</b> 3 m <sup>3</sup> ( <b>1000 gallons</b> ) of slurry mix will cover 0.067 ha ( <b>1/6 acre</b> ).
<b>Method 4</b>	Erosion Control Blanket Category 3 Seed mixture 190 @ 1.1 kg/100 m <sup>2</sup> ( <b>2 pounds per 100 square yards</b> ) Fertilizer 10-10-20 @ 4.3 kg/100 m <sup>2</sup> ( <b>8 pounds per 100 square yards</b> )
<b>Method 5</b>	Rip Rap Class II Geotextile Type III

N1 Placement

**Method 1**

Prior to placement the soil surface should be in a loose condition so that the mulch can be anchored. The mulch shall be placed to obtain approximately 90% ground coverage. Wherever possible, the mulch shall be placed by blower equipment. In inaccessible areas the mulch may have to be placed by hand. Immediately after placement, the mulch shall be anchored with a disc anchoring tool. The approximate area of coverage is 0.2-0.8 ha (**1/2-2 acres**).

**Method 2**

Prior to placement the soil surface should be in a loose condition. The mulch shall be placed to obtain approximately 75% ground coverage. Wherever possible, the mulch shall be placed by blower equipment. In inaccessible areas the mulch may have to be placed by hand. Immediately after placement, the mulch shall be over-sprayed

with Type 5 Hydraulic Soil Stabilizer at a rate of 840 kg/ha (**750 pounds per acre**). The approximate area of coverage is 0.2-0.8 ha (**½-2 acres**).

**Method 3**

Rate of slurry application shall be variable depending on surface roughness, slope configuration and degree of undulation but it is expected that 56 m<sup>3</sup> of slurry will be needed per hectare (**6 M gallons per acre**). This rate is equivalent to applying Type 6 Hydraulic Soil Stabilizer at 2353 kg/ha (**2100 pounds per acre**). Amount of material applied shall be such to obtain 100% soil surface coverage. In inaccessible areas, the mix may be pumped through a hose. The approximate quantity of coverage is 11.4-34 m<sup>3</sup> (**3000-9000 gallons**) of slurry.

**Method 4**

The fertilizer, seed and erosion control blanket shall be placed as described in 2575.3. The upgrade end of each blanket strip shall be buried at least 150 mm (**6 inches**) in a vertical check slot. Staples shall be placed at seams and throughout the blanket at a maximum spacing in all directions of 0.6 m (**2 feet**). The approximate area of coverage is 75 – 650 m<sup>2</sup> (**100 – 800 square yards**).

**Method 5**

Rock and geotextile shall be placed in the areas and to the configurations as directed by the Engineer. The approximate quantities per Project visit are 9-18 metric tons (**10-20 tons**).

**O Acceptance of Work**

The Contractor shall notify the Engineer at least 24 hours in advance of beginning and also of changing turf establishment operations. The Contractor shall schedule working hours according to 1803. Work done without notification, without inspection according to 1511, or outside of the scheduled working hours without prior approval will be considered as unauthorized work. Turf establishment that is not verified by inspection in accordance with 1511 will be considered as unauthorized work.

**O1 Seeding**

The Engineer will generally accept permanent seeding in area increments once the seed has been properly placed in accordance with the specifications. After acceptance of seeding by the Engineer, the Contractor is relieved of responsibility for further maintenance and repair of the seeding and mulching performed on the area accepted, except for the repair of damages due to causes entirely within the Contractor's control.

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#### O2 Mulching

The Engineer will accept mulching 2 days after initial placement. Areas where the mulch has blown off or washed away during the 2 day period will be remulched at no expense to the Department.

#### O3 Sod

Upon satisfactory placement of the sod, the Engineer may authorize partial payment not exceeding 80 percent of the Contract bid price. The remaining percentage shall not become due and payable until expiration of the sod maintenance period, and then only as otherwise provided for in the Contract.

Upon expiration of the sod maintenance period on individual areas or sections of the Project, the Engineer will make an inspection of the work and will accept all sod that is in normal, healthy growing condition. No payment will be made for sod that is not in acceptable condition at the time of the final inspection an amount will be deducted from any moneys due or that may become due the Contractor equal to 100 percent of the Contract bid price per unit of measure of unacceptable sod. Sod that is within 3 m (**10 feet**) of the shoulder or is directly abutting a roadway surface that is acceptably maintained, but dies out due to salt or winter maintenance activities beyond the Contractor's control, may be paid for at 100 percent of Contract price provided that the sod has been maintained for at least 20 calendar days prior to December 1.

#### O4 Erosion Netting, Blankets and Stabilization Mats

When maintenance is not specified in the Contract, the Engineer will accept blankets and erosion control netting and mats, at the time of acceptance of the sodding or seeding over which the materials are properly placed.

When maintenance is specified as an integral part of a erosion control blanket installation or stabilization mat the Engineer may authorize partial payment for the installation in an amount not exceeding 80 percent of the Contract bid price. The remaining percentage shall not become due and payable until final acceptance by the Engineer.

#### O5 Products Used in lieu of Sod

When other products or methods are used in lieu of sod, the Engineer may authorize partial payment not exceeding 80% of the substituted product price upon proper placement. The remaining percentage shall not become due and payable until the expiration of the maintenance period, and then only as acceptable to the Engineer.

#### O6 Hydraulic Soil Stabilizers

Hydraulic soil stabilizers, except for Type 8, will be accepted upon satisfactory placement. Acceptance of acres covered by Type 8 will be

made by the Engineer when it is evident that the seed placed has germinated and will establish an adequate protective cover. In the event of seeding failures or erosion, the Contractor will be required to correct and reseed such areas at no expense to the Department until adequate vegetative cover is established. Upon proper placement of Type 8 the Engineer may authorize partial payment for the installation in an amount not exceeding 80% of the Contract bid price. The remaining percentage shall not become due and payable until final acceptance by the Engineer.

**P Restoration**

After acceptance of turf establishment in an area, the Engineer may order the Contractor to restore areas damaged by erosion and sedimentation that occurred beyond the Contractor's control. Restoration work consists of scarifying, grading, shaping, excavating, tilling, and any other operation the Engineer considers necessary to restore eroded areas and clean up sedimentation. Depressions and washouts resulting from erosion shall be shaped, filled with suitable material, and compacted to the satisfaction of the Engineer. Sedimentation shall be removed to the original grade or as necessary to properly restore the area as determined by the Engineer. Sediment removed shall be spread or disposed of to the satisfaction of the Engineer.

The Engineer will determine the seed, mulch, erosion blankets, and sod used in the restoration.

The Contractor will be compensated for restoration costs at the Contract unit prices. If no Contract unit prices are provided for in the Contract, the Contractor will be compensated for restoration costs as Extra Work. No compensation, however, will be made when the damage results from the Contractor's neglect or operations.

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**V Workmanship and Quality Control**

The Contractor is responsible for maintaining quality control on the project by ensuring that all work performed and all materials furnished are in conformance with the dimensions, installation requirements and material specifications shown in the Plans or indicated in the Specifications. Quality workmanship shall be used in all aspects of the work and shall be uniform in character throughout the project.

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**W Workmanship Rework Schedule**

Performance of the work shall be controlled by the contractor so that the materials installed and the workmanship practices are of good quality. When the quality falls below a threshold level defined in Table 2575-4, the contractor shall take immediate action to correct the situation and prevent it from reoccurring. As indicated in Table 2575-4 the contractor shall correct unacceptable workmanship to qualify for payment.

**TABLE 2575-4  
REQUIRED CORRECTIVE ACTION**

<b>Item</b>	<b>Corrective action required when:</b>
Seeding	Not uniform placement Not seeded with drill when required Depth of seed incorrect No seedbed firming Incorrect rate of seed application Less than 76 mm ( <b>3 inches</b> ) tillage Not mulched within 24 hours
Fertilizer and lime	Incorrect rate of application Not uniform placement Not incorporated properly
Mulch material, hydraulic soil stabilizer	Incorrect rate of application Not uniform placement Rutting of slopes with equipment
Erosion control blankets and mats	Inadequate soil loosening or preparation Upgrade ends not embedded on slopes Improper overlaps and joints Insufficient number of staples Improper stapling pattern No embedment of joints in drainageways
Turf establishment lump sum	Erosion not controlled Insufficient vegetative cover established

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The above table pertains to a threshold level of workmanship only and does not pertain to the use of nonconforming materials. The disposition of nonconforming materials shall be in accordance with 1503. The Contractor at no cost to the Department shall perform any corrective actions required for acceptance of the work.

### 2575.4 METHOD OF MEASUREMENT

#### A Fertilizer

Fertilizer will be measured by the weight of each kind furnished and applied. When a different analysis fertilizer than in the Plans, is used it will be converted to equivalent of planned fertilizer.

#### B Lime

Agricultural lime will be measured by the weight of material furnished and applied. Industrial Slag will be measured by mass on the same basis as Agricultural Lime.

#### C Seeding

Seeding will be measured by the area seeded, regardless of the seed mixture or quantity of seed used, and regardless of whether the seed was furnished by the Contractor or the Department. Areas reseeded by order of the Engineer, after the original seeding of the area was accepted, will be measured and added to the area originally seeded.

#### D Seed

The Engineer will measure seed by mass of each mixture or species except when pure live seed (PLS) is indicated. When PLS is indicated, the Engineer will measure the portion of the seed mixture by mass of PLS and add it to the mass of seed mixture specified as bulk mass.

#### E Mulch

The Engineer will measure:

- (1) Mulch material of Types 1, 3, 4, 7, and 8 by the mass of each type furnished and applied acceptably. Type 4 mulch shall consist of a measurement of Type 1 mulch and Type 5 hydraulic soil stabilizer.
- (2) Type 5 and 6 mulch material by volume (vehicular measure) of the material furnished and acceptably used.
- (3) Type 9 (aggregate) mulch by volume, based on the area of aggregate furnished and acceptably placed to the Plan thickness.
- (4) Additional mulch materials ordered by and then accepted by the Engineer in remulched areas will be added to the mulch quantities originally used and accepted.

#### F Water

Water used by order of the Engineer for establishment of areas covered with mulch will be measured by volume.

#### G Disk Anchoring

Disk anchoring of Type 1, Type 3, Type 7 and Type 8 mulches will be measured by the area of mulch disked acceptably.

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### **H Sodding**

The Engineer will measure sodding that is acceptably installed and maintained by the surface area based on field measurement. Where sod is authorized to be placed shingle-style, the overlapped portion of the sod will also be measured.

### **I Hydraulic Soil Stabilizers**

The Engineer will measure Type 1 by the area acceptably covered taking into account the type of material used and the manufacture's recommended application rate. The Engineer will measure all other hydraulic soil stabilizers by the mass or weight of each type used. The Engineer may convert the mass or weight of material used to a square meter (**square yard**) basis.

### **J Lump Sum Turf Establishment**

The item of turf establishment, lump sum will be considered to include all materials and labor as necessary to accomplish the work regardless of quantities involved. Measurement will be by lump sum unit, and under this provision, no measurement will be made of any individual turf establishment item.

### **K Erosion Netting, Blankets and Stabilization Mats**

Erosion netting and blankets of each kind will be measured separately by the area covered. Overlapped portions will not be added additionally to the area measured.

Erosion Stabilization mats will be measured by the area covered. Overlapped portions will not be added additionally to the area measured. Seed, fertilizer, topsoil and blankets placed in conjunction with the erosion stabilization mat system will be measured separately.

### **L Mowing**

Mowing will be measured by the area acceptably mowed.

### **M Weed Spraying**

Weed spraying will be measured by the area acceptably sprayed.

### **N Weed Spray Mixture**

Weed spray mixture will be measured by the volume of ingredients furnished and used.

### **O Blank**

### **P Compost**

Grade 1 compost will be measured by mass of material furnished and applied. Grade 2 compost will be measured by loose volume determined by vehicular measurement of material delivered.

### **Q Rapid Stabilization**

**Method 1 and 2** will each be measured by the hectare (**acre**) acceptably installed. Disc anchoring or hydraulic soil stabilizer shall be considered incidental for which no direct payment will be made.

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**Method 3** will be measured by the cubic meter (**M Gallons**) of slurry furnished and acceptably placed. Seed, fertilizer, and hydraulic soil stabilizer shall be considered incidental for which no direct payment will be made.

**Method 4** will be measured by the square meter (**square yard**) of blanket acceptably installed. Seed and fertilizer shall be considered incidental for which no direct payment will be made.

**Method 5** will be measured by the metric ton (**ton**) of rock furnished and acceptably installed. Geotextile shall be considered incidental for which no direct payment will be made.

### **2575.5 BASIS OF PAYMENT**

Payment for any of the turf establishment items at the Contract prices per unit of measure will be compensation in full for all labor, materials, equipment, and other incidentals necessary to complete the work as specified, including the costs of maintenance, replacement, and repair as required by the Contract.

#### **A Erosion Control Items**

Payment for erosion control blankets may include maintenance, when so specified. If no maintenance is specified, payment shall be compensation in full for all labor, materials, equipment, and other incidental items necessary for proper installation of the blankets. If maintenance is specified, payment shall also include the cost of watering, replacement, and repair as required by the Contract.

Payment for hydraulic soil stabilizers will be based upon acceptance of the application by the Engineer. Payment for Type 1, 5, and 6 shall be compensation in full for all labor, materials, and equipment, for proper installation of the materials. Type 8 shall be eligible for partial payment not to exceed 80% of the contract bid price upon satisfactory installation of the material. The remaining 20% shall be made available when final acceptance is made based on adequate vegetative cover and erosion control.

#### **B Temporary Seeding**

Interim seeding, and the application of fertilizer and mulch as required in conjunction therewith, will be paid for at the Contract prices or, in the absence of a Contract bid price, according to the established unit prices, or in the absence of a Contract price and unit price, as Extra Work.

#### **C Seed**

Seed will be paid for by the mass of each mixture or species except when pure live seed (PLS) is indicated. When PLS is indicated on a portion of the seed mixture, payment will be made by mass of the PLS species plus the mass of the bulk portion of the seed mixture. Payment for seed not meeting germination and purity requirements of 3876 shall

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be subject to 1503. When components are missing from the specified mixture the affected seeded areas shall be reseeded with the correct mixture by the Contractor at no additional cost to the Department and a deduction of the value of the missing ingredients shall also be applied.

**D Mulch**

D1 Type 4 Mulch

Type 1 mulch and Type 5 hydraulic soil stabilizer will be paid for separately.

D2 Shoulder Mulch Overspray

Type 1 hydraulic soil stabilizer shall be paid for independent of the Type 1 mulch and disk anchoring or shoulder mulch overspray.

**E Mowing and Weed Spraying**

Payment for mowing and weed spraying at the Contract prices per unit of measure will be compensation in full for all labor and equipment employed in the work, and for all materials used, except that separate payment will be made for the weed spray mixture furnished and applied in conjunction with the item of weed spraying.

**F Sod**

Netted and stapled sod shall be paid at 150% of unnetted sod.

**G Products in Lieu of Sod**

Payment for products used in lieu of sod, that are not as labor intensive or do not require the same watering sequence as sod shall be paid for at 75 percent of the sod Contract price.

**H Rapid Stabilization**

Payment for the various items of work required for Rapid Stabilization will be made in accordance with the appropriate Contract bid price per unit of measure for each method specified. Such payment, in each instance, shall be construed to be compensation in full for all costs incidental thereto including mobilization.

**I Unit Prices**

The Department will pay the following unit prices for erosion control and vegetation establishment items in the absence of a Contract bid price:

- (1) Additional tillage ordered by the Engineer before seeding interim mulched areas will be paid for at the same unit price as disk anchoring.
- (2) Disk Anchoring ..... \$75 per hectare (**\$30 per acre**)
- (3) Temporary Seed Mixtures
  - Mixture 100-110..... @ \$0.44 per kilogram (**\$.20 per pound**)
  - Mixture 150 ..... @ \$3.00 per kilogram (**\$1.35 per pound**)
  - Mixture 190 ..... @ \$2.75 per kilogram (**\$1.25 per pound**)
- (4) Erosion Control Blanket Category 4  
..... \$2.20 m<sup>2</sup> (**\$2.00/square yard**)

- (5) Rapid Stabilization Methods
  - Method 1.....\$900/ha (**\$400/acre**)
  - Method 2.....\$1235/ha (**\$500/acre**)
  - Method 3.....\$86/m<sup>3</sup> (**\$325/M gallon**)
  - Method 4.....\$3.00/m<sup>2</sup> (**\$2.50/sq yd**)
  - Method 5.....\$27/metric ton (**\$25/ton**)
- (6) Water.....\$4.65/cubic meter (**\$17.00/MGal**)

**J Payment Schedule**

Payment for turf establishment and maintenance will be made on the basis of the following schedule:

<b>Item No.</b>	<b>Item</b>	<b>Unit</b>
2575.501	Seeding .....	hectare( <b>acre</b> )
2575.502	Seed, Mixture ____, or (Species) .....	kilogram( <b>pound</b> )
2575.505	Sodding Type __.....	square meter( <b>square yard</b> )
2575.511	Mulch Material, Type __.....	metric ton ( <b>ton</b> )
2575.513	Mulch Material, Type __.....	cubic meter ( <b>cubic yard</b> )
2575.519	Disk Anchoring.....	hectare ( <b>acre</b> )
2575.521	Erosion Control Netting .....	square meter ( <b>square yard</b> )
2575.523	Erosion Control Blankets, Category ____(1) .....	square meter( <b>square yard</b> )
2575.525	Erosion Stabilization Mat, Class __ .....	square meter ( <b>square yard</b> )
2575.531	Fertilizer, Type __.....	metric ton ( <b>ton</b> )
2575.532	Fertilizer, Type __.....	kilogram ( <b>pound</b> )
2575.533	Agricultural Lime .....	metric ton ( <b>ton</b> )
2575.535	Water .....	cubic meter ( <b>M Gallons</b> )
2575.541	Mowing.....	hectare( <b>acre</b> )
2575.545	Weed Spraying .....	hectare ( <b>acre</b> )
2575.547	Weed Spray Mixture.....	liter ( <b>gallon</b> )
2575.550	Compost, Grade 2 .....	cubic meter ( <b>cubic yard</b> )
2575.551	Compost, Grade 1 .....	metric ton ( <b>ton</b> )
2575.555	Turf Establishment.....	lump sum
2575.560	Hydraulic Soil Stabilizer, Type __.....	kilogram ( <b>pound</b> )
2575.561	Hydraulic Soil Stabilizer, Type 1 .....	square meter ( <b>square yard</b> )
2575.570	Rapid Stabilization Method 1 or 2.....	hectare ( <b>acre</b> )
2575.571	Rapid Stabilization Method 3 .....	cubic meter ( <b>M Gallons</b> )
2575.572	Rapid Stabilization Method 4 .....	square meter ( <b>square yard</b> )
2575.573	Rapid Stabilization Method 5.....	metric ton ( <b>ton</b> )

**2575.5**

Note: (1) If maintenance applies, a subnote will be placed on the pay item shown in the summary of quantities in the Plan: "Includes Maintenance."

**2577**

**Soil Bioengineered Systems**

**2577.1 DESCRIPTION**

This work shall consist of installing vegetation in conjunction with geosynthetic or natural materials for stabilizing areas susceptible to erosion. Soil Bioengineering may be used as a permanent soil stabilization system in ditches, along stream banks, on shorelines or on slopes. The work shall consist of furnishing and installing a composite system by the Contractor on site.

**2577.2 MATERIALS**

<b>A Seed, mix as specified .....</b>	<b>3876</b>
<b>B Mulch, Type as specified .....</b>	<b>3882</b>
<b>C Erosion control blankets .....</b>	<b>3885</b>
<b>D. Erosion control netting.....</b>	<b>3883</b>
<b>E. Nursery plant stock .....</b>	<b>3861</b>
<b>F. Fiber log.....</b>	<b>3895</b>
<b>G. Riprap .....</b>	<b>3601</b>
<b>H. Concrete Armor Units.....</b>	<b>3608</b>

**2577.3 CONSTRUCTION REQUIREMENTS**

**A General**

The installation locations and layouts shown in the Plans are approximate only. The exact locations and layout shall be as determined by the Engineer.

The harvest and installation of plant material shall be performed by qualified nurserymen or landscape specialists, or shall be performed by experienced crews working under the direct supervision of a qualified nurseryman or landscape specialist.

Planting operations shall not be started, nor shall any planting stock be delivered to the Project site, until it has been determined by the Engineer that weather and soil conditions are suitable for planting and that all necessary preparations have been made.

During placement, the Contractor shall install all components consecutively without significant lapse of time between each phase of the operation. On slopes, installation of material shall start at the bottom of slope and proceed in horizontal lifts upward. On shorelines and banks, installation of material shall start below the water line and proceed up the bank.

During the work, the Contractor shall take all necessary precautions and actions to prevent siltation and turbidity of flowing or