EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. NPDES General Permit No. 2

B. Stormwater Pollution Prevention Plan (SWPPP)

C. Erosion Control Measures

D. Velocity and Flow Control Measures

E. Sediment Control Measures

F. Application/Installation of Measures

G. Removal/Replacement of Measures

1.02 DESCRIPTION OF WORK

A. Furnish all materials; install, construct, maintain, and remove specified erosion control devices; at locations shown on the plans, or where specified by the Engineer, in accordance with the contract documents.

B. Complete the required construction work on this project, while minimizing soil erosion and controlling water pollution. Maintain these features as specified, from initial construction stages to final completion of the project.

1.03 SUBMITTALS

Follow the General Provisions (Requirements) and Covenants, as well as the following:

Upon request, provide copies of all records and documentation related to compliance with the Iowa DNR NPDES Permit.

1.04 SUBSTITUTIONS

Follow the General Provisions (Requirements) and Covenants.

1.05 DELIVERY, STORAGE, AND HANDLING

Follow the General Provisions (Requirements) and Covenants.

1.06 SCHEDULING AND CONFLICTS

Follow the General Provisions (Requirements) and Covenants, as well as the following:

A. Implement erosion and sediment control measures at the appropriate time(s).

B. Coordinate construction to minimize damage to erosion and sediment control devices.

1.07 SPECIAL REQUIREMENTS

A. Iowa DNR Permit:

1. When applicable, comply with the requirements of the Iowa Department of Natural Resources, *NPDES (National Pollutant Discharge Elimination System) General Permit No. 2 for Stormwater Discharge Associated with Industrial Activity for Construction Activities*, and the Stormwater Pollution Prevention Plan.

2. For projects covered under the Iowa DNR General Permit No. 2, sign on as a co-permittee with the owner and any other contractors or subcontractors.

B. Protection of Property: Prevent accumulation of earth, sediment, or debris from project site onto adjoining public or private property. Remove any accumulation of earth or debris immediately, and take remedial actions for prevention.

1.08 MEASUREMENT FOR PAYMENT

A. Stormwater Pollution Prevention Plan (SWPPP):

1. Preparation: Item will be paid for as a lump sum for the project. Item includes development of a SWPPP by the Contractor, filing the required public notices, filing a Notice of Intent for coverage of the project under the Iowa DNR NPDES General Permit No. 2, and payment of associated NPDES permit fees.

Item will be paid for upon approval of the SWPPP by the Engineer, and after the Notice of Intent has been filed by the Contractor.

2. Management: Item will be paid for as a lump sum for the project. Item includes all work required to comply with the administrative provisions of the Iowa DNR NPDES General Permit No. 2; including record keeping, documentation, updating the SWPPP, filing the Notice of Discontinuation, etc. Item also includes weekly inspections required to satisfy the provisions of General Permit No. 2, unless otherwise stated in the contract documents.

This item does not include installation or maintenance of erosion and sediment control practices, or inspection after 1/2 inch or greater rainfall events.

The Engineer may make partial payments based upon estimates of the project completion. Final payment will be made when the site reaches final stabilization and the Notice of Discontinuation is filed.

3. Inspection: Based upon inspection records, the Engineer will count the number of individual inspections required and performed after each 1/2 inch or greater rainfall event.

The contract unit price will be paid for each inspection of erosion and sediment control measures performed after storm events.

B. Compost Blankets: Compost blankets will be measured and paid for by the square foot for each thickness of blanket specified.

1.08 MEASUREMENT FOR PAYMENT (Continued)

C. Dust Control:

1. Water applied to haul roads and other areas to control dust will be measured by metering. If metering is not available, measurement will be done by counting the loads from a transporting tank of known volume and gauging the contents of the transporting truck for partial loads. Payment will be made at the contract unit price per 1,000 gallons.

2. Dust control products applied to haul roads, gravel roads, or other areas will be measured and paid for by the square yard of treated area, where product is applied as specified.

D. Erosion Control Mulching:

1. Conventional Mulching: Conventional mulching will be measured in squares, each square containing 100 square feet, or by acres, as specified. Application to undisturbed areas or areas outside of construction limits will not be measured for payment.

2. Hydromulching: Hydromulching will be measured in squares, each square containing 100 square feet, or by acres, as specified. Each type of hydromulching specified will be measured separately. Application to undisturbed areas or areas outside of the construction limits will not be measured for payment.

E. Temporary Rolled Erosion Control Products (RECP): Temporary RECP will be measured and paid for by the square yard of area covered with each type of installed RECP. Staples, anchoring devices, and any other products or materials necessary for proper installation will be considered incidental.

F. Turf Reinforcement Mats (TRM): TRM will be measured and paid for by the square yard of area covered with each type of installed mat.
Staples, anchoring devices, and any other products or materials necessary for proper installation will be considered incidental.

G. Surface Roughening: Surface roughening, including directional tracking or grooving/furrowing, performed according to the specifications or as directed by the Engineer, will be paid for by the square yard.

H. Wattles:

1. Installation: Wattles will be measured and paid for by the linear foot for each type and size of wattle installed as specified.

Wattles installed to replace existing wattles that are no longer adequate, due to sediment accumulation, will be measured and paid for as new wattles.

2. Removal: Wattle removal will be measured and paid for by the linear foot.

I. Check Dams:

1. Installation:
a. Check dams (except rock check dams) will be measured and paid for by the linear foot of each size and type of check dam specified. Rolled Erosion Control Products, when specified for use with check dams, will be paid for separately.
b. Rock check dams will be measured and paid for by the ton of stone installed. Contract unit price includes engineering fabric.

1.08 MEASUREMENT FOR PAYMENT (Continued)

2. **Removal:**
   a. Removal of check dams (except rock check dams) will be measured and paid for by the linear foot for each type specified. Contract unit price includes removal and disposal of check dam materials, accumulated sediment, and restoration of the area to finished grade.
   b. Removal of rock check dams will be measured and paid for by each.

J. Temporary Earth Diversion Structures: Temporary earth diversion structures will be measured and paid for by the linear foot of each type and size of diversion structure constructed. Price includes removal of the structure upon completion of the project.

K. Level Spreaders: Level spreaders will be measured and paid for by the linear foot. Price includes maintaining the spreader during the period of construction and removal upon completion of the project, unless otherwise specified.

L. Temporary Pipe Slope Drains: Temporary pipe slope drains will be measured from end of apron to end of apron and paid for by the linear foot for each diameter specified and installed. Contract unit price includes pipe, pipe aprons, necessary grading, and removal of the slope drain upon completion of the project.

M. Filter Berms: Filter berms will be measured and paid for by the linear foot for the size specified. Measurement will be made longitudinally along the top of the berm.

Filter berms installed to replace berms that are no longer adequate, due to sediment accumulation, will be measured and paid for as new berms.

N. Filter Socks:

1. **Installation:** Filter socks will be measured and paid for by the linear foot for each diameter specified.

   Filter socks installed to replace existing socks that are no longer adequate, due to sediment accumulation, will be measured and paid for as new socks.

2. **Removal:** Filter sock removal will be measured and paid for by the linear foot.

O. Sediment Basin Outlet Structure:

1. **Installation:** Measurement and payment will be made for each sediment basin outlet structure installed by size. Contract unit price includes all work and materials required to construct the sediment basin outlet structure as specified, and as shown on Figures 9040.15, 9040.16, and 9040.17. Price includes concrete base, dewatering device, anti-vortex device, outlet pipe, and anti-seep collars, if specified. Earthwork required for construction of the sediment basin will be measured and paid for separately.

2. **Removal of Sediment:** Measurement and payment will be made for each sediment basin cleanout required and performed. Contract unit price includes dewatering, and removal, and disposal of accumulated sediment.

3. **Removal of Device:** Measurement and payment will be made for each sediment basin outlet structure properly removed. Contract unit price includes dewatering and removal and disposal of the outlet structure, concrete base, and emergency spillway. Earthwork required to remove the sediment basin and restoration of the ground to finished grade will be paid for separately.

1.08 MEASUREMENT FOR PAYMENT (Continued)

P. Sediment Trap Outlet:

1. **Installation:** Measurement and payment will be made by the tons of crushed stone placed to construct the sediment trap outlet. Engineering fabric will be considered incidental. Earthwork required for construction of the sediment trap will be measured and paid for separately.

2. **Removal of Sediment:** Measurement and payment will be made for each sediment trap cleanout required and performed. Contract unit price includes dewatering, removal, and disposal of accumulated sediment.

3. **Removal of Device:** Each sediment trap outlet properly removed will be counted and paid for individually. Contract unit price includes dewatering, removal, and disposal of the outlet structure, concrete base, and emergency spillway. Earthwork required to remove the sediment trap and restoration of the ground to finished grade will be paid for separately.

Q. Silt Fence:

1. **Installation:** Measurement and payment will be by the linear foot of silt fence properly installed.

   Silt fence installed to replace existing fences that are no longer adequate due to sediment accumulation, will be measured and paid for as new silt fence.

2. **Removal of Sediment:** When allowed by the Engineer, removal of sediment from existing silt fence installations will be measured and paid for by the linear foot as a new silt fence installation.

3. **Removal of Device:** Removal of silt fence will be measured and paid for by the linear foot. Contract unit price includes restoration of the area to finished grade and removal and disposal of fence, posts, and accumulated sediment.

R. Stabilized Construction Entrance: Stabilized construction entrance will be measured and paid for by the square yard or ton, as specified in the contract documents.

1. When square yard measurement is specified, the contract unit price includes the cost to place and maintain a stabilized construction entrance as specified in the contract documents. No additional payment will be made for cleaning or installing additional material required to maintain the entrance in a functional condition.

2. When measurement by the ton is specified, payment will be made for each ton of material placed to construct a stabilized construction entrance as specified in the contract documents. Additional material placed as required to maintain the entrance in a functional condition will be paid for at the contract unit price.

3. Subgrade stabilization fabric is considered incidental.

S. Inlet Protection Device:

1. **Installation:** Each type of inlet protection device, installed and maintained as shown in the plans or on the SWPPP, will be counted and paid for as each.

2. **Maintenance:** The Contractor will be paid the contract unit price for inlet protection device cleanout for each maintenance occurrence.

1.08 MEASUREMENT FOR PAYMENT (Continued)

T. Flow Transition Mat: Flow Transition Mats will be measured and paid for by the square foot of mat installed. Anchoring devices required for proper installation are considered incidental. Accessory products, such as sod, TRMs, and/or seeding will be measured and paid for separately.

U. Rock Outlet Protection: Rock revetment or erosion stone will be measured and paid for by the ton, based upon weight tickets, as required to construct outlet protection, as specified in the contract documents. Engineering fabric is considered incidental and will not be measured and paid for separately.

V. Incidental Items:

1. When applicable, conduct all operations in compliance with the Iowa DNR NPDES General Permit No. 2. Labor, equipment, or materials not included as a bid item, but necessary to prevent stormwater contamination from construction related sources, are considered incidental. Incidental work related to compliance with the permit may include, but is not limited to: hazardous materials protection, fuel containment, waste disposal, and providing employee sanitary facilities.

2. Replacing erosion and sediment control practices that are damaged or removed by the contractor in a manner that is inconsistent with the current project staging or SWPPP is the Contractor's responsibility and will be at the Contractor's expense.

3. Additional maintenance, inspections, or other items of work that are required because work was not completed within the specified contract time, due to no fault of the contracting authority, will be considered incidental, and will be at the Contractor's expense.

PART 2 - PRODUCTS

2.01 FILTER MATERIAL

Material for use in filter socks, filter berms, and other areas, as specified.

A. Use material derived from wood, bark, or other, non-toxic vegetative feedstocks.

B. Use material with no visible admixture of refuse or other physical contaminants, nor any material toxic to plant growth.

C. Use material meeting the following particle sizes:

Sieve Size	Percent Passing[1]
2”	100
1”	90-100
3/8”	0-30

[1]The target flow rate of in-place material is 10 gal/min/lf. The Engineer may approve use of alternate materials meeting the target flow rate.

2.02 FILTER SOCK

A. For slope and sediment control applications, use a continuous, tubular, knitted, mesh netting with 3/8 inch openings, constructed of 5-mil thickness, photodegradable HDPE.

B. For inlet protection, use a continuous, tubular, knitted, mesh netting with 3/8 inch openings, constructed of 500-denier polypropylene.

C. Use 1 inch by 2 inch (minimum) hardwood stakes or stakes of equivalent strength.

2.03 COMPOST BLANKETS

See Section 9010 for compost material requirements for compost blankets.

2.04 COMPOST BLANKET AND FILTER BERM TACKIFIER

A. Use a biodegradable, organic binding agent or polyacrylamide that can be mixed with, or injected into, compost or filter material as it is placed, which is not detrimental to the establishment of vegetation.

B. Use in filter berms or compost blankets when specified in the contract documents.

C. Apply at the rate recommended by the manufacturer.

2.05 SILT FENCE

Use silt fence that meets the following requirements:

A. Fabric: Conform to Iowa DOT Article 4196.01.

B. Posts: 4 foot minimum steel (T-section) weighing at least 1.25 pounds per foot, exclusive of anchor plate. Painted posts are not required.

C. Fastener: Wire or plastic ties with a minimum tensile strength of 50 pounds.

2.06 DUST CONTROL

A. Water: Use potable water or water from a source approved by the engineer.

B. Calcium Chloride: Conform to Iowa DOT Article 4194.01.

C. Lignosulfonate (Tree Sap): Use a commercially-available product with known lignin content.

D. Soapstock (Soybean Oil):

1. Use a commercially-available, undiluted, soybean oil soapstock emulsion.

2. Conform to specific storage, transportation, temperature, and application equipment requirements, as recommended by the manufacturer.

2.07 EROSION CONTROL MULCH

A. Conventional Mulch:

1. Use dry cereal straw (oats, wheat, barley, or rye) or native grass straw.

2. Use material that is free of noxious weeds, seed-bearing stalks, or roots and will be inspected and approved by the Engineer prior to use.

3. Other materials, subject to the approval of the Engineer may be used.

B. Hydromulch:

1. Wood Cellulose Mulch: See Section 9010.

2. Bonded Fiber Matrix (BFM): See Section 9010.

3. Mechanically Bonded Fiber Matrix (MBFM): See Section 9010.

2.08 TEMPORARY ROLLED EROSION CONTROL PRODUCTS (RECP)

Use temporary rolled erosion control products that are classified and have material properties according to the Erosion Control Technology Council's (ECTC) guidelines as follows:

A. Material Classification:

1. RECP Type 1 (Ultra Short-Term): Functional longevity of three months or less and classified as follows:
   - **a. RECP Type 1.A:** Mulch control net, consisting of a photodegradable synthetic mesh or woven biodegradable natural fiber netting.
   - **b. RECP Type 1.B:** Netless rolled erosion control blankets, consisting of natural and/or polymer fibers, mechanically interlocked and/or chemically adhered together to form a RECP.
   - **c. RECP Type 1.C:** Single-net erosion control blankets and open weave textiles, consisting of processed degradable natural and/or polymer fibers, mechanically bound together by a single rapidly-degrading, synthetic or natural fiber netting, or an open weave textile of processed rapidly-degrading natural or polymer yarns or twines woven into a continuous matrix.
   - **d. RECP Type 1.D:** Double-net erosion control blankets, consisting of processed degradable natural and/or polymer fibers, mechanically bound together between two rapidly-degrading, synthetic or natural fiber nettings.

2.08 TEMPORARY ROLLED EROSION CONTROL PRODUCTS (RECP) (Continued)

2. **RECP Type 2 (Short-Term):** Functional longevity between 3 and 12 months and classified as follows:
   a. **RECP Type 2.A:** Mulch control net, consisting of a photodegradable synthetic mesh or woven biodegradable natural fiber netting.
   b. **RECP Type 2.B:** Netless rolled erosion control blankets, consisting of natural and/or polymer fibers, mechanically interlocked and/or chemically adhered together to form a RECP.
   c. **RECP Type 2.C:** Single-net erosion control blankets and open weave textiles, consisting of an erosion control blanket composed of processed degradable natural or polymer fibers, mechanically bound together by a single degradable synthetic or natural fiber netting to form a continuous matrix, or an open weave textile composed of processed degradable natural or polymer yarns or twines woven into a continuous matrix.
   d. **RECP Type 2.D:** Double-net erosion control blanket, consisting of processed degradable natural and/or polymer fibers, mechanically bound together between two degradable synthetic or natural fiber nettings.

3. **RECP Type 3 (Extended Term):** Functional longevity between 12 and 24 months and classified as follows:
   a. **RECP Type 3.A:** Mulch control nets, consisting of a slow-degrading synthetic mesh or woven natural fiber netting.
   b. **RECP Type 3.B:** Erosion control blankets and open weave textiles, consisting of processed slow-degrading natural or polymer fibers, mechanically bound together between two slow-degrading synthetic or natural fiber nettings to form a continuous matrix, or an open weave textile composed of processed slow-degrading natural or polymer yarns or twines woven into a continuous matrix.

4. **RECP Type 4 (Long Term):** Functional longevity of 36 months and classified as follows: Erosion control blankets and open weave textiles, consisting of processed slow-degrading natural or polymer fibers, mechanically bound together between two slow degrading synthetic or natural fiber nettings to form a continuous matrix, or an open weave textile composed of processed slow-degrading natural or polymer yarns or twines woven into a continuous matrix.

B. Properties and Performance:

1. Testing performed according to the ECTC's Testing Procedures for Rolled Erosion Control Products. Verify manufacturer's test results by independent testing.

2. Material properties meeting the Erosion Control Technology Council's (ECTC) Standard Specifications for Rolled Erosion Control Products as follows:

Classification	Slope Application	Channel Application	Min. Tensile
	Max. Grade*	Permissible Shear Stress	Strength
RECP Type 1.A	5:1 (H:V)	0.25 lb/ft^2	5 lb/ft
RECP Type 1.B	4:1 (H:V)	0.50 lb/ft^2	5 lb/ft
RECP Type 1.C	3:1 (H:V)	1.50 lb/ft^2	50 lb/ft
RECP Type 1.D	2:1 (H:V)	1.75 lb/ft^2	75 lb/ft
RECP Type 2.A	5:1 (H:V)	0.25 lb/ft^2	5 lb/ft
RECP Type 2.B	4:1 (H:V)	0.50 lb/ft^2	5 lb/ft
RECP Type 2.C	3:1 (H:V)	1.50 lb/ft^2	50 lb/ft
RECP Type 2.D	2:1 (H:V)	1.75 lb/ft^2	75 lb/ft
RECP Type 3.A	5:1 (H:V)	0.25 lb/ft^2	25 lb/ft
RECP Type 3.B	1.5:1 (H:V)	2.00 lb/ft^2	100 lb/ft
RECP Type 4	1:1 (H:V)	2.25 lb/ft^2	125 lb/ft
*Product tested according to ECTC Test Method No. 2 and meeting the ECTC Standard Specifications for "C" factor.			

2.08 TEMPORARY ROLLED EROSION CONTROL PRODUCTS (RECP) (Continued)

C. RECP Anchors: Stakes or staples as recommended by manufacturer, with a minimum length of 6 inches.

2.09 TURF REINFORCEMENT MATS (TRM)

A. Material Classification:

1. TRM Type 1: Use a TRM that is constructed of a web of mechanically or melt-bonded polymer netting, monofilaments, or fibers that are entangled to form a strong and dimensionally stable mat. Bonding methods include polymer welding, thermal or polymer fusion, or the placement of synthetic fibers between two high-strength, biaxially-oriented nets, mechanically bound by parallel stitching with polyolefin thread. Products may contain a degradable component.

2. TRM Type 2 and 3: Use a TRM that is constructed of a web of mechanically or melt-bonded polymer netting, monofilaments, or fibers that are entangled or woven to form a strong and dimensionally stable mat. Non-woven bonding methods include polymer welding, thermal or polymer fusion, or the placement of fibers between two high-strength, biaxially oriented nets, mechanically bound by parallel stitching with polyolefin thread. Use only components that are 100% synthetic and resistant to biological, chemical, and ultraviolet degradation.

3. TRM Type 4: Use a high performance/survivability TRM that is composed of monofilament yarns woven into a resilient uniform configuration. Use a mat that has a matrix that exhibits very high interlock and reinforcement capacities with both soil and root systems and demonstrate a high tensile modulus. TRMs manufactured from discontinuous or loosely held together by stitched or glued, netting, or composites are not allowed in this category. Use only components that are 100% synthetic and resistant to biological, chemical, and ultraviolet degradation. Use this category when field conditions exist with high loading and/or high survivability requirements.

B. Properties and Performance: Meet the minimum material and performance requirements contained in the following table:

	Property[1]	Test Method	Type 1	Type 2	Type 3	Type 4
Material	Thickness	ASTM D 6525	0.25 in	0.25 in	0.25 in	0.25 in
	Tensile Strength[2]	ASTM D 6818	125 lb/ft	240 lb/ft	750 lb/ft	3,000
	UV Resistance[3]	ASTM D 4355	80% @ 500 hrs	80% @ 1,000 hrs	80% @ 1,000 hrs	90% @ 3,000 hrs
Performance	Maximum Shear Stress[4] (Channel Applications)	ASTM D 6460	7 lb/ft^2	10 lb/ft^2	12 lb/ft^2	15 lb/ft^2
	Maximum Slope Gradient (Slope Applications)	N/A	1:1 (H:V) or flatter	1:1 (H:V) or flatter	1:1 (H:V) or greater	1:1 (H:V) or greater

1 For TRMs containing degradable components, all values must be obtained on the non-degradable portion of the matting.
2 Minimum Average Roll Values, machine direction only.
3 Tensile strength of structural components retained after UV exposure.
4 Minimum shear stress that fully-vegetated TRM can sustain without physical damage or excess erosion (0.5 in soil loss) during a 30 minute flow event in large scale testing. Acceptable large scale testing protocol includes ASTM D 6460 or independent testing conducted by the Texas Transportation Institute, Colorado State University, Utah State University, or other approved testing facility. Bench scale testing is not acceptable.

2.10 WATTLES

Use wattles that meet the following requirements:

A. Netting: Open weave, degradable netting. Nominal diameter of 9 inches, or as specified.

B. Fill Material: Straw, wood excelsior, coir, or other natural materials approved by the Engineer.

C. Stakes: 1 inch by 1 inch (minimum) wooden stakes, or stakes of equivalent strength.

2.11 CHECK DAMS

Use check dams that meet the following requirements:

A. Silt Fence Ditch Check: See Section 9040, 2.05.

B. Synthetic Permeable Check Dam (HDPE):

1. Ditch Berm:
a. Installed height of 9 to10 inches.
b. Manufactured check dam constructed from sheets of perforated, UV-stabilized High Density Polyethylene (HDPE).
c. Perforations of 30 to 40% open area.

2. RECP for Permeable Check Dam (when specified):
a. RECP Type 4.
b. 4 feet width.

3. Anchors: As recommended by the manufacturer.

C. Triangular Foam Check Dam:

1. Triangular-shaped device with a height of 8 to 10 inches and a base of 16 to 20 inches.

2. Inner Support Material: Urethane foam.

3. Outer Cover: Woven geotextile material shaped to fit around the inner support material, extending 2 to 3 feet beyond the bottom edge of the triangular-shaped inner support.

4. Length: 7 feet.

D. Rock Check Dam:

1. Aggregate: Erosion stone conforming to Iowa DOT Section 4130, gradation No. 34.

2. Engineering Fabric: See Section 9040, 2.18.

2.12 LEVEL SPREADERS

A. Provide 2 inch by 8 inch (minimum) pressure-treated timber of the length specified.

B. Use timbers that are relatively straight and have a minimum length of 5 feet each.

2.13 TEMPORARY PIPE SLOPE DRAINS

A. PVC, HDPE, and metal pipes as specified in Section 4020, 2.01.

B. HDPE, Type C (corrugated interior).

C. All pipes listed are permitted for use within the right-of-way.

2.14 FLOW TRANSITION MATS

Use flow transition mats that meet the following requirements:

A. UV-stabilized HDPE plastic sheet with openings for vegetation growth and energy dissipation.

B. Use a nominal sheet size of 4 feet by 4 feet by 1/2 inch.

C. Use duckbill style anchors, as specified by the mat manufacturer.

2.15 SEDIMENT BASIN OUTLET STRUCTURES

A. Base: Class C concrete unless otherwise specified.

B. Riser:

1. CMP per Section 4020.
2. Diameter as specified.

C. Dewatering Device:

1. Drill holes in the riser of the number, diameter, and at the elevation specified in the contract documents.
2. Hardware cloth: 1/4 inch by 1/4 inch or 1/2 inch by 1/2 inch wire mesh.

D. Barrel:

1. CMP per Section 4020.
2. Diameter as specified.

E. Anti-Vortex Device:

1. CMP per Section 4020.
2. Diameter according to Figure 9040.16 and riser diameter as specified.

F. Anti-Seep Collar:

1. Corrugated metal sheet of same material and gage as barrel section.
2. Size according to Figure 9040.17.

2.16 SEDIMENT TRAPS

A. Erosion Stone: See Section 9040, 2.19.

B. Engineering Fabric: See Section 9040, 2.18.

2.17 INLET PROTECTION

A. Drop-In Intake Protection:

1. Use a manufactured device that is inserted into the intake, and is capable of trapping or filtering sediment from runoff prior to entering the storm sewer.

2. All components must be contained entirely below the surface of the intake grate.

3. Incorporate means of emergency outflow to prevent flooding if plugged with sediment.

B. Surface-Applied Intake Protection:

1. Use devices or filter socks, placed around or over the intake, that are capable of trapping or filtering sediment from runoff prior to entering the storm sewer.

2. Do not allow the device to completely block or plug the intake, preventing inflow.

2.18 ENGINEERING FABRIC

Comply with Iowa DOT Article 4196.01, B (Embankment Erosion Control).

2.19 REVETMENT AND EROSION STONE

A. Class A Revetment: Conform to Iowa DOT Section 4130.

B. Class B Revetment: Conform to Iowa DOT Section 4130.

C. Class D and E Revetment: Conform to Iowa DOT Section 4130.

D. Erosion Stone: Conform to Iowa DOT Section 4130.

2.20 STABILIZED CONSTRUCTION ENTRANCE

A. Entrance Stone: Use Iowa DOT Section 4122, Gradation 13, Macadam crushed stone.

B. Subgrade Stabilization Material:

1. Use woven, UV-stabilized geotextile.

2. Minimum tensile strength of 135 lb/ft.

PART 3 - EXECUTION

3.01 SWPPP PREPARATION

A. Prepare a Stormwater Pollution Prevention Plan (SWPPP) according to the requirements of the Iowa DNR NPDES General Permit No. 2.

B. Have the SWPPP prepared by an individual experienced in erosion and sediment control.

C. Ensure that controls utilized in the SWPPP conform to the type and quantity of erosion and sediment controls shown in the contract documents.

D. Submit the completed SWPPP to the Engineer for review and approval prior to filing the Notice of Intent.

E. Upon approval of the Engineer, file public notices, as required by the NPDES General Permit No. 2.

F. File the Notice of Intent and fee, as required by the NPDES General Permit No. 2.

3.02 SWPPP MANAGEMENT

Coordinate and carry out all requirements of Iowa DNR NPDES General Permit No. 2 and any local ordinance requirements, including:

A. Update the SWPPP according to the requirements of the NPDES General Permit No. 2.

B. Revise the SWPPP and implement changes, as necessary, to prevent sediment or hazardous materials from being transported off the site.

C. Submit all SWPPP revisions to the Engineer for review and approval.

D. Perform, and maintain records of, weekly erosion and sediment control site inspections, unless otherwise specified.

E. Maintain records of transferal of responsibility under the NPDES General Permit No. 2.

F. Retain all records on-site, or as required by the NPDES General Permit No. 2.

G. After final stabilization, file a Notice of Discontinuation, according to the NPDES General Permit No. 2.

H. Provide all records and documentation to the Engineer upon completion of the project. Retain a copy of all records for the period required under the Permit.

I. Continue to perform the work required under this item throughout the duration of the project, and until final stabilization is achieved, and a Notice of Discontinuation is filed.

3.03 EROSION AND SEDIMENT CONTROL INSPECTION

A. Perform inspections according to and at frequency required by the Iowa DNR NPDES General Permit No. 2.

B. Schedule necessary maintenance or improvements for items that are included in the contract documents.

C. Notify the Engineer immediately of situations requiring attention beyond that provided for in the contract documents.

3.03 EROSION AND SEDIMENT CONTROL INSPECTION (Continued)

D. Provide copies of the inspection reports to the Engineer.

3.04 COMPOST BLANKETS

A. Loosen the ground surface to a minimum depth of 1 inch.

B. Construct according to Figure 9040.1.

C. Evenly spread compost to the specified depth, as specified in the contract documents, or as directed by the Engineer.

D. Divert concentrated flows away from the slope.

E. Do not operate heavy equipment over the compost blanket after placement, or throughout the required period of protection.

F. Inspect the ground under the blanket at regular intervals for signs of erosion.

3.05 FILTER BERMS

A. Construct berm with filter material to the dimensions shown in Figure 9040.2, unless otherwise specified.

B. Install filter berm along the contour as specified in the contract documents, or as directed by the Engineer.

C. Turn the ends of the filter berm uphill to prevent runoff from flowing around the end of the berm.

D. When a vegetated berm is specified, apply seed to the surface of the berm.

E. Replace the berm when sediment accumulation reaches one-half of the height of the berm.

3.06 FILTER SOCKS

A. Installation:

1. Pneumatically fill mesh filter sock of size and length indicated in the contract documents, or as directed by the Engineer. Alternative methods of filling the sock may be allowed upon approval of the Engineer.

2. Fill socks with filter material.

3. Place the filter sock along the contour as specified in the contract documents, or as directed by the Engineer.

4. Place additional filter material or soil from the site, on the upstream side of the sock, in the seam between the tube and the ground.

5. Construct a “J-hook” at each end of a continuous run of filter sock, by turning the end of the sock uphill, as necessary to prevent runoff from flowing around the ends when water behind the sock ponds up to a level even with the top of the sock.

6. Drive stakes into the ground at a maximum spacing of 10 feet, and as required to secure the sock and prevent movement.

3.06 FILTER SOCKS (Continued)

7. Construct according to Figure 9040.2 for perimeter control and sediment control on grade.

B. Maintenance: Perform the following incidental work.

1. Repair or replace non-functioning filter socks that allow water to flow under the sock, are torn, or are otherwise damaged, due to inadequate installation.

2. Remove filter material from damaged socks that are located along streambanks, around intakes, in ditches, or in other locations where the material may be carried to surface waters.

C. Removal: When indicated in the contract documents, or as directed by the Engineer; remove the filter sock upon completion of the project, and after final stabilization is achieved; or as indicated in the SWPPP, if applicable.

1. Upon completion of the project, completely remove socks and filter material that are located along streambanks, around intakes, in ditches, or in other locations where the filter material may be carried to surface waters if the sock degrades and/or tears.

2. Slice the sock longitudinally. Remove and dispose of the filter sock material and stakes.

3. Spread the filter material and accumulated sediment to match finished grade and to ensure proper drainage.

4. If the site has been brought to finished grade and prepared for permanent seeding, spread and incorporate the filter material into the surface by tilling, or as required to break up any large particles and provide a finished surface suitable for permanent seeding.

D. Replacement:

1. When accumulated sediment reaches a level one-half the height of the sock, or when the sock becomes clogged with sediment and no longer allows runoff to flow through, remove the sock as described above, and replace according to the installation instructions above.

2. At the Engineer's option, the existing filter sock and accumulated sediment may be left in place, and a new filter sock installed up-slope from the existing filter sock.

3.07 SILT FENCES

A. Installation:

1. Install material along the contour of the ground, as specified in the contract documents, or as directed by the Engineer.

2. Install silt fence with a mechanical soil slicing machine that creates a slit in the ground while simultaneously installing the fabric. The trenching method may be used when situations will not allow soil slicing, as determined by the Engineer.

3. Construct a "J-hook" at each end of a continuous run of silt fence, by turning the end of the silt fence uphill, as necessary to prevent runoff from flowing around ends when water behind the fence ponds to a level even with the top of the fence.

4. Insert 12 inches of fabric to a minimum depth of 6 inches (fabric may be folded below the ground line).

3.07 SILT FENCES (Continued)

5. Compact installation by driving along each side of the silt fence, or by other means, as necessary to adequately anchor the material in the ground, to prevent pullout and water flow under the fence.

6. Drive steel posts into the ground alongside the silt fence, to a minimum depth of 20 inches, unless otherwise specified by the Engineer. Space posts as shown on Figure 9040.19, or as required to adequately support silt fence.

B. Maintenance: At the Contractor's expense, repair or replace non-functioning silt fence that allows water to flow under the fence, is torn, or is otherwise damaged, due to inadequate installation.

C. Removal:

1. Remove the silt fence upon final stabilization of the project area, or according to the staging indicated in the SWPPP.

2. Remove and dispose of silt fence and posts.

3. Remove sediment or spread to match finished grade; ensure proper drainage.

4. Stabilize the area disturbed by removal operations.

D. Replacement:

1. When accumulated sediment reaches a level one-half the height of the fence, remove the silt fence as described above, and replace according to the installation instructions above.
2. At the Engineer's option, the existing silt fence and accumulated sediment may be left in place, and a new silt fence installed up-slope from the existing silt fence.

3. When permitted by the Engineer, the existing silt fence may be left in place and the accumulated sediment removed. Carefully inspect the existing silt fence for structural integrity and signs of undermining. Make any necessary repairs.

3.08 DUST CONTROL

A. Water: Apply frequent light watering to ground surface, as required to control dust.

B. Calcium Chloride: Apply according to Iowa DOT Section 2314.

C. Lignosulfonate (Tree Sap):

1. Loosen the top 1 to 2 inches of the roadway surface.

2. Apply solution with a 50% residual concentration, at a rate of 0.50 gal/yd^2, to deliver a 25% residual. For diluted solutions, increase the application rate, as required, to deliver an equivalent 25% residual.

3. Allow product to penetrate through the loosened material.

4. Tight-blade road surface.

3.08 DUST CONTROL (Continued)

D. Soapstock (Soybean Oil):

1. Loosen the top 1 to 2 inches of the roadway surface.
2. Apply undiluted soapstock at a rate of 0.70 gal/yd^2.
3. Allow product to penetrate through the loosened material.
4. Tight-blade road surface.

3.09 TEMPORARY EROSION CONTROL SEEDING

See Section 9010.

3.10 EROSION CONTROL MULCHING

A. Conventional Mulching:

1. Use conventional mulching when the surface cannot be stabilized by seeding, due to season or ground conditions.
2. Uniformly distribute mulch over the required areas, at a rate of 2 tons/acre for dry cereal straw, or 2.5 tons/acre for prairie hay.
3. Work the mulch into the soil with a mulch tucker, designed to anchor the mulch into the soil, by means of dull blades or disks.

B. Hydromulching:

1. Place mulch and tackifier (if applicable) in equipment specifically manufactured for hydraulic mulching.
2. Mix materials with fresh, potable water; using a combination of re-circulation through the equipment's pump, and mechanical agitation to form a homogeneous slurry.
3. If necessary, dampen any dry, dusty soil, as required to prevent balling of the material during application.
4. Apply hydromulch in multiple layers from opposing directions, where possible.
5. Apply the slurry evenly over all specified areas, at the minimum component material rates specified:
   a. Wood Cellulose Mulch:
      1) Mulch: 2600 lb/acre dry weight.
      2) Tackifier: 50 lb/acre.
   b. Bonded Fiber Matrix: 3600 lb/acre dry weight.
   c. Mechanically Bonded Fiber Matrix: 3600 lb/acre dry weight.
6. Retain and count empty bags of mulch to ensure final application rate.

3.11 SURFACE ROUGHENING

A. Directional Tracking:

1. Do not use on slopes steeper than 3:1.

2. Operate tracked equipment up and down exposed slope, to create ridges perpendicular to the slope.

3. Continue operation until the entire surface has been tracked.

B. Grooving/Furrowing:

1. May be used on all slopes.

2. Use rippers, disks, harrows, chisel plows, or other equipment, capable of operating on the slope and creating grooves a maximum of 15 inches apart and 3 inches deep.

3. Operate equipment along the contour of the slope, to create grooves that are perpendicular to the slope.

4. Perform over all exposed slopes as specified.

3.12 TEMPORARY ROLLED EROSION CONTROL PRODUCTS

Install temporary RECPs according to the manufacturer's published installation recommendations, subject to the following minimum requirements:

A. Slope Application:

1. Grade and smooth surface. Remove all rocks, clods, vegetation, or other obstructions that will prevent direct contact between the RECP and the soil surface.

2. When specified, prepare seedbed and place seed and fertilizer according to Section 9010 prior to placing RECP.

3. Install according to Figure 9040.3.
   a. Install anchor trench at top of slope. Seed and fertilize trench after backfill and compaction, if seeding is specified.
   b. Unroll the RECP down or horizontally across the slope.
   c. Place consecutive blankets down the slope end-over-end, shingle style.
   d. Overlap ends of consecutive rolls a minimum of 3 inches, and install anchors at a maximum spacing of 18 inches along all overlaps.
   e. Overlap edges of adjacent rolls a minimum of 2 inches.
   f. Install anchors at edge seams between rows.

B. Channel/Ditch Application:

1. When specified, prepare seedbed and place seed and fertilizer according to Section 9010, prior to placing RECP.

2. Install RECP according to Figure 9040.4.

3.13 TURF REINFORCEMENT MATS

Install according to the manufacturer's published installation literature, for the product specified and application (slope or channel).

3.14 WATTLES

A. Installation:

1. Construct a shallow trench, 2 to 4 inches deep, matching the width and contour of the wattle.

2. Place and compact excavated soil against the wattle, on the uphill side.

3. Drive stakes through the center of the wattle, into the ground at a maximum spacing of 4 feet along the length of the wattle, and as needed to secure the wattle and prevent movement.

4. Butt ends firmly and stake securely to prevent leakage. Do not overlap.

B. Removal: When indicated in the contract documents, or as directed by the Engineer, remove the wattle upon completion of the project, and after final stabilization is achieved; or as indicated in the SWPPP, if applicable.

1. Completely remove the wattle netting, filler material, and stakes.

2. Spread the accumulated sediment to match finished grade and to ensure proper drainage.

3. When permitted by the Engineer, the wattle netting may be sliced open and the filler material spread out over the ground. Removal of netting and stakes and spreading of sediment is still required.

C. Replacement:

1. When accumulated sediment reaches a level one-half the height of the wattle, or when the wattle becomes clogged with sediment and no longer allows runoff to flow through, remove the wattle as described above, and replace according to the installation instructions above.

2. At the Engineer's option, the existing wattle and accumulated sediment may be left in place, and a new wattle installed up-slope from the existing wattle.

3.15 CHECK DAMS

A. Silt Fence Ditch Check: Construct according to Figure 9040.19.

B. Synthetic Permeable Check Dam (HDPE):

1. Install according to the manufacturer's recommendations.

2. When specified, provide an RECP under the check dam, installed according to the manufacturer's recommendations.

C. Triangular Foam Check Dam: Install according to the manufacturer's recommendations.

D. Rock Check Dam: Construct according to Figure 9040.7.

E. Removal: When indicated in the contract documents, or as directed by the Engineer, remove check dams upon completion of the project, and after final stabilization is achieved; or as indicated in the SWPPP, if applicable.

3.15 CHECK DAMS (Continued)

1. Remove the check dam and dispose of materials, or salvage to the contractor.

2. Remove the accumulated sediment or spread to match finished grade; ensure proper drainage.

3. Stabilize the area disturbed by removal operations.

3.16 LEVEL SPREADERS

A. Construct at locations shown in the contract documents, or as directed by the Engineer.

B. Construct according to Figure 9040.9, and to length specified in the contract documents.

C. Butt multiple timbers together, as necessary to provide the required length.

D. Ensure that the spreader is installed level in all directions. Maintain the spreader in a level state during construction.

E. Excavate a depression behind the spreader to the depth specified on the plans. The depression may be over-excavated up to 1 foot to provide an area for sediment accumulation.

F. Remove the accumulated sediment from the depression when the depth is reduced below that specified in the contract documents.

3.17 TEMPORARY EARTH DIVERSION STRUCTURES

A. Construct at the location shown in the contract documents.

B. Construct according to Figure 9040.8, and to the dimensions specified in the contract documents.

C. Ensure positive drainage along the diversion toward the outlet area.

D. Adequately compact fill to prevent failures or seepage.

E. Outlet the diversion to undisturbed and/or stabilized areas only.

F. Stabilize the surface of the earth diversion with temporary erosion control seeding, as specified in Section 9010.

3.18 TEMPORARY SLOPE DRAINS

Construct temporary slope drains according to Figure 9040.12.

3.19 FLOW TRANSITION MATS

Install according to the manufacturer's published recommendations.

3.20 SEDIMENT BASIN OUTLET STRUCTURES

A. Concrete Base: Construct the concrete base and anchor riser section, as shown in Figure 9040.15.

3.20 SEDIMENT BASIN OUTLET STRUCTURES (Continued)

B. Dewatering Device:

1. Drill holes in the riser section. The number, diameter, and configuration will be specified in the contract documents.

2. Wrap the perforated section of the riser pipe with metal hardware cloth.

3.21 SEDIMENT TRAPS

A. Construct the storage area to the size and elevations indicated in the contract documents.

B. Construct the rock outlet as shown in Figure 9040.18, to the dimensions indicated in the contract documents.

3.22 INLET PROTECTION

A. Install inlet protection devices according to the manufacturer's recommendations.

B. Remove the accumulated sediment, as required to maintain the inlet protection device in working order. Remove any accumulated sediment from streets open to traffic if it encroaches into the traveled roadway.

3.23 ROCK OUTLET PROTECTION

A. Install the quantity of revetment stone or erosion stone, as specified in the contract documents.

B. Shape as shown in Figures 9040.10 and 9040.11, and as specified in the contract documents.

3.24 STABILIZED CONSTRUCTION ENTRANCE

A. Install a stabilized construction entrance at all locations where construction traffic leaving the site presents the potential for sediment track-out.

B. Construct the entrance according to Figure 9040.20.

C. Remove the accumulated sediment and install new stone, as required to prevent track-out.

3.25 MAINTENANCE

A. If temporary erosion and pollution control measures are required due to the Contractor's negligence, carelessness, or failure to install permanent controls as a part of the work as scheduled, and are ordered by the Engineer; perform such work at the Contractor's expense.

B. Prevent the accumulation of soil sediment or debris onto streets adjacent to project site. Remove any accumulation of earth or soil immediately, and take remedial actions for prevention.

C. In case of repeated failures on the part of the Contractor to control erosion, pollution, and/or siltation, the Engineer reserves the right to employ outside assistance, or to use the Jurisdiction's own forces to provide the necessary corrective measures. Such incurred direct costs, plus project engineering costs, will be at the Contractor's expense, and appropriate deductions will be made from the Contractor's monthly progress estimate and final payment.

END OF SECTION