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**PART 1 - GENERAL**

**1.1 DESCRIPTION**

A. Work Included

Work under this SECTION covers requirements for materials, tools, equipment and services necessary to install sediment and erosion control practices for this project. Practices may be declared permanent or temporary as shown on the plans or as directed by Engineer or Division. The work shall include, but is not necessarily limited to, completion of the following work:

1. Installation of sediment and erosion control practices.
2. Repairs or replacement of said sediment and erosion control practices.
3. Removal of said temporary sediment and erosion control practices not less than ninety (90) days and not later than six (6) months following a documented show of green vegetation on the site.
4. Assistance with SWPPP inspections and documentation upon request of Division

B. Construction sites where one (1) acre or more of land is disturbed or made bare are regulated by the National Pollutant Discharge Elimination System (NPDES) program. The purpose of these regulations is to reduce pollution to the nation's waterways. Coverage under the NPDES program for construction sites is obtained from the Iowa Department of Natural Resources (IDNR) through General Permit No. 2. The Division has submitted the permit application, the Engineer has developed the Storm Water Pollution Prevention Plan (SWPPP), and the Contractor is responsible for implementing the plan.

C. The SWPPP prepared by Engineer is included in the Plans. Contractor shall follow this plan unless modifications are made by Engineer or Division during the course of construction. Contractor shall be responsible for any damages that arise due to failure of Contractor to properly implement the erosion control plan. Division shall maintain the record copy of the SWPPP, including modifications or changes and inspection reports. Portions of the record documents will be provided by Engineer. Contractor shall assist as requested with SWPPP documentation.

**1.2 QUALITY ASSURANCE**

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this SECTION.

B. In addition to complying with requirements of governmental agencies having jurisdiction, comply with the directives of Engineer and Division. Engineer or Division may request additional control methods to be implemented by Contractor.

C. The SWPPP design prepared by the Engineer will be implemented by the Contractor. Modifications, repairs, or replacement of erosion and sediment control measures and practices will be implemented by the Contractor as soon as practical.

D. In the event of conflict between the SWPPP and the requirements with water pollution control laws, rules, and regulations of other federal, state, and local agencies, the more restrictive laws, rules, or regulations will apply.

E. References

1. Statewide Urban Design and Specifications (SUDAS)
2. Iowa Department of Transportation (IDOT) Standard Specifications
3. Natural Resource Conservation Service (NRCS) IA-95
4. Erosion Control Technology Council (ECTC) Standards
5. Test Method for the Examination of Composting and Compost (TMECC)

**1.3 JOB CONDITIONS**

- A. Abandoned mine land sites typically do not contain very good if any vegetative cover material and are highly susceptible to erosion. Contractor shall take care while grading the site to reduce the amount of sedimentation.
- B. Wetlands, ponds, and streams are often located within and adjacent to abandoned mine land sites. Extra care shall be exercised to protect these features from sedimentation where these features are to remain in place.
- C. Contractor shall protect all existing underground utilities, including any private tiles.

**1.4 SUBMITTALS**

- A. Contractor shall be a co-permittee with Division for the IDNR NPDES General Permit No. 2 for this site. The Division is responsible for permit fees, public notice, and permit submittal.
- B. The Contractor and any subcontractors that will perform grading, structural installation, and seeding shall sign the SWPPP Contractor Certification Statements as prepared by the Engineer.
- C. A physical hardcopy of a SWPPP documentation booklet is NOT required on site. An electronic copy of the SWPPP documentation booklet shall be developed by the Engineer and submitted to the Division. Division, with cooperation from Engineer and Contractor, will maintain SWPPP documentation for the duration of the project.
- D. One (1) scanned electronic copy of each signed Contractor certification statement shall be kept with the official SWPPP documentation booklet developed by Engineer. An electronic copy of the SWPPP documentation booklet will be maintained by Division.
- E. Engineer shall submit to Division an electronic copy of a sketch or marked up drawing showing locations of sediment and erosion control practices that satisfy the objectives of the SWPPP. Upon request of the Division, Engineer shall submit electronic copies of updated drawings as necessary that document any changes to practices required by the SWPPP.
- F. Contractor shall provide any necessary information requested by Engineer or Division required for maintenance of the SWPPP documentation.
- G. Weekly SWPPP inspection reports will be developed by Division personnel. Electronic copies will be submitted to the Engineer and Contractor. Dates of observed deficiencies and dates of subsequent corrections to deficiencies shall be noted on the reports.
- H. Contractor shall submit to Engineer and Construction Observer documentation that various materials used for erosion and sediment control practices meet the requirements of the specifications.

## 1.5 SCHEDULING

- A. Contractor shall sequence his work to minimize erosion of the site and implement the sediment and erosion control measures as outlined in the SWPPP. No grading work will be allowed until the appropriate control measures are in place.
- B. When rain events cause necessary repairs or replacement to sediment and erosion control practices as determined by the inspection completed by Engineer or Division, Contractor shall implement the requested work as soon as practically possible.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Erosion Control Mulch
  - 1. Conventional Mulch - Materials shall consist of wheat, oats, rye, hay, grass cut from native grasses or other plants approved in writing by Division, that is of air dry straw that has been properly cured and harvested. Mulch harvested after a killing frost or during dormant periods will not be acceptable. Mulch shall not be rotted, brittle, moldy, caked or otherwise degraded. Mulch shall generally be free of noxious weeds as published by the local County Weed Commissioner.
  - 2. Other types of mulch, such as hydro-mulch meeting SUDAS 9010, 2.07, may also be used but is subject to the approval of Engineer.
- B. Compost Blankets
  - 1. Compost used for blankets shall be derived from a well-decomposed source of organic matter, produced using an aerobic composting process meeting Code of Federal Regulations (CFR) 503 for time, temperature, and heavy metal concentrations. The compost shall have no visible admixture of refuse or other physical contaminants, nor any material toxic to plant growth. The compost shall be certified by the U.S. Composting Council's Seal of Testing Assurance (STA) program and conform to the chemical, physical, and biological parameters of AASHTO MP 10-03, with the following additional requirements:
    - a. Follow U.S. Composting Council's TMECC guidelines for all testing.
    - b. Organic Matter Content: 30% minimum.
    - c. pH: between 6.0 and 8.0.
    - d. Maturity (growth screening): Minimum 90% emergence for all compost to be vegetated.
    - e. Particle size shall follow that shown in Table 02120-01:

**Table 02120-01: Particle sizes for Compost Blankets**

Sieve Size	Percent Passing*
2"	100
1"	90-100
3/4"	65-100
3/8"	0-75
*6 inch maximum particle length.	

2. A biodegradable, organic binding agent or polyacrylamide can be mixed, or injected into the compost as it is placed provided it is not detrimental to the establishment of vegetation. The binding agent shall be applied at the rate recommended by the manufacturer.

C. Silt Fences

1. Fabric used for silt fences shall meet the requirements of IDOT 4196.01.
2. Posts used for silt fences shall be steel T-posts with a minimum length of four (4) feet weighing at least one and one-quarter (1-1/4) pounds per foot, exclusive of the anchor plate. Painted posts are not required.
3. Wire or plastic ties with a minimum tensile strength of fifty (50) pounds shall be used for fasteners.

D. Check Dams

1. Check dams using silt fence shall comply with details of 2.1.C above
2. Check dams using Rolled Erosion Control Products (RECP) shall be Type 4 with a minimum four (4) foot width and shall comply with details of 2.1.G below.
3. Triangular foam check dams shall have a height of eight (8) to ten (10) inches with a base width of sixteen (16) to twenty (20) inches and a length of seven (7) feet. The inner support material shall be urethane foam and the outer cover shall be woven geotextile shaped to fit around the inner support material with the bottom edge extending two (2) to three (3) feet beyond the bottom edge.
4. Filter fabric used for fabric checks shall consist of non-woven geotextile material and can be either heat-bonded or resin bonded and shall satisfy the material properties shown on Table 02120-02.

**Table 02120-02: Properties of Non-Woven Geotextiles for Fabric Check Dams** (from NRCS IA-95)

Property	Test Method	Class 1	Class 2	Class 3	Class 4 <sup>3</sup>
Tensile strength (Lb.) <sup>1</sup>	ASTM D 4632 grab test	180 minimum	120 minimum	90 minimum	115 minimum
Elongation at failure (%) <sup>1</sup>	ASTM D 4632	> 50	> 50	> 50	> 50
Puncture (Lb.)	ASTM D 4833	80 minimum	60 minimum	40 minimum	40 minimum
Ultraviolet light (% residual tensile strength)	ASTM D 4355 150-hr exposure	70 minimum	70 minimum	70 minimum	70 minimum
Apparent opening size – AOS	ASTM D 4751	As specified max. #40 <sup>2</sup>	As specified max. #40 <sup>2</sup>	As specified max. #40 <sup>2</sup>	As specified max. #40 <sup>2</sup>
Permittivity sec <sup>-1</sup>	ASTM D 4491	0.70 minimum	0.70 minimum	0.70 minimum	0.10 minimum

<sup>1</sup> Minimum average roll value (weakest principal direction).

<sup>2</sup> U.S. standard sieve size

<sup>3</sup> Heat-bonded or resin bonded geotextile may be used for classes 3 and 4. They are particularly well suited to class 4. Needle punched geotextiles are required for all other classes.

5. Rock check dams shall be composed of either Erosion Stone conforming to IDOT 4130, Gradation No. 34 or Riprap (revetment) conforming to IDOT 4130.02. All rock check dams shall be encapsulated in engineering fabric meeting the requirements of IDOT 4196.01C, unless noted otherwise.

E. Filter Berms and Filter Socks

1. Materials used for filter berms and in filter socks shall be derived from wood, bark, or other non-toxic vegetative feed stock. The material shall not contain any material that is toxic to plant growth. The target flow rate of the in-place material is ten (10) gallons per minute per linear foot. The material shall meet the particle sizes shown on Table 02120-3

**Table 02120-03: Particle Sizes for Filter Sock or Filter Berm Filler**

Sieve Size	Percent Passing
2 inch	100
1 inch	90-100
3/8 inch	0-30

2. Where required for slope and sediment control applications, the filter sock shall consist of a continuous, tubular, knitted, mesh netting with three-eighth (3/8) inch openings constructed of five (5) millimeter thickness and photodegradable high-density polyethylene (HDPE).
3. Filter socks will be supported by one (1) inch by two (2) inch hard wood stakes or stakes of equivalent strength.

F. Wattles

1. Netting for wattles shall be degradable with an open weave having a nominal diameter of nine (9) inches or as specified.
2. Fill material shall consist of straw, wood excelsior, coir, or other natural materials approved by Engineer.

3. Stakes shall be one (1) inch by one (1) inch wood stakes or stakes of equivalent strength.

G. 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:

1. RECP Type 1 (Ultra Short-Term): Functional longevity of three months or less and classified as follows:
  - a. RECP Type 1A: Mulch control net, consisting of a photodegradable synthetic mesh or woven biodegradable natural fiber netting.
  - b. RECP Type 1B: 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 1C: 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 1D: 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. RECP Type 2 (Short-Term): Functional longevity between three (3) and twelve (12) months and classified as follows:
  - a. RECP Type 2A: Mulch control net, consisting of a photodegradable synthetic mesh or woven biodegradable natural fiber netting.
  - b. RECP Type 2B: 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 2C: 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 2D: 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 twelve (12) and twenty-four (24) months and classified as follows:
  - a. RECP Type 3A: Mulch control nets, consisting of a slow-degrading synthetic mesh or woven natural fiber netting.
  - b. RECP Type 3B: 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 thirty-six (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.
5. Properties and Performance:

Testing performed according to the ECTC’s Testing Procedures for Rolled Erosion Control Products. Verify manufacturer’s test results by independent testing. Material properties meeting the Erosion Control Technology Council’s (ECTC) Standard Specifications for Rolled Erosion Control Products are shown on Table 02120-04:

**Table 02120-04: Properties for Rolled Erosion Control Products**

Classification	Slope Application	Channel Application	Min. Tensile Strength
	Max. Grade*	Permissible Shear Stress	
RECP Type 1A	5:1 (H:V)	0.25 lb/ft <sup>2</sup>	5 lb/ft
RECP Type 1B	4:1 (H:V)	0.50 lb/ft <sup>2</sup>	5 lb/ft
RECP Type 1C	3:1 (H:V)	1.50 lb/ft <sup>2</sup>	50 lb/ft
RECP Type 1D	2:1 (H:V)	1.75 lb/ft <sup>2</sup>	75 lb/ft
RECP Type 2A	5:1 (H:V)	0.25 lb/ft <sup>2</sup>	5 lb/ft
RECP Type 2B	4:1 (H:V)	0.50 lb/ft <sup>2</sup>	5 lb/ft
RECP Type 2C	3:1 (H:V)	1.50 lb/ft <sup>2</sup>	50 lb/ft
RECP Type 2D	2:1 (H:V)	1.75 lb/ft <sup>2</sup>	75 lb/ft
RECP Type 3A	5:1 (H:V)	0.25 lb/ft <sup>2</sup>	25 lb/ft
RECP Type 3B	1.5:1 (H:V)	2.00 lb/ft <sup>2</sup>	100 lb/ft
RECP Type 4	1:1 (H:V)	2.25 lb/ft <sup>2</sup>	125 lb/ft

\*Product tested according to ECTC Test Method No. 2 and meeting the ECTC Standard Specifications for “C” factor.

6. RECP Anchors shall be non-metallic stakes or staples as recommended by manufacturer, with a minimum length of 6 inches.



H. Turf Reinforcing Mats (TRM)

1. TRM Type 1: Use a TRM that is constructed of a web of mechanically or melt-bonded polymer netting, or monofilaments 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. These requirements consist of maintenance, structural backfills protecting critical structures, potential traffic areas, abrasion, higher factors of safety, and/or general durability concerns.
4. TRMs shall meet the minimum material and performance requirements contained in the Table 02120-05:

**Table 02120-05: Properties for Turf Reinforcing Mats**

	Property <sup>1</sup>	Test Method	Type 1	Type 2	Type 3	Type 4
Material	Thickness	ASTM D6525	0.25 in	0.25 in	0.25 in	0.25 in
	Tensile Strength <sup>2</sup>	ASTM D6818	125 lb/ft	240 lb/ft	750 lb/ft	3,000 lb/ft
	UV Resistance <sup>3</sup>	ASTM D4355	80% @ 500 hrs	80% @ 1,000 hrs	80% @ 1,000 hrs	90% @ 3,000 hrs
Performance	Maximum Shear Stress (Channel Applications) <sup>4</sup>	ASTM D4640	7 lb/ft <sup>2</sup>	10 lb/ft <sup>2</sup>	12 lb/ft <sup>2</sup>	15 lb/ft <sup>2</sup>
	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. Tensile strength from ASTM D5035 may be substituted upon approval.
3. Tensile strength of structural components retained after 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 D6460 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.

- I. Sediment Basin Outlet Structures
  - 1. The base, riser, and outlet pipe shall conform to the details as shown on the plans. The riser shall include an anti-vortex device and the outlet pipe shall include anti-seep collars as shown.
- J. Stabilized Construction Entrance
  - 1. Use IDOT Section 4122, Gradation 13, Macadam crushed stone where construction entrance adjoins a publicly used road. Refer to SWPPP for location and dimensions.
- K. Earthen Sediment Berms
  - 1. In some instances, berms constructed from on-site soil material can be used to keep sediment out of areas to be protected such as streams or wetlands. The location and dimensions of these berms shall be as agreed upon by the Engineer and Contractor.
  - 2. The earthen berm shall be constructed from on-site material in the immediate vicinity and shall be compacted as needed to provide stability. No benching or undercutting is required for berms that will be removed after general grading is completed.
- L. Tied Concrete Block Mat
  - 1. Tied concrete block mats shall be manufactured from individual concrete blocks cast into and tied together with a high-strength polypropylene geogrid having properties described in Table 02120-06 below. Each block shall be tapered, beveled and interlocked. Each block shall incorporate interlocking surfaces or connections that prevent lateral displacement of the blocks within the mats when they are lifted for placement.

**Table 02120-06: Physical Characteristics of Geogrid for Tied Concrete Block Mat**

<b>Mass/Unit Area:</b>	ASTM D-5261, 7.0 oz./yd <sup>2</sup> (240 g/m <sup>2</sup> )
<b>Aperture Size Measured:</b>	1.6 inch x 1.6 inch (40 mm x 40 mm)
<b>Wide Width Tensile Strength:</b>	ASTM D-6637 Machine Direction (MD), 2055 lb/ft (30 kN/m) Cross Machine Direction (CMD), 2055 lb/ft (30 kN/m) Elongation at Break, 6%
<b>Tensile Strength @ 2%</b>	ASTM D-6637 Machine Direction (MD), 822 lb/ft (12 kN/m) Cross Machine Direction (CMD), 822 lb/ft (12 kN/m)
<b>Tensile Strength @ 5%</b>	ASTM D-6637 Machine Direction (MD), 1640 lb/ft (24 kN/m) Cross Machine Direction (CMD), 1640 lb/ft (24 kN/m)
<b>Tensile Modulus @ 2%</b>	ASTM D-6637 Machine Direction (MD), 41,100 lb/ft 600 kN/m Cross Machine Direction (CMD), 41,100 lb/ft 600 kN/m
<b>Tensile Modulus @ 5%</b>	ASTM D-6637, Machine Direction (MD), 32900 lb/ft (480 kN/m)

- 2. Cementitious Materials used to craft the concrete blocks shall conform to the following applicable ASTM specifications:
  - a. Portland Cements – Specification C 150, for Portland Cement
  - b. Blended Cements – Specification C 595, for Blended Hydraulic Cements
  - c. Hydrated Lime Types – Specification C 207, for Hydrated Lime Types
  - d. Pozzolans Specification C 618, for Fly Ash and Raw or Calcined Natural Pozzolans for use in Portland Cement Concrete

3. Aggregates used in the fabrication of the concrete block units shall conform to the following ASTM specifications, except that the aggregate gradation requirements shall not necessarily apply:

Normal Weight – Specification C 33, for Aggregates

4. Physical properties of the concrete block units, as cast, shall satisfy requirements shown in Table 02120-07.

**Table 02120-07: Physical Properties of Concrete Blocks for Tied Concrete Block Mat**

	Min. Compressive Strength, psi (mPa)	Max. Water Absorption, lb/ft <sup>3</sup> (kg/m <sup>3</sup> )
Individual Block	3500 (24)	12 (192)
Avg. of 3 Blocks	4000 (27.6)	10 (160)

5. Open Area: The Tied Concrete Block Mat shall have a minimum open area of 10%
6. Chemical Resistance: The Tied Concrete Block Mat shall exhibit resistance to mild concentrations of acids, alkalis, and solvents.
7. Polypropylene Geogrid used in the fabrication of the Tied Concrete Block Mat will be selected by the mat manufacturer. The selected geogrid must satisfy the minimum requirements of Table 02120-06, above.
8. Backing: Tied Concrete Block Mat shall be packaged and shipped with a permanent Turf Reinforcement Mat (TRM) that shall provide for simultaneous placement with Tied Concrete Block Mat as it is unrolled. The TRM shall be Type 1 as described in 2.1 I., 1 of this SECTION. The TRM shall also have a minimum forty percent (40%) light penetration and a material density not greater than eight ounces per square yard (8.0 oz/yd<sup>2</sup>) as measured by ASTM D6566. Thicker or denser TRMs shall not be acceptable. Recyclax® TRM or approved equal will be an acceptable product for this application
9. Roll Width: To facilitate shipping, Tied Concrete Block Mat should be packaged and shipped in widths specified on the plans. Manufactured widths do not exceed sixteen (16) feet
10. Roll length: The length of rolls for tied block mat is indicated on the plan, but the roll length may be modified to custom lengths subject to engineer approval. Shop drawings shall be provided which illustrate how custom roll lengths will be properly installed to satisfy requirements shown on the drawings. Cutting and splicing of rolls shall not be allowed except where pre-approved by Engineer. Total roll length provided shall be sufficient to allow for appropriate amounts of overlap at transverse seams, as recommended by the manufacturer.
11. Stainless Steel Zip Ties: Stainless Steel Zip Ties (*hereafter "ties" for this SECTION*) shall be nominally 20" long x 5/16" wide. Tie material shall be 304 Stainless Steel. Each tie shall have a minimum tensile strength of 250 Lb. A sufficient number of ties shall be supplied so that one tie may be installed between every two blocks along the seams of adjoining Tied Concrete Block Mats.
12. Rebar "U" Anchors: Rebar "U" Rebar Anchors (*hereinafter "U-Anchors" for this SECTION*) may be used for either longitudinal or transverse seams depending upon the application subject to Engineer approval. Consult plan details or manufacturer's recommendations for acceptable use and spacing. Each U-Anchor shall be bent into the shape of a long slender "U" and made from #3 Grade 40 steel re-bar. The diameter of the bend shall be approximately three inches (3"). Each leg of the rebar staple shall be at least eighteen inches (18") in length exclusive of the bend. Some applications may require rebar staples to be epoxy coated to improve corrosion resistance. Consult Engineer or

Supplemental Specifications for coating requirements. U-Anchors shall be installed perpendicular to the flow of water.

13. Duck-Bill Earth Anchors: Duck Bill Earth Anchors (*hereafter "anchors" for this SECTION*) are used to secure tied block mat to the soil surface. Each anchor shall include a stainless steel cable having minimum dimensions of 1/8 inch diameter x 30 inches long. The duckbill fastened to one end of the cable is 4-3/4 inches long x 1 inch diameter made of tinzallo aluminum alloy that will not corrode or rust. Each anchor shall provide a holding capacity of 1,100 lbs. in normal soil. A driving rod is required to drive the anchor assembly vertically into undisturbed soil to the required depth. After the duckbill is driven into the soil, an upward pull on anchor rotates the duckbill into a load-lock position approximately 15° from horizontal. Further tension causes anchor to plane sideways through undisturbed soil, increasing pullout resistance. Anchors shall require no rods, stakes, pipes, or stems to be left above ground except for a sufficient length of cable for re-tensioning
14. Visual Inspection: All units shall be sound and free of defects that would interfere with the proper placing of the unit or impair the strength or permanence of the construction. Surface cracks incidental to the usual methods of manufacture, or surface chipping resulting from customary methods of handling in shipment and delivery, shall not be deemed grounds for rejection.
15. Sampling and Testing: The purchaser or his authorized representative shall inspect the units upon delivery. Units missing more than 4 blocks per 80 square feet section shall be deemed grounds for rejection.
16. Packaging: Tied concrete block mats are packaged in rolls with high strength lifting straps for moving material into place with an excavator. Contractor shall use spreader bars as necessary to adequately support rolls while lifting.
17. Manufacturer: A manufacturer of the Tied Concrete Block Mat is Motz Enterprise, which markets the product under the name, "*Flexamat*". The manufacturer's contact information is as follows:

*Motz Enterprise, 11006 Reading Road, Cincinnati, OH 45241*  
*Phone: 513-772-MOTZ (513-772-6689)*
18. Engineer approved equivalents to the Flexamat product shall be acceptable.

### **PART 3 - EXECUTION**

#### **3.1 SWPPP PREPARATION**

- A. The Erosion Control Plan for this project prepared by Engineer has been included in the Plans. The completed SWPPP will be provided to Contractor prior to initiation of construction and will be based on the Erosion Control Plan.
- B. Contractor shall be co-permittee with Division on the IDNR NPDES General Permit No. 2 that shall be completed by Division.

#### **3.2 SWPPP MANAGEMENT**

- A. Contractor shall maintain access to the site at all times during construction so that SWPPP management and inspections may be conducted.
- B. A SWPPP inspection must be conducted at least once every seven (7) calendar days. Division personnel will conduct the inspections, develop the reports, and distribute electronic copies. Contractor shall be available, upon request of the Division, to provide assistance with the inspections as may be necessary.

Inspections and reports are required at the specified interval from initiation of clearing until the Notice of Discontinuation is filed with the Iowa DNR.

- C. During construction, Contractor shall be responsible for implementation of the various sediment and erosion control practices prescribed in the SWPPP. At each progress meeting, the SWPPP practices shall be reviewed for compliance. Deficiencies shall be corrected prior to approval of payment for those measures. Division reserves the right to suspend all payments due to Contractor until deficiencies are corrected.
- D. Contractor shall properly manage all hazardous materials (i.e. fuel, oil, concrete wash out, etc.) brought to the site to conform to the SWPPP all at his own expense.
- E. Contractor may propose alternative measures than those specified by Engineer but shall receive approval from Division or Engineer prior to installation of these alternative measures. All changes and modifications must be documented and kept with the SWPPP documentation.
- F. Division will file the Notice of Discontinuation after final sufficient vegetation is established to provide final stabilization.
- G. Division will maintain SWPPP records for a period of three (3) years after the Notice of Discontinuation is submitted.

### 3.3 INSTALLATION OF SEDIMENT AND EROSION CONTROL MEASURES

- A. Surface Roughening
  - 1. Directional Tracking: Operate tracked equipment up and down slopes that are less steep than three to one (3:1) horizontal to vertical (H:V) to create ridges that are perpendicular to the slope.
  - 2. Grooving/Furrowing: Use rippers, disks, harrows, chisel plows, or other equipment capable of operating on the slope to create grooves that are about three (3) inches deep and spaced a maximum of fifteen (15) inches apart. Grooves must be made along the contour and perpendicular to the slope. Surface roughening is often accomplished by deep disking associated with subgrade preparation as discussed in SECTION 02400 and SECTION 02410.
- B. Erosion Control Mulching
  - 1. Conventional: Uniformly distribute mulch over the required area at a rate of two (2) tons per acre and work the mulch into the soil with a mulch tucker designed to anchor the mulch into soil by means of dull blades or disks.
  - 2. Other types of mulching, if approved by Engineer, will be at the determined rates of application with appropriate equipment.
- C. Compost Blankets
  - 1. Loosen the ground to a minimum depth of one (1) inch and evenly apply the compost to the specified depth.
  - 2. All concentrated flows shall be diverted away from the slope.
  - 3. No heavy equipment shall be operated over the compost blanket throughout the required period of protection.

D. Temporary Erosion Control Seeding

1. Till soil to a minimum depth of five (5) inches with a disk, harrow, or field cultivator.
2. Apply Nitrogen (N) fertilizer to all seeded areas at a rate of fifty (50) pounds per acre.
3. On areas accessible to field machinery, sow seed with an end-gate cyclone seeder. Areas that are not accessible shall use hand-operated cyclone seeding methods.
4. Cover the seed and fertilizer lightly by tiling the seeded area with a disk, rigid harrow, spring tooth harrow, or field cultivator.

E. Temporary Earth Diversion Structures

1. Construct the temporary earth diversion structure at the location and with the dimensions shown on the plans or as agreed to on site with Engineer. Adequately compact fill to prevent failures and seepage. Failures due to inadequate compaction shall be repaired by Contractor at no cost to Division.
2. Ensure positive drainage along the diversion ditch to the designated outlet area.
3. Apply temporary erosion control seeding if structures are specified to be vegetated.

F. Silt Fences

1. Install silt fences along the specified contour and to the dimension shown on the erosion control plan or as directed by Engineer. The ends of continuous run silt fences shall be turned uphill with a J-hook to prevent runoff from flowing around the end when the water behind the fence ponds to a level even with the top of the fence.
2. Install silt fence fabric 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 the slicing method cannot be used and is subject to approval by Engineer. The silt fence fabric shall be installed such that twelve (12) inches is installed at least six (6) inches below the ground line (folding is allowed). After the fabric is installed, the ground shall be compacted on each side by driving over the area with rubber-tired equipment or by other means as necessary to adequately anchor the material in the ground to prevent pullout and water flow under the fence.
3. Steel post supports shall be placed at a maximum spacing of eight (8) feet or as directed by Engineer. The steel posts shall be installed with a minimum embedment depth of twenty (20) inches. Fabric shall be tied to the steel posts at least four (4) evenly spaced locations using metal ties or plastic ties that have ultraviolet protection.
4. Non-functioning silt fences that allow flow underneath or that are damaged due to improper installation shall be repaired or replaced by Contractor at no cost to Division.
5. Silt fences shall be cleaned out when the accumulated sediment reaches a level of one-half the height of the silt fence or when the silt fence becomes clogged with sediment and no longer allows runoff to flow through. Silt fences shall be replaced when necessary.
6. Silt fences shall be removed at the appropriate time by removing the stakes, ties, and fabric from the site or burying material in an approved location and manner. The accumulated

sediment shall be spread and distributed in surrounding areas and smoothed to match finished grade and to ensure proper drainage.

G. Check Dams

1. Install fabric and silt fence check dams as shown on the plans or as recommended by the manufacturer.
2. Fabric check dams shall be installed so that eighteen (18) inches are placed in a trench on the upstream side of its intended location. Material excavated from trench shall be replaced and compacted to hold the fabric check in place. The remaining eighteen (18) inches shall be placed loosely on the surface facing downstream.
3. Silt Fence check dams shall be installed as described in 3.3 F. above. Use adequate number of posts for support. Care shall be taken so the center of check dam is at least twelve inches (12") lower than the ends.
4. Install rock check dams following details provided on the plans. Use riprap, erosion stone, macadam stone or approved combination thereof. Choke voids with smaller stone or site soils as specified. the center shall be at least twelve inches (12") lower than the ends. The ends of the rock check dams shall be sufficiently keyed into the sides of the drainageway. Depending upon the application, rock check dams may be considered either permanent or temporary.
5. Clean out check dams as directed by Engineer when they become non-functioning by sediment accumulation.
6. Remove any temporary check dams as directed by Engineer after site is stabilized. All accumulated sediment and disturbed areas shall be regraded and spread as needed to match finished grade and ensure proper drainage.

H. Filter Berms

1. Filter berms shall be constructed to the dimensions and along the contour as shown on the plans or as directed by Engineer.
2. The ends of filter berms shall be turned uphill to prevent runoff from flowing around the ends.
3. Apply temporary erosion control evenly to the surface if the berm is specified to be vegetated.
4. Filter berm shall be cleaned out when sediment accumulation reaches one-half of the height of the berm or as directed by Engineer.

I. Filter Socks

1. Filter socks shall be filled with the appropriate filter material pneumatically to the size and length indicated on the plans or as directed by Engineer.
2. Filter socks shall be placed along the contour as indicated on the plans or as directed by Engineer. The ends of the each filter sock shall be turned uphill to create a J-hook to prevent runoff from flowing around the ends when water ponds up to a level even with the top of the sock.

3. Filter socks shall be embedded into the soil surface at least one inch (1") and/or additional filter material or soil shall be placed on the uphill side of the filter sock between the filter sock and the ground as directed by Engineer
4. Drive support stakes into the ground on the downhill side of the filter socks at a maximum spacing of six (6) feet. Place additional stakes as needed to secure the sock and prevent movement.
5. Non-functioning filter socks that allow flow underneath or socks that are damaged due to improper installation shall be repaired or replaced by Contractor at no cost to Division.
6. Filter socks shall be cleaned out when the accumulated sediment reaches a level of one-half the height of the sock or when the sock becomes clogged with sediment and no longer allows runoff to flow through.
7. Filter socks shall be removed at the appropriate time by slicing the sock longitudinally and removing the mesh and staking materials. The filter material and accumulated sediment shall be spread to match finished grade and ensure proper drainage.

J. Wattles

1. Construct a shallow trench that is two (2) to four (4) inches deep that matches the width and the contour of the wattle. Place the wattle and compact excavated soil against the wattle on the uphill side.
2. Drive stakes through the center of the wattle at a maximum spacing of four (4) feet and as needed to secure the wattle and prevent movement. Extra staking is needed at butted ends to prevent leakage. Do not overlap wattles vertically. Horizontal overlaps may be acceptable with Engineer approval.
3. Non-functioning wattles that allow flow underneath or wattles that are damaged due to improper installation shall be repaired or replaced by Contractor at no cost to Division.
4. Wattles shall be cleaned out when the accumulated sediment reaches a level of one-half the height of the wattle or when the wattle becomes clogged with sediment and no longer allows runoff to flow through.
5. Wattles shall be removed at the appropriate time by slicing the wattle and removing the mesh and staking materials. The filler material and accumulated sediment shall be spread to match finished grade and ensure proper drainage.

K. Temporary Rolled Erosion Control Products (RECPs)

1. Install all RECPs according to the manufacturer's published installation recommendations along with the following minimum requirements.
2. Grade and smooth surface. Remove all rocks, clods, vegetation, or other obstructions that will prevent direct contact between the RECP and the soil surface.
3. When specified, prepare seedbed and place seed and fertilizer according to SECTION 02700.



4. Slope Application: Install anchor trench along at the top of the slope. Unroll the RECP down and horizontally across the slope. Place consecutive blankets down the slope end over end, shingle style. Overlap rolls a minimum of three (3) inches and install anchors at a maximum spacing of eighteen (18) inches along all the overlaps. Backfill and compact trench and place additional seed as required.
  5. Channel Application: Install RECP As shown on the details shown on the plans.
- L. Turf Reinforcement Mats (TRMs)
1. Install TRMs according to the published installation literature for the product specified and for the appropriate application.
  2. Depending upon the sequence and timing of construction, it may be necessary to delay installation of TRMs to correspond to dates when permanent seeding can take place in the spring and fall seeding periods.
- M. Sediment Basin Outlet Structures
1. Concrete Base: Construct concrete base and anchor riser section as shown on the plans.
  2. Dewatering Device: Drill holes in riser section with the number, diameter and configuration as shown on the plans. Wrap the perforated section of the riser pipe with metal hardware cloth.
  3. Riser and Barrel: Place the specified corrugated metal pipe and properly backfill as needed with compacted lifts of soil. The anti-vortex and anti-seep collars shall also be properly placed where shown on the plans.
  4. Repairs required to the sediment basin or outlet structure due to improper installation shall be repaired by Contractor at no cost to Division.
- N. Stabilized Construction Entrance
1. Place macadam stone at entrance to correspond to the dimensions provided in the Plans, the SWPPP or as directed by Engineer. Alternative stone material may be proposed, but must be approved by Engineer.
  2. Engineer may require geotextile fabric to be installed under the macadam stone depending upon site conditions. In cases where non-woven geotextile fabric is required, the cost of the non-woven fabric shall be incidental to the cost of the macadam stone.
  3. If voids become plugged, replace or regrade as needed.

### 3.4 MEASUREMENT AND PAYMENT

The construction cost of all work included in this SECTION of the Construction Specifications shall be included in Contractor's unit prices set forth in the Proposal and Schedule of Prices (*Document C*) for the work items described below. The unit price for each of these items shall include its pro rata share of overhead so that the sum of the products obtained by multiplying the unit prices so set forth by the amount of the work actually constructed, measured as described herein, shall constitute full payment to Contractor for performance of the work included in this SECTION. The unit price shall include all labor, materials, and equipment necessary for proper installation of the various practices. The unit price shall also include cost for removal of temporary practices at the appropriate time once vegetation is established; unless extenuating circumstances exist as

determined by Engineer or DIVISION, vegetation will be considered established ninety (90) days after a documented show of green across the site. If Contractor does not remove temporary practices in a timely manner, Division may delay payment of retainage or seek resolution with Contractor's bonding company.

For certain particular practices identified by Engineer in Supplemental Specifications, where timely removal is critical, Division reserves the right to pay up to one-half the unit price for the practice upon installation and the remaining one-half after satisfactory removal.

If erosion and sediment control measures are properly installed by Contractor and storm events cause failure or reduces the effectiveness of these measures, replacement shall be completed as directed by Engineer and will be paid for by Division to Contractor as defined below.

If temporary erosion and pollution control practices are required due to Contractor's negligence, carelessness, or failure to install permanent controls as part of his work as scheduled and are deemed necessary by Engineer or Division, the practices shall be completed by Contractor at no cost to Division.

In case of repeated failures on part of Contractor to control erosion, pollution, and/or siltation, Division reserves the right to employ outside assistance to provide the necessary corrective actions. Such incurred direct costs, plus Engineering costs, will be at Contractor's own expense with the appropriate deduction taken from future pay requests.

Measurement and payment for each work item in this SECTION shall be in accordance with the following:

- A. *Surface Roughening*: Payment for surface roughening performed as directed by Engineer will be measured and paid for by the contract unit price per acre. Areas shall be jointly measured by Engineer and Contractor. Surface roughening shall not be considered a separate pay item when it is accomplished by the work of subgrade preparation.
- B. *Erosion Control Mulching*: Payment for mulching will be measured and paid for at the contract unit price per acre. Mulch placed outside designated areas will not be measure for payment. Areas shall be measured jointly by Engineer and Contractor.
- C. *Compost Blankets*: Payment for the cost of placing compost blankets will be measured and paid for by the contract unit price of each square foot for each thickness of blanket specified and shall include preparing the subgrade. Compost blankets placed outside specified areas will not be measured for payments. Measurements will be taken jointly by Engineer and Contractor.
- D. *Temporary Erosion Control Seeding*: Payment for placement of temporary seeding will be measured and paid for by the acre. The unit contract price shall include preparing the subgrade, placement of fertilizer and seed, and final cultivating. The area for payment will be measured jointly by Engineer and Contractor.
- E. *Temporary Earth Diversion Structures*: Payment for installation and removal of temporary earth diversion structures will be measured and paid for by the linear foot for each type and size of diversion structure. Payment will be jointly measured by contractor and Engineer. Full payment for this item will not be made until removal is complete. The unit price shall include all labor and equipment necessary.
- F. *Silt Fences*: Payment for installation of silt fence will be measured and paid for at the contract unit price per linear foot of silt fence as measured jointly by the contractor and Engineer. The unit cost shall include all labor, equipment, and materials for proper installation. Payment will be made for removal of silt fence, either at the end of the project after seeding is established or if replacement silt fence is required during construction. Payment will be made based on the contractor's unit price and will match the linear feet of silt fence installed. The removal of silt fence shall include removal and disposal of

stakes, fabric, and ties. Silt fence removal shall also include restoring the disturbed area to finished grade and removal or distribution of the accumulated sediment.

- G. *Check Dams:* Payment for temporary check dams not constructed with erosion stone or riprap will be measured and paid for at the contract unit price per linear foot of each size and check dam specified. The length of the check dams will be measured jointly by Engineer and Contractor. .

Check dams made from erosion stone or riprap will be paid for to the nearest one-hundredth (0.01) of ton of material placed provided the dimensions of the check dam are similar to that shown on the plans or as otherwise approved. Filter fabric used beneath the erosion stone or riprap will not be measured for payment and shall be considered incidental. The unit cost shall include all labor, equipment, and material costs that are necessary. Excavation costs and distribution of the soil materials are considered incidental and shall not be measured separately for payment.

- H. *Filter Berms:* Payment for filter berms will be measured and paid for at the contract unit price by the linear foot of each size specified. Measurements will be taken longitudinally along the top of the berm and will be measured jointly by Contractor and Engineer. Filter berms that are needed to replace existing filter berms because of sediment accumulation will also be measured for payment.
- I. *Filter Socks:* Payment for filter socks will be measured and paid for at the contract unit price by the linear foot of each diameter specified. Measurements will be taken jointly by Contractor and Engineer. Filter socks that are needed to replace existing filter socks because of sediment accumulation will also be measured for payment. Removal of filter sock will also be paid for at contractor's unit price and shall include removal and disposal of sock and stakes. The removal cost shall also include distribution of the accumulated sediment and filter material.
- J. *Wattles:* Payment for wattles will be measured and paid for at the contract unit price per linear foot. Any excavation required for placement and the staking of the wattle shall be considered incidental to the installation costs. A separate contract unit price shall be provided for removal. The length of wattle for payment of installation and removal shall be the same and measured jointly by Engineer and Contractor.
- K. *Temporary Rolled Erosion Control Products (RECPs):* Payment for temporary RECPs will be measure and paid for at the contract unit price per square yard of area covered for each type used. Overlaps will not be measured for payment. Staples, anchors, or other products needed for proper installation are considered incidental. Areas shall be jointly measured by Contractor and Engineer.
- L. *Turf Reinforcing Mats (TRMs):* Payment for TRMs will be measure and paid for at the contract unit price per square yard of area covered for each type used. Overlaps will not be measured for payment. Staples, anchors, or other products needed for proper installation are considered incidental. Areas shall be jointly measured by Contractor and Engineer.
- M. *Sediment Basin Outlet Structures:* Measurement and payment will be made for each sediment basin outlet structure installed by size. The contract unit price shall include all materials, labor, and equipment required to construct the outlet structure as specified and shown on the plans. The unit price for installation shall include the concrete base, anti-vortex device, outlet pipe, and any anti-seep collars required. Earthwork required for construction of the sediment basin will be measured and paid as part of the general excavation quantities.

Measurement and payment will also be made for each sediment basin cleanout required during construction. Contract unit price includes dewatering, and removal and disposal of accumulated sediment. The measurement and payment will also be made for each sediment basin outlet structure properly removed. Contract unit price includes dewatering and removal of sediment accumulated at the end of the project, disposal of the outlet structure, concrete base, and emergency spillway. Earthwork

required to restore the sediment basin and restoration of the area to finished grade will be measured and paid for separately.

- N. *Stabilized Construction Entrance:* The unit price shall include all materials and work required for installation of the stabilized construction entrance in conformance with these Construction Specifications and the Plans, including excavation, removal and disposal of excavated material, and furnishing and placing the stone. Measurement for payment shall be based on the tonnage of granular surfacing material actually installed as determined from weight tickets, rounded to the nearest one-tenth (0.1) ton. Only material placed in accordance with the Plans and Specifications shall be measured and paid.

After project is complete, and, if so directed by Engineer and Division, the granular material placed for the stabilized entrance shall be removed and either transported offsite or stockpiled for benefit of the landowner in an approved location on site. Any minor grading needed to maintain drainage shall also be included with removal at no additional cost to Division.

- O. *Summary:* Proposal Bid Items applicable to work covered by this SECTION are as follows:

<u>Description</u>	<u>Unit</u>
Surface Roughening	Acre
Erosion Control Mulching	Acre
Compost Blankets	Square Foot
Temporary Erosion Control Seeding	Acre
Temporary Earth Diversion Structures	Linear Foot
Silt Fences – Installation	Linear Foot
Check Dams – Temporary	Linear Foot
Check Dams – Permanent	Ton
Filter Berms	Linear Foot
Filter Socks – Installation	Linear Foot
Wattles – Installation	Linear Foot
Temporary Rolled Erosion Control Products	Square Yard
Turf Reinforcing Mats	Square Yard
Sediment Basin Outlet Structures – Installation	Lump Sum
Sediment Basin Outlet Structures – Cleanout	Lump Sum
Stabilized Construction Entrance	Ton

**END OF SECTION 02120**