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### Section 816. TURF ESTABLISHMENT

**816.01. Description.** This work consists of conducting soil tests, preparing the soil, and placing sod or seed and mulch to permanently stabilize disturbed areas as shown on the plans. Establish turf in accordance with this section, the MDOT SESC Manual, and as directed by the Engineer.

The following terms apply to this section.

**Mulch Anchor.** A glue type material sprayed over mulch to hold it in place.

**Broadleaf Weed.** Weeds described by the Engineer as target weeds controlled by spraying. Broadleaf weeds include, but are not limited to, dandelion, clovers, thistles, and ragweed,

**Compost.** A mature and stabilized, humus-like material derived from the aerobic decomposition of yard clippings, leaves, and brush with a diameter less than 4 inches.

**Dormant Seeding.** Seeding placed in late November and December when plant growth ends for the season. Seeds are placed on unfrozen ground and mulched to lie dormant over winter and germinate the following spring.

**Friable.** Easily crumbled or pulverized soil.

**Friable Condition.** Soil in a "friable condition" is a crumbled, pulverized, worked-up, loosened, or cultivated soil, free of lumps and clods detrimental to seeding and sodding operations.

**Humus.** A brown or black material formed by the decomposition of vegetable or animal matter. The organic portion of soil, essential to fertility.

**Hydroseeding.** Spraying seed combined with water onto the prepared seed bed.

**Muck.** Organic matter consisting of decomposed plant material accumulated under conditions of excessive moisture. If organic remains are not identifiable as plant form, it is considered muck.

**Mulch.** Material placed over seeding to improve germination by conserving moisture, moderating the soil temperature, and protecting the seed and soil from water and wind erosion.

**Peat.** Organic matter consisting of undecomposed or slightly decomposed plant material accumulated under conditions of

excessive moisture. If organic remains are identifiable as plant form, it is considered peat.

**Target Weed.** Weeds that the Engineer identifies for removal by spraying or other methods.

**816.02. Materials.** Provide materials in accordance with the following:

Compost .....	917
Topsoil .....	917
Fertilizer .....	917
Seed .....	917
Sod .....	917
Mulch .....	917
Mulch Anchoring .....	917
Mulch Netting .....	917
Mulch Blankets .....	917
Weed Control .....	917
Water .....	911

**816.03. Construction.**

A. **Topsoiling.** Before placing topsoil, prepare the foundation. Provide, place, and spread humus bearing topsoil, compost, or both. Use topsoil from within the project limits or from off-site sources.

1. **Preparation of Earth Bed.** Seven to ten days before preparing earth bed, including areas previously mulched or rye seeded for temporary erosion control, kill existing vegetation by spraying with the non-selective herbicide Glyphosate.

Construct the earth bed to the required grade and trim. Just before placing topsoil or compost, harrow all earth beds, including areas previously mulched or rye seeded for temporary erosion control, into a friable condition with a disk, a spring tooth drag or a spike tooth drag a minimum of 3 inches deep.

Leave horizontal soil impressions from equipment, across the face of the slope.

2. **Placing Topsoil.** Cover areas requiring seeding or sodding with topsoil, compost, or both, except for slopes constructed of topsoil, muck or peat.

Spread topsoil, compost, or both on the prepared areas at least 3 inches deep. Pulverize large clods and lumps. Rake out rocks with a diameter greater than 2 inches, roots, litter, and deleterious

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material. Dispose of raked out material in accordance with subsection 205.03.A.3 and subsection 205.03.P.

Incorporate topsoil and compost into the upper 2 inches of the conditioned earth bed. Do not work topsoil or compost if wet.

3. **Surplus Excavated Topsoil or Salvaged Topsoil.** The Engineer will direct stockpiling surplus excavated or salvaged topsoil within the right-of-way. Leave the stockpile with an aesthetically pleasing appearance, as approved by the Engineer.

**B. Chemical Fertilizer Nutrient.** Conduct soil tests to determine the need for fertilizer containing phosphorus. Provide and place fertilizer as indicated by soil tests.

In areas requiring sod, uniformly apply granular fertilizer before laying the sod.

Uniformly apply granular fertilizer, free of lumps, on the prepared seed and sod bed and incorporate into the upper 1 inch to 2 inches of the topsoil and compost by light disking or harrowing.

Apply the required class of fertilizer to the required locations at the following application rates:

1. For Class A fertilizer, evenly apply 228 pounds per acre on a prepared seed bed.
2. For Class B fertilizer, evenly apply 120 pounds per acre on a prepared seed bed.
3. For Class C fertilizer, evenly apply 80 pounds per acre on established turf.

If using the hydroseeding method, constantly agitate the seed-fertilizer mixture. Do not disk or harrow after placement. Apply fertilizer mixed with seed within 1 hour of mixing.

Remove excess fertilizer from impervious surfaces adjacent to prepared seed and sod beds by sweeping back into beds. Do not use water to flush excess fertilizer into storm drains or surface water.

**C. Seeding.** Obtain the Engineer's approval for topsoil placement prior to seeding. Provide each seed species selected from the Qualified Products List. Do not broadcast or hydroseed during windy conditions, or conditions that would prevent seed placement as required. Apply turf and specialty seed mixtures in accordance with the mix ratios and seeding rates in Table 816-1 and Table 816-2.

1. **Permanent Seeding.**

- a. **Sowing.** Harrow the topsoil or compost, at least 3 inches deep, immediately before seeding. Harrow using a disk, spring tooth drag, spike tooth drag, or other equipment, approved by the Engineer and designed to prepare the soil to a friable condition. Harrow horizontally, across the face of the slope. In areas requiring a Turf Loamy to Heavy (THM) seed mixture, grade the seed bed to a Class A slope as specified in subsection 205.03.N.

While the seed bed is in a friable condition, sow seed with or following the application of fertilizer. Sow seed before applying mulch. Sow or resow the seed mixture, providing uniform coverage, at the rate specified in Table 816-1 or Table 816-2.

Sow using mechanical drills, hydroseeders, or by broadcasting. In areas with 1:4 slopes, or flatter, use mechanical drills.

The Department will allow hydroseeding on slopes steeper than 1:4 provided the Engineer determines the seeding equipment is effective and attains required results.

Empty the hydroseeder tank within 1 hour of introducing the seed and fertilizer to the tank. Dispose of seed that remains in the tank mixed with water for longer than 1 hour.

Broadcast in areas requiring resowing, or in areas not accessible to a drill or hydroseeder.

The Engineer will visually inspect areas sown by broadcast or hydroseed for uniformity of application. Resow areas that do not have an average of two seeds per square inch, at no additional cost to the Department.

- b. **Setting the Seed.** Lightly compact or rake areas sown by hydroseed or broadcast methods to incorporate the seed into the top ½ inch of the topsoil. Immediately after setting the seed, mulch in accordance with subsection 816.03.E and subsection 816.03.F.

<b>Table 816-1 General Roadside Seed Mix Selection Guide</b>				
<b>Symbol for Turf Seed Mixture</b>	<b>Soil Type</b>	<b>General Location</b>	<b>Seed Rate</b>	<b>Salt Tolerance</b>
TDS (Turf Dry Sandy)	Dry sandy to sand loam	Rural or urban	220 lb/acre	Low to medium
THV (Turf Heavy Soil)	Heavy	Rural	220 lb/acre	Medium to high
TUF (Turf Urban Freeway)	All types	Urban freeways, blvds., service roads, city streets	220 lb/acre	Low to high
TGM (Turf Medium to Heavy Soil)	Medium to heavy	All	220 lb/acre	Low
THM (Turf Loamy to Heavy)	Loamy to heavy	Residential and business turf	220 lb/acre	Low to medium

<b>Table 816-2 Specialty Seed Mix Selection Guide</b>				
<b>Symbol for Seed Mixture</b>	<b>Soil Type</b>	<b>General Location</b>	<b>Seed Rate</b>	<b>Salt Tolerance</b>
<b>Mixture for Upland Areas</b>				
ES (Environmental Seeding)	All	Upland Areas	Table 917-1	N/A
<b>Temporary Seeding Mixtures</b>				
CR (Cereal Rye, <6 mos)	All	All	70 lb/acre	N/A
TSM 6/24 (Temporary seeding, 6–24 mos)	All	All	100 lb/acre	N/A
TSM 24+ (Temporary seeding, >24 mos)	All	All	200 lb/acre	N/A

2. **Temporary Seeding.** Obtain the Engineer's approval for temporary seeding. Place temporary seed only for erosion control or temporary soil stabilization. Do not temporarily seed slopes 1:3 or steeper after placing topsoil; permanently seed these slopes. Sow temporary seed in accordance with subsection 816.03.C.1. Before project completion, replace temporary seeding with permanent seeding as shown on the plans or directed by the Engineer.
3. **Dormant Seeding.** The Engineer will allow dormant seeding in limited areas. Obtain the Engineer's approval for dormant seeding. Dormant seed in accordance with subsection 816.03.C.1.

4. **Seasonal Limitations.**

- a. **Permanent Seeding.** Permanently seed the following locations during the specified periods:
  - i. Southern Lower Peninsula. South of the north boundary of Township 20 North; April 15 through October 10.
  - ii. Northern Lower Peninsula. North of the north boundary of Township 20 North; May 1 through October 1.
  - iii. Upper Peninsula. May 1 through September 20.
- b. **Dormant Seeding.** Dormant seed the following locations during the specified periods:
  - i. Southern Lower Peninsula. South of the north boundary of Township 20 North; after November 15, but not on frozen ground.
  - ii. Upper Peninsula and Northern Lower Peninsula. North of the north boundary of Township 20 North; after November 1, but not on frozen ground.
- c. **Temporary Seeding.** Temporary seed in accordance with the seasonal limitations specified in subsection 816.03.C.4.a.

5. **Inspection.** The Engineer will inspect the seeded turf to ensure the end product is well established, weed free, growing, vigorous, and contains the species required by the seeding mixture.

The Engineer will approve slopes as the Contractor completes permanent restoration on cut slopes, embankment slopes, or portions of slopes. The Engineer will consider each cut or embankment slope, on each side of the roadway, separately for approval.

If the Engineer requires weed control, complete work in accordance with subsection 816.03.J. If using hay mulch, provide weed control at no additional cost to the Department.

- D. **Sodding.** Prepare the topsoil surface, provide and place the sod, and dispose of surplus material. Grade areas required for sodding to Class A slopes in accordance with subsection 205.03.N.

Immediately before laying sod, harrow the topsoil, at least 3 inches deep using a disk, spring tooth drag, spike tooth drag, or other equipment designed to condition the soil. Obtain the Engineer's approval for harrowing equipment. Harrow horizontally across the face of slopes.

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Dampen the earth bed before laying the sod. Water the sod immediately after placement, in accordance with subsection 816.03.I. The Engineer will reject sod that has dried out.

Protect sod until placement. Lay sod within 24 hours after cutting. Do not handle sod with pitch forks, or dump from vehicles. Do not place frozen sod, or place sod on frozen soil. Unless otherwise approved by the Engineer, do not place sod in June, July, or August.

Place sod as shown on Standard Plan R-100 Series. Stagger the transverse joints of the sod strips and lay parallel to the flow of water on slopes and in ditches. Place strips with tight joints. Lay sod starting at the base of the slope and work up the slope. Turn edges of sodded areas into the ground and cover with a layer of earth or shoulder material. Compact this material to allow the surface water to flow over the edge of the sod. Butt the edges of sod firmly against, and level with, paved surfaces.

Work from ladders or treaded planks if necessary to prevent the displacement of sod during sodding operations. Compact sod by tamping immediately after placement. Tamp to a smooth, even surface free of bumps and depressions. If Class A slopes are required, finish the sodded surface to a lawn-like appearance. On slopes steeper than 1:3, use wooden pegs to secure the sod. Space pegs no greater than 2 feet apart and drive flush with the sod surface.

**E. Mulching.** Provide, spread, and anchor mulch material. Place mulch within one calendar day after seeding.

Do not mulch during winds that prevent placement and anchoring of the mulch.

Place mulch to allow sunlight to penetrate and air to circulate, but thick enough to shade the ground, conserve soil moisture, and prevent or reduce water and wind erosion.

Spread mulch over the surface to a uniform thickness with an application rate of 2 tons per acre. If the Engineer allows dormant seeding, spread the mulch with an application rate of 3 tons per acre. After seed germinates and turf is established, apply herbicide in accordance with subsection 816.03.J. Apply herbicide to hay mulch at no additional cost to the Department.

Maintain the mulched areas and repair areas damaged by erosion, traffic, fire, or other causes, before partial or final acceptance. Replace displaced mulch. Repair or replace damaged mulch areas at no

additional cost to the Department, unless otherwise provided by subsection 107.11 or section 208.

Replace and anchor mulch that blows away or becomes displaced, for reasons attributable to the Contractor, as directed by the Engineer and at no additional cost to the Department.

**F. Mulch Anchoring.** Provide a mulch anchoring material selected from the Qualified Products List. Spray mulch anchoring immediately after placing mulch. Do not spray if wind prevents the required placement of adhesive. Protect traffic, signs, structures, and other objects from the tackifier material. Immediately remove overspray.

Mix and apply latex base, recycled newsprint, wood fiber, guar gum, and other mulch tackifier material as follows:

1. **Latex-Base.** Mix 15 gallons of adhesive, or the manufacturer's recommended adhesive volume, whichever is greater, with at least 250 pounds of recycled newsprint and 375 gallons of water.
2. **Recycled Newsprint.** Mix 750 pounds of recycled newsprint with 1,500 gallons of water.
3. **Wood Fiber.** Mix 750 pounds of wood fiber with 1,500 gallons of water.
4. **Guar Gum.** Mix 50 pounds of dry adhesive and at least 250 pounds of recycled newsprint with 1,300 gallons of water.
5. **Other Tackifiers.** Mix 100 pounds of dry adhesive, or the manufacturer's recommended adhesive volume, whichever is greater, with at least 250 pounds of recycled newsprint and 1,300 gallons of water.

**G. Mulching Netting.** Place netting over mulch and secure with net anchors.

Spread the netting over the mulch, allowing work space between adjacent widths. Then, pull the edges of adjacent widths together and hold in place with net anchors. Space net anchors no greater than 2½ feet apart along the edges, joints, and centerline of the net, in accordance with the manufacturer's recommendation. Do not place the netting in direct contact with the ground. Butt the ends of each width of netting together and hold in place using net anchors at each corner and at the center of the netting.

Do not allow foot traffic or equipment over the netting after placement, except for repair work. Replace torn or damaged netting.

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If using dormant seeding methods, apply mulch netting in addition to the mulch adhesive, at no additional cost to the Department.

H. **Mulch Blankets.** Provide, install, and anchor mulch blankets. Provide mulch blankets selected from the Qualified Products List. Place mulch blankets within one calendar day after seeding. Secure with net anchors. Place and anchor blankets in accordance with the minimum requirements specified in this subsection or the manufacturer's specifications, whichever is greater.

Overlap blanket edges by 2 inches and shingle lap blanket ends with a 6-inch overlap. Place net anchors along joint edges and blanket centerlines no greater than 2 feet apart. In waterways, shingle lap blankets with an overlap of 12 inches on the downslope edge. Place blankets on backslopes perpendicular to the roadbed. On foreslopes, lay the first strip adjacent to the road, parallel to the road. Lay the remainder of the strips on foreslopes parallel or perpendicular to the road. If installing blankets from the top of the slope, do not allow them to free fall down the slope.

1. **High Velocity Blankets.** Use high velocity blankets on slopes of 1:2 or steeper and on ditch bottoms, including 12 inches up the front and back slopes.

The Contractor may substitute high velocity blankets for mulch blankets at no additional cost to the Department.

2. **Mulch Blankets.** Use mulch blankets on slopes of less than 1:2, next to shoulders, and behind curbs. Place mulch blankets with the netting on top and mulch fibers contacting the soil.

The Contractor may only use mulch blankets on ditch bottoms with ditch gradients no greater than 1.5 percent.

- I. **Water.** Provide and apply water to sodded and seeded areas at the required rates. The Engineer may require additional watering based on the season and weather conditions.

1. **Sod.**
  - a. Water the earth bed with at least 3½ gallons per square yard before laying the sod;
  - b. Apply at least 27 gallons per square yard after placing the sod;
  - c. Apply an additional 6 gallons per square yard within 8 hours after placing the sod; and
  - d. Apply 3½ gallons per square yard of sod, five times at three to four day intervals.

2. **Seed.**

- a. Water seeded areas, at 3½ gallons per square yard, as determined by the Engineer; and
- b. Continue watering regularly to prevent seeds and seedlings from drying out.

J. **Weed Control.** Provide and apply herbicides as directed by the Engineer. Submit the name and application rate of the herbicide to the Engineer, and obtain the Engineer's approval before applying.

To apply herbicides, use a commercial herbicide applicator, licensed in the State of Michigan, and certified by the Michigan Department of Agriculture in the required category. Use application procedures and materials in accordance with federal, state, and local regulations.

Before spraying, allow inspection of, and obtain the Engineer's approval for, the spraying equipment. Demonstrate to the Engineer that equipment and operators can apply an even and controlled layer of herbicide within the required target area. Use equipment that meets federal, state, and local safety requirements.

Spray target weeds in the newly seeded turf after the new turfgrass is established and will withstand herbicide application.

Control target weeds from 14 days to 21 days after spraying. Apply additional weed control if the first application fails.

Preserve and protect property adjacent to the roadway or work area from injury. Repair damage arising from acts or omissions in the performance of the work, at no additional cost to the Department.

**816.04. Measurement and Payment.**

<b>Pay Item</b>	<b>Pay Unit</b>
Compost Surface, Furn, LM .....	Cubic Yard
Compost Surface, Furn, __ inch.....	Square Yard
Topsoil Surface, Salv, LM.....	Cubic Yard
Topsoil Surface, Salv, __ inch .....	Square Yard
Topsoil Surface, Furn, LM .....	Cubic Yard
Topsoil Surface, Furn, __ inch .....	Square Yard
Fertilizer, Chemical Nutrient, Cl __ .....	Pound
Seeding, Mixture __ .....	Pound
Sodding.....	Square Yard
Mulch .....	Square Yard
Mulch Anchoring.....	Square Yard
Mulch Netting.....	Square Yard
Mulch Blanket .....	Square Yard

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Mulch Blanket, High Velocity .....	Square Yard
Water, Sodding/Seeding.....	Unit
Weed Control.....	Acre

A. **Compost.** The Engineer will measure **Compost Surface, Furn LM**, at the source, before hauling to the project.

The Engineer will measure **Compost Surface, Furn, \_\_ inch** in place.

B. **Topsoil.** The Engineer will measure **Topsoil Surface, Salv, LM** at the source, before placement at the final location.

The Engineer will measure **Topsoil Surface, Salv, \_\_ inch** in place.

The Engineer will measure **Topsoil Surface, Furn, LM**, at the source, before hauling to the project.

The Engineer will measure **Topsoil Surface, Furn, \_\_ inch** in place.

C. **Fertilizer, Chemical Nutrient.** The Engineer will measure **Fertilizer, Chemical Nutrient, CI \_\_**, of the type required, by the weight of nutrient in the fertilizer. The Engineer will determine the weight of chemical fertilizer nutrient for payment using the following formula:

$$T = W \times \sum N \qquad \text{Formula 816-1}$$

where:

$T$  = The weight of chemical fertilizer nutrients applied,

$W$  = Total fertilizer weight applied, and

$N$  = The percentages of nutrients contained in the fertilizer used.

The unit price for **Fertilizer, Chemical Nutrient, CI \_\_** includes the cost of conducting soil test to determine need for phosphorus before applying fertilizer.

D. **Sod.** The Engineer will measure **Sodding** in place.

E. **Mulching Material.** The Engineer will measure the following types of **Mulch Blanket** in place:

1. Excelsior mulch blankets,
2. Straw mulch blankets,
3. High velocity excelsior mulch blanket, and
4. High velocity straw mulch blanket.

For straw mulch, marsh hay mulch, or hay mulch, provide the Engineer with tickets, in triplicate, at the time of delivery, showing the number of

bales and weight of each load. Weigh the mulch on scales in accordance with subsection 101.04.F and subsection 109.01.B.6.

The unit price for **Mulch** includes providing and spreading straw mulch, or marsh hay mulch, at the rate shown on the plans. The Department will not make adjustments if the Engineer allows the use of hay. If the Engineer allows dormant seeding, the Department will pay for mulching it at 1.5 times the unit price for **Mulch**.

The unit price for **Mulch Blanket, High Velocity** includes the cost of providing, placing, and anchoring the blankets.

The unit price for **Mulch Blanket** includes the cost of providing, placing, and anchoring the blankets. If the Contractor substitutes **Mulch Blanket, High Velocity** for **Mulch Blanket**, the Department will pay for the substitution at the unit price for **Mulch Blanket**.

The Engineer will measure **Mulch Anchoring** in place. The unit price for **Mulch Anchoring** includes the cost of providing and spraying the tackifier.

The Engineer will measure **Mulch Netting** in place. The unit price for **Mulch Netting** includes the cost of providing, placing, and anchoring netting.

F. **Water, Sodding and Seeding.** The Engineer will measure **Water Seeding/Sodding** in units; each unit is equal to 1,000 gallons.

G. **Weed Control.** The Engineer will measure **Weed Control** in place.

H. **Seeding, Mixture.** The Engineer will measure **Seeding Mixture** of the type required, in pounds of seed applied.