

## CHAPTER 200 – SOILS

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## **SECTION 201 – CLEARING AND GRUBBING**

### **201.01 GENERAL**

This work consists of clearing, grubbing, removing, and disposing of all vegetation and debris within the limits of construction, except those objects that are designated to remain or are to be removed under other Pay Items.

### **201.02 PRECONSTRUCTION CONSIDERATIONS**

#### **A. Preconstruction Meeting**

Together with the Contractor's superintendent, conduct a thorough field check of all areas that require clearing and grubbing. Topics for discussion include the following:

- Method of stake out control.
- Special conditions in the right-of-way agreements, Special Provisions, and Plans that could affect clearing and grubbing operations. These details could include trees to be saved, stakes and survey control points to be preserved, and known utilities that could be damaged during clearing operations.
- Method of identifying objects to remain.
- Acceptable temporary stockpile storage locations.
- Ensure that the Contractor provides a copy of the Notice of Intent (NOI) that they submitted to the Oklahoma Department of Environmental Quality (DEQ). Emphasize that earth-disturbing activities are not to begin until a copy of the Authorization to Discharge permit issued by the DEQ has been given to the Resident Engineer for inclusion in the Project file.
- Other required submittals, such as offsite disposal agreements.
- Contractor's schedule/plan for the work, including the placement of temporary erosion and sediment control measures.

#### **B. Acceptance of Materials**

None Required.

#### **C. Preparatory Work and Contractor Work Plans**

##### **1. Survey and Staking**

Before allowing the Contractor to begin clearing and grubbing operations, verify that the Contractor has established and staked the limits of clearing in accordance with the Plans.

##### **2. Identifying Objects Designated to Remain**

**Section 201.04.C** of the Standard Specifications provides for preserving areas that will not interfere with construction. Mark trees and shrubs that are to remain in a distinguishable manner. Inform the Contractor of the identification method used.

Refer to the Plans to identify those trees and shrubs that should be saved. In addition, use judgment in the field with regard to trees near the top of high cut slopes that may become a traffic hazard or threaten the stability of the slopes if they remain. Similarly, trees at the bottom of fill slopes may also require removal beyond the slope limits if the Contract does not include tree wells or similar provisions for protecting them from silt and mud deposition.

Another point to consider when determining whether or not to leave a tree in place is the tree's health and condition. As an example, a larger tree, which at the time is a good shade tree or a desirable looking tree may be at the age when decay is setting in. It is often better to consider cutting the larger tree and leaving a smaller one that has a longer life expectancy.

### **3. Contractor Work Plans**

The Standard Specifications do not require formal submittals for this work. Equipment and methods are generally left to the Contractor's discretion. However, if the Contractor chooses to dispose of debris removed during the clearing and grubbing operation by either burning, disposing offsite, or both, it is necessary to verify that the Contractor has obtained the required permits or agreements.

#### **(a) Open Burning**

If the Contractor's disposal plan includes open burning, check that the Contractor has obtained the required permits and releases from the applicable governmental agencies and fire marshal having jurisdiction over the area.

#### **(b) Offsite Disposal**

If, instead of, or in addition to, open burning, the Contractor plans to dispose of materials outside the right-of-way limits, ensure that the Contractor will dispose of the debris in a landfill approved for fill materials of this type or, if on private property, in accordance with a written agreement with the property owner. In the case of the latter, require the Contractor to submit a copy of the written agreement with the property owner. The agreement will primarily serve as written permission from the owner to the Contractor for using the land for the intended purpose. The terms and conditions of such an agreement will typically define acceptable and unacceptable uses of the property and the manner in which the owner will indicate it is satisfied with the Contractor's restoration and cleanup. Representatives of the Contractor and the property owner, not Department personnel, sign the agreement.

Written permission from the property owner does not automatically mean Department approval. Prior to approving such offsite disposal areas,

ensure that the Contractor's disposal plan includes the following, as applicable:

- A satisfactory erosion and sedimentation control plan.
- An approved storm water (Authorization to Discharge) permit.
- US Army Corps of Engineers (USACE) clearance or permit if wetlands are impacted.
- Historical and archaeological clearances from State Historical Preservation Officer.
- Professional biologist report indicating no impact to threatened or endangered species.
- An indication that the disposal area is not in a location that will present an unsightly appearance to the Project.
- An explanation of how the disposal area will not present future maintenance problems for the Department.

#### **D. Safety and Environmental Issues**

Ensure that erosion and sediment control installations are complete and in accordance with the Plans and Specifications before allowing the Contractor to proceed with clearing and grubbing operations. Review **Sections 220** and **221** of the Standard Specifications and this Construction Manual for information related to erosion and sedimentation control.

### **201.03 INSPECTION GUIDELINES DURING CONSTRUCTION**

#### **A. Acceptance of Materials**

None Required.

#### **B. Equipment and Methods**

The choice of equipment and methods for this work is usually left to the Contractor. Typical equipment includes power saws and bulldozers equipped with clearing forks or grubbing forks.

Do not allow the Contractor to use equipment and methods near structures that are to remain if such equipment and methods could damage the structure (for example, use of explosives in congested areas). Similarly, do not allow the Contractor to continue to use equipment that yields poor results or delays progress.

## **C. Construction Operations**

### **1. Clearing and Removing Materials**

Before allowing the Contractor to begin clearing operations, ensure that the Contractor has received the Authorization to Discharge permit from the DEQ and has placed temporary erosion and sediment control measures. Obtain a copy of the permit for the Department's Project file.

Ensure that the Contractor removes trees, stumps, and large roots from excavation areas to a depth that satisfies the Specifications and that will prevent objectionable material from mixing with the select material being incorporated into the embankment.

Excavation areas will normally require scalping to remove small bushes, vegetation, rubbish, and other objectionable material. In addition, areas of heavy timber, undergrowth, and small trees may require root raking to remove the majority of the roots left in the ground after the aboveground portions are cleared. Verify that the Contractor's root rake sufficiently removes debris from topsoil that is to be salvaged according to [Section 205](#) of the Standard Specifications.

### **2. Disposing of Materials**

The Contractor should completely dispose of all tree and plant growth removed during clearing and grubbing. Note that timber removed from the Project may be, all or in part, of merchantable quality. Merchantable timber is not distinguished from other timber and becomes the property of the Contractor unless otherwise specified.

Possible methods of disposing of debris include chipping, burning, and disposing outside the right-of-way.

#### **(a) Chipping**

Chipping is an acceptable method for disposing of clearing and grubbing debris. The chipping equipment usually loads the chips directly into a truck for removal.

If the chips are to temporarily remain on the Project site, ensure that the Contractor coordinates the stockpile location with other work, subcontractors, and utilities. Chip piles should never remain for an extended period of time because the piles can self-ignite and may cause damage to adjacent properties.

#### **(b) Burning**

Become familiar with all State and local fire ordinances and regulations in the area where the Project is located. The DEQ and Department of

Agriculture have firm regulations regarding open burning. The Contractor must obtain approval from both of these offices before burning timber. The following instructions are to be used only to the extent that they do not conflict with the stated regulations and permits.

In areas that do not prohibit burning and where smoke will not present a problem, the Contractor may burn combustible materials such as trees, limbs, stumps, and brush within the limits of construction. The Contractor should provide competent watchmen to ensure that the burning will not injure anything designated to remain in the right-of-way, such as surrounding timber, grassland, and other adjacent property. The Contractor should notify the State Fire Marshall prior to performing considerable burning operations. Ensure that the Contractor understands and complies with all restrictions imposed by the Fire Marshall related to the manner and timing of the burning.

**(c) Disposing of Material Outside the Right-of-Way**

Allow the Contractor to only use private property outside the right-of-way for debris disposal if the Department has reviewed the Contractor's written agreement with the property owner and has no objections to the Contractor's disposal plan. See [Section 201.02.C.3\(b\)](#) of this Manual for additional information related to offsite disposal requirements.

**3. Preserving Objects Designated to Remain**

During clearing and grubbing and other construction operations, the Contractor must take precautionary measures to protect objects designated to remain in place. These objects may include trees, shrubs, survey or historical markers, objects of historical or archaeological value, and others. Clearly marking such objects as described in [Section 201.02.C.2](#) of this Manual and making the Contractor aware of their location will help ensure the preservation of these objects.

It may be necessary for the Contractor to remove low hanging and unsound or unsightly limbs from those trees that remain in place. The Contractor should perform this work in a manner that will not damage the remainder of the tree. Branches of trees extending over the roadbed should be trimmed to give a clear height of 20 feet above the road surface. The Contractor should perform this work using skilled workers and in accordance with good tree surgery practice.

**4. Protecting and Preserving Adjacent Property**

The Contractor must protect and preserve not only the designated items and areas within the right-of-way, but also the natural growth and man-made improvements on adjacent properties. Where damage occurs due to the Contractor's negligence, the Contractor is solely responsible for correcting the damage.

Allow the Contractor to determine the method by which it will protect and preserve designated items and areas, provided the chosen method is reasonable and consistent with the Plans and Specifications and good construction practice.

Emphasize to the Contractor the need to protect and preserve all alignment stakes, grade stakes, guard stakes, boundary markers, benchmarks, tie points, and other similar items during construction. When the Resident Engineer determines such items are no longer needed, inform the Contractor that they may be removed or destroyed.

## **5. Selective Clearing**

The Contractor will usually be required to perform selective clearing outside of the construction limits. This work consists of removing dead, diseased, and undesirable trees and shrubs. Use the guidelines provided in [Section 201.02.C.2](#) of this Manual to help determine which trees should be considered undesirable.

Stumps outside the construction limits may remain if they are cut off as near as possible to the ground line and treated with a Department-approved herbicide. The treatment of these stumps will prevent re-growth and minimize contamination of the dead wood by borers and other insects. Following this procedure will lessen the possible spreading of such infestation to adjoining property. Natural ground cover should be protected as far as practical to minimize siltation to adjoining property.

## **6. Maintaining the Ground Surface**

Ensure that the Contractor backfills and compacts stump holes or depressions left by the removal of stumps in accordance with [Section 202.04](#) of the Standard Specifications.

# **D. Safety and Environmental Considerations**

## **1. Erosion and Sediment Control**

Do not allow the Contractor to expose an area of erodible soil that exceeds the limits of the Plans and Specifications. Frequently inspect construction operations to check that the Contractor logically sequences activities to minimize potential damage to earthwork during heavy rains. The cleared areas may also require blading to provide positive drainage.

See Sections [220](#) and [221](#) of this Manual for additional information on erosion and sediment control.

## **2. Tall Timbered Areas**

Clearing and grubbing operations, particularly in dense, tall timbered regions, can be very dangerous. Ensure that the Contractor's operation does not endanger



those working in the area, does not result in potential hazards to the traveling public, and does not damage existing facilities in, or adjacent to, the right-of-way.

Extremely tall timber demands extra care and the proper equipment to get it on the ground without damage to surrounding property. Both Department personnel and the Contractor must wear the proper safety equipment, including hard hats and eye and ear protection, during this work.

### **3. Burning**

Contractors frequently choose to burn combustible debris within the right-of-way. The Contractor is solely responsible for the careful control of such operations. Left unattended or performed improperly, open-air burning of combustible materials can quickly develop into wildfires outside the right-of-way. Consider the following guidelines when inspecting the Contractor's burning operation:

- Legal Issues: Check that the Contractor's burning operation is performed in accordance with the Specifications and the applicable laws, ordinances, regulations, and provisions of the DEQ.
- Fire Fighting Equipment: Check to make sure that the Contractor has adequate fire fighting equipment readily available.
- Watchmen: Ensure that the Contractor provides adequate watchmen to control the spread of fire.
- Location: Visually inspect to ensure that the Contractor is burning debris on the right-of-way and in a location that will prevent the spread of fire to adjacent timber or other combustible materials.
- Utilities: Do not allow the Contractor to burn materials near overhead utility lines. Also, give consideration to the type and depth of existing underground utility facilities (for example, gas lines).
- Preparation of Area: Inspect the burning operation to make sure the Contractor properly prepares and cleans the surrounding area of combustible debris.
- Pile Size: Where it is apparently advisable for better control, inform the Contractor to use chippers to reduce the size of burn piles.
- Unfavorable Conditions: In high winds or very dry conditions, halt burning operations until more favorable weather and ground moisture conditions exist.
- Verify that the Contractor douses smoldering embers to prevent rekindling by high winds.

## **E. Documentation**

### **1. Daily Work Report**

Address the following items, as appropriate, on the Daily Work Report:

- Limits in which work was accomplished for that day.
- Damage to private property caused by the Contractor's equipment or operations and the actions taken.

- Final disposition of salvable materials (e.g., merchantable timber).
- The inspection of clearing and grubbing operations also provides an excellent opportunity to observe and record, by station number, areas that appear to be unusually soft, spongy, or contain other evidence of unsatisfactory material, seeps, or other conditions that may require corrective measures.

## **2. Measurement and Payment**

Document this Lump Sum item within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

- a. Select the Clearing and Grubbing pay item from the list of Contract pay items.
- b. In the appropriate field, enter either a descriptive location or the station-to-station extents, preferably both.
- c. In the Placed Quantity field, enter an estimated percentage of the lump sum item completed, ensuring that the total quantity to date does not exceed 1.00 Lump Sum.

## **201.04 POST-CONSTRUCTION CONSIDERATIONS**

### **A. Acceptance of Materials**

None Required.

### **B. Audit Requirements**

Use the Contract Item Work Report within SiteManager to verify that the correct quantities have been placed and paid. Payment for this item must equal 1.00 Lump Sum. Add link for screen shot of the Report, SSS Database, etc.

### **C. Protection of the Work**

A newly cleared site is vulnerable to erosion. Check the Storm Water Pollution Prevention Plan (SWPPP) and the provisions of the Contract related to the best management practices required for erosion and sedimentation control. See Sections [220](#) and [221](#) of this Manual for additional information.

## CHECKLIST – CLEARING AND GRUBBING

<b>Part 1: Preconstruction</b>					
<b>Issue</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comments</b>	<b>Initials</b>
Are the limits of clearing and grubbing clearly marked?					
Have general clearing and disposal procedures been discussed with the Contractor?					
Have all trees, shrubs, survey or historical markers, objects of historical or archeological value, or other objects that are to be preserved or remain in place, been clearly marked?					
Has the Contractor been advised of the location of, and method used to identify, all trees, shrubs, survey or historical markers, objects of historical or archeological value, or other objects that are to remain in place?					
Has the Contractor provided copies of the NOI submitted to the DEQ and the Authorization to Discharge permit obtained from DEQ for the Department's Project file?					
Is the Contractor implementing the necessary erosion control requirements?					
Has the Contractor made proper arrangements to dispose of trees and other waste material?					
Has the Contractor obtained written permission from property owners if planning to dispose of materials and debris offsite?					

<b>Part 2: During Construction</b>					
<b>Issue</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comments</b>	<b>Initials</b>
Is the Contractor performing clearing and grubbing within the required limits?					
Is the Contractor disposing of timber in accordance with the Plans and Specifications?					

**Part 2: During Construction**

Issue	Yes	No	N/A	Comments	Initials
Is the amount of exposed erodible earth within the limit specified in the Plans and Specifications?					
Have sufficient erosion control measures been installed?					
If burning will be performed, has the Contractor obtained permits and submitted fire prevention plans, if required?					
If debris is being disposed of outside of the right-of-way, does the Contractor have proper authority for this disposal area from the property owner and the Resident Engineer?					
Has clearing and grubbing of additional right-of-way easements not shown on the Plans been approved in writing?					
Has the Resident Engineer been advised of possible soft or spongy materials, seeps or other unsatisfactory materials?					

**Part 3: Post-Construction**

Issue	Yes	No	N/A	Comments	Initials
Do changes to the clearing limits require adjustments to the lump sum payment?					
Has sufficient clearing and grubbing been performed to allow the Contractor to proceed with grading operations?					
Has the Contractor taken adequate precautions to protect the cleared areas from erosion?					
Has the Contractor backfilled and compacted stump holes and depressions created by the removal of stumps?					

## **SECTION 202 – EARTHWORK**

### **202.01 GENERAL**

This work consists of excavating material and constructing embankments.

### **202.02 PRECONSTRUCTION CONSIDERATIONS**

#### **A. Preconstruction Meeting**

Discuss the following at the Preconstruction Meeting:

- Limits of construction and Contractor's schedule for construction staking.
- Location and legal description of Contractor's proposed borrow pits or other off-site facilities.
- Location of known existing features, such as utilities, stakes and survey monuments, and other objects designated to remain that could be damaged during construction.
- Schedule and status of remaining utility relocations.
- Environmentally sensitive areas, such as wetlands, animal habitats, hazardous waste sites, historical sites, and archaeological and paleontological sites.
- Salvageable materials.
- Contractor's responsibility to submit a copy of the Notice of Intent (NOI) that they submitted to the Oklahoma Department of Environmental Quality (DEQ). Emphasize that earth-disturbing activities are not to begin until a copy of the Authorization to Discharge permit issued by the DEQ has been given to the Resident Engineer for inclusion in the Project file.
- Contractor's schedule/plan for the work, including the placement of temporary erosion and sediment control measures.
- Stockpile areas.

#### **B. Acceptance of Materials**

As soon as practical, obtain sufficient samples of the excavation, embankment, and borrow materials that the Contractor will use to construct the roadway. Perform applicable tests on these materials to determine:

- Soil classification: AASHTO M 145.
- Maximum density and optimum moisture (proctor): AASHTO T 99 or T 180.

When reporting the maximum density, provide a physical description of the soil to help the inspector determine the proctor to be used when measuring roadway compaction.

## **C. Preparatory Work and Contractor Work Plans**

### **1. Staking of Limits of Construction and Other Critical Areas**

#### **(a) Limits of Construction / Slope Stakes**

Verify that the limits of construction have been properly staked. The limits of construction define the area in which construction personnel and equipment may operate. Verify that slope stakes set by the Contractor to establish the grading extremities and to guide the grading work itself meet the lines and grades of the Typical Sections in the Project Plans. Slope stakes must be set at the top of the slope in cuts and at the toe of slopes in fills, on both sides of the roadway opposite each offset stake. The stakes must be set in accordance with the cross-section template and the construction staking item.

A simple rule of thumb in verifying slope stakes is that if the elevation given in the cross-section for the slope stake catch point for the tie to natural ground does not match the actual natural ground elevation at that point, then there may be a possible error in the cross-section elevations. When the design cross-sections are based on aerial survey flight data, occasionally a uniform elevation error will exist throughout the whole flight based on an incorrect tie to natural ground in the flight data, i.e. - if the flight elevations were to tie to the top of grass growing 6 inches above natural ground, a 6-inch elevation error could carry throughout the entire set of cross-sections. Then, as slope stakes are set in the field, the catch point elevation would be consistently 6 inches above natural ground, and the earthwork quantities would have to be corrected to account for the error.

#### **(b) Environmentally Sensitive Areas**

The following areas, if identified as part of a Site Investigation or Environmental Assessment, should be staked or otherwise clearly delineated:

- Historical sites and markers;
- Archaeological and paleontological sites;
- Hazardous waste locations; and
- Wetland areas and animal habitats.

Emphasize to the Contractor the importance of preserving stakes and other markings until they are no longer necessary.

## **2. Access to Private Property**

Construction operations must not encroach upon private property without the written permission of the property owner. Discuss with owners of adjacent property the location of construction entrances and service roads.

Use of private property is allowed only through written agreement between the land owner and Contractor. This agreement will define the limits of access, allowed use (e.g., disposal or borrow source), and restoration requirements. The Contractor must submit a copy of this agreement before using private property.

## **3. Utilities**

The Contractor is responsible for notifying utility companies and requesting that utilities be located prior to commencing work. Operators of underground utilities can be notified by calling the Oklahoma One Call system telephone number (1-800-522-OKIE).

## **4. Clearing and Grubbing**

Verify that the site has been properly cleared and grubbed (see [Section 201](#) of this Manual) before allowing the Contractor to perform subsequent earthwork operations.

## **5. Use of Explosives**

If the Contractor intends to remove rock through the use of explosives, a blasting plan and applicable permits should be submitted to the Resident Engineer at least two weeks before the intended work. This plan should address the experience and qualifications of the blasting specialists, storage of explosives, pattern and station limits of proposed shots, distance to critical structures, notification of adjacent property and utility owners, and similar information.

# **D. Safety and Environmental Issues**

## **1. Erosion and Sediment Control**

Ensure that all erosion and sediment control installations are complete and in accordance with the Plans and Specifications, and that the Contractor has submitted a copy of the DEQ Authorization to Discharge permit to the Resident Engineer before allowing the Contractor to proceed with earth-disturbing operations.

## **2. Nuclear Density Gauge Testing**

The Standard Specifications require measurement of in-place field density and soil moisture using a nuclear density gauge according to AASHTO T 310. Because nuclear density gauges contain radioactive material, they are subject to

the control and regulation of the Nuclear Regulatory Commission (NRC). Ensure that nuclear gauge operators are NRC-certified and follow safety procedures regarding handling, storage, and use of the device.

## **202.03 INSPECTION GUIDELINES DURING CONSTRUCTION**

### **A. Acceptance of Materials**

As the Contractor excavates, hauls, and compacts material that will be incorporated into the work, be observant of any visible changes that could warrant the use of a different proctor or additional sampling and testing.

If the Contract requires chemical subgrade treatment, a soil classification test will be required to determine the appropriate type and percentage of chemical to be used. Additionally, care should be taken in the western part of the State to avoid placing chemical additives in sulfate-containing soils. The obvious presence of gypsum is a good indication of sulfate soils.

When the Contractor is excavating roadway sections, be observant of areas that exhibit signs of underground water (springs, seepage, cattails, willows, etc.) that could possibly require the installation of underdrains. Contact the Materials Division to request a seepage investigation.

Conduct density tests as required to ensure the Contractor's conformance with compaction requirements. During construction of roadway embankment, visually observe areas that exhibit signs of unstable material (pumping subgrade under wheel load, obviously wet or saturated material, etc.). If the embankment fails to meet density or visual requirements, the Contractor must take corrective actions.

Perform applicable tests on these materials to determine:

- Compaction of embankment: AASHTO T 310. [Document in Template C95001].

If visible changes occur in the material, perform the following tests:

- Soil classification: AASHTO M 145.
- Maximum density and optimum moisture (proctor): AASHTO T 99 or T 180.
- Compaction of embankment: AASHTO T 310. [Document in Template C95001].
- Soluble sulfate content in soil: OHD L-49.

### **B. Equipment and Methods**

Before embankment operations begin, the Contractor should bring certain equipment onsite. This includes adequate water trucks, hauling equipment, disc, and compaction equipment suitable for the type of soils being used (e.g., steel-wheel for granular material and sheep foot for clayey material).



Verify that the Contractor provides a water source and watering equipment of sufficient capacity to ensure proper moisture content and compaction of the material being worked.

The Contractor should have equipment onsite to properly manipulate and compact the material to achieve uniformity in the material and moisture content. The Contractor could use a motor grader, tractor with disc and sheep foot, etc. to accomplish this.

### **1. Fine-Grained Materials**

Generally speaking, earth embankments with enough plasticity index to allow the material to ball up in your fist are best compacted by use of a sheep foot roller in combination with a pneumatic roller. When rolling first begins with the sheep foot roller, you will notice a line in the surface of the fill section created by the outside edge of the roller drum as it cuts into the embankment material. As proper compaction is achieved by the sheep foot roller, the line marks will no longer be created by the outside edge of the roller drum because the sheep foot roller will have “walked itself out” of the embankment material, and the roller will be walking on the nubs of the sheep foot such that the outside edges of the roller drum no longer touch or cut a line into the lift being compacted.

### **2. Granular Materials**

Generally speaking, sandy materials are best compacted by flooding, vibration, or a combination of the two. A vibrating flat steel drum roller combined with water achieves the best results.

### **3. Rock**

“Header banking” is a construction technique whereby rock is end dumped near the edge of the lift being constructed, such that a dozer can then push the rock embankment forward to extend the lift longitudinally. The dozer then provides consolidation for the rock embankment as the header banking process continues to extend the lift longitudinally.

As a rule of thumb, the larger the rock size, the more water that is needed to ensure spalls and earthen material washes into the voids between the large rocks. When constructing rock embankment, the Contractor is to use the equipment indicated in [Section 202.04.A\(5\)\(b\)\(1\)](#) of the Standard Specifications.

## COMPACTOR TYPES

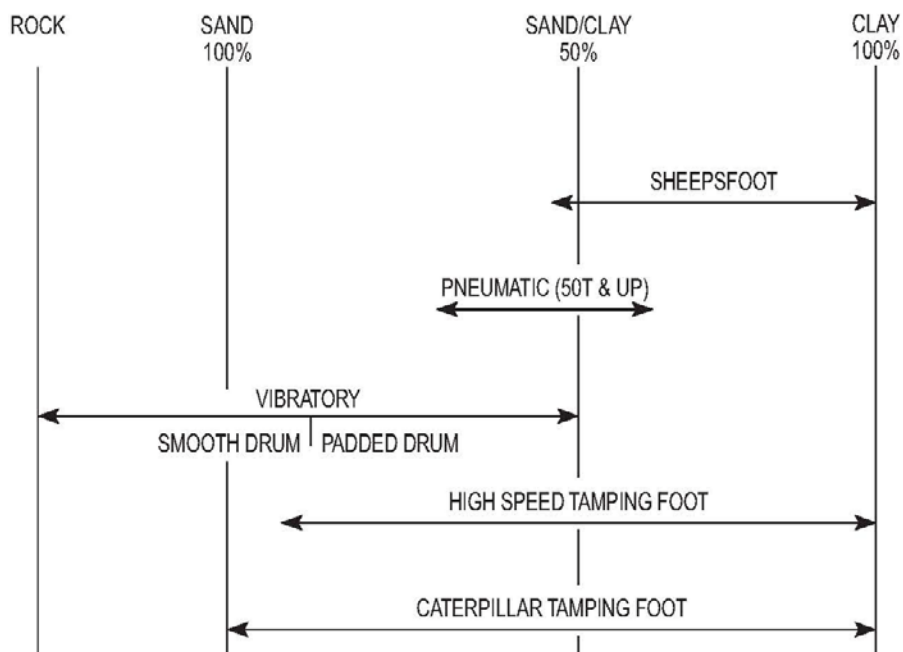
Compaction equipment can be grouped generally into the following classifications:

- sheepsfoot
- vibratory
- pneumatic
- high speed tamping foot
- chopper wheels (see Landfill Compactor section)

Combinations of these types are also available, such as a vibrating smooth steel drum.

For ease of comparison, the compactors have been placed on the Zones of Application Chart shown below. This chart contains a range of material moistures from 100% clay to 100% sand, plus a rock zone. Each type has been positioned in what is considered to be its most effective and economical zone of application. However, it is not uncommon to find them working out of their zones. Exact positioning of the zones can vary with differing material conditions.

## RANGES OF SOIL TYPES FOR SOIL COMPACTION EQUIPMENT



## **C. Construction Operations**

### **1. Types of Soil**

#### **(a) Unsuitable Soils (Muck)**

Organic soil, commonly referred to as muck, is formed when vegetation is deposited in marshy or swampy areas. If the vegetation has rotted or decomposed, the soil will usually be black in color, although some organic silt may range in color from light to dark gray. Organic soil may contain hydrogen sulfide gas, which when wet or heated, will emit an odor similar to rotten eggs.

Muck has poor engineering qualities (low shear strength, difficult to compact, etc.) and is unsuitable for highway construction. Where muck material is known to exist on the Project or where it is encountered during construction, its removal and replacement with suitable soil is generally required. Where muck must be removed, ensure that it is removed for its full depth and is replaced with a material that is suitable for use as an embankment foundation.

#### **(b) Suitable Soils**

Most earthwork for highway construction will involve soil material that is composed of the insoluble products of rock weathering. This type of soil usually contains many different types and sizes of granular particles. Soils that are composed of bulky particles (i.e., sands and gravels) are capable of supporting heavy, static loads but may be easily displaced by vibration. Soils that contain a large percent of fine grained particles (i.e. clay and silt) tend to deform easily under static loads but are not greatly affected by vibration. Clay will usually have a greasy or slippery feel when squeezed between the fingertips. Soil materials that are composed of the insoluble products of rock weathering are generally suitable for highway construction, but suitability will depend on the soil's engineering characteristics and intended construction application.

#### **(c) Select Borrow**

Certain construction applications require the use of soil with specific engineering properties. Refer to the Plans and Special Provisions for select borrow properties and placement locations.

## **2. Types of Excavation**

### **(a) Rock Excavation**

Rock excavation includes all masses of material that cannot be ripped with the equipment specified in [Section 202.03](#) of the Standard Specifications.

### **(b) Unclassified Excavation**

Unclassified excavation includes all materials encountered regardless of their nature or the manner in which they must be removed.

### **(c) Muck Excavation**

Muck excavation provides for the removal and disposal of saturated or unsaturated mixtures of soil and organic matter that are not suitable for a foundation material or embankment.

### **(d) Borrow Excavation**

Borrow excavation consists of approved material, required for embankments or other portions of work, acquired from outside the right-of-way.

### **(e) Stripping**

Stripping consists of the removal of overburden or other specified material from pits before the underlying material is excavated for use in the roadway. Stripping also includes replacing the stripped material. This work is considered incidental to the Unclassified Borrow item and will not be measured for payment.

## **3. Types of Embankment**

### **(a) Embankment Material**

Embankment material consists of approved material acquired from excavation that is hauled and placed in embankments.

### **(b) Earth Fill**

Earth fill is done when the largest particles in the embankment material are less than 6 inches, and the material can be placed and effectively compacted in layers of 8-inch maximum thickness.

### **(c) Rock Fill**

Rock fill is required when the material being compacted contains rock that cannot be constructed in layers of 8-inch maximum thickness. In no

instance would a layer or rock size greater than 2 feet be allowed in the rock fill.

#### **4. Excavation and Embankment Operations**

Ensure that the Contractor preserves slope stakes and control point references during earthwork operations. Monitor the work for conformance with the lines and grades shown in the Plans. Perform spot checks against the cross-section sheets in the Project Plans. As the work progresses, the Contractor should shape the ground lines to a grade and slope that will allow surface water to drain and that will minimize ponding. Consider the following guidelines while monitoring excavation and embankment construction.

##### **(a) Excavation**

##### **(1) Drilling and Blasting**

Rock may be loosened by ripping or by drilling and blasting.

Drill hole patterns must be carefully controlled to avoid overbreakage and to produce cut slopes as smooth and true to line as possible. Drilling must not extend beyond the slope lines. Overshooting may shatter the hillside behind the slope and cause overbreakage and subsequent slides.

While not assuming responsibility for the Contractor's methods of procedure, carefully observe the drilling and blasting operations and become familiar with the properties, uses, and action of the explosives being used. Rough sketches of drill hole patterns and records of amounts and types of explosives can be worthwhile. Caution the Contractor, as necessary, if it appears that the procedures being used may result in overshooting or in damage to adjacent property, to the roadway, or to structures under construction. Become familiar with the applicable State and local laws regulating blasting, as well as with rules affecting good general practice.

##### **(2) Excavated Materials**

Observe and report noticeable changes in excavated material with regard to type, texture, and color. Such factors may indicate the presence of unsuitable materials or need for additional sampling and testing. Verify removal based on directives from the Resident Engineer. Document the locations, quantities, and disposition of unsuitable materials. Also note any materials that could be used elsewhere (e.g., topsoil, riprap). Where topsoil stripping is specified, ensure that topsoil is properly salvaged (see [Section 205](#) of this Manual).

Unless otherwise designated in the Plans, the Contractor is to use excavated material for the planned embankments. Excess excavation or waste material is to be disposed of by the Contractor in a location approved by the Resident Engineer.

**(3) Unstable Material / Areas**

Observe and report areas that are encountered that appear to have insufficient stability or strength to allow for the proper completion of the work. Do not allow construction to proceed (placement of the next layer of embankment, base material or pavement) until the Resident Engineer is notified and has the opportunity to observe the area. Possible corrective actions the Contractor may perform include undercut and replacement of the unstable material, installation of underdrain, chemical treatment of the soil, installation of geotextile or geogrid and aggregate base, etc. If undercut is authorized by the Resident Engineer, record accurate measurements of the area removed for the basis of payment for this work.

**(4) Salvageable Material**

Salvageable materials that are to become the property of the Department must be carefully removed in sections and properly marked and stored by the Contractor. Where required, check that the Contractor utilizes match markings for the reassembly of structures. Check the provisions of the Contract for special requirements. Verify that the Contractor is aware of the disposition of salvageable material before earthwork activities begin. Inspect materials for damage if they are to be reused on the Project.

**(5) Disposal of Unsuitable Material and Debris**

Verify that the Contractor disposes of roots, logs, and other unsuitable materials in designated areas outside the fill area as approved by the Resident Engineer.

**(b) Embankment**

**(1) General Embankment**

The importance of uniformity in embankment construction cannot be overemphasized. Practical construction methods that ensure uniformity of material, layer thickness, moisture content, and compactive effort are critical to achieving a quality embankment. Most roadway failures can generally be traced to a lack of uniformity in the embankment.

**Section 202** of the Standard Specifications describes the activities that the Contractor must perform to produce a uniform embankment. This includes performing the following preparatory foundation work before starting embankment construction:

- Clearing and grubbing trees and organic matter;
- Removing salvageable topsoil;
- Backfilling stump holes or other small excavations in the limits of the embankment with suitable material and thoroughly tamping; and
- Removing existing pavement or reducing it to a maximum particle size of 3 inches. (Note that the Department will not allow existing pavement in the top 12 inches of fill below the subgrade elevation.)

Once the ground surface has been adequately cleared, it should be plowed or scarified to a depth of 8 inches and compacted to at least 95 percent of the standard density.

If unstable material is encountered, consult the Resident Engineer to determine if it should be removed or bridged. The Resident Engineer may require a bridge of fill material, or a combination of fill material and geogrid fabric. If bridged, the thickness of the fill material layer should be limited to the minimum necessary to support equipment. Instruct the Contractor to dump fill material on top of the constructed fill layer and to extend the bridge by pushing the fill material into place and over the unstable material until the bridge is complete.

Horizontal benches should be cut to a width that accommodates placing and compacting operations and equipment. Each bench should begin at the intersection of the original ground and the vertical cut of the previous bench.

Observe the area for unsuitable material and wet spots. Verify removal or treatment based on the direction given by the Resident Engineer. Document the locations, quantities, and disposition of materials and treatments.

## **(2) Earth Embankment**

Earth embankments are composed primarily of material other than rock. The material used must meet specified requirements and be from approved sources.

Unless otherwise specified, the Contractor is to construct earth embankments in successive layers for the full width of the individual roadway cross-section and in such lengths that will best suit the sprinkling and compaction methods used so as to provide a uniform, evenly distributed embankment.

A minor quantity of rock or broken concrete encountered in the construction of the Project may be incorporated in the lower layers of the embankment if acceptable to the Resident Engineer. Or, it may be placed in the deeper fills, in accordance with the requirements for the construction of rock embankments, provided the placement of rock is not immediately adjacent to structures or in areas where bridge foundations are to be constructed. Also, rock or broken concrete may be placed in the portions of embankments outside the limits of the completed roadbed width where the size of the rock or broken concrete prevents its incorporation in the normal embankment layers. All exposed reinforcing steel must be cut and removed from the broken concrete.

Each layer of embankment must be uniform as to material, density, and moisture content before the Contractor begins compaction operations. Where layers of unlike materials abut each other, each layer should be feathered for at least 100 feet, or the material should be so mixed as to prevent abrupt changes in the soil. Ensure that no material placed in a pile or windrow is incorporated in a layer in that position. All such piles or windrows must be moved by blading or similar methods. Clods or lumps of material must be broken and the embankment material mixed by blading, harrowing, disking, or similar methods until a uniform material of uniform density is achieved in each layer.

It is the Contractor's responsibility to ensure uniform moisture content throughout the layer. In order to facilitate uniform wetting of the embankment material, the Contractor may apply water at the material source (or pre-wet the material) if the sequence and methods do not cause an undue waste of water. This practice can increase the Contractor's rate of production.

### **(3) Rock Embankment**

Rock embankments are those composed primarily of rock.

Unless otherwise specified, the Contractor is to construct rock embankments in successive layers for the full width of the individual roadway cross-section and 8 inches or less in depth. When, in the opinion of the Resident Engineer, the rock sizes necessitate a greater depth of layer, the Contractor may increase the layer depth as necessary, up to a maximum of 2 feet. The Contractor is to construct the layers in a manner that ensures that voids created by larger stones are filled with smaller stones, spalls, or earthen materials, or by the placement of succeeding layers of material. This is most commonly achieved by "header banking" the rock fill section, a technique by which rock is dumped onto the edge of the fill layer being constructed and pushed over the leading



edge onto the previous layer with a crawler dozer. The dozer should weigh at least 70,000 pounds to ensure adequate initial consolidation.

The Contractor must wet, compact, level, and smooth each layer. The moisture content may require adjustment for compaction; a rule of thumb is that the larger the rock size, the more water that is needed to ensure spalls and earthen material wash into the voids between the large rocks.

For compaction, the Contractor must use a pneumatic or tamping foot type roller. Solid drum steel wheel rollers will bridge over areas and full compaction will not be achieved.

For rock fill layers 12 inches thick or less, the Contractor should compact the full width with one of the following minimum procedures:

- Four passes using a 50-ton pneumatic tired roller;
- Four passes using a vibratory tamping foot roller with a dynamic force of at least 40,500 pound-force per cycle, and a frequency of at least 16 hertz;
- Eight passes using a 22-ton pneumatic tired roller; or
- Eight passes using a vibratory tamping foot roller with a dynamic force of at least 29,250 pound-force per cycle, and a frequency of at least 16 hertz.

For rock fill layers thicker than 12 inches, the number of roller-passes for each additional 6-inch increment should be increased by the number required for the first 12 inches, per respective roller.

Ensure that the Contractor operates pneumatic tired rollers at speeds less than 5 miles per hour and vibratory tamping foot rollers at speeds less than 3 miles per hour.

The Contractor should construct rock fills from 12 inches to 2 feet below the subgrade elevation with earth and rocks having diameters no greater than 8 inches. Ensure that voids are filled and the rock is chinked, creating uniform compaction. The top 12 inches of rock fills should be constructed with approved material, placed in layers not exceeding 8 inches in loose thickness, and compacted in accordance with [Section 202.04.A\(5\)\(b\)\(2\)](#) of the Standard Specifications. Rocks with a diameter larger than 3 inches should not be placed in the top 12 inches of compacted fill.

Unless otherwise shown on the Plans, the upper or final layer of the embankment must be composed of material so graded that the density and uniformity of the surface layer may be secured by the

density control method. Exposed oversize rock must be reduced by sledging, or removed.

Proof rolling the final lift of rock embankment with a large pneumatic roller is always a good idea as well.

#### **(4) Placement and Compaction**

Verify that the embankment material is placed in uniform horizontal lifts that do not exceed the allowable maximum 8-inch thickness for earth fills and 2 feet for rock fills. Monitor the soil type to ensure that it remains consistent and uniform; report any changes in material type that occur. Observe the compaction operation for uniformity with respect to moisture content and target density. Monitor the operation of specialized compaction equipment for compliance. Check that the top 2 feet of embankment is constructed with rock free material. Trees, stumps, roots, vegetation or other unsuitable materials should not be placed in embankment.

Ensure that embankment is constructed in layers approximately parallel to the finished grade of the roadbed, unless otherwise shown in the Plans.

Embankments should be constructed to the grade and sections shown in the Plans and cross-sections, or as established by the Resident Engineer. Ensure that the Contractor continuously maintains the embankment to its finished section and grade until the Project is accepted.

#### **(5) Adjacent Structures**

Ensure that the Contractor places embankment material in a manner that avoids damage to adjacent structures. Oversize material with diameters larger than 6 inches must not be used within 5 feet of structures or pile driving locations.

#### **(6) Cross-Sections**

Frequently monitor the earthwork cross-section (e.g., width, side slopes, and grade) for conformance to the planned cross-sections and typical sections. Ensure that the Contractor is not building the embankment section “too full,” especially when using borrow, as this will result in excessive overruns of the borrow material.

#### **(7) Existing Embankments**

Where existing embankments are to be widened or raised in terms of grade, the new material should be keyed into the existing embankment by plowing, terracing, or benching.

**(c) Steep Slopes and Transitions**

Where embankments are constructed on steep slopes, a good interlock must be achieved between the sloping foundation and the new embankment material. Material interlock can be effectively achieved by plowing, terracing, or benching the foundation slope.

**(1) Slide Areas**

Be alert to conditions that could indicate a possible slide area and notify the Resident Engineer of areas of concern.

**(2) Base of Cut/Top of Slope**

Verify that rock encountered at the base of cuts has been excavated to the proper grade. Ensure that rounding along the top of cut slopes is performed where specified.

**(3) Benching**

Verify that slopes and transition areas are being treated as specified with regard to keying the new material. When required in the Plans, the volume of the material excavated for the benching may require measurement for payment as Unclassified Excavation.

**(4) Hard Sloping Surfaces**

Slopes that have a relatively hard surface will create a slip plane unless properly treated. Such slopes must be plowed, terraced, or benched to properly key the embankment material as it is placed and compacted.

**(5) Transition Areas**

Benching is used in the transition area between sizable cuts and fills. The transition area is the point where a cut section changes to a fill section. Particular attention should be placed in these areas. Failure to provide sufficient transverse benching and uniformity in compaction may result in a rough pavement surface at this junction.

**(d) Plan Variations due to Field Conditions**

The Contractor is responsible for finishing the surface in conformity with the lines and grades shown in the Plans. The shoulder lines and slopes should be true and ditches should be finished to a grade that will drain. However, existing conditions encountered on the Project site could warrant deviations from the Plans that are authorized by the Resident Engineer.

For example, it may be necessary to flatten slopes for stability or revegetation. Where more rock is encountered than anticipated, economy will dictate the steepening of slopes. Changes in grade, alignment, and/or slopes may be necessary to balance quantities, avoid wasting materials, and minimize overruns in excavation quantities.

If unstable or soft areas are encountered, these may be corrected by aeration or by removal and replacement of the unsuitable materials. Investigate areas that appear to be excessively wet for seeps and other sources of water. If such conditions are found, inform the Resident Engineer that a problem exists so that the appropriate action can be taken before allowing work to continue in that area.

Other potential problems that could affect grading operations include the following:

- Inclusion of oversized rock in the fill.
- Placement of questionable materials.
- Placement of material that changes in color, contains roots or other organic material, or is in some other way different from the material approved for use in the embankment.
- Improper type or use of compaction equipment.
- Juncture between cut and fill (grade point).
- Concentration of embankment fill activity in one area.
- Soil clogging the sheepsfoot roller or soil covering the steel-wheel roller.
- Insufficient number of passes with the compactor.
- Excessive lift thickness.
- Insufficient moisture content, as indicated by surface cracking or powdering.
- Excessive moisture content, as indicated by pumping or weaving action.
- Fill placement adjacent to manholes, inlets, or similar structures where smaller compaction equipment may be needed.

## **D. Safety and Environmental Considerations**

### **1. Hazardous Operations/Blasting and Explosives**

In accordance with **Section 107** of the Standard Specifications, the Contractor is solely responsible for adhering to Federal and State laws and local ordinances with respect to the safety of personnel and the general public. Periodically review construction operations for obvious signs of non-compliance. Explosives handling and blasting operations present significant hazards. Immediately notify the Resident Engineer of suspect operations.

## **2. Hazardous Material/Hazardous Waste**

If unforeseen hazardous material is encountered, immediately stop the affected construction operations and contact the Resident Engineer. The ODOT Environmental Programs Division may coordinate the removal of the hazardous material or be a resource for mitigation recommendations.

## **3. Drainage and Erosion**

Verify ditch construction (e.g., typical sections, staking, natural drainage, interceptor ditches at tops of cuts). Watch for damage to the embankment (e.g., unexpected high water with respect to design, improperly drained foundation or roadbed, damage from precipitation). Ensure that the best management practices for storm water management are monitored as required (see [Section 220](#) of the Standard Specifications and this Manual).

## **4. Excavation near Wetlands**

Excavation in and near wetland areas should be carefully monitored for compliance with environmental requirements. Non-permitted encroachment of wetland areas is unacceptable. Such practices may cause permanent damage to these protected areas and result in litigation.

## **5. Operation of Nuclear Density Gauges**

When using nuclear gauges to measure in-place field density, ensure that the proper safety procedures and governmental regulations are being followed. This will include maintaining the following distances from the gauge:

- Operator – 3 feet
- Bystanders – 15 feet
- Equipment, vehicles, etc. – 15 feet
- Other nuclear gauges – 30 feet

## **E. Documentation**

### **1. Daily Work Report**

Record the following information, as appropriate:

- Weather conditions or other conditions (e.g., equipment break downs, etc.) affecting the progress of, or delaying prosecution of, the work.
- Discussions with the Contractor regarding conditions or activities that are of an unusual nature and any specific recommendations or instructions given to the Contractor.
- Quantity and type material cut/filled.

- Location of operations, including the station extents of the work (excavation, embankment, rough/finish grading, etc.), borrow pits being used, etc.
- Disposition of material removed.

## **2. Measurement and Payment**

When earthwork items are Pay Plan Quantity or Lump Sum, no calculations will be required. Documentation of a Pay Plan Quantity item may be performed within the SiteManager / Daily Work Reports / Work Items tab. Authorized deviations from plan quantity must be documented by a change order. The authorized quantity deviation must be documented in the appropriate DWR Template or in the change order (i.e. description, explanation, attachment, etc.).

### **(a) Cubic Yard Unit of Measure Pay Items**

The final quantities for these pay items will be determined by one of the methods defined in [Section 202.05](#) of the Standard Specifications.

Document these items within the SiteManager / Daily Work Reports / Work Items tab / DWR Template in accordance with the steps listed below. Note: The same template will be used for each method of measurement, but the information required will depend on the option selected.

1. Select the appropriate pay item from the list of contract pay items.
2. Open the 'DWR Templates' icon in the toolbar.
3. Select the payment option from the drop down list (Load Counts, Estimated Percentage of Plan Quantity, Undercut or Audit Adjustment) that is going to be used as the method of measurement for the work performed.
4. Depending on the option selected, enter the applicable information as described below.
  - a. Load Counts Option:

This option will be used for progressive payments only.

- (1) In the appropriate fields, enter both a descriptive location and the station-to-station extents.
- (2) Enter the number of loads and the CY per load.
- (3) For equipment with a different capacity (CY per Load), select the 'New Row' button.

b. Estimated Percentage of Plan Quantity Option:

This option can be used for progressive payments and for items designated as pay plan quantity.

- (1) In the appropriate fields, enter both a descriptive location and the station-to-station extents.
- (2) In the Placed Quantity field, enter the estimated quantity (CY) of the item completed, ensuring that the total quantities to date do not exceed the plan quantity.

c. Three Dimensional Measured Quantity Option:

This option can be used for progressive payments or for documenting the final quantity of volumes necessary for undercut, excavation of structures, and isolated locations.

- (1) In the appropriate fields, enter both a descriptive location and the station to station extents.
- (2) Input the measured length, width, and depth to calculate a volume.
- (3) For additional areas or additional locations, with different dimensions, select the 'New Row' button.

d. Calculated Quantity Option:

This option will allow the input of quantities calculated by either the Average End Area Method or the Surface to Surface Method, and can be used for progressive payments or for documenting the final quantity of volumes for all earthwork related pay items.

- (1) In the appropriate fields, enter both a descriptive location and the station to station extents.
- (2) In the Placed Quantity field, enter the calculated quantity (CY) of the item completed, ensuring that the total quantities to date do not exceed the plan quantity.
- (3) In the 'Remarks' area provide sufficient information to provide the location of the documentation for the calculations.

- (4) For additional areas or additional locations, with different dimensions, select the 'New Row' button.

**(b) Lump Sum Unit of Measure Pay Items**

Document these items within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

1. Select the appropriate pay item from the list of contract pay items.
2. In the appropriate field, enter either a descriptive location or the station to station extents, preferably both.
3. In the Placed Quantity field, enter an estimated percentage of the lump sum item completed, ensuring that the total quantities to date does not exceed 1.000 Lump Sum.

**(c) Documentation Procedures for Earthwork Pay Items**

**(1) Unclassified Excavation (CY)**

This pay item will be documented using the DWR template for Excavation / Embankment. When documenting the "Undercut" of unsuitable and/or unstable material, the DWR Template for "Undercut" will be used. Make a separate record for the "Out" and the "In" quantity for Undercut, unless Unclassified Borrow is a pay item and is being used for backfill. Indicate in the "Remarks" field whether this record is for the "Out" or the "In".

**(2) Muck Excavation (CY)**

This pay item will be documented using the DWR template for Excavation / Embankment.

**(3) Rock Excavation (CY)**

This pay item will be documented using the DWR template for Excavation / Embankment.

**(4) Unclassified Borrow (CY)**

This pay item will be documented using the DWR template for Excavation / Embankment. When documenting the "In" (backfill) quantity of "Undercut" of unsuitable and/or unstable material, the DWR template for "Undercut" will be used.



**(5) Select Borrow (CY)**

This pay item will be documented using the DWR template for Excavation / Embankment.

**(6) Embankments (CY)**

This pay item will be documented using the DWR template for Excavation / Embankment.

**(7) Presplitting of Rock (LF)**

This pay item will be documented using the SiteManager / Daily Work Reports / Work Items tab.

**(8) Earthwork (LSUM)**

This pay item will be documented using the SiteManager / Daily Work Reports / Work Items tab.

**(9) Selective Subgrade Topping (LSUM)**

This pay item will be documented using the SiteManager / Daily Work Reports / Work Items tab.

In the “Remarks” field of the final DWR Template (Audit Adjustment), provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown. **Add link for screen shot of the Template.**

## **202.04 POST-CONSTRUCTION CONSIDERATIONS**

### **A. Acceptance of Materials**

Ensure that the “final” density and moisture requirements have been satisfied.

Perform applicable tests on these materials to determine:

- Compaction of embankment: AASHTO T 310. [Document in Template C95001].

### **B. Audit Requirements**

When earthwork items are Pay Plan Quantity or Lump Sum, no calculations will be required. In all other instances, when earthwork calculations are required, include a letter with the documentation that contains the following information:

- Method and equipment used for measurement of the areas (GPS, Data Collection, etc.);
- Software used for calculations (SurveyPak, Inroads, GeoPak, etc.);
- Detailed explanation of the calculation method (average end area, surface to surface, etc.) used to develop the quantities;

- Any additional documentation as required by **Section 202.05** of the Standard Specifications;
- “Final” earthwork quantity summary for each pay item; and
- Signature of the individual responsible for producing the documentation for these quantities.

Use the Contract Item Work Report within SiteManager to verify that correct quantities have been placed and paid. **Add link for screen shot of the Report, SSS Database, etc.** Compare the Contract Item Work Report with the documentation provided for each pay item to verify the accuracy of the quantities submitted and to ensure that no features or gaps in the extents of the work were omitted or duplicated. If the basis of payment is Plan Quantity, ensure that the total quantities paid equals the plan quantity.

### **C. Protection of the Work**

Check the installation of drainage structures for proper operation and soil or debris accumulation. Ensure that the Contractor maintains the roadbed in proper condition and protects the slopes against erosion.

Once the work is completed, the Contractor will shape the ground lines to a grade and slope to drain surface water and minimize ponding.

If required by the Contract, the Contractor must take the actions necessary to protect the subgrade from loss of moisture (prime coat, etc.).

## CHECKLIST – EARTHWORK

<b>Part 1: Preconstruction</b>					
<b>Issue</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comments</b>	<b>Initials</b>
Have limits of construction been staked out and the original cross-sections taken?					
Has OKIE (1-800-522-6543) been contacted? Have underground utilities been located and protected?					
Have all culverts, pipes, and other drainage structures been located and staked out?					
Have environmentally sensitive areas been clearly delineated?					
Has the Contractor secured the necessary erosion and sediment control permits from the DEQ for the Project and offsite disposal or borrow areas?					
Have detours been provided where needed?					
Have all soil samples been pulled for the preliminary testing for soil classification, Standard Proctor for compaction tests, etc.?					

<b>Part 2: During Construction</b>					
<b>Issue</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comments</b>	<b>Initials</b>
Are fills free of debris or other unsuitable material?					
Has the Contractor disposed of unsuitable excavation in the designated areas outside of the fill area?					
Has undercut been authorized and documented (undercut sheet signed by Inspector and Contractor Representative)?					
If undercut is necessary, has the Contractor removed the extent of the unsuitable material?					
Is the Contractor using the appropriate type of compaction equipment, particularly adjacent to manholes, inlets, and other structures?					

## Part 2: During Construction

Issue	Yes	No	N/A	Comments	Initials
Is the Contractor placing embankment materials to the correct thickness, density, and moisture content?					
Have embankment foundations been checked for stability?					
Is the Contractor preserving slope stakes and control point references, as necessary?					
Are right-of-way agreements concerning entrances, items to be preserved, etc. being carried out?					
Is material being stockpiled appropriately?					
Are drainage ditches and other erosion and sediment control measures being adequately maintained?					
Has subgrade been test rolled and shaped to proper profile and cross-section?					

## Part 3: Post-Construction

Issue	Yes	No	N/A	Comments	Initials
Do the final sections conform to the lines and grades shown on the Plans?					
Have all necessary final measurements, sketches, and cross-sections been made?					
Is the Contractor adequately maintaining embankment to the finished section and grade?					
Has reclamation of borrow pits been completed in accordance with permit requirements?					
Have areas been restored to pre-construction conditions?					
Are drainage ditches and other erosion and sediment control measures being adequately maintained?					
Has the Contractor placed topsoil, permanent or temporary erosion control measures, etc.?					

## **SECTION 203 – TEST ROLLING**

### **203.01 GENERAL**

This work consists of test rolling embankments and cut sections with heavy pneumatic-tired rollers.

Test rolling is a loading test performed to evaluate the stability of subgrades and determine the extent of unstable soils. Unstable soils are those incapable of supporting equipment loads without yielding, rutting, or otherwise showing distress or distortion.

Note that test rolling is not a substitute for compaction tests that measure density and moisture content, nor is it a substitute for proper inspection, control, and testing during all construction stages.

### **203.02 PRECONSTRUCTION CONSIDERATIONS**

#### **A. Preconstruction Meeting**

Discuss the following at the Preconstruction Meeting:

- What will be considered “soft, yielding, or unstable” material.
- Contractor’s proposed test rolling equipment.
- Allowable corrective actions in the event unstable material is detected.

#### **B. Acceptance of Materials**

None required.

#### **C. Preparatory Work and Contractor Work Plans**

None required.

#### **D. Safety and Environmental Issues**

None required.

### **203.03 INSPECTION GUIDELINES DURING CONSTRUCTION**

#### **A. Acceptance of Materials**

None required - This is a visually observed test.

If the material being test rolled deforms and does not come back to its original condition or if it deflects more than 1 inch, then it does not meet the specification requirement.

## **B. Equipment and Methods**

The Standard Specifications contain specific requirements regarding acceptable tire inflation pressure and loading capacity of the pneumatic-tired rollers to be used for test rolling. Ensure that the Contractor provides sufficient ballast to load the equipment to the weight specified. Obtain from the Contractor the certified weights of both the empty roller and the ballast.

Use discretion in approving Contractor-proposed substitutes (for example, loaded dump trucks) in place of the specified test-rolling equipment. The Contractor must be able to demonstrate that the proposed substitute provides equal or better effectiveness. At a minimum, the equipment should provide a load that will equal or slightly exceed the load on the subgrade of the finished roadway when opened to traffic.

## **C. Construction Operations**

Ensure that the Contractor begins performing the test rolling 2 feet below the finish grade and at the finish grade. Observe the Contractor's test rolling operations to identify soft, yielding, or unstable materials. If the material being test rolled deforms and does not come back to its original condition or if it deflects more than 1 inch, then it doesn't meet the specification requirement. Direct the Contractor to remove and replace or re-work such unstable material at no cost to the Department.

Note that soil stability can be highly dependent upon moisture content. If moisture content is excessive and movement is observed, the moisture content must be lowered and the test rolling repeated. Conversely, excessively low moisture contents could provide a false impression of stability.

## **D. Safety and Environmental Considerations**

Ensure that the Contractor adequately protects structural facilities, such as culverts and utilities, from damage due to test rolling equipment. Protection may include detouring around the area(s) of concern, unloading and reloading of the roller, or using protective pads or other suitable methods.

## **E. Documentation**

### **1. Daily Work Report**

Record the following information, as appropriate:

- Equipment specifications, including weight of roller and ballast and size and number of wheels.
- Location tested.
- Location of unstable soils.
- Any corrective actions needed, including estimate of suitable soil fill quantities required.

## **2. Measurement and Payment**

Document this Lump Sum item within the SiteManager/ Daily Work Reports / Work Items tab in accordance with the steps listed below.

- a. Select the Test Rolling pay item from the list of Contract pay items.
- b. In the appropriate field, enter either a descriptive location or the station-to-station extents, preferably both.
- c. In the Placed Quantity field, enter an estimated percentage of the lump sum item completed, ensuring that the total quantities to date does not exceed 1.00 Lump Sum.

### **203.04 POST-CONSTRUCTION CONSIDERATIONS**

#### **A. Acceptance of Materials**

None required.

#### **B. Audit Requirements**

Use the Contract Item Work Report within SiteManager to verify that correct quantities have been placed and paid. Payment for this item must equal 1.00 Lump Sum. [Add link for screen shot of the Report, SSS Database, etc.](#)

#### **C. Protection of the Work**

Locations of unstable soils should be properly delineated to facilitate subsequent corrective action.

## CHECKLIST – TEST ROLLING

<b>Part 1: Preconstruction</b>					
<b>Issue</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comments</b>	<b>Initials</b>
Has the Contractor provided a detail of their proposed equipment? Does the proposed equipment meet the specification requirements?					
Has the Contractor been informed of what will be considered yielding material?					
Have the allowable corrective actions for yielding material been discussed with the Contractor?					
Have utilities, culverts, and similar structures been adequately protected?					

<b>Part 2: During Construction</b>					
<b>Issue</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comments</b>	<b>Initials</b>
Has the Contractor provided a certified roller weight?					
Have the tire pressures been confirmed to meet the specification requirements?					
Were there any yielding areas identified? If so, were they adequately addressed by the Contractor and re-tested to confirm compliance?					

<b>Part 3: Post-Construction</b>					
<b>Issue</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comments</b>	<b>Initials</b>
None.					



## **SECTION 205 – SALVAGING TOPSOIL**

### **205.01 GENERAL**

This work consists of salvaging topsoil from areas of excavation and embankment.

### **205.02 PRECONSTRUCTION CONSIDERATIONS**

#### **A. Preconstruction Meeting**

Discuss the following at the Preconstruction Meeting:

- Areas in which topsoil is to be stripped, salvaged, or spread.
- Limits of construction.
- Stockpile locations, including requirements regarding storage outside the right-of-way.
- Proper stockpiling techniques (for example, allowable height and slope, etc.).
- Erosion and sediment control requirements.

#### **B. Acceptance of Materials**

Advise the Contractor of requirements for fertilizer (guaranteed analysis).

#### **C. Preparatory Work and Contractor Work Plans**

##### **1. Topsoil Locations**

The locations of topsoil areas should be determined well in advance of the work. Approximate locations are usually given in the computations, in the field review reports, and in the Plans (primarily on the estimate sheets). The areas from which topsoil is to be removed can be either cut or fill areas. Preliminary approval or rejection of the material will enable the Department to properly determine the disposition of the material.

##### **2. Site Preparation**

Verify that the Contractor's clearing and grubbing operations have removed debris, roots, heavy clay, hard clods, brush, toxic substances, and stones larger than 6 inches from topsoil that is to be salvaged.

#### **D. Safety and Environmental Issues**

Before allowing the Contractor to begin topsoil salvage operations, ensure that all erosion and sediment control measures have been installed in areas in which topsoil is to be removed, stored, or placed.

## **205.03 INSPECTION GUIDELINES DURING CONSTRUCTION**

### **A. Acceptance of Materials**

Before placing the salvaged topsoil on the roadway slopes, the Contractor is to apply fertilizer of the type and at the rate shown on the Plans. Inspect the fertilizer packaging, invoice, or both for the guaranteed analysis and complete the sample record for fertilizer (AM5007).

### **B. Equipment and Methods**

To ensure that the topsoil is removed within reasonable conformity to the Plans and Specifications, direct the Contractor to remove a scraper width strip at periodic intervals or leave a narrow strip between scraper paths, thereby obtaining a reference for depth of removal.

### **C. Construction Operations**

All topsoil excavated and stockpiled must be free of boulders, roots, stumps, and other deleterious material. The Standard Specifications do not require Contractor to screen the material.

Because topsoil depths vary, closely watch the removal operations to ensure that material unsuitable for use as topsoil is not excavated and incorporated in the stockpile. Generally, the topsoil will not exceed 18 inches in depth and will contain vegetation and roots.

Also note that stripping topsoil too deep may contaminate the topsoil with common material, thus reducing the quality of the topsoil. Conversely, shallow stripping will waste topsoil, reduce the estimated yield, and leave poor soils in the subgrade.

Although there may be no measurements required for pay purposes, the quantity of topsoil being stockpiled and the manner in which it is excavated are important. An estimated total of stockpiled material should be maintained to ensure that enough topsoil is stockpiled before excavation for embankment construction begins.

#### **1. Type A Salvaged Topsoil**

##### **(a) Topsoil Removal**

The upper soil layer of roadway cut areas, embankment foundation areas, and borrow areas can be stripped before excavation work begins. This topsoil can be stockpiled and used later to cover completed cut slopes, embankment slopes, and other disturbed areas where re-vegetation is desirable. Ensure sufficient topsoil will be available for the intended use.

**(b) Topsoil Stockpiles**

Topsoil must be stockpiled in an area where it will not be disturbed until it is ready for use. Assist the Contractor in the selection of suitable stockpile areas to minimize the haul involved and not interfere with or delay other construction operations.

**(c) Application of Fertilizer**

Ensure that prior to placing topsoil on the finished slopes and groundlines, the Contractor applies the correct type of fertilizer at the application rate specified in the Plans.

**(d) Topsoil Placement**

Ensure that the Contractor is evenly distributing the topsoil to the specified depth. The areas to be covered with topsoil should be smooth to allow placement of a uniform layer of topsoil. After placement, the topsoil should be disked or harrowed to break up the lumps and provide a smooth seedbed. The time of placement of topsoil should be as close as possible to the time of the seeding operations.

Topsoil placement on slopes requires special treatment to avoid creep and erosion of the soil from the underlying base soil. The topsoil should be keyed to the slope (if feasible) by harrowing, diskings, or rolling. An ideal method, especially on steeper slopes, is to use the cleats of a crawler tractor that is driven or winched up and down the slope.

**2. Type B Salvaged Topsoil**

Do not direct the Contractor to stockpile topsoil unless designated in the Plans or directed by the Resident Engineer. Pay close attention to the stripping operations. Assist the Contractor in the selection of suitable stockpile areas to minimize the haul involved and not interfere with or delay other construction operations.

**D. Safety and Environmental Considerations**

Ensure that the Contractor installs and maintains the required erosion, sediment, and pollution control measures in areas in which topsoil is to be removed, stored, or placed.

**E. Documentation**

**1. Daily Work Report**

Record the following information, as appropriate:

- Stockpiled topsoil volumes
- Station numbers for stockpiles

- Station numbers for final placement
- 2. Measurement and Payment**

**(a) Cubic Yard Unit of Measure Pay Items**

The final quantities for these pay items will be determined by one of the methods defined in **Section 205.05** of the Standard Specifications.

Document these items within the SiteManager / Daily Work Reports / Work Items tab / DWR Template in accordance with the steps listed below. Note: The same template will be used for each method of measurement, but the information required will depend on the option selected.

1. Select the appropriate pay item from the list of contract pay items.
2. Open the 'DWR Templates' icon in the toolbar.
3. Select the payment option from the drop down list (Load Counts, Estimated Percentage of Plan Quantity, or Audit Adjustment) that is going to be used as the method of measurement for the work performed.
4. Depending on the option selected, enter the applicable information as described below.

**a. Load Counts Option:**

This option will be used for progressive payments only.

- (1) In the appropriate fields, enter both a descriptive location and the station to station extents.
- (2) Enter the number of loads and the CY per load.
- (3) For equipment with a different capacity (CY per Load), select the 'New Row' button.

**b. Estimated Percentage of Plan Quantity Option:**

This option can be used for progressive payments and for items designated as pay plan quantity.

- (1) In the appropriate fields, enter both a descriptive location and the station to station extents.

- (2) In the Placed Quantity field, enter the estimated quantity (CY) of the item completed, ensuring that the total quantities to date do not exceed the plan quantity.

c. Three Dimensional Measured Quantity Option:

This option can be used for progressive payments or for documenting the final quantity of volumes.

- (1) In the appropriate fields, enter both a descriptive location and the station to station extents.
- (2) Input the measured length, width and depth to calculate a volume.
- (3) For additional areas or additional locations, with different dimensions, select the 'New Row' button.

d. Calculated Quantity Option:

This option will allow the input of quantities calculated by either the Average End Area Method or the Surface to Surface Method, and can be used for progressive payments or for documenting the final quantity of volumes for all earthwork related pay items.

- (1) In the appropriate fields, enter both a descriptive location and the station to station extents.
- (2) In the Placed Quantity field, enter the calculated quantity (CY) of the item completed, ensuring that the total quantities to date do not exceed the plan quantity.
- (3) In the 'Remarks' area provide sufficient information to provide the location of the documentation for the calculations.
- (4) For additional areas or additional locations, with different dimensions, select the 'New Row' button.

**(b) Lump Sum Unit of Measure Pay Items**

Document these items within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

1. Select the appropriate pay item from the list of contract pay items.
2. In the appropriate field, enter either a descriptive location or the station to station extents, preferably both.
3. In the Placed Quantity field, enter an estimated percentage of the lump sum item completed, ensuring that the total quantities to date does not exceed 1.000 Lump Sum.

**(c) Documentation Procedures for Earthwork Pay Items**

**(1) Type “A” Salvaged Topsoil (CY)**

This pay item will be documented using the DWR template for Excavation / Embankment. The Department will consider Type “A” Salvaged Topsoil pay item 50% complete when the material has been removed from its original location and stockpiled; and 100% complete when the material has been placed in its final location.

**(2) Type “A” Salvaged Topsoil (LSUM)**

This pay item will be documented using the SiteManager / Daily Work Reports / Work Items tab. The Department will consider Type “A” Salvaged Topsoil pay item 50% complete when the material has been removed from its original location and stockpiled; and 100% complete when the material has been placed in its final location.

**(3) Type “B” Salvaged Topsoil (CY)**

This pay item will be documented using the DWR template for Excavation / Embankment. The Department will consider Type “B” Salvaged Topsoil pay item 100% complete when the material has been removed from its original location and stockpiled. This material will be used for the Broadcast Sprigging Method “B” item of work.

In the “remarks” field of the final DWR template (audit adjustment), provide the physical location (folder #, envelope #, file, etc.) of the supporting documentation for the quantities shown. **Add link for screen shot of the template.**

**205.04 POST-CONSTRUCTION CONSIDERATIONS**

**A. Acceptance of Materials**

None required.

## **B. Audit Requirements**

When the Salvaged Topsoil item is Pay Plan Quantity or Lump Sum, no calculations will be required. In all other instances, when earthwork calculations are required, include a letter with the documentation that contains the following information:

- Method and equipment used for measurement of the areas (GPS, Data Collection, etc.);
- Software used for calculations (SurveyPak, Inroads, GeoPak, etc.);
- Detailed explanation of the calculation method (average end area, surface to surface, etc.) utilized to develop the quantities;
- Any additional documentation as required by [Section 205.05](#) of the Standard Specifications;
- The “Final” earthwork quantity summary for each pay item; and
- Signature of the individual responsible for producing the documentation for these quantities.

Use the Contract Item Work Report within SiteManager to verify that correct quantities have been placed and paid. [Add link for screen shot of the Report, SSS Database, etc.](#) Compare the Contract Item Work Report with the documentation provided for each pay item to verify the accuracy of the quantities submitted and to ensure that no features or gaps in the extents of the work were omitted or duplicated. If the basis of payment is Plan Quantity, ensure that the total quantities paid equals the plan quantity.

## **C. Protection of the Work**

Check the Storm Water Pollution Prevention Plan for the best management practices for erosion and sedimentation control that may be required upon completing topsoil placement. The Contractor should take appropriate measures to prevent contamination of stockpiled topsoil.

## CHECKLIST – SALVAGING TOPSOIL

### Part 1: Preconstruction

Issue	Yes	No	N/A	Comments	Initials
Has the Contractor placed the necessary erosion and sedimentation control measures in areas where topsoil is to be stripped, stored, and placed?					
Has the Contractor coordinated stockpile locations with other work? Will the locations chosen minimize haul distance?					
Have slopes been adequately prepared to accept and retain placed topsoil until vegetative cover is established?					

### Part 2: During Construction

Issue	Yes	No	N/A	Comments	Initials
Is salvaged topsoil free of boulders, roots, stumps, and other deleterious material?					
Is the Contractor evenly distributing topsoil to the specified depth?					
Has the Contractor applied fertilizer of the type and at the rate shown on the Plans?					

### Part 3: Post-Construction

Issue	Yes	No	N/A	Comments	Initials
Is the Contractor taking the necessary precautions to prevent contamination of stockpiled topsoil?					



## **SECTION 208 – CLAY PLATING**

### **208.01 GENERAL**

This work consists of constructing a layer of clay soil or other approved material on exposed slopes composed of dispersive or erosive soils.

### **208.02 PRECONSTRUCTION CONSIDERATIONS**

#### **A. Preconstruction Meeting**

Discuss the following at the Preconstruction Meeting:

- Location and thickness designated for clay plating.
- Clay plating material requirements.
- Contractor's proposed source of material.

#### **B. Acceptance of Materials**

As soon as practical, obtain sufficient samples of proposed materials to be used in clay plating of the roadway. If the Contract does not specify plating material requirements, perform applicable tests on these materials to determine:

- Plasticity Index from 7 to 18.
- Non-dispersive, using the Emerson Crumb Test, and either the Pinhole Test (ASTM 4647) or Double Hydrometer Test (ASTM 4221).
- Soil classification: AASHTO M 145.
- Maximum density and optimum moisture (proctor): AASHTO T 99.

When reporting the maximum density, provide a physical description of the material/soil to help the Inspector determine the proctor to be used when measuring roadway compaction.

#### **C. Preparatory Work and Contractor Work Plans**

Before allowing the Contractor to begin placing the plating materials, ensure that the slope has been graded and shaped according to the Plans and that objectionable material such as vegetation and debris has been removed. Do not allow the Contractor to place plating material on frozen ground.

#### **D. Safety and Environmental Issues**

The Standard Specifications require measurement of in-place field density and soil moisture using a nuclear density gauge according to AASHTO T 310. Because nuclear density gauges contain radioactive material, they are subject to the control and regulation of the Nuclear Regulatory Commission (NRC). Ensure that nuclear gauge operators are NRC-certified and follow safety procedures regarding handling, storage, and use of the device.

## **208.03 INSPECTION GUIDELINES DURING CONSTRUCTION**

### **A. Acceptance of Materials**

During the excavation, hauling and compaction of the material being used, be observant of visible changes that could warrant the use of a different proctor or additional sampling and testing of the material.

Conduct density tests as required to ensure the Contractor's conformance with compaction requirements. If the clay plating fails to meet density or visual requirements, the Contractor must take corrective actions.

Ensure the moisture content of the plating material is from optimum to 3 percentage points above optimum moisture content in accordance with AASHTO T 99.

Perform applicable tests on these materials to determine:

- Compaction of embankment: AASHTO T 310. [Document in Template C95001].

If visible changes occur in the material perform the following tests:

- Plasticity Index of from 7 to 18.
- Non-dispersive, using the Emerson Crumb Test, and either the Pinhole Test (ASTM 4647) or Double Hydrometer Test (ASTM 4221).
- Soil classification: AASHTO M 145.
- Maximum density and optimum moisture (proctor): AASHTO T 99.
- Compaction of embankment: AASHTO T 310. [Document in Template C95001].

### **B. Equipment and Methods**

The choice of equipment and methods for this work is left to the Contractor to ensure compliance with [Sections 202](#) and [208](#) of the Standard Specifications.

### **C. Construction Operations**

Ensure that the plating material placed by the Contractor meets Contract requirements. If visible changes occur in the characteristics of the soil, pull additional samples and retest the material to ensure that it is still in compliance.

Verify that each layer of plating material is placed in successive, horizontal, and uniform compacted layers. Verify that the thickness of each lift does not exceed 8 inches in accordance with [Section 202.04](#) of the Specifications, until the total thickness placed is reached as required by the Plans. Lifts that are placed too thick, too dry, or too wet may not achieve target density when compacted. Additionally, ensure that the moisture content of the plating material is between optimum and 3% above optimum moisture content at the time of compaction. The Contractor is responsible for obtaining the required density and moisture content by any means desired.

## **D. Safety and Environmental Considerations**

When using nuclear gauges to measure in-place field density, ensure that the proper safety procedures and governmental regulations are being followed. This will include maintaining the following distances from the gauge:

- Operator – 3 feet
- Bystanders – 15 feet
- Equipment, vehicles, etc. – 15 feet
- Other nuclear gauges – 30 feet

## **E. Documentation**

### **1. Daily Work Report**

Record the following information, as appropriate:

- Location of operations.
- Estimated volume of plating material placed.
- Areas requiring additional compactive effort or rework.

### **2. Measurement and Payment**

#### **(a) Cubic Yard Unit of Measure Pay Items**

The final quantity for this pay item will be determined by the method defined in **Section 208.05** of the Standard Specifications.

Document this item within the SiteManager / Daily Work Reports / Work Items tab / DWR Template in accordance with the steps listed below. Note: The same template will be used for each method of measurement, but the information required will depend on the option selected.

1. Select the Clay Plating pay item from the list of contract pay items.
2. Open the 'DWR Templates' icon in the toolbar.
3. Select the payment option from the drop down list (Load Counts, Estimated Percentage of Plan Quantity, or Audit Adjustment) that is going to be used as the method of measurement for the work performed.
4. Depending on the option selected, enter the following information:

#### **a. Load Counts Option:**

This option will be used for progressive payments only.

- (1) In the appropriate fields, enter both a descriptive location and the station to station extents.
- (2) Enter the number of loads and the CY per load.
- (3) For equipment with a different capacity (CY per Load), select the 'New Row' button.

**b. Estimated Percentage of Plan Quantity Option:**

This option can be used for progressive payments and for items designated as pay plan quantity.

- (1) In the appropriate fields, enter both a descriptive location and the station to station extents.
- (2) In the Placed Quantity field, enter the estimated quantity (CY) of the item completed, ensuring that the total quantities to date do not exceed the plan quantity.

**c. Three Dimensional Measured Quantity Option:**

This option can be used for progressive payments or for documenting the final quantity of volumes.

- (1) In the appropriate fields, enter both a descriptive location and the station to station extents.
- (2) Input the measured length, width and depth to calculate a volume.
- (3) For additional areas or additional locations, with different dimensions, select the 'New Row' button.

**(b) Documentation Procedures for Earthwork Pay Items**

**(1) Clay Plating (CY)**

This pay item will be documented using the DWR template for Excavation / Embankment. The volume of the compacted in-place Clay Plating item will be measured by multiplying the completed length of clay plating by the area of the theoretical typical section shown on the Plans.

In the "Remarks" field of the final DWR Template (Audit Adjustment), provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown. **Add link for screen shot of the Template.**

## **208.04 POST-CONSTRUCTION CONSIDERATIONS**

### **A. Acceptance of Materials**

Ensure that the “final” density and moisture requirements have been satisfied.

Perform applicable tests on these materials to determine:

- Compaction of embankment: AASHTO T 310. [Document in Template C95001].

### **B. Audit Requirements**

When the Clay Plating item is Pay Plan Quantity, no calculations will be required. In all other instances, the Three Dimensional Measured Quantity Calculation will be required in accordance with [Section 208.05](#) of the Standard Specifications.

Use the Contract Item Work Report within SiteManager to verify that correct quantities have been placed and paid. [Add link for screen shot of the Report, SSS Database, etc.](#)

Compare the Contract Item Work Report with the documentation provided for each pay item to verify the accuracy of the quantities submitted and to ensure that no features or gaps in the extents of the work were omitted or duplicated. If the basis of payment is Plan Quantity, ensure that the total quantity paid equals the plan quantity.

### **C. Protection of the Work**

Ensure that the Contractor properly maintains the finished slope, including providing and maintaining adequate protection against erosion, until such time that the topsoil and permanent grassing is completed.

## CHECKLIST – CLAY PLATING

<b>Part 1: Preconstruction</b>					
<b>Issue</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comments</b>	<b>Initials</b>
Has the Contractor graded and shaped the surface in accordance with the Plans?					
Has vegetation and debris been removed from the surface?					
Are conditions suitable for clay plating (i.e., ground surface isn't frozen)?					

<b>Part 2: During Construction</b>					
<b>Issue</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comments</b>	<b>Initials</b>
Is the Contractor using acceptable plating material?					
Is the Contractor placing the plating materials to the appropriate lift thickness (typically not to exceed 8 inches)?					
Is the material compacted to the required density and moisture content?					

<b>Part 3: Post-Construction</b>					
<b>Issue</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comments</b>	<b>Initials</b>
Is the material placed to the lines and grades shown on the Plans?					
Is the Contractor adequately maintaining the finished slope?					
Is the Contractor maintaining erosion and sedimentation controls?					

## **SECTION 209 – MACHINE GRADING**

### **209.01 GENERAL**

This work consists of grading, using heavy machine blading and some drifting and hauling, to move earthwork material between balanced cuts and fills.

### **209.02 PRECONSTRUCTION CONSIDERATIONS**

#### **A. Preconstruction Meeting**

Discuss the following at the Preconstruction Meeting:

- Typical sections.
- Planned drainage facilities.
- Balancing of quantities and Contractor's planned sequence of work.
- Erosion and sediment control requirements.

#### **B. Acceptance of Materials**

As soon as practical, obtain sufficient samples of the materials that will be used to construct the roadway. Perform applicable tests on these materials to determine:

- Soil classification: AASHTO M 145.
- Maximum density and optimum moisture (proctor): AASHTO T 99 or T 180.

When reporting the maximum density, provide a physical description of the material/soil to help the Inspector determine the proctor to be used when measuring roadway compaction.

#### **C. Preparatory Work and Contractor Work Plans**

##### **1. Staking**

Verify that the slope stakes set by the Contractor to establish the grading extremities and to guide the grading work itself meet the grades and lines of the Typical Sections shown in the Plans. Slope stakes must be set at the top of the slope in cuts and at the toe of slopes in fills, on both sides of the roadway opposite each offset stake. The stakes must be set in accordance with the cross-section template and the construction staking item.

##### **2. Site Preparation**

Inspect the cleared and grubbed areas well in advance of the grading operation to minimize interference with the Contractor's grading forces. Do not allow grading work to begin on a section of the Project until the full extent of clearing and grubbing and salvaging of topsoil has been completed and approved.

#### **D. Safety and Environmental Issues**

Ensure that all erosion and sediment control installations are complete and in accordance with the Plans and Specifications before allowing the Contractor to proceed with grading operations.

### **209.03 INSPECTION GUIDELINES DURING CONSTRUCTION**

#### **A. Acceptance of Materials**

During the drifting or hauling of excavation, and compaction of the material being used, be observant of any visible changes that could warrant the use of a different proctor or additional sampling and testing of the material.

If the Contract requires chemical subgrade treatment, a soil classification test will be required to determine the appropriate type and percentage of chemical to be used. Additionally, care should be taken in the western part of the State to avoid placing chemical additives in sulfate-containing soils. The obvious presence of gypsum is a good indication of sulfate soils.

When the Contractor is excavating roadway sections, be observant of areas that exhibit signs of underground water (springs, seepage, cattails, willows, etc.) and could possibly require the installation of underdrains. Contact the Materials Division to request a seepage investigation.

Conduct density tests as required to ensure the Contractor's conformance with compaction requirements. During construction of roadway embankment, visually observe areas that exhibit signs of unstable material (pumping subgrade under wheel load, obviously wet or saturated material, etc.). If the embankment fails to meet density or visual requirements, direct the Contractor to take corrective actions.

Perform applicable tests on these materials to determine:

- Compaction of embankment: AASHTO T 310. [Document in Template C95001].

If visible changes occur in the material perform the following tests:

- Soil classification: AASHTO M 145.
- Maximum density and optimum moisture (proctor): AASHTO T 99 or T 180.
- Compaction of embankment: AASHTO T 310. [Document in Template C95001].
- Determine soluble sulfate content in soil: OHD L-49.

#### **B. Equipment and Methods**

Follow the instructions provided in [Section 202.03.B](#) of this Manual.



### **C. Construction Operations**

Verify that the Contractor has finished the surface in conformity with the lines and grades shown in the Plans. The shoulder lines and slopes should be true and ditches should be finished to a grade that will drain.

Field conditions encountered during the progress of the work may necessitate changes to the initial grading plans. For example, it may be necessary to flatten slopes for stability or revegetation. Where more rock is encountered than anticipated, economy will dictate the steepening of slopes. Changes in grade, alignment, and/or slopes may be necessary to balance quantities, avoid wasting materials, and minimize overruns in excavation quantities.

If unstable or soft areas are encountered, these may be corrected by aeration or by removal and replacement of the unsuitable materials. Investigate areas that appear to be excessively wet for seeps and other sources of water. If such conditions are found, inform the Resident Engineer that a problem exists so that the appropriate action can be taken.

Other potential problems that could affect grading operations include the following:

- Inclusion of oversized rock in the fill.
- Placement of questionable materials.
- Placement of material that changes in color, contains roots or other organic material, or is in some other way different from the material approved for use in the embankment.
- Improper type or use of compaction equipment.
- Juncture between cut and fill (grade point).
- Concentration of embankment fill activity in one area.
- Soil clogging the sheep foot roller or soil covering the steel-wheel roller.
- Insufficient number of passes with the compactor.
- Excessive lift thickness.
- Insufficient moisture content, as indicated by surface cracking or powdering.
- Excessive moisture content, as indicated by pumping or weaving action.
- Fill placement adjacent to manholes, inlets, or similar structures where smaller compaction equipment may be needed.

### **D. Safety and Environmental Considerations**

Verify ditch construction (e.g., typical sections, staking, natural drainage, interceptor ditches at tops of cuts). Watch for damage to the embankment (e.g., unexpected high water with respect to design, improperly drained foundation or roadbed, damage from precipitation). Ensure that the best management practices for storm water management are monitored as required (see [Section 220](#) of the Standard Specifications and this Manual).

When using nuclear gauges to measure in-place field density, ensure that the proper safety procedures and governmental regulations are being followed. This will include maintaining the following distances from the gauge:

- Operator – 3 feet
- Bystanders – 15 feet
- Equipment, vehicles, etc. – 15 feet
- Other nuclear gauges – 30 feet

## **E. Documentation**

### **1. Daily Work Report**

Record the following information, as appropriate:

- Data on work in progress, including station extents, channels, rough grading or finish grading, borrow pits used, etc.

### **2. Measurement and Payment**

Document this Linear Foot item within the SiteManager / Daily Work Reports / Work Items tab / DWR Template in accordance with the steps listed below.

- a. Select the Machine Grading pay item from the list of Contract pay items.
- b. Open the 'DWR Templates' icon in the toolbar.
- c. Select the payment option from the drop down list (Progressive Estimate or Audit Adjustment) that is going to be used as the method of measurement for the work performed.
- d. In the appropriate field, enter the station to station extents and a descriptive location.
- e. If the actual ground measurement is different than the Station Length, place that measurement in the Measured Length field.
- f. If the basis of payment is Plan Quantity, for progressive payments enter the estimated quantity of the item completed in the Measured Length field. Ensure that the total quantity to date does not exceed plan quantity.

## **209.04 POST-CONSTRUCTION CONSIDERATIONS**

### **A. Acceptance of Materials**

Ensure that the “final” density and moisture requirements have been satisfied.

Perform applicable tests on these materials to determine:

- Compaction of embankment: AASHTO T 310. [Document in Template C95001].

## **B. Audit Requirements**

When the Machine Grading item is Pay Plan Quantity, no calculations will be required. In all other instances, the Machine Grading will be measured along the centerline.

Use the Contract Item Work Report within SiteManager to verify that correct quantities have been placed and paid. [Add link for screen shot of the Report, SSS Database, etc.](#) Compare the Contract Item Work Report with the documentation provided for each pay item to verify the accuracy of the quantities submitted and to ensure that no features or gaps in the extents of the work were omitted or duplicated. If the basis of payment is Plan Quantity, ensure that the total quantities paid equals the plan quantity.

## **C. Protection of the Work**

Check the installation of drainage structures for proper operation and soil or debris accumulation. Ensure that the Contractor maintains the roadbed in proper condition and protects the slopes against erosion.

Once the work is completed, the Contractor should shape the ground lines to a grade and slope that will drain surface water and minimize ponding.

If required by the Contract, the Contractor must take the actions necessary to protect the subgrade from loss of moisture (prime coat, etc.).

## CHECKLIST – MACHINE GRADING

### Part 1: Preconstruction

Issue	Yes	No	N/A	Comments	Initials
Has the Contractor satisfactorily completed all necessary site preparation activities (e.g., clearing and grubbing, wetlands delineation, staking and layout, etc.)?					
Has salvageable topsoil been stripped and stockpiled?					
Are erosion and sediment control measures installed and functioning properly?					

### Part 2: During Construction

Issue	Yes	No	N/A	Comments	Initials
Is the Contractor using appropriate fill material (e.g., no oversize or organic material, etc.)?					
Is the Contractor achieving the required density and moisture content?					
Is the Contractor taking adequate precautions not to damage adjacent work or structures?					
Is the Contractor preserving slope stakes and control point references, as necessary?					

### Part 3: Post-Construction

Issue	Yes	No	N/A	Comments	Initials
Does the finished surface conform to the lines and grades shown on the Plans?					
Does the finished surface drain properly?					
Are ditches finished reasonably true to grade? Do they provide for proper drainage?					

## **SECTION 210 – OBLITERATING ABANDONED ROAD**

### **210.01 GENERAL**

This work consists of obliterating sections of abandoned roadway, and regrading and shaping the abandoned subgrade material.

### **210.02 PRECONSTRUCTION CONSIDERATIONS**

#### **A. Preconstruction Meeting**

Discuss the following at the Preconstruction Meeting:

- Limits of removal.
- Items to be salvaged.
- Structures or materials that may be abandoned in place.
- Contractor's proposed method for disposal of excess materials.
- Contractor's schedule/plan for the work, including the placement and maintenance of temporary erosion and sediment control measures.
- Basis of payment, including any ancillary work that will be included in the unit price (e.g., regrading and shaping of the roadway).

#### **B. Acceptance of Materials**

None required.

#### **C. Preparatory Work and Contractor Work Plans**

Quantities and locations of an obliterated road are normally noted on the Plans. Some items may be designated for removal and will require measurement for payment prior to the actual removal work (e.g., curb and gutter, sidewalk). Measure and mark these items and ensure that the Contractor understands the limits of removal.

#### **D. Safety and Environmental Issues**

Ensure that all erosion and sediment control installations are complete and in accordance with the Plans and Specifications, and that the Resident Engineer has received a copy of the ODEQ Authorization to Discharge permit from the Contractor before allowing the Contractor to proceed with earth-disturbing operations.

### **210.03 INSPECTION GUIDELINES DURING CONSTRUCTION**

#### **A. Acceptance of Materials**

None required.

## **B. Equipment and Methods**

The choice of equipment and methods is up to the Contractor; however, do not allow any construction method or equipment operation to continue if it could damage an adjacent structure or portion of a structure designated to remain in place.

## **C. Construction Operations**

Where the Contract specifies complete removal of pavement, sidewalks, curbs, and gutters, verify removal to the proper width and depth. Check that the material is disposed of properly.

If partial removal is specified, verify that sawed cut lines are true and maintained.

## **D. Safety and Environmental Considerations**

If hazardous materials or underground storage tanks are encountered during removal operations, consult the Resident Engineer for further guidance.

Ensure that salvaged and removed items are stored properly.

Verify ditch construction (e.g., typical sections, staking, natural drainage, interceptor ditches at tops of cuts). Watch for damage to the embankment (e.g., unexpected high water with respect to design, improperly drained foundation or roadbed, damage from precipitation). Ensure that the Best Management Practices for storm water management are monitored as required (see [Section 220](#) of the Standard Specifications and this Manual).

## **E. Documentation**

### **1. Daily Work Report**

Record the following information, as appropriate:

- Station extents of removal operations or other associated work.
- Type of materials salvaged.

### **2. Measurement and Payment**

Document this Linear Foot item within the SiteManager / Daily Work Reports / Work Items tab / DWR Template in accordance with the steps listed below.

- a. Select the Obliterating Abandoned Road pay item from the list of contract pay items.
- b. Open the 'DWR Templates' icon in the toolbar.

- c. Select the payment option from the drop down list (Progressive Estimate or Audit Adjustment) that is going to be used as the method of measurement for the work performed.
- d. In the appropriate field, enter the station to station extents and a descriptive location.
- e. If the actual ground measurement is different than the Station Length, place that measurement in the Measured Length field.
- f. If the basis of payment is Plan Quantity, for progressive payments enter the estimated quantity of the item completed in the Measured Length field. Ensure that the total quantities to date does not exceed plan quantity.

## **210.04 POST-CONSTRUCTION CONSIDERATIONS**

### **A. Acceptance of Materials**

None required.

### **B. Audit Requirements**

When the Obliterating Abandoned Road item is Pay Plan Quantity, no calculations will be required. In all other instances, the Obliterating Abandoned Road will be measured along the centerline.

Utilize the Contract Item Work Report within SiteManager to verify that correct quantities have been placed and paid. [Add link for screen shot of the Report, SSS Database, etc.](#) Compare the Contract Item Work Report with the documentation provided for each pay item to verify the accuracy of the quantities submitted and to ensure that no features or gaps in the extents of the work were omitted or duplicated. If the basis of payment is Plan Quantity, ensure that the total quantities paid equals the plan quantity.

### **C. Protection of the Work**

Ensure that the abandoned roadway is graded to drain surface water and shaped to provide a smooth transition to adjacent areas.

Check drainage structures for proper operation and soil or debris accumulation. Ensure that the Contractor maintains the work area and protects it adequately against erosion.

## CHECKLIST – OBLITERATING ABANDONED ROAD

<b>Part 1: Preconstruction</b>					
<b>Issue</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comments</b>	<b>Initials</b>
Have the limits of removal been adequately marked?					
Have structures designated to remain in place been adequately marked?					

<b>Part 2: During Construction</b>					
<b>Issue</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comments</b>	<b>Initials</b>
Is the Contractor removing the pavement to the proper width and depth?					
Is the Contractor is taking adequate precautions not to damage adjacent work or structures designated to remain in place?					

<b>Part 3:Post-Construction</b>					
<b>Issue</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comments</b>	<b>Initials</b>
Has the Contractor removed the roadway to the proper depth and width?					
Has the abandoned subgrade material been graded and shaped to drain surface water?					
Does the area of removed roadway smoothly transition to adjoining areas?					
If only a portion of the roadway was removed, is the saw cut line reasonably true?					



## **SECTION 220 – MANAGEMENT OF EROSION, SEDIMENTATION, AND STORM WATER POLLUTION PREVENTION AND CONTROL**

### **220.01 GENERAL**

This work consists of overseeing the construction and maintenance of erosion and sediment control measures and providing the documentation necessary to comply with the Oklahoma Department of Environmental Quality (DEQ) construction storm water management regulations.

### **220.02 PRECONSTRUCTION CONSIDERATIONS**

#### **A. Preconstruction Meeting**

Discuss the following at the Preconstruction Meeting:

- Issues of environmental sensitivity or concern (e.g., water quality requirements, wetlands, cultural issues, hazardous materials, threatened and endangered species, etc.).
- Site specific erosion and sediment control plan.
- OPDES General Permit for Construction Activities (OKR10), including the [Notice of Intent](#) (NOI) and [Notice of Termination](#) (NOT) submittals. A copy of the submitted NOI must be provided by the Contractor.
- Earth disturbing activities must not commence until the Contractor has provided the Resident Engineer a copy of the [Authorization to Discharge](#) (Permit) that they have obtained from the DEQ. Note that failure to get a timely Permit will not be cause for Contract time suspension.
- Storm Water Pollution Prevention Plan (SWPPP) requirements, including identification of the Contractor's personnel responsible for the timely installation and maintenance of the erosion and sediment control measures.
- The Contractor's emergency contact and who will be conducting the on-site weekly inspections in accordance with Sections [220.04.C](#) and [220.04.H\(4\)](#) of the Standard Specifications.
- Additional permits or related submittals required by local, municipal, or federal agencies.

#### **B. Acceptance of Materials**

None Required.

#### **C. Preparatory Work and Contractor Work Plans**

##### **1. Schedule Review**

Review the Contractor's proposed schedule to ensure proper coordination of temporary and permanent erosion control measures with earth-disturbing activities. The area of exposed erodible earth should not exceed that which can be managed by the erosion and sediment control measures in place. Time and work

area limitations are specified in Section [220.04.H\(3\)](#) of the Standard Specifications.

## **2. Storm Water Pollution Prevention Plan (SWPPP)**

At the Preconstruction Meeting, the Contractor is required to submit a project-specific SWPPP. Section [220.04.C](#) of the Standard Specifications discusses the requirements of the SWPPP. The SWPPP will include detailed plans that define the best management practices (BMPs) required for water quality control by type and project survey station. Additionally, the Contractor must also prepare a Spill Prevention and Response Plan (SPRP) to address how it intends to prevent uncontrolled releases of hazardous materials, including oil generated by construction activities and use of construction equipment.

### **D. Safety and Environmental Issues**

The Contractor must submit a copy of its completed [NOI](#) and the [ODEQ Authorization to Discharge](#) prior to starting earth-disturbing activities.

The Contractor must also obtain the necessary permits and develop the required SWPPP for related work taking place outside the right-of-way (e.g., offsite borrow sources, staging areas, temporary plant sites, or disposal areas).

## **220.03 INSPECTION GUIDELINES DURING CONSTRUCTION**

### **A. Acceptance of Materials**

None Required.

### **B. Equipment and Methods**

BMPs should be installed and maintained in accordance with the SWPPP. Verify compliance through on-site inspections and through the review of the Contractor's weekly inspection reports.

### **C. Construction Operations**

#### **1. Erosion and Sediment Control Measures**

Review the SWPPP to fully understand the types and locations of the BMPs that the Contractor intends to use. Ensure that construction activities are sequenced in a manner that limits the area of exposed earth to that which can be managed by the installed BMPs.

As the work progresses, coordinate with the Contractor to anticipate potential erosion and sedimentation problems and provide timely and adequate controls to prevent or minimize environmental impacts. Figure 220:1 shows the effects of ineffective erosion and sediment controls.

Ineffective erosion control measures allows sediment to leave project.



**Figure 220:1. Photo. Ineffective Erosion Control Measures**

Such conditions may require the installation of additional BMPs not originally contemplated in the SWPPP. Any BMPs needed to adequately address the onsite conditions, which are not included in the Contract, should be added by the Resident Engineer by Change Order.

The SWPPP will likely include a combination of the following BMPs:

**(a) Soil Stabilization Practices**

Soil stabilization practices (e.g., seeding, mulching, sodding) are temporary or permanent treatments that stabilize and protect exposed earthen surfaces from erosion due to rainfall, overland flow, and runoff.

**(b) Structural Practices**

Structural practices (e.g., hay bales, silt fences and dikes, check dams, sediment traps and basins) are temporary or permanent treatments that protect soil surfaces from erosion by interrupting, diverting, and/or storing the flow of runoff.

**(c) Pollution Mitigation Practices**

Pollution mitigation measures are used to protect receiving waters from pollutant releases (e.g., spill prevention, waste disposal).

**(d) Buffer Zones**

Buffer Zones (or Strips) are vegetated or revegetated surfaces that are designed to treat sheet flow from adjacent surfaces. Buffer strips function by slowing runoff velocities and allowing sediment and other pollutants to settle and by providing infiltration into underlying soils. Buffer strips are best accomplished by not disturbing existing vegetation around the perimeter of the Project, especially between disturbed soils and watercourses.

Projects located in identified “sensitive waters or watersheds” must retain a vegetative buffer zone of at least 100 feet between the limits of the work and the stream. These requirements can be found in ODEQ regulations, General Permit OKR10 for Construction Activities, Addendum A.

**2. Slope Treatment**

Emphasize to the Contractor that the most effective method of controlling erosion and sedimentation is to provide early stabilization of cut and fill slopes. Slope treatment varies but generally consists of sodding, seeding and mulching in accordance with [Section 232](#) and [Section 233](#) of the Standard Specifications.

Check that all slopes are stabilized and the surface area of exposed erodible material is minimized. Note that areas that will remain inactive for longer than 21 days must be stabilized by temporarily seeding or placing permanent grassing items. Figure 220:2 shows a completed slope prior to stabilization.



These completed slopes need to be stabilized before erosion occurs with temporary or permanent erosion control measures.



**Figure 220:2. Photo. Completed Slope Prior to Stabilization**

To prevent or minimize erosion of a completed slope, the most effective treatment would be the timely placement of the topsoil and permanent erosion control measures, as illustrated in Figure 220:3. Before the Contractor begins earth moving activities, ensure that it has the necessary materials and equipment on hand to provide early slope stabilization and to perform corrective measures.

Acceptable and timely use of permanent erosion control for stabilization of a completed slope.



**Figure 220:3. Photo. Proper Stabilization of a Completed Slope**



In contrast to Figure 220:3 above, Figure 220:4 and Figure 220:5 illustrate unacceptable conditions that should have been prevented by proper installation and maintenance of effective erosion and sedimentation control measures. Direct the Contractor to repair such damaged slopes as soon as practical.



**Figure 220:4. Photo. Unacceptable Slope Stabilization**



**Figure 220:5. Photo. Unacceptable Stabilization of Erodible Material**

### **3. Inspection of BMPs**

#### **(a) General Site Inspections**

The Department will inspect the Project site to ensure that the Contractor has in place the proper erosion and sediment control measures to protect adjacent rivers, streams, wetlands, and impoundments.

#### **(b) Post-Rain Event Inspections**

After rainfall events of 0.5 inch or greater, the Contractor must inspect all erosion and sediment control measures to ensure that they are functioning properly and to identify if any additional measures are necessary.

Verify that the Contractor has formally documented the results of these inspections. Check the Contractor's report to ensure that they provide a valid representation of the work site.



Notify the Contractor in writing of malfunctions, and require corrective action. Take photographs to document conditions.

**(c) Storm Water Compliance Inspections**

Ensure that the Contractor conducts weekly storm water inspections to verify compliance with OPDES permit requirements and the SWPPP. The results of these inspections must be formally documented. Verify the Contractor's documented weekly inspection reports and retain a copy for the Project file. Check the Contractor's reports to ensure that they provide a valid representation of the work site.

Notify the Contractor in writing of any malfunctions, and require corrective action. Take photographs to document conditions.

During the course of construction, ODEQ may perform random inspections of the Project for compliance with OPDES permit requirements. This will result in the issuance of an [ODEQ routine inspection report](#) indicating deficiencies that must be corrected by the Contractor.

**4. Maintenance and Repair of Erosion and Sediment Control Measures**

Ensure that the Contractor maintains all erosion and sediment control measures in an operating condition. This may require the Contractor to clean out sediment build-up and debris, replace component parts, and rebuild as needed. Removed sediment must be disposed of properly, or, if suitable, used as fill elsewhere on the Project.

The Contractor should minimize tracking of sediment by vehicles by using gravel construction entrances and regularly performing sweeping and good housekeeping.

**5. Updates to the SWPPP**

Standard updates to the SWPPP by the Contractor will include the dates and locations that measures are installed or maintained. Additionally, the Contractor must amend the SWPPP when:

- There is a change in design, construction, operation or maintenance that has a significant effect on the discharge of pollutants to the waters of the State that has not been addressed in the SWPPP.
- Inspections or investigations by site operators, local, State, or Federal officials indicate the SWPPP is ineffective in eliminating or significantly minimizing pollutants or is otherwise not achieving the general objectives of controlling pollutants in storm water associated with construction activity.

## **D. Safety and Environmental Considerations**

Ensure that the Contractor is in full compliance with the requirements of the OPDES. This will entail inspections and maintenance of installed BMPs.

## **E. Documentation**

### **1. Daily Work Report**

Record the following information, as appropriate:

- Verification of the Contractor's weekly inspection reports
- Corrective action required of the Contractor to address deficient measures
- Notice of Violation or Consent Orders received by the Contractor

### **2. Measurement and Payment**

Document this Lump Sum item within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

- a. Select the SWPPP Documentation and Management pay item from the list of contract pay items.
- b. In the Location field, enter the corresponding status of the contract work correlating to the percentage to be paid from the schedule of payments. For example, if paying for the first 10%, you would write that "The initial SWPPP documentation has been received."
- c. In the Placed Quantity field, enter the percentage of the lump sum item completed, based on the schedule listed below. Ensure that the total quantity to date does not exceed 1.00 Lump Sum.
- d. Base payment for this item of work on the following schedule from **Section 220.06** of the Standard Specifications:
  - 10 percent for approved earth disturbing SWPPP documentation as specified in **Section 220.04.C** of the Standard Specifications
  - 15 percent when 25 percent of the Contract work is completed
  - 25 percent when 50 percent of the Contract work is completed
  - 25 percent when 75 percent of the Contract work is completed
  - 25 percent when 70 percent stabilization has been obtained, all temporary erosion and sediment control devices have been removed, and the storm water permit has been terminated.

If the Resident Engineer determines it to be appropriate, non-compliance assessments will be charged in accordance with **Table 220:1** of the Standard Specifications for failure to comply with the procedures specified in

**Section 220.04.** The Resident Engineer will provide written notice of non-compliance to the Contractor as well as a time line for accomplishment before assessments are applied. The Resident Engineer will compile a schedule of calendar days for each and every day of non-compliance by the Contractor. The compiled schedule of calendar days will form the basis for charging the non-compliance assessments.

Non-compliance assessments will continue until the Resident Engineer provides written notice of satisfactory compliance with these specifications to the Contractor. Such assessments will be handled in the following manner:

- Progressive non-compliance assessments will be made using line item adjustments for this pay item.
- At the conclusion of the Contract work, all of the progressive non-compliance assessments will be documented by change order. The Resident Engineer's documentation supporting the assessments must be included with the change order.
- **When the change order is approved, the assessments must be charged to the new line item and the line item adjustments must be removed.**

## **220.04 POST-CONSTRUCTION CONSIDERATIONS**

### **A. Acceptance of Materials**

None Required.

### **B. Audit Requirements**

Pay item documentation must include the following:

- Approved documentation of [NOI](#),
- [Authorization to Discharge](#),
- initial and updated SWPPPs,
- inspections,
- inspection reports, and
- acceptance of [NOT](#) by ODEQ

Use the Contract Item Work Report within SiteManager to verify that correct quantities have been placed and paid. Payment for this item must equal 1.00 Lump Sum. [Add link for screen shot of the Report, SSS Database, etc.](#)

If non-compliance assessments have been made, ensure that the associated change order has been approved and that the assessments have charged to the new pay item and removed from the line item adjustments.

### C. Protection of the Work

Upon completion of the Project, instruct the Contractor to remove temporary erosion and sediment control features that are still in place. Verify that the Contractor's final stabilization efforts are in accordance with the SWPPP, permit requirements, and best practice. For example, Figure 220:6 illustrates unacceptable final stabilization practices.



**Figure 220:6. Photo. Unacceptable Final Stabilization**

Once the Project has 70 percent stabilization of the native background cover, the Contractor must submit the Notice of Termination (NOT) to the ODEQ. The ODEQ recommends that a one-time [Inspection Request form](#) be submitted by the Contractor prior to submitting their NOT, to determine if the Project meets ODEQ's requirements for Termination of the permit. Submission of this request will result in a termination inspection by the ODEQ and will result in the issuance of an [inspection report](#), which will indicate any deficiencies that must be corrected.

## CHECKLIST – MANAGEMENT OF EROSION, SEDIMENTATION, AND STORM WATER POLLUTION PREVENTION AND CONTROL

<b>Part 1: Preconstruction</b>					
<b>Issue</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comments</b>	<b>Initials</b>
Has the Contractor submitted the NOI to the ODEQ?					
Has the Contractor prepared and submitted a SWPPP? A SPRP?					
Has the Contractor received authorization to discharge under the OPDES General Permit?					
Does the Contractor have adequate spill response equipment onsite to effectively respond to accidental pollutant releases?					
Has the Contractor provided a complete and current contact list of its emergency response personnel?					

<b>Part 2: During Construction</b>					
<b>Issue</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comments</b>	<b>Initials</b>
Is the Contractor in full compliance with the permit and the approved SWPPP?					
Is the Contractor conducting and documenting the inspections required by the permit and the approved SWPPP?					
Are the Contractor's records adequately and accurately documenting the results of the inspections?					
Is the Contractor updating the SWPPP as necessary?					

<b>Part 3: Post-Construction</b>					
<b>Issue</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comments</b>	<b>Initials</b>
Has the Contractor filed the NOT with the ODEQ?					

## **SECTION 221 – TEMPORARY SEDIMENT CONTROLS**

### **221.01 GENERAL**

This work consists of constructing, maintaining, and removing temporary erosion and sediment control measures at locations shown on the Storm Water Pollution Prevention Plan (SWPPP) and as the Resident Engineer otherwise deems necessary. These measures may include slope drains, bale barriers, silt fence, sediment basins, silt dikes, rock dams, and other measures designed to prevent or minimize soil erosion by interrupting, diverting, or storing runoff.

### **221.02 PRECONSTRUCTION CONSIDERATIONS**

#### **A. Preconstruction Meeting**

Discuss the following at the Preconstruction Meeting:

- Storm Water Pollution Prevention Plan (SWPPP) requirements, including identification of the Contractor's personnel responsible for the timely installation and maintenance of the erosion and sediment control measures.
- OPDES General Permit for Construction Activities (OKR10) permit requirements.
- Contractor's proposed types, locations, and sources of temporary erosion and sediment control measures to be used.

#### **B. Acceptance of Materials**

Silt fence, silt dike, or rock filter dams, if used on the Project, are to be provided from an approved source, as shown in the Approved Products List (APL) [\[add link\]](#).

All other pay items require no sampling and testing, but must be visually inspected for compliance with the requirements of [Section 221.02](#) of the Standard Specifications.

#### **C. Preparatory Work and Contractor Work Plans**

At the Preconstruction Meeting, the Contractor is required to submit a project-specific SWPPP. Before the start of earthmoving operations, review types and locations of the temporary erosion and sediment control measures included in the SWPPP. Compare the planned locations with field conditions to determine if adjustments are necessary. Substitution of materials may be necessary. As an example, silt fence may not always be adequate to prevent erosion and formation of gullies on areas subject to concentrated flow of water at a relatively high velocity and, in such cases, erosion control may require the use of rock filter dams or other appropriate measures.

Note that temporary control measures may also be required at the Contractor's offsite locations (e.g., offsite disposal areas or borrow sources), and would be installed at the Contractor's expense.



## **D. Safety and Environmental Issues**

Prior to allowing earthmoving operations to begin, ensure that, at a minimum, erosion and sediment control measures are in place along the Project perimeter.

## **221.03 INSPECTION GUIDELINES DURING CONSTRUCTION**

### **A. Acceptance of Materials**

If silt fence, silt dike, or rock filter dams are being used, ensure that they are provided from an approved source, as shown in the Approved Products List (APL) [\[add link\]](#). [Document in Template AM5001]

All other pay items require no sampling and testing, but must be visually inspected for compliance with the requirements of [Section 221.02](#) of the Standard Specifications.

### **B. Equipment and Methods**

Measures are to be installed in accordance with the Department's Standard Drawings or the manufacturer's recommendations.

### **C. Construction Operations**

#### **1. General**

Temporary and permanent erosion control measures should be installed in a timely manner. Be alert for situations requiring additional erosion control measures not foreseen in the SWPPP and schedule, and direct the Contractor to install these measures where needed to prevent pollution.

Temporary erosion control measures should be coordinated with permanent measures to provide continuous erosion control as economically as possible. However, temporary measures are not to be constructed in lieu of permanent measures specified in the Contract, because it is the permanent measures that provide the ultimate control.

The Contractor should practice good housekeeping with regard to offsite vehicle tracking. Excess dirt should be removed from the traffic lanes. When possible, loaded haul trucks should be covered with tarpaulin. Adequate dust control may require dampening of hauls roads.

#### **2. Temporary Erosion and Sediment Control Measures**

The Contractor's SWPPP may include all or a combination of the temporary erosion and sediment control measures discussed below. If the Contract does not include pay items for measures needed on the Project, the necessary items should be added by the Resident Engineer by Change Order.

**(a) Temporary Slope Drains**

Slope drains are generally constructed along shoulders, slopes, and at other locations designated by the Resident Engineer to control surface water flow and prevent erosion. Slope drain pipe may consist of high density polyethylene (HDPE) plastic, corrugated metal, asphalt-fiber, or concrete material in accordance with [Section 221.04.A](#) of the Standard Specifications. Inlets are typically pipe end sections. Outlet protection, such as rock, straw, or brush, is also typically required.

**(b) Temporary Bale Barriers**

Temporary bale barriers may be used along the toe of cut and fill slopes, as small ditch checks, around inlets, and at the outlets of drainage structures. Where flow is concentrated, temporary wire fence may be necessary to prevent movement. Otherwise, stakes driven through the hay bales are usually sufficient to secure it in place and prevent movement. Bales must be trenched 6 inches into the surface.

Note that installation of bales varies with the intended purpose. As described in [Section 221.04.B](#) of the Standard Specifications, when used as ditch checks, bales should be staggered across the waterway in accordance with the Department's Standard Drawings. When used as slope barriers, bales should be placed end-to-end, parallel to the slope.

Inspect bale barriers after each rainfall to ensure that the Contractor does not allow sediment accumulation to exceed 50% of the height of the bales. Damage to bale barriers must be repaired. Evaluate the location of the barriers to ensure their effectiveness at controlling runoff.

**(c) Temporary Silt Fence**

Silt fence may be used in areas where flow is distributed uniformly over a large area. Examples are along the toe of cuts and fills, adjacent to ponds and lakes, in low swampy areas, and around stockpile storage areas.

Verify that the silt fence installation is in accordance with [Section 221.04.C](#) of the Standard Specifications. Inspect trench construction, post spacing, and joining of adjacent sections of geotextile. Verify that the geotextile is fastened to the upstream face of the post to help ensure that the fence can withstand pressure during storms.

Inspect silt fence after each rainfall to ensure that the Contractor does not allow sediment accumulation to exceed 50% of the height of the silt fence. Damage to silt fence must be repaired. Evaluate the location of the fences to ensure their effectiveness at controlling runoff.



Figure 221:1 illustrates a situation where the silt fence is properly installed, but additional erosion control measures are required to fully manage the exposed area of erodible earth.



**Figure 221:1. Photo. Silt Fence**

After installation, the Contractor must continue to maintain the silt fence and provide additional erosion control measures as necessary to prevent the conditions depicted in Figure 221:2.



**Figure 221:2. Photo. Inadequate Maintenance of Silt Fence**

**(d) Temporary Sediment Filters**

Sediment filters may be installed to filter runoff before it enters inlets. Filters of either straw bales or silt fence should be installed in accordance with [Section 221.04.D](#) of the Standard Specifications as soon as the inlets are completed to receive runoff.

Inspect sediment filters after each rainfall to ensure that the Contractor does not allow sediment accumulation to exceed 50% of the height of the filter. Damage to the sediment filters must be repaired. Evaluate the location of the filters to ensure their effectiveness at controlling runoff.

**(e) Temporary Sediment Basins**

The inlets of sediment basins should be constructed with a wide cross-section and minimum grade to prevent turbulence and allow deposition of the soil particles.



Inspect sediment basins after each rainfall to ensure that the Contractor does not allow sediment accumulation to exceed 50% of the height of the basin. Consider placing a cleanout stake near the center of the basin to indicate the level to which sediment may accumulate.

Evaluate the location and construction of the basins to ensure their effectiveness at controlling runoff. Sediment basins are typically designed to dewater in no less than two days to allow adequate time for sediment to drop out. Verify that the basin provides adequate detention time. Also ensure that discharge from the spillways does not scour the receiving area. It may be necessary to provide riprap at the outlets to dissipate the discharge.

Damage to the sediment basins must be repaired. Sediment basins normally remain in service until all disturbed areas draining into the structure have been satisfactorily stabilized. When use of temporary sediment basins is to be discontinued, all excavations are to be backfilled and properly compacted, fill material removed, and the existing ground restored to its natural or intended condition.

**(f) Temporary Silt Dikes**

Temporary silt dikes may be used along the toe of cut and fill slopes, as small ditch checks, around inlets, and at the outlets of drainage structures. Ensure silt dikes are secured in a manner that will prevent movement. Figure 221:3 illustrates what could happen if the silt dike is not properly pinned.



**Figure 221:3. Photo. Improperly Installed Silt Dike**

Evaluate the location of the dikes to ensure their effectiveness at controlling runoff. Because they are too short, the silt dikes shown in Figure 221:4 below will not effectively control runoff. Silt dikes should be installed so that water flows over the center, and not around, the dike.





These silt dikes are ineffective because they are too short. The silt dikes should be placed so that water will flow over the center not around the dike.

**Figure 221:4. Photo. Ineffective Silt Dikes**

Inspect silt dikes after each rainfall to ensure that the Contractor does not allow sediment accumulation to exceed 50% of the height of the dike, as is the case in Figure 221:5. Any damage to the silt dikes must be repaired.



**Figure 221:5. Photo. Inadequate Maintenance of Silt Dike**

**(g) Rock Filter Dams**

A rock dam is usually installed down grade from a culvert outlet, locations where drainage exits the right-of-way, and across ditches with high-velocity water flow. The size (length and height) of the rock dam depends on the volume of water that flows through the drainage structure, and the width of the drainage channel. Rock dams are not appropriate where impounded sediment and gravel could accumulate inside of the culvert. Also, rock dams are not appropriate in streams that are regulated by the US Army Corps of Engineers under Section 404 of the Clean Water Act. In these cases, rock dams are to be placed at the ditch outlets, parallel to the stream.

**3. Maintenance Inspections**

Inspect erosion and sediment control measures to ensure adequacy and performance. Direct corrective actions where and when needed. Contractor's

formally documented inspections are required weekly, after each 0.5-inch rainfall, and at the completion of the Project.

Direct the Contractor to replace erosion control items that are damaged, lost or found to be defective. Replacement necessitated by damage or loss resulting from conditions beyond the Contractor's control will be paid for under the standard bid item. Defective materials or installation shall be replaced at no cost to the Department.

#### **D. Safety and Environmental Considerations**

The Contractor is expected to ensure that the work does not adversely affect areas outside the highway right-of-way. If an adverse situation occurs, direct the Contractor to cease the work operation, remove all encroachments, and restore the area to its prior condition as nearly as practicable.

#### **E. Documentation**

##### **1. Daily Work Report**

Record the following information, as appropriate:

- Type, location, and quantity of erosion and sediment control measures installed
- Any discussions with the Contractor concerning installation of additional erosion and sediment control measures
- Discussions with the Contractor concerning any necessary maintenance of temporary erosion and sediment control devices (i.e. replacement of damaged silt fence, removal of sediment from silt dikes, etc.)

##### **2. Measurement and Payment**

###### **(a) Linear Foot Unit of Measure Pay Items**

Documentation of these items will be performed within the SiteManager / Daily Work Reports / Work Items tab / DWR Template.

1. Select the appropriate pay item from the list of contract pay items.
2. Open the 'DWR Templates' icon in the toolbar.
3. Select the payment option from the drop down list (Progressive Estimate or Audit Adjustment) that is going to be used as the method of documentation for the work performed.



4. In the appropriate field, enter the station to station extents and a descriptive location.
5. If the actual ground measurement is different than the Station Length, place that measurement in the Measured Length field, and an explanation is required in the Remarks field.
6. For additional areas or additional locations, with different dimensions, select the 'New Row' button.

**(b) Each Unit of Measure Pay Items**

Documentation of these items will be performed within the SiteManager / Daily Work Reports / Work Items tab / DWR Template.

1. Select the appropriate pay item from the list of contract pay items.
2. Open the 'DWR Templates' icon in the toolbar.
3. Select the payment option from the drop down list (Progressive Estimate or Audit Adjustment) that is going to be used as the method of documentation for the work performed.
4. In the appropriate field, enter the station for each item and a descriptive location.
5. If the Placed Quantity field is more than one, an explanation is required in the Remarks field.
6. For additional areas or additional locations, select the 'New Row' button.

**(c) Cubic Yard Unit of Measure Pay Items**

Documentation of these items will be performed within the SiteManager / Daily Work Reports / Work Items tab / DWR Template.

1. Select the appropriate pay item from the list of contract pay items.
2. Open the 'DWR Templates' icon in the toolbar.
3. Select the payment option from the drop down list (Progressive Estimate or Audit Adjustment) that is going to



be used as the method of documentation for the work performed.

4. Select the appropriate method of measurement from the Type radio button options. Depending on the option selected, enter the following information:

- a. Three Dimensional Measured Quantity Option.

This option can be used to allow the template to calculate volumes for progressive payments or for documenting the final quantity. Typically this option will be used for volumes involving simple calculations which will only require length, width and thickness.

- (1) In the appropriate fields, enter both a descriptive location and the station to station extents.
- (2) Input the measured length, width and depth to calculate a volume.
- (3) For additional areas or additional locations, with different dimensions, select the 'New Row' button.

- b. Calculated Quantity Option.

This option will allow the input of quantities calculated outside of the template (i.e. spreadsheet, hand calculations, etc.), and can be used for progressive payments or for documenting the final quantity of volumes. Typically this option will be used for volumes involving multiple dimensions, irregular shapes, etc.

- (1) In the appropriate fields, enter both a descriptive location and the station to station extents.
- (2) In the Placed Quantity field, enter the calculated quantity (CY) of the item completed.
- (3) In the Book/Folder/Envelope # field provide the location of the documentation for the calculations.
- (4) For additional areas or additional locations, with different dimensions, select the 'New Row' button.

**(d) Documentation Procedures for the Temporary Sediment Control Pay Items**

**(1) Temporary Slope Drains (LF)**

This pay item will be documented utilizing the DWR template for Linear Feet (LFT).

**(2) Temporary Bale Barrier (LF)**

This pay item will be documented utilizing the DWR template for Linear Feet (LFT).

**(3) Temporary Silt Fence (LF)**

This pay item will be documented utilizing the DWR template for Linear Feet (LFT).

**(4) Temporary Sediment Filter (EA)**

This pay item will be documented utilizing the DWR template for Each (EACH).

**(5) Temporary Sediment Basin (EA)**

This pay item will be documented utilizing the DWR template for Each (EACH).

**(6) Temporary Silt Dike (LF)**

This pay item will be documented utilizing the DWR template for Linear Feet (LFT).

**(7) Rock Filter Dam (CY)**

This pay item will be documented utilizing the DWR template for Cubic Yard (CuYd).

In the Book/Folder/Envelope # field of the final DWR Template (Audit Adjustment), provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown. Add link for screen shot of the Template.

**221.04 POST-CONSTRUCTION CONSIDERATIONS**

**A. Acceptance of Materials**

None Required.

**B. Audit Requirements**

When a temporary sediment control item is Pay Plan Quantity, no calculations will be required. In all other instances, the completed item's quantity will be measured in accordance with subsection 221.05 of the standard specifications.

Utilize the Contract Item Work Report within SiteManager to verify that correct quantities have been placed and paid. Add link for screen shot of the Report, SSS Database, etc. Compare the Contract Item Work Report with the documentation provided for each pay item to verify the accuracy of the quantities submitted and to ensure that no features or gaps in the extents of the work were omitted or duplicated. If the basis of payment is Plan Quantity, ensure that the total quantities paid equals the plan quantity

### **C. Protection of the Work**

Continue to inspect erosion and sediment control measures until the site is stabilized. Ensure that accumulated sediment and excavated material are disposed of in locations that will not cause harm to the environment or the Project.

Upon completion of the Project, the Contractor must remove temporary erosion and sediment control measures. After temporary control measures are removed, ensure that the Contractor restores the existing ground to its natural or intended condition.

## CHECKLIST – TEMPORARY SEDIMENT CONTROLS

<b>Part 1: Preconstruction</b>					
<b>Issue</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comments</b>	<b>Initials</b>
Is construction of temporary sediment controls in accordance with the Standard Drawings and the approved SWPPP?					
Is the Contractor using materials from the Approved Products List, if applicable?					

<b>Part 2: During Construction</b>					
<b>Issue</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comments</b>	<b>Initials</b>
Are the in-place erosion and sediment controls sufficient to manage the area of exposed erodible earth?					
Is the Contractor maintaining installed BMPs in an operable condition?					
Is the Contractor removing silt and sediment once accumulation reaches 50% of the height of the control measure?					
Is the Contractor properly disposing of silt and sediment?					
Are temporary control measures effectively controlling runoff?					
Is the Contractor performing adequate housekeeping and maintenance of haul roads to minimize offsite tracking of sediment?					
Is the Contractor performing adequate dust control to minimize air pollution?					
Is the Contractor repairing or replacing damaged or inadequate control measures in a timely manner?					

**Part 3: Post-Construction**

<b>Issue</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comments</b>	<b>Initials</b>
Have all disturbed areas been stabilized?					
Has the Contractor removed temporary control measures?					
If the Contractor has removed temporary control measures, has it also performed the necessary work to restore the ground to its natural or intended condition?					

## **SECTION 228 – NYLON EROSION CONTROL MAT**

### **228.01 GENERAL**

This work consists of providing and installing nylon erosion control mat for lining ditches and protecting slopes.

### **228.02 PRECONSTRUCTION CONSIDERATIONS**

#### **A. Preconstruction Meeting**

Discuss the following at the Preconstruction Meeting:

- Area designated for coverage.
- Contractor's proposed source of material (nylon mat, seed, sod or sprigs) and need for certification.
- Basis of payment, including what is considered in the unit price (e.g., fasteners, seeding, overlaps and wasted material, etc.).
- Contractor's schedule/plan for installation.

#### **B. Acceptance of Materials**

None required.

#### **C. Preparatory Work and Contractor Work Plans**

Check the Contractor's sequence of construction to ensure timely installation of the nylon erosion control mat to reduce the need for temporary erosion and sediment control measures.

#### **D. Safety and Environmental Issues**

Timely and proper installation of the nylon erosion control mat is necessary to minimize erosion from storm water runoff on slopes and ditches.

### **228.03 INSPECTION GUIDELINES DURING CONSTRUCTION**

#### **A. Acceptance of Materials**

Inspect all materials upon arrival and verify that they conform to the following requirements:

- Nylon erosion control mat must comply with **Section 735.04.G** of the Standard Specifications and requires a Type D certification.
- Seed provided must comply with the requirements of **Table 735:1** of the Standard Specifications.

- Mat fasteners must comply with ODOT Standard Drawing ECM3-2.

## **B. Equipment and Methods**

Mat should be installed in accordance with the manufacturer's recommendations.

## **C. Construction Operations**

Verify that the Contractor complies with the manufacturer's recommendations regarding area preparation, mat placement and fastening method, maintenance, and repair work. In addition, ensure that:

- The soil is free of rocks or other obstructions that could puncture the mat or prevent intimate contact.
- Soil, sprig, or seed is applied before mat placement.
- The mat is in complete contact with the soil.
- The top of the mat is trenched-in (there should be no evidence of water flowing under the mat).
- Mat sections are overlapped and stapled in accordance with [Section 228.04.A](#) and [B](#) of the Standard Specifications.

## **D. Safety and Environmental Considerations**

Timely placement of nylon erosion control mat should fall within 14 days of completion of the grading. If this does not occur, require the Contractor to place temporary erosion and sediment control measures.

## **E. Documentation**

### **1. Daily Work Report**

Record the following information, as appropriate:

- Location and quantity of Nylon Erosion Control Mat installed
- Any discussions with the Contractor concerning installation of additional Nylon Erosion Control Mat
- Discussions with the Contractor concerning any necessary maintenance (i.e. replacement of damaged mat, reseeding, etc.)

### **2. Measurement and Payment**

Measure the area covered by the Nylon Erosion Control Mat installed in place, not including overlaps between adjacent pieces of mat in accordance with subsection 228.05 of the standard specifications.

Documentation of this Square Yard item will be performed within the SiteManager / Daily Work Reports / Work Items tab / DWR Template.

- a. Select the Nylon Erosion Control Mat from the list of contract pay items.
- b. Open the 'DWR Templates' icon in the toolbar.
- c. Select the payment option from the drop down list (Progressive Estimate or Audit Adjustment) that is going to be used as the method of documentation for the work performed.
- d. Select the appropriate method of measurement from the Type radio button options. Depending on the option selected, enter the following information:

1. Two Dimensional Measured Quantity Option.

This option can be used to allow the template to calculate areas for progressive payments or for documenting the final quantity. Typically this option will be used for areas involving simple calculations which will only require length and width.

- a. In the appropriate fields, enter both a descriptive location and the station to station extents.
- b. Input the measured length and width to calculate an area.
- c. For additional areas or additional locations, with different dimensions, select the 'New Row' button.

2. Calculated Quantity Option.

This option will allow the input of quantities calculated outside of the template (i.e. spreadsheet, hand calculations, etc.), and can be used for progressive payments or for documenting the final quantity of areas. Typically this option will be used for areas involving multiple dimensions, irregular shapes, etc.

- a. In the appropriate fields, enter both a descriptive location and the station to station extents.
- b. In the Placed Quantity field, enter the calculated quantity (SY) of the item completed.
- c. In the Book/Folder/Envelope # field provide the location of the documentation for the calculations.



For additional areas or additional locations, with different dimensions, select the 'New Row' button.

## **228.04 POST-CONSTRUCTION CONSIDERATIONS**

### **A. Acceptance of Materials**

None required.

### **B. Audit Requirements**

When the Nylon Erosion Control Mat item is Pay Plan Quantity, no calculations will be required. In all other instances, the area covered by the Nylon Erosion Control Mat will be measured in place, not including overlaps between adjacent pieces of mat.

Utilize the Contract Item Work Report within SiteManager to verify that correct quantities have been placed and paid. [Add link for screen shot of the Report, SSS Database, etc.](#) Compare the Contract Item Work Report with the documentation provided for each pay item to verify the accuracy of the quantities submitted and to ensure that no features or gaps in the extents of the work were omitted or duplicated. If the basis of payment is Plan Quantity, ensure that the total quantity paid equals the plan quantity.

### **C. Protection of the Work**

The Contractor should maintain the matted area until acceptance, performing all necessary reseeding, mat replacement, and refilling of eroded areas.

## CHECKLIST – NYLON EROSION CONTROL MAT

<b>Part 1: Preconstruction</b>					
<b>Issue</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comments</b>	<b>Initials</b>
Do the materials conform to Contract requirements?					

<b>Part 2: During Construction</b>					
<b>Issue</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comments</b>	<b>Initials</b>
Has the Contractor prepared the area in accordance with the manufacturer's recommendations (e.g., surface should be free of rocks that could puncture or tear the mat)?					
Is the Contractor installing the mat in accordance with the manufacturer's instructions?					
Is the Contractor placing the nylon erosion control mat in a timely manner (i.e., typically within 14 days of grading)?					
In the Contractor minimizing wastage of material?					

<b>Part 3: Post-Construction</b>					
<b>Issue</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comments</b>	<b>Initials</b>
Is the mat in complete contact with the underlying soil?					
Is the Contractor adequately maintaining the matted area?					

## **SECTION 229 – DITCH LINER PROTECTION**

### **229.01 GENERAL**

This work consists of providing and installing excelsior mat or solid slab sod to protect ditch liners.

### **229.02 PRECONSTRUCTION CONSIDERATIONS**

#### **A. Preconstruction Meeting**

Discuss the following at the Preconstruction Meeting:

- Ditches designated for lining.
- Contractor's proposed type and source of ditch liner protection.
- Contractor's schedule/plan for installation.
- Basis of payment, including what is considered in the unit price (e.g., fasteners, seeding, fertilizer, overlaps and wasted material, etc.).

#### **B. Acceptance of Materials**

The Resident Engineer must approve the source of sod before the Contractor may begin sodding operations.

#### **C. Preparatory Work and Contractor Work Plans**

Inspect the underlying soil for rocks or other obstructions that must be removed prior to placement of ditch liner protection.

#### **D. Safety and Environmental Issues**

Timely and proper installation of the ditch liner protection is necessary to minimize erosion from storm water runoff on slopes and ditches.

### **229.03 INSPECTION GUIDELINES DURING CONSTRUCTION**

#### **A. Acceptance of Materials**

Inspect all materials upon arrival and verify that they conform to the following requirements:

- Excelsior mat must comply with **Section 735.04.C** of the Standard Specifications and requires a Type D certification.
- Solid slab sod must comply with the requirements of **Section 735.01** of the Standard Specifications.
- Mat fasteners must comply with ODOT Standard Drawing ECM3-2.

## **B. Equipment and Methods**

The excelsior mat should be installed in accordance with the manufacturers' recommendations.

## **C. Construction Operations**

Verify that the Contractor performs the work in accordance with [Section 229](#) of the Standard Specifications and in accordance with the Plans. For excelsior mat, verify compliance with the requirements for placement and fastening, maintenance, and repair work contained in [Section 229.04.A](#) of the Standard Specifications.

For sod, verify compliance with the preparation and placement requirements contained in [Section 230.04.A](#) of the Standard Specifications and the specified water and fertilizer application rates in [Section 229.04.B](#) of the Standard Specifications. Before approval, the Contractor may not mow or till the area. After approval, the Contractor should mow vegetative growth higher than 3 inches and remove the residue before harvesting the sod or sprigs.

## **D. Safety and Environmental Considerations**

Timely placement of ditch liner protection should fall within 14 days of completion of the grading. If this does not occur, require the Contractor to place temporary erosion and sediment control measures.

## **E. Documentation**

### **1. Daily Work Report**

Record the following information, as appropriate:

- Station extents and location, type, and quantity of Ditch Liner Protection installed
- Any discussions with the Contractor concerning installation of additional Ditch Liner Protection
- Discussions with the Contractor concerning any necessary maintenance (i.e. replacement, fertilizer application, etc.)

### **2. Measurement and Payment**

Measure the Ditch Liner Protection along the centerline of the ditch. The linear measurement includes the Ditch Liner Protection for both sides of the ditch to the width shown on the Plans.

Documentation of the Ditch Liner Protection item will be performed within the SiteManager / Daily Work Reports / Work Items tab / DWR Template.

- a. Select the Ditch Liner Protection pay item from the list of contract pay items.
- b. Open the 'DWR Templates' icon in the toolbar.
- c. Select the payment option from the drop down list (Progressive Estimate or Audit Adjustment) that is going to be used as the method of documentation for the work performed.
- d. In the appropriate field, enter the station to station extents and a descriptive location.

If the actual ground measurement is different than the Station Length, place that measurement in the Measured Length field, and an explanation is required in the Remarks field.

## **229.04 POST-CONSTRUCTION CONSIDERATIONS**

### **A. Acceptance of Materials**

None required.

### **B. Audit Requirements**

When the Ditch Liner Protection item is Pay Plan Quantity, no calculations will be required. In all other instances, the Ditch Liner Protection will be measured in place along the centerline of the ditch. The linear measurement includes the Ditch Liner Protection for both sides of the ditch to the width shown on the Plans.

Utilize the Contract Item Work Report within SiteManager to verify that correct quantities have been placed and paid. **Add link for screen shot of the Report, SSS Database, etc.** Compare the Contract Item Work Report with the documentation provided for each pay item to verify the accuracy of the quantities submitted and to ensure that no features or gaps in the extents of the work were omitted or duplicated. If the basis of payment is Plan Quantity, ensure that the total quantity paid equals the plan quantity.

### **C. Protection of the Work**

The Contractor should maintain the lined ditch until acceptance, performing any necessary replacement and refilling of eroded areas.

## CHECKLIST – DITCH LINER PROTECTION

<b>Part 1: Preconstruction</b>					
<b>Issue</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comments</b>	<b>Initials</b>
Has the Resident Engineer approved the Contractor's source of sod?					
Do materials meet the specified requirements?					
Have rocks and other obstructions been removed from the underlying soil?					

<b>Part 2: During Construction</b>					
<b>Issue</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comments</b>	<b>Initials</b>
Is ditch liner protection placed in a timely manner (i.e., within 14 days of grading)?					
Is the Contractor installing excelsior mat in accordance with the manufacturer's recommendations?					
Is the Contractor placing sod in accordance with the Contract requirements?					

<b>Part 3: Post-Construction</b>					
<b>Issue</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comments</b>	<b>Initials</b>
Is the Contractor adequately maintaining the lined ditch?					

## **SECTION 230 – SODDING AND SPRIGGING**

### **230.01 GENERAL**

This work consists of providing and planting Bermuda grass sod or sprigs.

### **230.02 PRECONSTRUCTION CONSIDERATIONS**

#### **A. Preconstruction Meeting**

Discuss the following at the Preconstruction Meeting:

- Sodding/sprigging limits.
- Proposed source for Resident Engineer's approval.
- Planting season.
- Contractor's schedule/plan for installation to minimize the need for temporary erosion control measures.

#### **B. Acceptance of Materials**

The Resident Engineer must approve the source of sod or sprigs before the Contractor may begin sodding or sprigging operations.

#### **C. Preparatory Work and Contractor Work Plans**

##### **1. General**

The Contractor's proposed sequence of operations should address:

- The source of the sod or sprigs;
- Time proposed between harvest and planting, and the method to be used to maintain moisture in the sod or sprigs in accordance with [Section 735.02](#) of the Standard Specifications; and
- The schedule for placement to reduce the need for temporary erosion control measures.

##### **2. Sodding**

Verify that sod is Bermuda. Make certain the rectangular sections of sod have uniform widths, retain native soil on roots, and are the specified thickness (1/2 to 3/4 inches).

Areas to be sodded must first be shaped, dressed smooth, and tilled or raked. These areas must also be fertilized at the specified rate. Sod should be placed in its final position within 48 hours of the time it is harvested. Sod must be kept moist until placed, but it must not be handled when it is so wet that it tears or breaks up or the soil drops off.

### **3. Sprigging**

Verify the type of sprigs to be used is Bermuda. The source of sprigs must be approved prior to procurement. The Resident Engineer may wish to request the services of the local County Extension Agent for a field review of the source prior to approval. Approval will be dependent on the mowing condition of the field, healthy condition of the sprigs, and presence of foreign species.

#### **D. Safety and Environmental Issues**

All mulch, seed, sod, plants, shrubs, and other similar biological material must be free from noxious weeds to minimize their propagation. Noxious weeds are plants that are detrimental to the health and well-being of other living organisms within the State. This should be discussed with the Contractor before operations such as seeding, sodding, planting, and mulching begin. Contact the Local County Extension Agent for additional information.

## **230.03 INSPECTION GUIDELINES DURING CONSTRUCTION**

#### **A. Acceptance of Materials**

Inspect all materials upon arrival and verify that they conform to the following requirements:

- Sodding and sprigging material provided complies with the requirements of **Section 735.01** of the Standard Specifications.
- Water is free of harmful quantities of toxic salts and other substances that may damage new and existing plants on the Project.

If fertilizer is included in the cost of the sodding or sprigging item, ensure that the Contractor applies fertilizer of the type and at the rate shown on the Plans and in accordance with **Section 230.04.G** of the Standard Specifications. Inspect the fertilizer packaging and/or invoice for the guaranteed analysis and complete the sample record for fertilizer (AM5007).

#### **B. Equipment and Methods**

Equipment used in the performance of sprigging may consist of farm tractors with plow attachments, discs, harrows, culti-packers and mechanical spriggers.

The mechanical sprigger basically consists of a machine attachment to the rear of a farm tractor that is capable of plowing a furrow, placing the sprig, covering, and compacting. The satisfactory field performance of the equipment is the responsibility of the Contractor.

Row sprigging equipment must be able to perform the following in one continuous operation:



- Open the furrows;
- Place the sprigs in the furrow; and
- Cover the sprigs and furrow with soil.

Rolling equipment must be of a size and weight capable of firmly compacting the sod into the soil and removing air voids.

Watering equipment must be capable of applying water as shown on the Plans from locations off the slopes, and measuring the water with a calibrated meter.

## **C. Construction Operations**

### **1. Sodding**

Sod is to be fertilized after placement is completed and before watering. The Contractor shall water the sod on a daily basis for the first seven days after placement, unless adequate rainfall occurs. For the next 30 days, the Contractor shall continue to water these areas as necessary. Watering will be measured and paid for when authorized by the Resident Engineer, unless it is included in the cost of the sodding.

Ensure that the Contractor firmly compacts the sod into place to provide close contact with the ground and to close the joints. On steep slopes, sod shall be placed in strips with the long edges parallel to the contour and starting at the bottom of the slope and progressing upward. In drainage channels, the long edges of the strips shall be laid parallel to the direction of flow.

Sod must be placed during the specified planting season. Do not allow the Contractor to place frozen sod or to place sod on frozen ground.

### **2. Sprigging**

The moisture content of the soil during the performance of sprigging is very important as sufficient moisture must be available to provide a stable embedment of the sprig.

Watering after the planting of sprigs is necessary to achieve a satisfactory stand of grass. The Contractor shall water the sprigged areas immediately after sprigging and on a daily basis for the first seven days after placement. For the next 30 days, these areas shall continue to be watered as necessary. Contrary to the item of seeding, where watering can be delayed until the seed sprouts, the watering of sprigged areas must generally begin immediately after planting. Watering will be measured and paid for when authorized by the Resident Engineer, unless it is included in the cost of the sprigging. If the Contractor continuously allows sprigged areas to become dry and crusted, advise him/her in writing.

### **3. Watering and Fertilizing**

Water or Fertilizer may be included in the cost for the Sodding or Sprigging. In these instances the Inspector may not be required to calculate the quantity for these items. However, the requirements of the specification must still be met (i.e. fertilizer application rate, moisture content, etc.)

During sodding or sprigging operations, ensure that the soil is moist, from 1 inch below to at least 5 inches below the surface. Estimate the required moisture content of the soil using the hand-squeeze test. The soil should form a tight cast when squeezed. The cast should break into two pieces without crumbling or leaving excess water on the hand.

Sodded or sprigged areas must be watered daily for the first 7 days after planting, unless adequate rainfall occurs. The Contractor shall continue to water these areas as necessary for 30 days after planting, unless the Contract requires or the Resident Engineer directs otherwise.

Ensure that the application rate and fineness of the spray provides uniform infiltration and prevents erosion or runoff.

The specifications require that the water be metered for the method of measurement. Ensure that the water being metered is being utilized only for the Sodding and Sprigging. If the water is being utilized for other purposes, the Resident Engineer may want to consider a change order to modify the method of measurement to load counts.

Verify that the Contractor is placing fertilizer at the rates specified in **Section 234** of the Standard Specifications. Do not allow fertilizer to be placed on hard or glazed surfaces. The Contractor may disk to prepare soil, remove weeds, and incorporate fertilizer in one operation, if approved by the Resident Engineer.

If the Plans show fertilizer that contains phosphorous (the second number of the fertilizer grade specified, such as 0-46-0), ensure that the fertilizer is mixed into the soil before the application of sod or sprigs using an offset or tandem disk plow.

If the specified fertilizer contains only nitrogen (the first number of the fertilizer grade specified, such as 34-0-0), ensure that the fertilizer is applied after the sodding or sprigging operations are complete.

### **D. Safety and Environmental Considerations**

During extreme weather periods, which are not conducive to sprigging or sod placement, the Resident Engineer may authorize the substitution of seeding and/or vegetative mulch in the interest of providing temporary erosion control until such time as permanent grassing can be done. This substitution must be made within the guidelines of the Standard Specifications.

## **E. Documentation**

### **1. Daily Work Report**

Record the following information, as appropriate:

- Location and quantity of Sodding, Sprigging installed
- Location and quantity of Water and Fertilizer installed. If Water or Fertilizer is included in the cost of the Sodding or Sprigging, the quantity may not be required.
- Any discussions with the Contractor concerning installation of additional Sodding, Sprigging or Watering
- Discussions with the Contractor concerning any necessary maintenance (i.e. replacement of damaged sod, resprigging, eroded slopes, etc.)

### **2. Measurement and Payment**

#### **(a) Square Yard Unit of Measure Pay Items**

Measure the area covered by the Sodding or Sprigging installed in accordance with section 230.04 of the standard specifications. Do not include gaps between adjacent rows of Solid Slab Sodding in any measurements. If Water or Fertilizer is included in the cost of the Sodding or Sprigging item, measurement and payment of these items may not be required. However, the requirements of the specification must still be met (i.e. fertilizer application rate, moisture content, etc.) If Water or Fertilizer is paid separately, ensure that fertilizer of the type and at the rate shown on the Plans is applied, in accordance with section 230.04G of the Standard Specifications. Inspect the fertilizer packaging and/or invoice for the guaranteed analysis and complete the sample record for fertilizer (AM5007).

Documentation of these Square Yard items will be performed within the SiteManager / Daily Work Reports / Work Items tab / DWR Template.

1. Select the Sodding or Sprigging from the list of contract pay items.
2. Open the 'DWR Templates' icon in the toolbar.
3. Select the payment option from the drop down list (Progressive Estimate or Audit Adjustment) that is going to be used as the method of documentation for the work performed.
4. Select the appropriate method of measurement from the Type radio button options.

5. Depending on the option selected, enter the following information:

- a. Two Dimensional Measured Quantity Option:

This option can be used to allow the template to calculate areas for progressive payments or for documenting the final quantity. Typically this option will be used for areas involving simple calculations which will only require length and width.

- (1) In the appropriate fields, enter both a descriptive location and the station to station extents.
- (2) Input the measured length and width to calculate an area.
- (3) For additional areas or additional locations, with different dimensions, select the 'New Row' button.

- b. Calculated Quantity Option.

This option will allow the input of quantities calculated outside of the template (i.e. spreadsheet, hand calculations, etc.), and can be used for progressive payments or for documenting the final quantity of areas. Typically this option will be used for areas involving multiple dimensions, irregular shapes, etc.

- (1) In the appropriate fields, enter both a descriptive location and the station to station extents.
- (2) In the Placed Quantity field, enter the calculated quantity (SY) of the item completed.
- (3) In the Book/Folder/Envelope # field provide the location of the documentation for the calculations.

For additional areas or additional locations, with different dimensions, select the 'New Row' button.

**(b) K-Gallon Unit of Measure Pay Item**

Measure the quantity of Watering placed utilizing a calibrated meter provided by the Contractor. "K-Gallon" and "M-Gallon" are both equivalent to 1,000 gallons. If the Resident Engineer agrees to allow the Contractor to use another method of measurement for Watering, the method must be documented by change order.

Documentation of this item will be performed within the SiteManager / Daily Work Reports / Work Items tab / DWR Template.

1. Select the Watering pay item from the list of contract pay items.
2. Open the 'DWR Templates' icon in the toolbar.
3. Select the payment option from the drop down list (Progressive Estimate or Audit Adjustment) that is going to be used as the method of documentation for the work performed.
4. In the appropriate field, enter either a descriptive location or the station to station extents, preferably both.
5. Select the appropriate method of measurement from the drop down list (meter reading or load count/audit adjustment). Depending on the option selected, enter the following information:

a. Meter Reading Option.

This option will be the default setting for the template and will allow the input of the beginning and ending meter reading for each day, and can be used for progressive payments or for documenting the final quantity of areas.

(1) In the appropriate fields, enter both a descriptive location and the station to station extents.

(2) In the Beginning/Ending Meter Reading fields, enter the meter reading from the begin and end of the day in K-Gallon (1,000 gallon) format.

If more than one meter is used or if the meter is changed out during the day, select the 'New Row' button.

b. Load Count/Audit Adjustment Option.

This option will allow the input of quantities calculated outside of the template (i.e. spreadsheet, hand calculations, etc.), and can be used for progressive payments or for documenting the final quantity of areas. Typically this option will be used when a change order is done to revise the method of measurement from meter reading to load counts. The capacity of each truck must be verified by certified scale weights, calculated volume by measurement

or manufacturer's certification plate on tank. The verified capacity and the signed (Contractor and Inspector) load tickets must be kept in the project files for the source documentation. Each load ticket must be signed and submitted by the Contractor and must include the date, project number, truck number and volume of water.

(1) In the appropriate fields, enter both a descriptive location and the station to station extents.

(2) In the Placed Quantity field, enter the calculated quantity (KGAL) of the Watering completed.

(3) In the Book/Folder/Envelope # field provide the location of the documentation for the calculations.

**(c) Documentation Procedures for the Sodding and Sprigging Pay Items**

**(1) Solid Slab Sodding (SY)**

This pay item will be documented utilizing the DWR template for Square Yard (SqYd).

**(2) Mulch Sodding (SY)**

This pay item will be documented utilizing the DWR template for Square Yard (SqYd).

**(3) Row Sprigging (SY)**

This pay item will be documented utilizing the DWR template for Square Yard (SqYd).

**(4) Broadcast Sprigging (Method A) (SY)**

This pay item will be documented utilizing the DWR template for Square Yard (SqYd).

**(5) Broadcast Sprigging (Method B) (SY)**

This pay item will be documented utilizing the DWR template for Square Yard (SqYd).

**(6) Watering (KGAL)**

This pay item will be documented utilizing the DWR template for K-Gallon (KGal).

In the Book/Folder/Envelope # field of the final DWR Template (Audit Adjustment), provide the physical location (Folder #, Envelope #, File,

etc.) of the supporting documentation for the quantities shown. Add link for screen shot of the Template.

## **230.04 POST-CONSTRUCTION CONSIDERATIONS**

### **A. Acceptance of Materials**

None required.

### **B. Audit Requirements**

When the Sodding, Sprigging or Watering pay items are Pay Plan Quantity, no calculations will be required. In all other instances, the area covered by the Sodding or Sprigging will be measured in place and the Watering will be measured on a daily basis.

Utilize the Contract Item Work Report within SiteManager to verify that correct quantities have been placed and paid. Add link for screen shot of the Report, SSS Database, etc. Compare the Contract Item Work Report with the documentation provided for each pay item to verify the accuracy of the quantities submitted and to ensure that no features or gaps in the extents of the work were omitted or duplicated. If the basis of payment is Plan Quantity, ensure that the total quantity paid equals the plan quantity.

### **C. Protection of the Work**

The Contractor must maintain the sodded and sprigged areas until acceptance, performing the necessary mowing, watering, and application of herbicides and fertilizer. Note that fertilizer and mowing will be paid for under the applicable bid item. The Contractor must repair any damaged or eroded areas by filling, reshaping, or cleaning ditches to the planned typical section.

Monitor sodded and sprigged areas to ensure that the grass is growing and to identify areas that are in need of repair. Verify that mowing is being performed as specified.

Assess the acceptability of the stand of grass (e.g., 70% density, defined as looking at a square yard of coverage, in which 70% of that square yard is covered with vegetation).

## CHECKLIST – SODDING AND SPRIGGING

<b>Part 1: Preconstruction</b>					
<b>Issue</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comments</b>	<b>Initials</b>
Has the Resident Engineer approved the Contractor's source of sod or sprigs?					
Is sod or sprigs Bermuda?					
If conditions are not suitable for sod or sprig application, has the Resident Engineer approved the use of temporary seeding or mulch application, if necessary?					

<b>Part 2: During Construction</b>					
<b>Issue</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comments</b>	<b>Initials</b>
Is the Contractor observing the specified planting season?					
Has the Contractor adequately prepared the surface to receive the sod or sprigs?					
Does the underlying soil have adequate moisture content?					
Is the Contractor placing sod or sprigs in the specified manner?					
Is the Contractor applying fertilizer of the type and at the rate specified?					
Is the Contractor applying water uniformly and in a manner that prevents erosion and minimizes runoff?					

<b>Part 3: Post-Construction</b>					
<b>Issue</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comments</b>	<b>Initials</b>
Is the Contractor adequately maintaining the sodded and sprigged areas (e.g., mowing, watering, applying herbicide and fertilizer, etc.)?					



<b>Part 3: Post-Construction</b>					
<b>Issue</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comments</b>	<b>Initials</b>
Has an acceptable stand of grass been achieved?					

## **SECTION 231 – PLANTING**

### **231.01 GENERAL**

This work consists of providing, handling, planting, and establishing plant materials.

### **231.02 PRECONSTRUCTION CONSIDERATIONS**

#### **A. Preconstruction Meeting**

Discuss the following at the Preconstruction Meeting:

- Plant types, condition, and layout.
- Underground utility locations.
- Required certificates.
- Planting season and weather restrictions.
- Maintenance of plantings as required by the Contract.

#### **B. Acceptance of Materials**

None required.

#### **C. Preparatory Work and Contractor Work Plans**

##### **1. Planting Layout**

Review and understand the planting layout that is included in the Contract. Review the Plans and Specifications to understand the types, sizes, and locations of vegetation to be provided.

Planting area outlines and planting pit locations must be staked and approved before any excavation.

##### **2. Utilities**

Verify that planting locations have been properly coordinated with existing utilities and any utilities that will be adjusted or relocated. Also consider any proposed utilities, such as irrigation systems.

##### **3. Season**

Check that the planting will be performed during the appropriate season. Verify whether the plants should be balled and burlapped or container grown.

#### **4. Credentials**

The Contractor should perform planting under the supervision of an experienced nurseryperson. Obtain the credentials of this supervisor prior to allowing the Contractor to start the work.

#### **5. Plant Types**

Check that plants have been properly labeled regarding species and variety with respect to the requirements of the Contract Plans. Verify that the specified types and sizes are provided according to the Plant List in the Contract.

#### **6. Plant Condition**

Check quality and size against the requirements in American Standards for Nursery Stock, Contract Plan tabulations, and the Contract Specifications. The plants supplied should be healthy with well-developed branch and root systems. Reject all plants having dry or damaged root systems. Check foliage for wilting or dryness. Observe any obvious signs of insect, disease or other damage. Verify balled and burlapped plants for a solid ball that conforms to specified dimensions. Check for broken, cracked, soft or pliable balls. Such types of damage are general grounds for rejection.

#### **7. Certification**

Check plants, trees, shrubs, vines, and ground cover for compliance. Check the certificates of inspection for plants, trees, and shrubs (e.g., inspected at nursery, Contractor-furnished samples). Do not accept plants without certificates. Retain certificates for the Project records.

#### **8. Other Materials**

Many other materials will be required for this type of work, including topsoil, fertilizer, lime, superphosphate, mulch, water, stakes for bracing and anchoring, weed control cloth, porous material for tree root protection, and pipe for underdrains. Ensure that these materials comply with specified requirements.

### **D. Safety and Environmental Issues**

Ensure that planting materials are certified free of disease. The Contractor must provide the Resident Engineer with a written statement that includes shipment origin and an invoice showing quantities, sizes, varieties, and inspection certificates, in accordance with Federal and State laws, certifying the plant is free of disease and insects in accordance with [Section 735.02.A](#) of the Standard Specifications.

## **231.03 INSPECTION GUIDELINES DURING CONSTRUCTION**

### **A. Acceptance of Materials**

All shipments of plant material must be inspected at their source by the required authorities. Each shipment of such material must be declared and certified to be free of disease of any kind.

Inspect all materials upon their arrival to the Project site and verify that they conform to the following requirements:

- Plant materials comply with the requirements of [Section 735.03.A](#) of the Standard Specifications.
- Planting soil mix and organic mulch / vegetable compost materials comply with the requirements of [Section 735.03B](#) and [C](#) of the Standard Specifications.
- Water will be free of harmful quantities of toxic salts and other substances that may damage new and existing plants on the Project.

Obtain from the Contractor a written statement identifying the shipment origin and an invoice showing quantities, sizes, varieties, and inspection certificates, in accordance with Federal and State laws, certifying the plant is free of disease and insects. Place this statement and invoice in the Project files.

If fertilizer is included in the cost of the planting item, ensure that the Contractor applies fertilizer of the type and at the rate shown on the Plans and in accordance with [Section 234](#) of the Standard Specifications. Inspect the fertilizer packaging and/or invoice for the guaranteed analysis.

### **B. Equipment and Methods**

Verify that the equipment used does not damage the ball of soil or the plant, especially for machine planting of trees.

### **C. Construction Operations**

#### **1. Seasons**

Planting may be done only during the permissible planting seasons as specified in [Section 231.04.C](#) of the Standard Specifications or as modified by Plan Notes. Do not allow the Contractor to plant material during freezing weather or on frozen ground. Direct the Contractor to replace dead and unhealthy plants during the earliest available planting season.

#### **2. Care and Handling**

Plant material must be delivered from the growing site to the planting site with special care to prevent excess drying of the roots and balls and wind damage to

the foliage. Consider recommending the use of tarps or covered vehicles to the Contractor.

Trees shall be picked up by the container or rootball, never by the trunk.

If the Contractor is unable to plant bare-rooted (BR) plants within 2 hours of delivery and balled and burlapped (B&B) or container plants within 24 hours, the Contractor must heel-in (temporarily plant) the plants using moist soil or mulch or store in a protected area in accordance with [Section 231.04.B](#) of the Standard Specifications.

The Contractor must replace plants that the Department determines to be unfit for planting, at no additional cost to the Department.

### **3. Planting Beds**

No planting soil mixtures should be mixed, worked, or placed when the material is muddy or frozen. All plant beds and pits shall be mulched. For details on the sizes and shapes of the holes excavated for the planting bed, refer to [Section 234.04.C](#) of the Standard Specifications. The details for the mulch required are in [Section 231.04.E](#) of the Standard Specifications.

### **4. Planting Procedure**

Observe the preparation of plants. Plants must be prepared according to specified requirements (e.g., soaked, unwrapped). Pruning must be performed using good tree-surgery practices. Verify that exposed roots of bare root plants are carefully protected while in transit or being moved and are heeled-in immediately on receipt. The size and condition of balls must be acceptable. Balled plant material must be protected if not planted immediately.

Loosening of the soil, placing of the plant, backfill requirements, etc. may be found in [Section 231.04.C](#) of the Standard Specifications.

### **5. Staking**

Verify staking locations based on prevailing wind direction. Check that the operation is being performed without damage to the tree (e.g., damage from guy wires), and that the tree trunks are being wrapped as required. Stake container trees with calipers 1 inch or larger, and B&B and machine planted trees with calipers 1.5 inches or larger.

The Contractor must use nylon staking ties (webbing or strapping) to attach the stake to the trunk, and place the staking ties loosely around the trunk just above the lowest set of branches. The nylon ties must be attached to stakes placed outside the perimeter of the tree well, with at least 3.5 feet of the stake left above ground.

## **6.      Watering**

Water the plants periodically during the plant establishment period as specified in the Contract Documents. The Contractor is responsible for monitoring the water needs of all plants.

## **7.      Substitution**

Substitutions will require approval by the Resident Engineer and may require a Change Order. Any substitutions being considered by the Resident Engineer should be approved by the Designer.

## **D.      Safety and Environmental Considerations**

Ensure that the Contractor adequately protects the existing landscape and vegetation during planting operations.

## **E.      Documentation**

### **1.      Daily Work Report**

Record the following information, as appropriate:

- Number, types, and locations of plant materials installed
- Locations of planting beds prepared and holes excavated
- Discussions with the Contractor concerning any necessary maintenance of temporary erosion and sediment control devices (i.e. watering, pruning, weed control, etc.)

### **2.      Measurement and Payment**

There are several pay items for the various types of plant materials being used, all of which are paid for by the EACH. Typically, the cost for watering, mulching and fertilizer will be included in the unit price of the relevant trees, shrubs or ground cover pay item.

Documentation of these items will be performed within the SiteManager / Daily Work Reports / Work Items tab / DWR Template.

- Select the appropriate pay item from the list of contract pay items.
- Open the 'DWR Templates' icon in the toolbar.

- Select the payment option from the drop down list (Progressive Estimate or Audit Adjustment) that is going to be used as the method of documentation for the work performed.
- In the appropriate field, enter the station for each item and a descriptive location.
- If the Placed Quantity field is more than one, an explanation is required in the Remarks field.
- For additional plant materials, select the 'New Row' button.

## **231.04 POST-CONSTRUCTION CONSIDERATIONS**

### **A. Acceptance of Materials**

None required.

### **B. Audit Requirements**

Utilize the Contract Item Work Report within SiteManager to verify that correct quantities have been placed and paid. Add link for screen shot of the Report, SSS Database, etc. Compare the Contract Item Work Report with the documentation provided for each pay item to verify the accuracy of the quantities submitted and to ensure that no features or gaps in the extents of the work were omitted or duplicated. If the basis of payment is Plan Quantity, ensure that the total quantities paid equals the plan quantity.

### **C. Protection of the Work**

#### **1. Establishment Period**

Ensure that the Contractor maintains the plant material for the entire establishment period, including watering, pruning, spraying for insects and disease control, and replacing unhealthy plants with plants of the same size and variety. Check the terms of the Contract for the length of the establishment period or possible Landscape Warranty Bond.

## **2. Final Acceptance**

Perform a final inspection at the end of the establishment period, when specified, otherwise when plantings are completed, to determine which plants, if any, need to be rejected and replaced. Ensure that rejected plants are properly replaced.



## CHECKLIST – PLANTING

<b>Part 1: Preconstruction</b>					
<b>Issue</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comments</b>	<b>Initials</b>
Has the Contractor coordinated planting locations with existing and proposed utilities?					
Has the Contractor provided the necessary inspection certificates to certify the plant is free of disease?					
Has the Contractor engaged an experienced nursery person to supervise its planting operations?					

<b>Part 2: During Construction</b>					
<b>Issue</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comments</b>	<b>Initials</b>
Is the Contractor providing plants of the specified size and variety?					
Do the plants appear healthy and free of disease or other damage?					
Is the Contractor properly protecting plants if not planting immediately?					
Are the weather and ground conditions appropriate for planting (e.g., not during freezing weather or on frozen ground)?					
Has the Contractor prepared the planting bed in accordance with the Plans and Specifications?					
Has the Contractor prepared and pruned plants in accordance with the Specifications and good tree surgery practice?					
Has the Contractor planted the plant materials in accordance with the Plans and Specifications?					

**Part 3: Post-Construction**

<b>Issue</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comments</b>	<b>Initials</b>
Is the Contractor adequately maintaining plants during the establishment period to ensure healthy growth (e.g., watering, pruning, spraying for insects and disease control)?					
As applicable, has the Contractor replaced rejected or unhealthy plants with healthy plants of the same size and variety?					

## **SECTION 232 – SEEDING**

### **232.01 GENERAL**

This work consists of preparing seedbeds, providing and planting seeds, and seeding for temporary and permanent erosion control.

### **232.02 PRECONSTRUCTION CONSIDERATIONS**

#### **A. Preconstruction Meeting**

Discuss the following at the Preconstruction Meeting:

- Seed material specified on the Plans.
- Seeding coverage and application rate.
- Surface preparation.
- Seasonal and weather restrictions considerations.
- Watering and maintenance requirements.
- Timeliness of the placement of the permanent and temporary seeding.
- Determination of acceptable stand establishment.

#### **B. Acceptance of Materials**

None required.

#### **C. Preparatory Work and Contractor Work Plans**

##### **1. Surface Preparation**

Spot check the prepared soil to ensure that the top four inches or specified depth has been prepared as required.

##### **2. Application Rate**

Know the application rates specified in the Plans for seed, fertilizer, and water.

##### **3. Seasonal Considerations**

Verify the season of the year for compliance with respect to the permanent or temporary seeding. The Department may waive specified requirements. Do not allow seeding on frozen ground.

##### **4. Watering/Maintenance**

Know requirements regarding watering and maintenance as specified in **Sections 231.04.D and F** of the Standard Specifications.

## **D. Safety and Environmental Issues**

Ensure timely placement of temporary seeding and mulching within 14 days of completion of the grading operations in areas where permanent grassing cannot be accomplished.

## **232.03 INSPECTION GUIDELINES DURING CONSTRUCTION**

### **A. Acceptance of Materials**

Verify that the mixture, names, purity, germination, weed content, and date of the last test on the seed labels are in accordance with **Table 735:1** of the Standard Specifications. Verify certification requirements (i.e., Contractor furnished, laboratory tests). Verify that the pure-live-seed (PLS) content has been determined based on the formula in the Contract Specifications. Check condition of seed for water, insect, and mold damage. Enforce the provisions of the Contract with respect to rejection. Ensure that the mixture is free from State noxious weeds and does not contain Johnson grass seed.

Inspect all materials upon arrival and verify that they conform to the following requirements:

- Seeding material complies with the requirements of **Section 735.04** of the Standard Specifications. Complete the sample record for seeding (AM5007).
- Water will be free of harmful quantities of toxic salts and other substances that may damage new and existing plants on the Project.

Retain seed labels and invoices for the Project files. If fertilizer is included in the cost of the seeding item, ensure that the Contractor applies fertilizer of the type and at the rate shown on the Plans and in accordance with **Section 230.04G** of the Standard Specifications. Inspect the fertilizer packaging and/or invoice for the guaranteed analysis.

### **B. Equipment and Methods**

Review **Sections 232.03** and **232.04.B** of the Standard Specifications for specific requirements related to the seeders and seeding methods that may be used to perform this work, including hydraulic seeders, grass seed drill, corrugated roller seeder, etc.

### **C. Construction Operations**

#### **1. Preparation of Seedbed**

The preparation of a good seedbed is the most important factor in the development of vegetative cover. A well-prepared seedbed is firm beneath, loose and open on the surface, and free from clods. Where hard and compacted soil exists, the soil should be loosened to promote root growth. The Contractor should be encouraged to prepare the seedbed deeper than the specified minimum on flat

areas and gentle slopes. On high steep slopes (i.e., 2:1 or steeper), seedbed preparation is critical; and, under these conditions, the surface must be broken and small pockets, trenches or ridges and serrations provided to lodge the seed. Enforce these provisions, because some contractors attempt to avoid such treatment on steep cut slopes. It is important that the soil be worked when moisture conditions are normal. If the soil is saturated, any attempt to prepare a seedbed will cause the seedbed to become very cloddy. Also, verify that the Contractor removes rocks and debris from the seedbed, as specified. After the seedbed has been prepared, vehicular traffic on the seedbed should be minimal to prevent recompaction. This can be accomplished by tracking the slope vertically.

## **2. Placement of Topsoil on Slopes**

The Plans may require that topsoil be placed on cut and fill slopes. Where topsoil is to be placed on such areas, cut slopes should be scarified so that the topsoil will have something to bond with. If topsoil is placed on the slope without proper scarification, much of the topsoil could be lost due to erosion during periods of even moderate rainfall. As soon as practicable after the topsoil has been placed on the slopes, seeding should begin.

## **3. Application of Seed**

Seeding schedules typically require the use of more than one type of seed. Observe the weighing and mixing of each type of seed. The seed should be thoroughly mixed before it is placed into mechanical spreaders. However, where hydroseeders are used, the seed proportions may be separately introduced and continuously mixed by the mixing blades throughout the hydroseeding operation. Where hydroseeders are used, the seed should be mixed only for the quantity necessary to treat 1 to 2 acres at a time. The Contractor should avoid using hydroseeders during high wind conditions, which may cause a concentration of seed on lower areas and poor distribution on the top of slopes. Seed should not remain in the fertilizer slurry for a period over 30 minutes, because the fertilizer may decrease the percent germination. In flat areas, such as median strips, shoulders and interchanges, drills or cultipackers must be used, because these methods provide superior results on level terrain. Seed that is allowed to germinate on top of the ground or in air pockets under the ground will result in poor root development or death of the young seedlings. Therefore, after seeding, ensure that the seed is covered and lightly compacted into the soil. Compaction can be achieved using cultipackers, light rollers and soil pulverizers. Covering seed to the proper depth (approximately 0.25 inches) will greatly aid in seedling emergence and will provide quick erosion control.

## **D. Safety and Environmental Considerations**

Ensure timely placement of temporary seeding and mulching within 14 days of completion of the grading operations in areas where permanent grassing cannot be accomplished.

## **E. Documentation**

### **1. Daily Work Report**

Record the following information, as appropriate:

- 
- Location and quantity of Seeding installed and application method used
- Seed type and mixture used
- Location and quantity of Water and Fertilizer installed. If Water or Fertilizer is included in the cost of the Seeding, the quantity may not be required
- Any discussions with the Contractor concerning installation of additional Seeding
- Discussions with the Contractor concerning any necessary maintenance (i.e. replacement of damaged seeded areas, eroded slopes, etc.)

### **2. Measurement and Payment**

Measure the area covered by Seeding installed in accordance with section 232.04 of the standard specifications. If Water or Fertilizer is included in the cost of the Seeding item, measurement and payment of these items may not be required. However, the requirements of the specification must still be met (i.e. fertilizer application rate, moisture content, etc.) If Water or Fertilizer is paid separately, ensure that fertilizer of the type and at the rate shown on the Plans is applied, in accordance with section 230.04G of the Standard Specifications. Inspect the fertilizer packaging and/or invoice for the guaranteed analysis and complete the sample record for fertilizer (AM5007).

Documentation of these Acre items will be performed within the SiteManager / Daily Work Reports / Work Items tab / DWR Template.

- a. Select the appropriate Seeding item from the list of contract pay items.
- b. Open the 'DWR Templates' icon in the toolbar.
- c. Select the payment option from the drop down list (Progressive Estimate or Audit Adjustment) that is going to be used as the method of documentation for the work performed.
- d. Select the appropriate method of measurement from the Type radio button options. Depending on the option selected, enter the following information:

#### **1. Two Dimensional Measured Quantity Option.**

This option can be used to allow the template to calculate areas for progressive payments or for documenting the final quantity.

Typically this option will be used for areas involving simple calculations which will only require length and width.

- a. In the appropriate fields, enter both a descriptive location and the station to station extents.
- b. Input the measured length and width to calculate an area.
- c. For additional areas or additional locations, with different dimensions, select the 'New Row' button.

## 2. Calculated Quantity Option.

This option will allow the input of quantities calculated outside of the template (i.e. spreadsheet, hand calculations, etc.), and can be used for progressive payments or for documenting the final quantity of areas. Typically this option will be used for areas involving multiple dimensions, irregular shapes, etc.

- a. In the appropriate fields, enter both a descriptive location and the station to station extents.
- b. In the Placed Quantity field, enter the calculated quantity (Acre) of the item completed.
- c. In the Book/Folder/Envelope # field provide the location of the documentation for the calculations.

For additional areas or additional locations, with different dimensions, select the 'New Row' button.

## **232.04 POST-CONSTRUCTION CONSIDERATIONS**

### **A. Acceptance of Materials**

None required.

### **B. Audit Requirements**

When the Seeding pay items are Pay Plan Quantity, no calculations will be required. In all other instances, the area covered by the Seeding will be measured in place.

Utilize the Contract Item Work Report within SiteManager to verify that correct quantities have been placed and paid. Add link for screen shot of the Report, SSS Database, etc. Compare the Contract Item Work Report with the documentation provided for each pay item to verify the accuracy of the quantities submitted and to ensure that no

features or gaps in the extents of the work were omitted or duplicated. If the basis of payment is Plan Quantity, ensure that the total quantity paid equals the plan quantity

**C. Protection of the Work**

Monitor seeded areas to ensure the grass is growing and to identify any areas that are in need of fertilizer, nitrogen, additional mulch, or overseeding. Verify that mowing is being performed as specified.

Assess the acceptability of the stand of grass (e.g., 70% density, defined as looking at a square yard of coverage, in which 70% of that square yard is covered with vegetation).



## CHECKLIST – SEEDING

<b>Part 1: Preconstruction</b>					
<b>Issue</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comments</b>	<b>Initials</b>
Has the Contractor prepared the surface in accordance with the specifications?					
Is the season appropriate for seeding?					
Is the seed free from water, insect, and mold damage?					
Is the seed free from State noxious weeds?					

<b>Part 2: During Construction</b>					
<b>Issue</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comments</b>	<b>Initials</b>
Has the Contractor adequately prepared the seedbed (e.g., loosened to promote root growth, free of rocks and debris)?					
Has suitable topsoil been placed, if required?					
Are the weather and ground conditions appropriate for seeding (e.g., not during freezing or excessively windy weather or on frozen ground)?					
Is the Contractor uniformly applying seed at the specified rate?					
Is the Contractor providing temporary seeding in a timely manner (typically within 14 days of the grading operation) in areas where permanent grassing is yet not appropriate?					

**Part 3: Post-Construction**

<b>Issue</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comments</b>	<b>Initials</b>
Is the Contractor adequately maintaining the seeded areas (e.g., watering, applying herbicide and fertilizer, mulching etc.)?					
Has an acceptable stand of grass been achieved?					

## **SECTION 233 – MULCHING**

### **233.01 GENERAL**

This work consists of providing, applying, and fastening mulching materials to the soil surface.

### **233.02 PRECONSTRUCTION CONSIDERATIONS**

#### **A. Preconstruction Meeting**

Discuss the following at the Preconstruction Meeting:

- Timeliness requirements for placement of the mulch.
- Mulching method and application rate.
- Materials proposed by the Contractor.

#### **B. Acceptance of Materials**

Before delivery of the mulching material, provide the Resident Engineer with the following:

- Notification of the intended material sources and quantities, and
- Representative samples of the materials.

The Resident Engineer may use the samples for conditional approval before delivery and will reject material with evidence of deterioration. The vegetative mulch shall be primarily long, heavy stemmed material.

#### **C. Preparatory Work and Contractor Work Plans**

##### **1. Contract Plans and Specifications**

Review the Contract for the areas to be treated and any special requirements.

##### **2. Slopes/Staking**

Verify slope adequacy and any staking for the areas to be mulched. Ensure the Contractor fully understands the limits of mulching.

##### **3. Mulching Method**

Understand the proper operation of the mulching method that will be used (e.g., mechanically crimped, hydraulic).

##### **4. Application Rate**

Know the specified rate of application for the specific type of mulch material and method of application to be used.

#### **D. Safety and Environmental Issues**

Ensure timely placement of temporary vegetative mulch within 14 days of completion of the grading operations in areas where permanent grassing cannot be accomplished.

### **233.03 INSPECTION GUIDELINES DURING CONSTRUCTION**

#### **A. Acceptance of Materials**

Verify that the proper type of mulch has been provided. Reject mulch that is discolored, brittle, rotten, moldy, or decayed. The vegetative mulch shall be long, heavy-stemmed material. Retain supplier certificates indicating dry weight to verify compliance with the required application rates for the project records. Hay should consist of native grasses free of State noxious weeds. Straw should consist of clean cereal shafts (barley, oats, rye or wheat) that are free of weeds that are named on the Noxious Weeds List. Tackifier will be a free flowing non-corrosive powder without mineral filler, recycled cellulose fiber, clays, or other substances that will inhibit plant growth.

Inspect all materials upon arrival and verify that they conform to the following requirements:

- The various mulching materials provided comply with the requirements of **Section 735.05** of the Standard Specifications
- The mulch fasteners provided comply with the requirements of **Section 735.06** of the Standard Specifications.

#### **B. Equipment and Methods**

Review **Sections 233.03** and **233.04.B** of the Standard Specifications for specific requirements related to the equipment and application methods that may be used to distribute and anchor mulch, including adhesive sprayers, mulching tillers, etc.

#### **C. Construction Operations**

Verify that the Contractor complies with the requirements for area preparation, mulch placement and fastening method, maintenance, and repair work in accordance with **Section 233.04** of the Standard Specifications and the following:

- The soil must be free of rocks or other obstructions that could puncture the mat or prevent intimate contact.
- Soil, sprig, or seed must be applied before the permanent mulch placement.
- Check that the top of the blanket is trenched-in (there should be no evidence of water flowing under the blanket or mat).
- Mulch should not be placed in concentrated flow areas.
- Check to see if erosion is occurring in the mulched area (more mulch may need to be applied).

## **1. Placement**

Repair eroded areas and clear ground of debris that would hinder the even application of mulch material. Ensure that the Contractor performs all spreading in accordance with the Specifications. Distribute mulch material evenly at required application rates.

## **2. Anchoring**

After spreading, mulch is anchored to the ground to hold it in place. If the mulch is not sufficiently anchored, it will not aid in erosion control. The method for anchoring mulch to the existing slope depends on the mulch material used. Review the specifications for anchoring requirements.

Straw mulch is to be anchored by crimping or tracking into the soil using mechanical equipment. If it is not sufficiently anchored, it can be blown or washed away. Both of these conditions can be easily observed during normal construction operations. If the straw is seen blowing or washing away, notify the Contractor so that maintenance can be performed.

When the mulch is to be anchored by the adhesive spray method, verify that the adhesive material is injected simultaneously into the mulch at the mulch blower discharge spout.

## **D. Safety and Environmental Considerations**

Ensure timely placement of temporary vegetative mulch within 14 days of completion of the grading operations in areas where permanent grassing cannot be accomplished.

## **E. Documentation**

### **1. Daily Work Report**

Record the following information, as appropriate:

- 
- Location and quantity of Mulching installed
- Type of mulch applied and anchoring method used
- Maintenance requirements (e.g., reseeding, remulching, etc.)
- Any discussions with the Contractor concerning installation of additional Mulching
- Discussions with the Contractor concerning any necessary maintenance (i.e. replacement of damaged mulched areas, eroded slopes, etc.)

### **2. Measurement and Payment**

**(a) Acre Unit of Measure Pay Items**

Documentation of these Acre items will be performed within the SiteManager / Daily Work Reports / Work Items tab / DWR Template.

1. Select the appropriate Mulching item from the list of contract pay items.
2. Open the 'DWR Templates' icon in the toolbar.
3. Select the payment option from the drop down list (Progressive Estimate or Audit Adjustment) that is going to be used as the method of documentation for the work performed.
4. Select the appropriate method of measurement from the Type radio button options. Depending on the option selected, enter the following information:

a. Two Dimensional Measured Quantity Option.

This option can be used to allow the template to calculate areas for progressive payments or for documenting the final quantity. Typically this option will be used for areas involving simple calculations which will only require length and width.

- (1) In the appropriate fields, enter both a descriptive location and the station to station extents.
- (2) Input the measured length and width to calculate an area.
- (3) For additional areas or additional locations, with different dimensions, select the 'New Row' button.

b. Calculated Quantity Option.

This option will allow the input of quantities calculated outside of the template (i.e. spreadsheet, hand calculations, etc.), and can be used for progressive payments or for documenting the final quantity of areas. Typically this option will be used for areas involving multiple dimensions, irregular shapes, etc.

- (1) In the appropriate fields, enter both a descriptive location and the station to station extents.

(2) In the Placed Quantity field, enter the calculated quantity (Acre) of the item completed.

(3) In the Book/Folder/Envelope # field provide the location of the documentation for the calculations.

(4) For additional areas or additional locations, with different dimensions, select the 'New Row' button.

**(b) Gallon Unit of Measure Pay Items**

Measure the quantity of Asphalt Mulching placed utilizing a volume measuring device or calibrated tank provided by the Contractor.

Documentation of this item will be performed within the SiteManager / Daily Work Reports / Work Items tab / DWR Template.

1. Select the Asphalt Mulching pay item from the list of contract pay items.
2. Open the 'DWR Templates' icon in the toolbar.
3. Select the payment option from the drop down list (Progressive Estimate or Audit Adjustment) that is going to be used as the method of documentation for the work performed.
4. In the appropriate field, enter the station to station extents, location, measured length and measured width.
5. In the Beginning/Ending Gallon fields, enter the tank reading from the begin and end of each application.
6. For additional areas or additional locations, select the 'New Row' button.

**(c) Square Yard Unit of Measure Pay Items**

Documentation of the Excelsior Mat pay item will be performed within the SiteManager / Daily Work Reports / Work Items tab / DWR Template.

1. Select the Excelsior Mat pay item from the list of contract pay items.
2. Open the 'DWR Templates' icon in the toolbar.
3. Select the payment option from the drop down list (Progressive Estimate or Audit Adjustment) that is going to

be used as the method of documentation for the work performed.

4. Select the appropriate method of measurement from the Type radio button options. Depending on the option selected, enter the following information:

- a. Two Dimensional Measured Quantity Option.

This option can be used to allow the template to calculate areas for progressive payments or for documenting the final quantity. Typically this option will be used for areas involving simple calculations which will only require length and width.

- (1) In the appropriate fields, enter both a descriptive location and the station to station extents.
- (2) Input the measured length and width to calculate an area.
- (3) For additional areas or additional locations, with different dimensions, select the 'New Row' button.

- b. Calculated Quantity Option.

This option will allow the input of quantities calculated outside of the template (i.e. spreadsheet, hand calculations, etc.), and can be used for progressive payments or for documenting the final quantity of areas. Typically this option will be used for areas involving multiple dimensions, irregular shapes, etc.

- (1) In the appropriate fields, enter both a descriptive location and the station to station extents.
- (2) In the Placed Quantity field, enter the calculated quantity (SY) of the item completed.
- (3) In the Book/Folder/Envelope # field provide the location of the documentation for the calculations.
- (4) For additional areas or additional locations, with different dimensions, select the 'New Row' button.



**(d) Documentation Procedures for the Mulching Pay Items**

**(1) Vegetative Mulching (AC)**

This pay item will be documented utilizing the DWR template for Acre (Acre).

**(2) Excelsior Mulching (AC)**

This pay item will be documented utilizing the DWR template for Acre (Acre).

**(3) Asphalt Mulching (GAL)**

This pay item will be documented utilizing the DWR template for Tack Coat (TACKCOAT).

**(4) Wood Cellulose Fiber (AC)**

This pay item will be documented utilizing the DWR template for Acre (Acre).

**(5) Excelsior Mat (SY)**

This pay item will be documented utilizing the DWR template for Square Yard (SqYd).

In the Book/Folder/Envelope # field of the final DWR Template (Audit Adjustment), provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown. Add link for screen shot of the Template.

**233.04 POST-CONSTRUCTION CONSIDERATIONS**

**A. Acceptance of Materials**

None required.

**B. Audit Requirements**

When the Mulching pay items are Pay Plan Quantity, no calculations will be required. In all other instances, the area covered by the Mulching will be measured in place.

Utilize the Contract Item Work Report within SiteManager to verify that correct quantities have been placed and paid. Add link for screen shot of the Report, SSS Database, etc. Compare the Contract Item Work Report with the documentation provided for each pay item to verify the accuracy of the quantities submitted and to ensure that no features or gaps in the extents of the work were omitted or duplicated. If the basis of payment is Plan Quantity, ensure that the total quantity paid equals the plan quantity

**C. Protection of the Work**

The Contractor is required to perform all maintenance to keep the mulched area in a satisfactory condition until final completion. When mulch blows or washes away or is not properly applied, spots in the mulched areas are apparent. Normally, this is also an indication of mulching failure. Bring such conditions to the Contractor's attention so that repair of eroded areas and remulching can be accomplished promptly.

## CHECKLIST – MULCHING

<b>Part 1: Preconstruction</b>					
<b>Issue</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comments</b>	<b>Initials</b>
Is the Contractor providing suitable mulch?					
Has the Contractor adequately prepared the surface (e.g., cleared debris, removed rocks, etc. that would hinder the even application of mulch)?					

<b>Part 2: During Construction</b>					
<b>Issue</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comments</b>	<b>Initials</b>
Is the Contractor applying mulch in a timely manner (typically within 14 days of the grading operations)?					
Is the mulch distributed evenly?					
Is the mulch distributed at the required application rate?					
Is the mulch sufficiently anchored?					

<b>Part 3: Post-Construction</b>					
<b>Issue</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comments</b>	<b>Initials</b>
Is the Contractor adequately maintaining the mulched area?					
Is the mulched area free of bare spots?					

## **SECTION 234 – FERTILIZING AND AGRICULTURAL LIMING**

### **234.01 GENERAL**

This work consists of providing and applying fertilizer or agricultural liming materials.

### **234.02 PRECONSTRUCTION CONSIDERATIONS**

#### **A. Preconstruction Meeting**

Discuss the following at the Preconstruction Meeting:

- Contractor's proposed sources of fertilizer and lime.
- Various fertilizer or lime materials and their intended uses and application rates.
- Basis of payment (e.g., measured or cost included in other items).
- Paperwork required for the Project files (e.g., bag labels, delivery tickets, etc.).

#### **B. Acceptance of Materials**

None required.

#### **C. Preparatory Work and Contractor Work Plans**

Verify that the Contractor has completed the surface preparation in accordance with the applicable specification for the replacement of the topsoil or the placement of the permanent grassing. Know the specified application rate for the type of fertilizer or lime being used.

#### **D. Safety and Environmental Issues**

Ensure that the Contractor observes all laws, rules and regulations regarding the handling and storage of fertilizer and lime, including the proper clean-up of any spilling of material.

### **234.03 INSPECTION GUIDELINES DURING CONSTRUCTION**

#### **A. Acceptance of Materials**

It will not be necessary to obtain samples of fertilizer; check shipments received at the Project site to ensure the specified type of fertilizer is being used, that the lime has the required tags or labels affixed, and that the material is not damaged or contaminated.

Check the fertilizer bag label for compliance with respect to mixture type (e.g., pellet or granular), percent, and class. Retain labels for Project records. Verify that the fertilizer is delivered in unopened containers.

Where lime is delivered in bulk, obtain the delivery tickets. Lime and nitrogen are generally not required for temporary seeding.

Inspect all materials upon arrival and verify that they conform to the following requirements:

- Inspect the fertilizer packaging and/or invoice for the guaranteed analysis in accordance with **Section 735.07.A** of the Standard Specifications and complete the sample record for fertilizer (AM5007).
- Sample the agriculture lime in accordance with **Section 735.07.B** of the Standard Specifications and submit to the Materials Division.

## **B. Equipment and Methods**

Review **Sections 234.03** and **234.04.B** of the Standard Specifications for specific requirements related to the equipment and methods that may be used to apply fertilizer and agricultural lime, including vertical drop and broadcast spreaders, power sprayers, hand broadcast spreaders, etc.

## **C. Construction Operations**

### **1. Agricultural Lime**

Soils are generally acidic and lime is added to improve this condition. Lime corrects soil acidity, increases the availability of minerals in the soil, improves the physical condition of the soil, and increases the efficiency of fertilizer materials.

When required by the Plans, lime must be applied at the specified rate during preparation of the seedbed. The rate may be adjusted based on the results of soil testing. The lime should be thoroughly mixed and incorporated into the seedbed to the depth of seedbed preparation.

### **2. Placement of Various Types of Fertilizer**

When required by the Plans, verify that fertilizer is placed at the required application rate prior to the replacement of the salvaged topsoil. Typically, phosphorus fertilizer (10-20-10) is placed before the sodding or sprigging operations and nitrogen fertilizer (36-0-0) is placed on top of the completed permanent grassing operations.

### **3. Fertilizer Substitutions**

Application rates are based on a specific grade (guaranteed analysis) of the fertilizer being applied. The term "grade" refers to the percent of nitrogen - phosphorous - potassium (10-20-10, 36-0-0, etc.). Occasionally a contractor may not be able to obtain the exact grade of fertilizer specified. If this occurs, a substitution will be allowed, as long as the application rates are adjusted as well. The following formula should be used to determine the necessary adjustment to the application rates:

$$A = (B \times C)/D$$

Where,

A = New application rate

B = Grade of specified fertilizer (converted from percent to decimal)

C = Specified application rate

D = Grade of new fertilizer (converted from percent to decimal)

Example: If the specified fertilizer is 36-0-0 and the Contractor can only obtain 10-20-10, the application rate will be 3.6 times that specified in the Plans.

Check the application rate to ensure a uniform rate of coverage is obtained. Watch for loss of seed and fertilizer in high winds and, where necessary, postpone application.

#### **D. Safety and Environmental Considerations**

Ensure the Contractor observes all laws, rules and regulations regarding the handling and storage of fertilizer and lime, including the proper clean-up of material spills.

#### **E. Documentation**

##### **1. Daily Work Report**

Record the following information, as appropriate:

- Location and quantity of Fertilizer or Lime applied. If Fertilizer or Lime is included in the cost of the Sodding or Sprigging, the quantity may not be required.
- Type of Fertilizer or Lime applied and application method used
- Any discussions with the Contractor concerning installation of additional Fertilizer or Lime

##### **2. Measurement and Payment**

If Fertilizer or Lime is included in the cost of the Sodding or Sprigging, measurement and payment of these items may not be required. However, the requirements of the specification must still be met (i.e. application rate and method used)

If Fertilizer or Lime is paid separately, ensure that fertilizer or lime of the type and at the rate shown on the Plans is applied in accordance with section 234.04 of the Standard Specifications. Inspect the fertilizer or lime packaging and/or invoice for the guaranteed analysis and complete the sample record for fertilizer or lime (AM5007).

Documentation of these Ton items will be performed within the SiteManager / Daily Work Reports / Work Items tab.

- Select the Fertilizer or Lime pay item from the list of contract pay items.
- When documenting a quantity for progressive payment, enter either a descriptive location or the station to station extents, preferably both, in the appropriate fields.
- When documenting a quantity for an audit adjustment, enter “Audit Adjustment” in the Location field.
- In the Placed Quantity field, enter the quantity placed that day.
- In the Remarks bubble enter the Book/Folder/Envelope # to provide the location of the documentation for the calculations (i.e. ticket audit spreadsheet, truck load tickets, etc.), or explain how the quantity was derived (i.e. number of bags multiplied by the weight per bag, certified truck load weight, etc.).

In the Remarks bubble of the final DWR entry (Audit Adjustment), provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown.

## **234.04 POST-CONSTRUCTION CONSIDERATIONS**

### **A. Acceptance of Materials**

None required.

### **B. Audit Requirements**

When the Fertilizer or Lime pay items are Pay Plan Quantity, no calculations will be required. In all other instances, the Fertilizer or Lime quantity will be measured by totaling the tickets or invoices.

Utilize the Contract Item Work Report within SiteManager to verify that correct quantities have been placed and paid. Add link for screen shot of the Report, SSS Database, etc. Compare the Contract Item Work Report with the documentation provided for each pay item to verify the accuracy of the quantities submitted and to ensure that no features or gaps in the extents of the work were omitted or duplicated. If the basis of payment is Plan Quantity, ensure that the total quantity paid equals the plan quantity

**C. Protection of the Work**

Ensure subsequent work is accomplished in a timely manner, which primarily includes the placement of the topsoil or permanent grassing on the placed fertilizer or lime.



## CHECKLIST – FERTILIZING AND AGRICULTURAL LIMING

<b>Part 1: Preconstruction</b>					
<b>Issue</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comments</b>	<b>Initials</b>
Is the Contractor handling and storing fertilizer and lime properly?					
Is the Contractor using the specified materials?					
Have labels been retained for the Project files?					
Are conditions appropriate for placement?					

<b>Part 2: During Construction</b>					
<b>Issue</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comments</b>	<b>Initials</b>
Is the Contractor obtaining uniform coverage?					
Is the Contractor applying specified materials at the specified rates?					

<b>Part 3: Post-Construction</b>					
<b>Issue</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comments</b>	<b>Initials</b>
Following the application of fertilizer or lime, did the Contractor apply topsoil or permanent grassing in a timely manner?					

## **SECTION 241 – MOWING**

### **241.01 GENERAL**

This work consists of mowing or hand-cutting vegetation at locations directed by the Resident Engineer.

### **241.02 PRECONSTRUCTION CONSIDERATIONS**

#### **A. Preconstruction Meeting**

Discuss the following at the Preconstruction Meeting:

- Locations designated for mowing.
- Scenarios that would require mowing.

#### **B. Acceptance of Materials**

None required.

#### **C. Preparatory Work and Contractor Work Plans**

Verify ground conditions to ensure that the use of mechanical equipment will not cause rutting.

#### **D. Safety and Environmental Issues**

None.

### **241.03 INSPECTION GUIDELINES DURING CONSTRUCTION**

#### **A. Acceptance of Materials**

None Required.

#### **B. Equipment and Methods**

The Contractor should use mechanical equipment to efficiently conduct mowing operations. However, hand-cutting methods may be necessary in areas inaccessible to mechanical mowers.

#### **C. Construction Operations**

Ensure that mowing is in accordance **Section 241** of the Standard Specifications, including removing litter and debris prior to the mowing operation. Mowing is to be done to a height of from 3 to 5 inches.

## **D. Safety and Environmental Considerations**

Ensure that clippings and other vegetation and debris are properly disposed.

## **E. Documentation**

### **1. Daily Work Report**

Record the following information, as appropriate:

- Location and quantity of Mowing performed
- Any discussions with the Contractor concerning performing additional Mowing

### **2. Measurement and Payment**

Measure the area removed of vegetation by Mowing performed in accordance with section 241.04 of the standard specifications.

Documentation of this Acre item will be performed within the SiteManager / Daily Work Reports / Work Items tab / DWR Template.

- a. Select the Mowing item from the list of contract pay items.
- b. Open the 'DWR Templates' icon in the toolbar.
- c. Select the payment option from the drop down list (Progressive Estimate or Audit Adjustment) that is going to be used as the method of documentation for the work performed.
- d. Select the appropriate method of measurement from the Type radio button options. Depending on the option selected, enter the following information:

#### **(1) Two Dimensional Measured Quantity Option.**

This option can be used to allow the template to calculate areas for progressive payments or for documenting the final quantity. Typically this option will be used for areas involving simple calculations which will only require length and width.

- a. In the appropriate fields, enter both a descriptive location and the station to station extents.
- b. Input the measured length and width to calculate an area.

- c. For additional areas or additional locations, with different dimensions, select the 'New Row' button.

**(2) Calculated Quantity Option.**

This option will allow the input of quantities calculated outside of the template (i.e. spreadsheet, hand calculations, etc.), and can be used for progressive payments or for documenting the final quantity of areas. Typically this option will be used for areas involving multiple dimensions, irregular shapes, etc.

- a. In the appropriate fields, enter both a descriptive location and the station to station extents.
- b. In the Placed Quantity field, enter the calculated quantity (Acre) of the item completed.
- c. In the Book/Folder/Envelope # field provide the location of the documentation for the calculations.

For additional areas or additional locations, with different dimensions, select the 'New Row' button.

**241.04 POST-CONSTRUCTION CONSIDERATIONS**

**A. Acceptance of Materials**

None required.

**B. Audit Requirements**

When the Mowing pay item is Pay Plan Quantity, no calculations will be required. In all other instances, the area covered by the Mowing will be measured in place.

Utilize the Contract Item Work Report within SiteManager to verify that correct quantities have been placed and paid. Add link for screen shot of the Report, SSS Database, etc. Compare the Contract Item Work Report with the documentation provided for each pay item to verify the accuracy of the quantities submitted and to ensure that no features or gaps in the extents of the work were omitted or duplicated. If the basis of payment is Plan Quantity, ensure that the total quantity paid equals the plan quantity

**C.      Protection of the Work**

Ensure that mowing is performed consistently to a height of from 3 to 5 inches and that any debris is removed and properly disposed.

## CHECKLIST – MOWING

<b>Part 1: Preconstruction</b>					
<b>Issue</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comments</b>	<b>Initials</b>
Are ground conditions adequate to support mechanical equipment without rutting?					
Did the Contractor remove debris prior to mowing?					

<b>Part 2: During Construction</b>					
<b>Issue</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comments</b>	<b>Initials</b>
Is mowing performed to a uniform height of from 3 to 5 inches ?					

<b>Part 3: Post-Construction</b>					
<b>Issue</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comments</b>	<b>Initials</b>
Did the Contractor properly dispose of clippings and other waste?					