

Sections 207 and 212 Construction Guidance

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Introduction

Revegetation activities include salvaging, stockpiling, and replacement of topsoil, incorporation of soil amendments, seeding, and application of permanent stabilization mulching or blanket cover. The Stormwater Management Plan (SWMP) Permanent Stabilization Plan Sheets and Site Maps (revegetation plan) or landscape plan sheets contain the site-specific seed mixes, amendments, and interim and final stabilization methods for the project.

Agenda templates and worksheets are available to document and track quantities for Engineers and Permanent Stabilization Subject Matter Expert (PSSME). This information is part of the project closeout including handoff, when there is a stormwater permit transfer. The following tools are available to assist and document revegetation activities as part of the project file and are found on the [Landscape Architecture web page](#).

- Your Region Environmental Staff are resources and can assist with review of submittals and revegetation inspections
- Environmental Pre-construction Conference Agenda
- Site Pre-vegetation Conference Agenda
- Inspection and Verification Checklists

Section 207

Environmental Pre-Construction Conference

The goal of the Environmental Pre-construction Conference is to improve the communication on the SWMP, Construction Stormwater Permit, if retaining topsoil, retaining the duff layer, and weed management throughout the project. This meeting is coordinated by the region's PSSME, and this individual should attend meetings and provide input on revegetation as the project progresses. The PSSME can also be the Regional Water Pollution Control Manager (RWPCM), the Landscape Architect, or the Water Quality Specialist. For the remainder of this document the PSSME will be used.

Site Pre-Vegetation Conference

The goal of the Site Pre-vegetation Conference is to effectively communicate Contract revegetation requirements and emphasize the importance of vegetation for the overall success of the project to the Contractor. This meeting is scheduled by the Project Engineer and conducted by the CDOT staff or consultant Landscape Architect or PSSME and occurs a minimum of 1 day before the subsoil preparation and topsoil placement activities or at the same time as the Environmental Pre-construction Conference. Allow for approximately 2 hours to discuss all items and address questions from grading and revegetation subcontractors, site inspectors, and other project stakeholders. The Inspection and Verification Checklist for Roadside Revegetation is a great resource for discussing submittals

and items that will be inspected and verified in the field. The Agenda and Handouts are found on the [Landscape Architecture web page](#) webpage.

Submittals

Send the PPSSME or their designee all required environmental submittals for revegetation and final stabilization as detailed in the following Sections:

- 201 Clearing and Grubbing
- 207 Subsoil and Topsoil
- 208 Erosion Control
- 209 Watering and Dust Palliative
- 212 Native Seeding and Amendments
- 213 Mulching
- 214 Planting
- 215 Transplanting
- 216 Soil Retention Covering
- 217 Weed Management
- 219 Sodding
- 220 Lawn Seeding

The PSSME can assist the Project Engineer with review of submittals, ensure they meet contract requirements, and with tracking quantities.

For all wetland submittals work with the Region Wetland Biologist.

Construction Checklist for Roadside Vegetation

The Project Engineer's Inspection and Verification Checklist of subsoil preparation, topsoil installation, topsoil amendments, and seeding activities are outlined in this Checklist at the end of this document. The PSSME can assist with reviewing submittals, inspections, and verification of these construction activities.

The following goes into greater detail from the checklist:

Favorable Conditions for Subsoil and Topsoil Preparation and Seeding - Soil Moisture Testing

Conduct subsoil preparation, and applications of topsoil, amendments, and seeding in the following conditions

- when winds and wind gusts are less than 20 mph
- when soils are not frozen or excessively wet.

Working frozen or wet soils will destroy the soil structure and further compact soils, the opposite of what is to be achieved. High winds during work will lead to soil loss and erosion, possibly create dangerous driving conditions, and loss of seed that will negatively impact

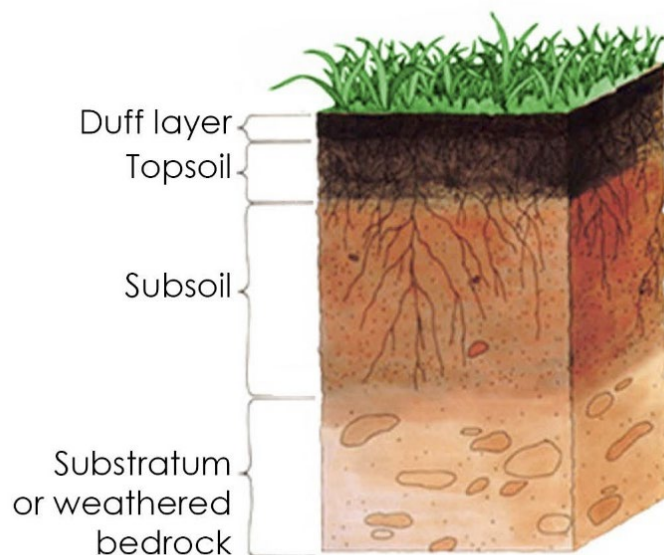
vegetation establishment.

A quick method to determine the soil moisture conditions is done in the field by taking a handful of soil from planting depth and using your hands, press the soil to form a ball. If the soil sticks to your hand or oozes between, it is too wet. Clay content could affect this. Drop the soil ball to the ground from waist height. If the soil ball doesn't break apart when it hits the soil surface, it's probably too wet. In addition, if any equipment leaves soil rutting or depressions greater than 1 to 2 inches and/or the soil sticks to the tire or track surfaces, then the soil is too wet.

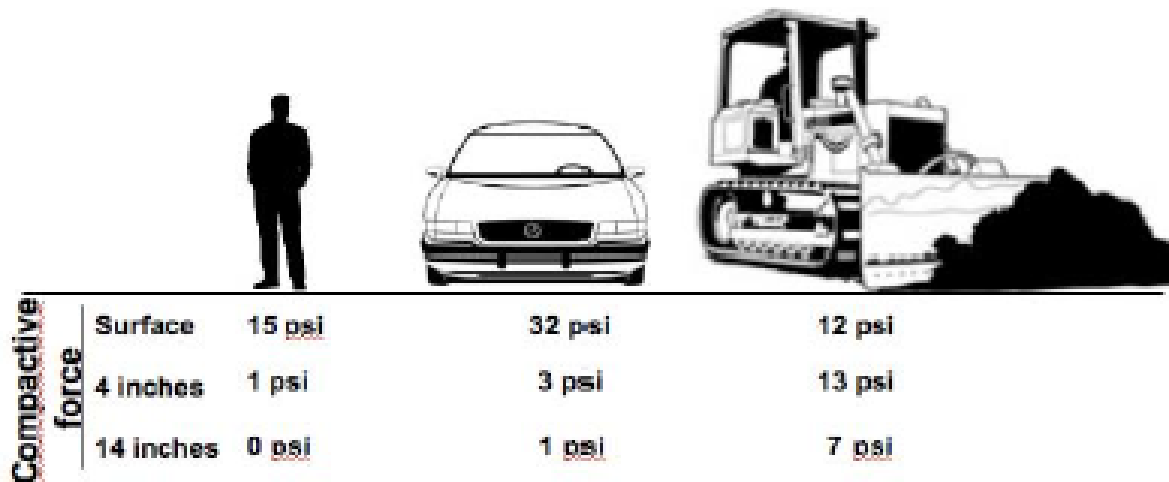
If soil is too wet, ask the Contractor to wait a day or two (assuming these are dry weather days) to allow the soil to dry to provide better soil conditions. Working in wet soil conditions results in soil compaction (what you are attempting to correct) and the result is uneven seed emergence and poor vegetation establishment making a timely closure of the Stormwater COR 040000 Permit difficult.

Subsoil Preparation

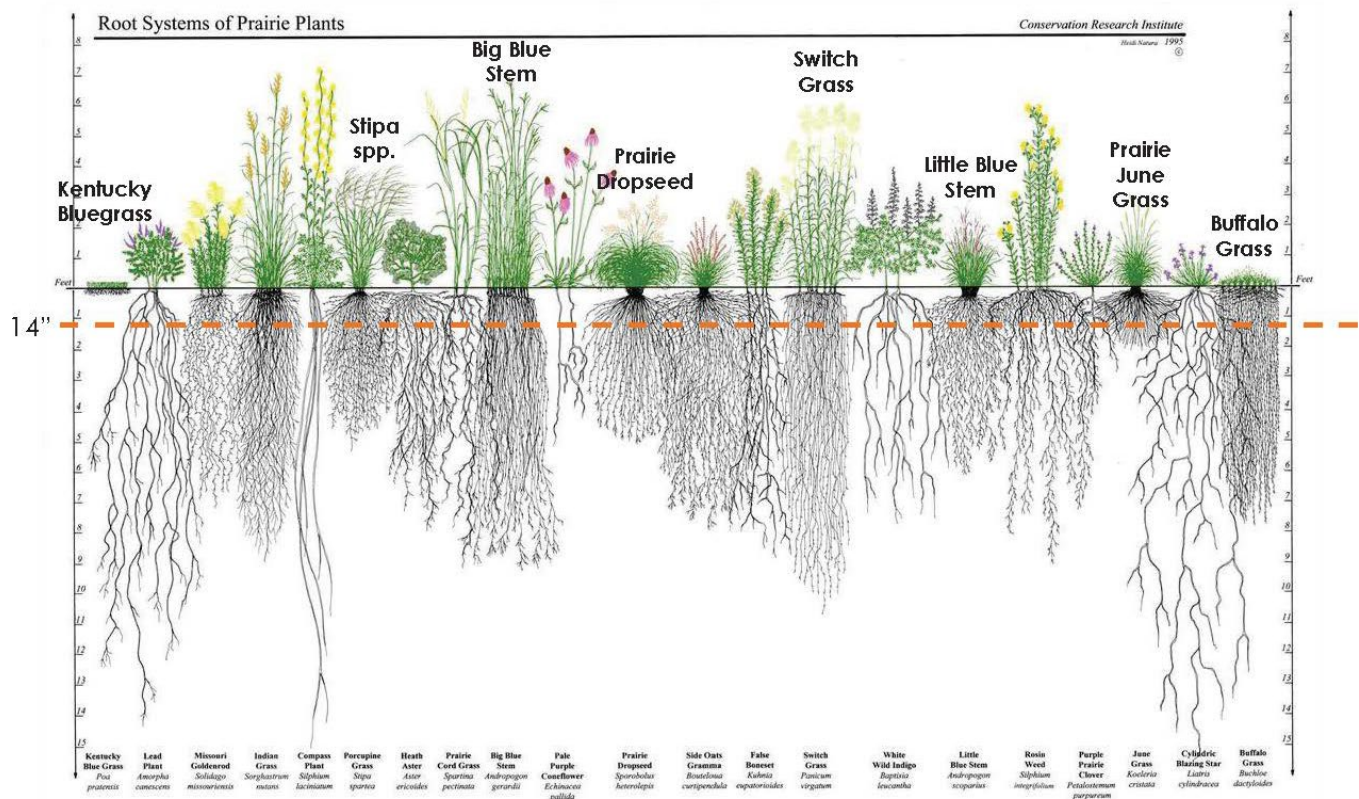
The purpose of decompaction is to create air and pore space for growth of plant roots. The roots of native plants grow deep into subsoils, generally 3 to 5 feet and some reach depths of 15 or more feet. The Contractor should provide their own penetrometer and verify they have sufficiently decompacted subsoils prior to topsoil placement.



Soil Profile Diagram: illustrates the layers of the soil profile.



The above diagram above illustrates the compactive forces of foot traffic, a car, and construction equipment. At the surface, the compact forces of equipment and a human is similar, but equipment has a greater impact below the surface where it compacts the void spaces between soil particles. Source: Larry Morris, University of Georgia.



Source: Conservation Research Institute

The diagram above illustrates the depth prairie plants grow. Notice how much deeper than 14" (orange dashed line) roots penetrate the soil vs our lawn grass, Kentucky bluegrass, which roots grow several inches deep as shown on the far left. Kentucky bluegrass, a non-native, needs rototilling only to 4 to 6 inches and watering three or more times a week to support growth.

Subsoil preparation is not appropriate for underground utilities.

Onsite Topsoil and Stockpiling

CDOT recommends reusing topsoil, where feasible. Topsoil contains organic matter including microbes, seed, and plant material native to the site that help increase the success of the project's revegetation establishment. CDPHE grading and stormwater permit states "Unless infeasible, topsoil shall be preserved for those areas of a site that will utilize vegetative final stabilization." Work with the Contractor to salvage quality topsoil that will support vegetation establishment.

Verify that topsoil stockpiles have signage per Section 207 to ensure the Contractor does not use topsoil for other purposes such as fill or inadvertently dump or mix other materials into the stockpiles. Depending on the duration of the project, topsoil stockpiles must have interim stabilization after 14 days of stockpile inactivity, per Section 208.

Stockpiles should meet the following criteria:

- Stockpiled in a manner to facilitate measurement
- Does obstruct natural drainage
- Minimizes sediment transport
- Are not compacted, per Section 208
- Have minimum of one erosion and sediment control measure
- Not located to noxious weeds (work with Region Environmental)
- Signed per 207

Topsoil stockpiles are not to be compacted per Sections 207. Compaction leads to anaerobic conditions that destroy the microbes and seed bank, which is in opposition to the intent of topsoil stockpiling. Topsoil stockpiles should be placed in a location that is less likely to be disturbed to prevent compaction. Topsoil can be pushed to the edge of the project in linear stockpiles but requires the addition of control measures per the permit and Section 208. Erosion and sediment control of topsoil stockpiles can be controlled with erosion control logs or silt fence. Silt fence staking can be used to include topsoil stockpiles signage as approved by the Project Engineer.

Payment for Topsoil (Onsite). Pay half once the topsoil is stockpiled and the pay the remaining the topsoil is put back in place.

If specifying drill seeding and/or erosion control blankets, all rocks greater than 3” are to be removed. If the project team determines to retain the rock, specify on the plans or create a PSP to retain rocks and specify hydraulic mulching. Erosion control blankets require soil contact to be effective.

Imported topsoil

Imported topsoil will be sourced from a known location with similar soil characteristics to the site where the topsoil is to be applied. When importing topsoil sampling will be required by the Contractor to ensure the topsoil has the adequate nutrient panel and meets the physical criteria. All imported topsoil will be approved by the Project Engineer. Reject all loads that do not meet requirements of Tables 207-1 and 207-2, have any noticeable chemical smell and/or contaminants such as trash, oil staining, car parts, large woody debris, or concrete and asphalt debris.

Wetland topsoil

Wetland topsoil should be stored for 3 months or less. In the case that wetland topsoil needs to be stored for longer periods, coordinate with the Region’s Wetland Specialist. The Project Engineer should coordinate with the Region Wetland Specialist throughout the project as it relates to wetland and riparian areas and soils. Documentation of the sourcing and location of the wetland topsoil will be completed by the Regional Wetland Specialist and communicated to the Project Engineer.

Engineered topsoil

Engineered topsoil should have a soil nutrient panel completed by the PSSME to determine quantities of amendments prior to incorporating amendments and placing the soil. Engineered topsoil can then be placed either in the final location or stockpiled as needed. If the engineered topsoil is to be stockpiled, use the guidance listed above for correct stockpiling operations.

Section 212

Amendments Delivery and Storage

Soil amendments must be stored per manufacturer specifications. Storage of amendments should be out of the sun and should not be in contact with rain, snow, or surface water. It is best if they are not delivered to the site until amending activities are to take place. Long term storage should be in a temperature-controlled space and away from moisture.

- The urea in organic fertilizers have the potential to explode if stored in high temperatures. Mycorrhizae stored in high temperatures will degrade or destroy the fungal propagules (living organisms) and the soil amendment will provide zero value to seeds or soils.
- All soil amendment containers should be sealed for safe storage to prevent the

- breakdown of the soil amendment with either sun or water-based degradation.
- Compost should smell of earth and not of manure. It should not contain visible debris and should be dark in color with no materials over 2” in length. Review the Certified Test Result (CTR).
- Organic Fertilizer - Verify the Nitrogen-Phosphorus-Potassium (NPK) rates and whether the fertilizer is high or low nitrogen and matches the plans.

Inspection - The work in any area will not be accepted until the required materials are applied in a uniform distribution at the specified rate. Reject any areas that do not receive a uniform distribution of seed and amendments. Get the PSSME involved if any amendment substitutions should occur. The following can help with inspections:

- When compost is applied on the topsoil surface it appears as a darker layer that appears to be approximately 1” deep prior to incorporation into the topsoil. The image below illustrates compost application, as generally covering the topsoil surface.
- Biotic Soil Amendment (Hydraulically Applied) is applied with hydroseeding activities.

Native Seeding

Seed Substitutions. The Engineer’s review of the seed mix substitutions will not exceed 10 calendar days. Seed Substitutions should be sent to the PSMME or project landscape architect for review.

Storage. Seed should be stored off site in air-conditioned spaces away from moisture if stored for periods greater than a day or two. Seed vigor (germination and growth rates and stress tolerance) decreases when stored in higher temperatures which have both short- and long-term negative effects on establishment.

Seeding Seasons. Seeding within the specified seasons, per Section 212, Table 212-8 Eastern Slope Seeding Seasons and 212-9 Western Slope Seeding Seasons ensures the optimal temperature and moisture conditions for seeds to remain viable and germinate. Seeding during the hotter drier months of June through August will result in much of it will be blown away, washed away in storms, or eaten by birds or other wildlife. If seed does germinate it will be desiccated in the hot dry sun during the long periods with no moisture. Seeding in the winter is not ideal as frozen soils do not allow for good seed to soil contact, seed will not germinate until spring and until that time can be blown or washed away or eaten by wildlife.

Seed Substitutions. Species substitutions will not be permitted in seed mixes unless a letter is submitted by the seed supplier that the seed is not available during the anticipated construction period. All seed substitutions must be reviewed and approved by the PSSME. If the seed mix specified in the plan is not available, the Contractor shall provide a letter from the seed vendor of the proposed substitute seeds species and quantities suitable for the project. Work with the PSSME to approve the changes, if any.

Note for the PSSME: Seed substitutions are common. The suggested substitutions should be native to the region with similar characteristics to the original seed. Ideally, grasses should be the same cool or warm season and rhizomatous or bunch or at least have a good mix of these characteristics in the mix. Forbs should have a similar family, bloom color, and season.

Seeding Rates. When seeding, the correct seeding rate is crucial to proper establishment. Under application of seed can lead to increased growth of weeds where exposed surface soil is present and increased surface erosion. Overseeding can result in a more vigorous initial establishment but in the long term there will be increased vegetation loss from competition of sun, nutrients, and water resources. Contractors shall calibrate seeders before seeding activities to ensure the correct amount seed is being placed during the seeding operation.

Seeding rates and timing are crucial to the establishment of desired vegetation. Seeding rates are set based on the methodology of seeding. If drill seeding rate is specified in the plans and the Contractor uses another method, the seeding rate shall be increased by 1.5 times at no additional cost to the Department.

Seeding Inspection

- Drill seeding should not occur in rocky soils as the equipment will not effectively apply the seed to the ¼” depth required. Note: Drill Seeding is the preferred seeding method where applicable.
- Hydraulic seeding occurs as a separate activity from hydro mulching. Application at the same time results in poor germination as the seed suspends in the mulch. This will negatively affect vegetation establishment and timely permit termination.
 - Water must be from a permitted water source. Rivers, streams, ditches on or off CDOT ROW are not a source of water due to Colorado Water Rights. In general, water must be trucked into the site from an off-site permitted source.
- Broadcast seeding occurs on smaller areas less than half of an acre and must be raked in afterwards to ensure seed to soil contact for germination success.

Construction Checklist for Roadside Vegetation

Section 207 Subsoil and Topsoil

General - applies to all 207 pay items

Y/N	Engineer's Review and Inspection	Comments
Y/N	Approve Contractor's Method Statement for the following: <ul style="list-style-type: none">• Topsoil stockpiling locations, stockpile maintenance (including erosion and sediment control measures, watering if required, and weeding)• Noxious weed treatment plan• Proposed locations that require subsoil preparation, and• Removal of clods, sticks, stones and debris, concrete and asphalt over 3" dia.	

Subsoil Preparation - 207-00704

Y/N	Engineer's Review and Inspection	Comments
	Verify that the initial 30' of subsoil preparation meets required decompaction depth requirements. Contractor shall perform the rod penetrometer transect method at 1-foot intervals along a 30-foot test section	
	Confirm achievement of adequate decompaction before approval. Contractor shall perform rod penetrometer testing at 10 random locations per acre.	

Topsoil General - applies to all topsoil pay items

Y/N	Engineer's Review and Inspection	Comments
	Confirm a minimum 6" topsoil depth, or per plans, has been placed on areas to be revegetated	
	Confirm that topsoil placed over subsoil is free of clods, sticks, stones, debris, concrete, and asphalt that exceeds 3 inches in any dimension. (Rocky soils to remain if PSP 207 is in Contract)	
	Confirm no equipment, storage, vehicle, and foot traffic is in topsoil areas to be revegetated	

Topsoil (On-site) - 207-00700

Y/N	Engineer's Review and Inspection	Comments
	Inspect topsoil stockpiles are signed and have erosion and sediment control measures during the duration of Construction activities	
	Inspect topsoil stockpiles are signed and have erosion and sediment control measures during the duration of Construction activities	

Topsoil (Imported) - 207-00702

Y/N	Engineer's Review and Inspection	Comments
	Verify that imported topsoil Certified Test Report (CTR)submittal meets the 207 Specification, Table 207-1 and 207-2. Reject material that doesn't meet the 207 criteria	
	Visually inspect imported topsoil upon arrival. Reject loads that have any of the following: off color, oil sheen, car parts, large woody debris, concrete and asphalt debris, and trash or have a chemical smell,	

Wetland Topsoil - 207-00703

Y/N	Engineer's Review and Inspection	Comments
	Confirm wetland topsoil is salvaged to a 12" depth, or per plan. and the stockpiled locations are approved. Coordinate with the region's wetland biologist	
	Confirm salvaged wetland topsoil is placed within 24 hours of excavation or as approved and to a 12" depth or per plan.	

PSP Engineered Topsoil - 207-00706

Y/N	Engineer's Review and Inspection	Comments
	Verify that CTR submittal for base material meets specifications	
	Coordinate with Region Environmental for sampling, testing, and amendment quantities	
	Verify amendments were incorporated prior to topsoil placement.	

Section 212 – Amendments and Native Seeding

Topsoil Amendments (applies to all pay items)

Y/N	Engineer's Review and Inspection	Comments
	Verify the correct amendment application rate	
	Confirm that bags or containers are sealed, undamaged, and contain the approved manufacturer's label. Do not accept damaged, opened, or wet bags.	
	Confirm that all soil amendments, seeding, and mulching are completed within 4 days of placing topsoil	

Organic Fertilizer - 212-00700

Y/N	Engineer's Review and Inspection	Comments
	Verify if using low nitrogen (N) fertilizer, per plans	
	Verify fertilizer is stored in a cool dark place prior to application due to urea that could explode.	

Compost (Mechanically Applied) - 212-00701

Y/N	Engineer's Review and Inspection	Comments
	Inspect and reject compost that smells like animal manure.	
	Verify Certified Test Report (CTR) has the following: <ul style="list-style-type: none">• Current member of the U.S. Composting Council STA.• Meets Section 212 properties and testing requirements• Includes CTR dated within 12 months	

Biotic Soil Amendments (Hydraulically Applied) - 212-00702

Y/N	Engineer's Review and Inspection	Comments
	Verify product and manufacturer is on the Approved Product List (APL) website	
	Verify BSA meets Material Components and Properties of Section 212	
	Verify water is obtained from a permitted on or off-site source	

Mycorrhizae - 212-00704

Y/N	Engineer's Review and Inspection	Comments
	Verify Certified Test Report (CTR) includes <ul style="list-style-type: none"> species and number of propagules per pound meet Section 212 production date within 1.5 years material is suitable for seeding type Table 212-5 	
	Inspect mycorrhizae is stored onsite to avoid direct sunlight and contact with water	

Seeding General (applies to all pay items)

Y/N	Engineer's Review and Inspection	Comments
	Confirm that all invasive and noxious weeds are chemically treated per Section 217 a minimum of two weeks prior to seeding activities and any remaining plants are uprooted and disposed of offsite prior to seeding	
	Inspect seed bag(s) to ensure unopened and are not wet or moldy	
	Review the vendors packing slip for the seed and confirm that the seed has not been in the Contractor's possession for more than 30 days, reject seed stored over 30 days	
	Confirm that the seed has been stored under dry conditions, between 35 ° to 80 ° F and out of direct sunlight	
	Verify the germination test date for any seed may not exceed 13 months from today's date	
	Verify that the seeding occurs within Seeding Seasons, per Section 212, Table 212-8 and 212-9	
	Confirm that the amended, placed topsoil is in a roughened condition with a surface variance of 2 to 4 inches prior to seeding, to create voids for seeds and limit losses to wind and erosion.	
	Confirm that the finished grade is 1 inch below the top of all curbs, junction and valve boxes, walks, drives and other structures.	
	Verify seeding method and species in the plans/pay items are the same method used, and species purchased.	

Drill Seeding - 212-00706

Y/N	Engineer's Review and Inspection	Comments
	Confirm that the drill seeder depth bands ride on the soil surface ensuring a ¼" planting depth and that furrows are closed with roller (packer) wheel. If it is observed that a 1/4" planting depth cannot be achieved, request that the Contractor make the necessary adjustments	
	Confirm that the distance between drill seeder furrows are no more than 8 inches apart. If rows exceed 8 inches, direct the Contractor to drill seed the areas twice at 30-degree angles to each other, where achievable, at no additional cost	

Hydraulic Seeding - 212-00707

Y/N	Engineer's Review and Inspection	Comments
	Confirm hydroseeding is applied separately from hydromulching application	
	Verify water is from a permitted onsite or offsite water source	
	Confirm 30 pounds per acre of wetting agent/tackifier is added to Hydroseeder	
	Confirm visually that a uniform by two applications in perpendicular directions and 100% coverage rate of the seeded area coverage was achieved	
	Direct any overspray of hydroseeding material be removed the same day to prevent loss of plant growth	
	Confirm that the permanent stabilization mulching was completed within 24 hours of hydraulic application of seed	

Broadcast Seeding - 212-00708

Y/N	Engineer's Review and Inspection	Comments
	Confirm that topsoil surface is in a roughened condition with 2 to 4 inches of variance prior to seeding activity	
	Confirm that seed and mycorrhizae are applied together and applied in two opposing directions	
	Inspect proper seed to soil contact. Seed should be hand raked to cover with ¼ to ½ inches of topsoil or use of a hand roller prior to mulching.	