

SPECIAL SPECIFICATION**2006****Moisture Treated Subgrade**

- 1. Description.** The purpose is to provide a layer of low swelling, strain absorbing material under the pavement section. This work consists of furnishing, placing, moisture conditioning, and compacting the existing expansive subgrade or the embankment material with moisture and density control to the depth shown on the plans.

This treatment is not recommended for embankment material within the strap zone behind the MSE walls. Backfill behind MSE walls shall be in accordance with Item 423, "Retaining Walls."

2. Materials.

- A. Subgrade.** Furnish approved material capable of forming a stable embankment from required excavation in the areas shown on the plans or from sources outside the right of way. The materials shall be free of roots, sod, weeds, wood, organic matter, construction debris, other deleterious materials, and shall be in accordance with Item 132, "Embankment." The top 2-ft. of subgrade shall not contain stones having size larger than 2.5 in. and shall have soluble sulfate levels of 5000 ppm or less when tested in accordance with Tex-145-E.
- B. Polyethylene Sheeting Material.** Furnish polyethylene sheeting that is at least 10 mils thick, 10 ft. wide, and free from visible defects. Provide black sheeting when color is not specified on the plans. The sheeting shall meet the requirements of ASTM D 4397.
- C. Water.** Furnish water that is free of industrial wastes, oil, salts, acid, alkali, sugar, vegetable, or other deleterious substances which may cause damage to the finished product. All water shall meet the requirements of AASHTO T 26.

- 3. Equipment.** Provide machinery, tools, and equipment in good operating condition that is specifically designed and manufactured for proper execution of the work. Maintain all machinery, tools, and equipment in a good working condition, free of leaks, and properly muffled.
 - A. Construction Equipment.** Provide water trucks and equipment that is specifically designed and manufactured for excavating, mixing, leveling, and compacting subgrade materials.
 - B. Mixing Equipment.** Provide either mixers of appropriate size and capacity so as not to delay the project and capable of mixing of the product or discs of sufficient size to effectively mix the subgrade soil and water.

C. Compaction Equipment. Provide sheepfoot compactors or variety of pneumatic tire rollers in accordance with Item 210, "Rolling". Compaction equipment shall be designed to obtain compaction requirements without adverse shoving, rutting, displacement or loosening of subgrade material. The equipment shall be operated by skilled workmen at a normal production rate for the specified type of work.

4. Construction.

For cut section, excavate and remove existing materials to the bottom limit of the moisture treated areas as shown on the plans and in accordance with Item 110, "Excavation." This work will be paid for under Item 110, "Excavation."

For fill section, construct embankment to the bottom limit of the moisture treated area as shown on the plans and in accordance with Item 132, "Embankment." Construct the embankment in layers approximately parallel to the finished grade for the full width of the individual roadway cross sections, unless otherwise shown on the plans. This work will be paid for under Item 132, "Embankment."

A. Embankments. Furnish material as specified on the plans or same material used for embankment below the moisture treated area. Excavated material within the right-of-way or imported material from sources outside the right-of-way is allowed as long as it meets the requirements of Item 132, "Embankment."

Scarify, moisture condition, and compact the subgrade to 8-in. below the excavation limit in the cut section prior to placing the material for moisture treatment. This work is considered subsidiary to this item.

Place the material in layers approximately parallel to the finished grade and construct the embankment to the grade and sections as shown on the plans. Do not exceed 8-in. per layer depth. Begin placement of material at the toe of slopes.

B. Moisture Treatment. At the completion of each layer, perform the following:

1. Mix the material with water by blading using approved equipment. Use a scarifier when necessary to loosen material prior to blading.
2. Compact the layer to at least the minimum percentage of Standard Proctor density as determined by ASTM D 698 (AASHTO T 99) at the moisture content range provided in following Table.

Material Description	Plasticity Index Range	Minimum Required Compacted Density	Required Moisture Range
Clayey Sand	5 – 15	98% of ASTM D 698	-1 to +3 Percentage Points of Optimum
Lean Clay Including Processed Weathered or un-weathered Limestone	16 – 25	95% of ASTM D 698	The minimum moisture content shall be that which reduces the swell to less than 1% for a laboratory compacted sample (ASTM D 698) under an overburden pressure of 200psf. The maximum moisture content shall be 3 percentage points greater than the minimum
Fat Clay	26 or Greater	94% of ASTM D 698	+3 to +6 Percentage Points Above Optimum

3. Each layer is subject to testing by the Engineer for stability, density and moisture content. When required, remove small areas of the layer to allow for testing. Replace the removed material and recompact at no additional costs. When the material fails to meet the moisture or density requirements, rework the material as necessary to obtain the specified compaction. Alter the compaction method on subsequent work to obtain specified density and moisture content when approved by the Engineer.
4. Construct the next moisture treated layer.
- C. **Maintenance of Moisture.** Protect the moisture treated subgrade from traffic and maintain the required moisture content, stability, and density until the upper layer of the subgrade is stabilized.
- D. **Polyethylene Sheeting Installation.** Install the polyethylene sheeting as shown on the plans. Care should be taken not to rip or tear the polyethylene sheeting during the installation. Do not place sheeting until all required underground elements such as pipes, conduits, etc. are installed within the area to be covered. No longitudinal cuts are allowed in the polyethylene sheeting unless approved by the Engineer.
5. **Quality Control.** Testing of moisture treated soils will be performed in accordance with the following:

**SCHEDULE FOR MINIMUM MATERIALS SAMPLING AND
TESTING FOR MOISTURE TREATED SUBGRADE**

Test Type	Test Standard	Minimum Frequency of Tests
In Place Soil Density and Moisture Content	AASHTO T 238 AASHTO T 239	One test for each 200 lane feet (not less than one test per day)
Atterberg Limits	ASTM D 4318 AASHTO T89 AASHTO T90	One test per soil type.
Moisture-Density Relationships	ASTM D 698 AASHTO T 99	One test per soil type.

6. Tolerances.

- A. Grade Tolerances.** Correct any deviation in excess of 0.04 feet in cross section and 0.04 feet in 16 feet measured longitudinally by loosening, adding or removing the material, reshaping and recompacting by sprinkling and rolling.
- B. Density Tolerances.** Correct density below the specified minimum set in Section 4.B, "Moisture Treatment," of this special specification by recompacting the subgrade until it is accepted.
- C. Moisture Tolerances.** Correct any loss of moisture below the limits set in Section 4.B, "Moisture Treatment," of this special specification by moisture conditioning and recompacting the subgrade, in a manner satisfactory to the Engineer. Maintain the required moisture content until the subgrade is stabilized.

7. Measurement. Moisture treated subgrade will be measured by the cubic yard in its final position using the average end area method and the depth as shown on the plans. This is a plans quantity measurement Item. The quantity to be paid is the quantity shown in the proposal, unless modified by Article 9.2, "Plans Quantity Measurement." Additional measurements or calculations will be made if adjustments of quantities are required.

8. Payment. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Moisture Treated Subgrade." This price is full compensation for furnishing, hauling, scarifying, placing, mixing, compacting, sprinkling, rolling, finishing, and reworking; disposal of waste material; maintaining and protecting the finished moisture treated subgrade; and equipment, labor, tools, and incidentals.

Furnishing and installation of polyethylene sheeting materials will not be paid for directly, but will be considered subsidiary to this Item.

Stabilized subgrade work will be measured and paid for under Special Specification Item 3147, "Stabilized Subgrade."