

2.7 Soil Surface Treatments

Erosion Control

<p>Bare Soil</p> <p>Treated Surface</p>	<p>Description: Soil surface treatments are measures applied to a bare soil surface to temporarily decrease the amount of soil lost to wind and water erosion. Substances typically applied to the soil surface are water and organic and inorganic palliatives. Soil surface treatments are also effective for the surfaces of temporary berms and stockpiles.</p>
<p style="text-align: center;"><u>KEY CONSIDERATIONS</u></p> <p>DESIGN CRITERIA:</p> <ul style="list-style-type: none"> • Maintain the original ground cover as long as practical • Select treatment method based on soil type, site conditions, and required duration of effectiveness • Control traffic on areas being treated • Apply water before start of work and repeat regularly • Select, dilute and apply palliatives according to manufacturer's recommendations <p>ADVANTAGES / BENEFITS:</p> <ul style="list-style-type: none"> • Prevents onsite and off-site impacts of dust deposition on roadways, drainage ways, or surface waters <p>DISADVANTAGES / LIMITATIONS:</p> <ul style="list-style-type: none"> • Sediment controls are still needed with soil surface treatments • Effectiveness is temporary • Control methods often require repeated applications • Water has limited effectiveness on soils in wind erodibility groups 1 – 4 and 4L <p>MAINTENANCE REQUIREMENTS:</p> <ul style="list-style-type: none"> • Inspect regularly • Reapply water and palliatives as needed 	<p style="text-align: center;"><u>APPLICATIONS</u></p> <p>Perimeter Control</p> <p>Slope Protection</p> <p>Sediment Barrier</p> <p>Channel Protection</p> <p>Temporary Stabilization</p> <p>Final Stabilization</p> <p>Waste Management</p> <p>Housekeeping Practices</p> <p>Fe=0.10-0.90 <i>(Depends on type of treatment)</i></p>
<p style="text-align: center;"><u>TARGETED POLLUTANTS</u></p> <ul style="list-style-type: none"> ● Sediment ○ Nutrients & Toxic Materials ○ Oil & Grease ○ Floatable Materials ○ Other Construction Wastes 	<p style="text-align: center;"><u>IMPLEMENTATION CONSIDERATIONS</u></p> <ul style="list-style-type: none"> ● Capital Costs ● Maintenance ● Training ● Suitability for Slopes > 5% <p>Other Considerations:</p> <ul style="list-style-type: none"> • <i>Worker protection for mixing, dilution, and application of some palliatives</i>

2.7.1 Primary Use

Surface treatments are used to reduce wind and water erosion by providing temporary stabilization of bare soil. They are primarily used where stabilization is needed for less than 12 months.

2.7.2 Applications

Soil surface treatments are applicable to any construction site where dust is created and there is the potential for air and water pollution from dust being blown off the site. The treatments are applicable to bare areas of soil, temporary soil berms, stockpiles, earth-moving activities, and demolition activities, all of which can be sources of dust.

The National Resources Conservation Service (NRCS) assigns a wind erodibility group to soils as shown in Table 2.3.

Group	Soil Type	Erosion Potential
1	Sands, coarse sands, fine sands and very fine sands	Extremely erodible
2	Loamy sands, loamy fine sands, and loamy very fine sands	Very highly erodible
3	Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams	Highly erodible
4L	Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate	Erodible
4	Clay, silty clays, clay loams and silty clay loams that are more than 35 percent clay	Moderately erodible
5	Loam soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate	Slightly erodible
6	Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams	Very slightly erodible
7	Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate	Slightly erodible
8	Stony or gravelly soils	Not subject to wind erosion

Soil surface treatments for dust control will be most applicable to soils in groups 1 through 4 and 4L. If the soil type is unknown, the native soil type(s) at a site can be identified on the NRCS Web Soil Survey at: <http://websoilsurvey.nrcs.gov/app/>. The website also provides the wind erodibility group for native soils.

Consider the depth of grading activities when determining the applicable surface treatments. Soil type varies with depth. The surface soil may have low potential for wind erosion, but the soil at a lower depth may be highly erodible when it is exposed by grading operations.

2.7.3 Design Criteria

General

- The first design criterion for soil surface treatments is to minimize the area of disturbed soil that requires treatment.

- Limit clearing and grading to the areas of the site required for the immediate phase of construction. For larger sites, plan the work to be phased such that the total disturbed area is less than 10 acres at all times. If possible, design the site layout and grading to allow for street and utility construction without having to grade the entire site to balance cut and fill.
- Selection of the surface treatment should consider the length of time for which stabilization is needed.
- Natural (e.g. trees) windbreaks or artificial wind screens can be designed into the site to decrease wind erosion potential. Wind screens should be 3 to 5 feet in height. Porosity of the wind screens should be a minimum of 20 percent. Optimum performance is in the 40 percent to 60 percent porosity range.
- Wind screens should never be impermeable. The purpose of the screen is to disrupt the wind, not block it.
- Wind screens placed around stockpiles shall enclose three sides of the stockpile.

Water Treatments

- Water treatment shall be used only for decreasing wind erosion. It provides no protection from erosion due to stormwater runoff.
- Water treatment is appropriate for areas that are worked daily or at least as frequently as every week or two. Areas where construction activities will not occur for more than 14 days shall receive another type of surface treatment, such as a palliative, vegetation, or other treatment that provides temporary stabilization and protection from water erosion.
- Water shall be applied 15 to 20 minutes before start of work and re-applied throughout the day as necessary to prevent visible emissions.
- At a minimum, sprinkle bare areas with an amount of water and at a rate that will moisten the top two inches of soil without creating runoff.
- When grading activities are occurring during prolonged dry and windy periods, sufficient water should be applied to moisten soil to the depth of cut or equipment penetration. This may require installing portable piping and sprinklers in advance of grading.
- If construction activities include installing an irrigation system, install it in early phases of construction, where feasible, to use for dust control.
- Water treatments provide limited stabilization against wind erosion and no stabilization against water erosion. Sediment controls are required with water treatments.

Palliative Treatments

- Palliatives consist of liquids that react with soil particles and bonds them into a cohesive crust that provides temporary resistance to wind and water erosion. Palliative treatments are also called soil binders.
- The major groups of palliatives used for erosion control are polyacrylamide (PAM), guar-based (organic) compounds, and polyvinyl acetates (inorganic polymers). Numerous variations and mixes of these palliatives are available, each with its unique properties.
- Palliative treatments are appropriate for areas that require temporary stabilization for 3 to 12 months. Palliative treatments are highly effective in controlling wind erosion and moderately effective in controlling water erosion. Perimeter controls for sediment should remain in place until final stabilization.
- In general, areas stabilized with palliatives must be protected from traffic to be effective. Palliative treatments that can withstand traffic (pedestrian or vehicle) are available; however, they are more expensive. The designer should determine whether the site can be controlled to prevent traffic on the stabilized areas. This analysis should consider non-construction related traffic. Often, the public driving ATV's and bicycles on the site when construction is not active is the cause of stabilization

failure. In many cases, temporary chain-link fencing is less expensive than a palliative that can withstand traffic or re-applying a palliative to areas that have been disturbed.

- Selection of the palliative mix, dilution rate, and application rate should be based on the soil type, site conditions, climate, anticipated traffic on the treated area, and required duration of the stabilization.
- The designer should work with the supplier to develop a mix specific for the soil, climate, and site conditions. A successful application is highly dependent on the right proportions in the mix. An “off the shelf” mix should not be used.
- Palliatives are dependent on soil penetration to be effective. Compaction of soil prior to stabilization should be minimized. If compaction has occurred or the soil has high clay content, loosening of the surface may be necessary before applying the palliative.
- Do not apply palliatives in rainy conditions or when the soil has high moisture content. Verify that there is not rain in the forecast for the length of time recommended by the manufacturer to cure the palliative. Typically, a minimum of 24 hours is required.
- If the soil is excessively dry, pre-wetting may be necessary to ensure the palliatives do not cure too quickly.
- Palliative mixes may be supplied as a powder or a concentrated liquid. The designer should work with the supplier to establish exact dilution and application rates for the site. An application without enough water for the site and climate conditions will dry too quickly, and the soil particles will not bond properly. A too wet mix will result in a weaker bond that may not be sustained for the required duration of the stabilization.
- Palliatives should not be diluted until it is time for the palliative to be applied.
- Palliatives may be applied with mulch to stabilize slopes of 3:1 to 1.5:1. Additional criteria are in [Section 2.5 Mulching](#).
- Palliatives may be mixed and applied with seed to establish vegetation. The palliative mix used for this application must be specified as one that is air and water permeable. The palliative will provide temporary stabilization until vegetation is established for final stabilization.

Vegetation Treatments

- If an area will not be disturbed by construction activities for a year or longer, vegetation is frequently the most cost-effective treatment.
- [Section 2.9 Vegetation](#) contains criteria for temporary stabilization with vegetation.

Other Treatments

- Gravel, recycled concrete or asphalt, or similar rock should be applied to temporary roads, contractor staging areas, employee parking lots and other portions of the site that receive daily traffic. The treatment will prevent dust and decrease the need for sediment controls on these areas during the duration of the construction project.
- Soil roughening, by driving tracked vehicles up and down slopes and across bare areas in irregular patterns, can be used to disrupt wind and water flow across the soil surface and decrease erosion for short periods of time. The track marks should be perpendicular to the predominate direction of water flow or wind.
- Similar to soil roughening, deep tillage (6 to 12 inches) in large open areas can significantly disrupt wind and drainage patterns to reduce erosion.
- Do not use “soil tackifiers” that are petroleum-based.

2.7.4 Design Guidance and Specifications

No specification for soil surface treatments is currently available in the Standard Specifications for Public Works Construction – North Central Texas Council of Governments.

2.7.5 Inspection and Maintenance Requirements

Soil surface treatments should be inspected regularly (at least as often as required by the TPDES Construction General Permit). Adequacy of watering for dust control should be visually monitored. If dust is observed, additional applications or different controls are needed.

Areas that have received a palliative treatment should be checked for breaks or eroded spots in the surface crust. This spots and areas that have been driven on or otherwise disturbed should be re-treated. Palliative treatments are intended to control sheet erosion. If rill erosion is detected during inspections, additional controls are needed.