Chapter 5 - VEGETATIVE PRACTICE STANDARDS

SAND FENCE (WIND FENCE)

Definition

An artificial barrier of evenly spaced wooden slats or approved fabri erected perpendicular to the prevailing wind and supported by posts.

Purpose

To reduce wind velocity at the ground surface and trap blowing sand.

Conditions Where Practice Applies

Across open, bare, sandy soil areas subject to frequent winds, where the trapping of blowing sand is desired. Wind fences are used primarily to build frontal ocean dunes (to control erosion from wave overwash and flooding). They may also prevent sand from blowing off disturbed areas onto roads or adjacent property.

Planning Considerations

Soil movement by wind depends on the physical character and condition of the soil. Normally only dry soils are moved by wind. The structure of soil in an air-dry state is the index to its erodibility. Loose, fine-textured soils are the most readily blown.

There are three types of soil movement operating simultaneously in the process of wind erosion:

1. suspension - fine dust particles are carried and suspended in air,

2. saltation - movement of particles in short bounces on the ground, and

3. surface creep - movement of large particles on the ground by both direct wind and bombardment by smaller particles.

Sand fences act as barriers that catch and hold blowing sand in much the same way as a snow fence prevents snow drift. The fence consists of evenly spaced wooden slats. The spaces between slats allow wind and sand to pass through the fence, but the wind velocity is reduced, causing sand deposition along the fence and between rows of fence (Figure 6-85a).

Figure 5-8 Sand Fences trap blowing sand to rebuild frontal dune.

Sand fences, commonly used to build up low areas of frontal dunes along the coast line, can trap large amounts of sand. Their effectiveness depends on the source of sand and the frequency and velocity of onshore wind. As a windward fence is filling, some sand drifts to the next leeward fence. When the dune is sufficiently wide and fences are approximately two-thirds filled with sand, another series of fences may be erected. In this manner, 2 to 6-foot dunes are built in a single season.

There is a limit to how high the frontal dune will form. The natural process of the rise and fall of the tide with an onshore wind provides the sand source to build the dune. The high tide, driven by on onshore wind, carries sand onto the beach. As the tide recedes, the sun and wind dry the sand and the wind blows it up the dune where it is caught by the fence. The process is repeated as the tides change. As the dune grows, it takes a progressively stronger wind to carry sand over the dune; but as the wind increases, the tides increase and water covers more of the beach. With less available beach sand, strong winds may remove sand along the fence instead of depositing it. In addition, the waves may reach the toe of the dune, causing it to cave and flatten. A change of wind direction more parallel to the coast will speed the erosion process because sand is carried along the beach instead of being deposited below the dune. Therefore, a wind fence must be located well above the expected high water mark to be effective.

When the dune has reached the level of other mature dunes in the area, stabilize it with vegetation. American beachgrass, sea oats, and other adapted vegetation will hold the captured sand in place and gradually capture more sand until the natural maximum dune height is reached. Dunes may be built by vegetation alone, but it usually takes a longer period of time (Vegetative Dune Stabilization).

Dunes built by wind fences and stabilized with appropriate beach vegetation do not provide permanent protection from beach erosion. However, they do speed up the rebuilding of the natural dune barrier and tend to reduce the average annual loss of frontal dunes.

Keep beach development at least 100 feet behind frontal dunes. Generally, do not attempt beach development in areas where the estimated average frontal dune loss is more than 2 ft/yr or in particularly vulnerable locations, such as areas adjoining ocean inlets.

Sand fences also trap blowing sand at construction sites to prevent off-site damage to roads, streams, and adjacent property. Generally, locate them perpendicular to the prevailing wind and as near to parallel as possible on the leeward side of the area. Wind fences have been found to be effective up to 22.5 degrees from perpendicular to the wind.

Design Criteria

No formal design criteria have been developed for wind fences. Construction Specifications below describe typical wind fence installation.

Construction Specifications

1. Normally, locate sand fences perpendicular to the direction of the prevailing wind, but they may be as much as 22.5 degrees from perpendicular and still be very effective.

2. Commercial sand fences usually consist of wooden slats wired together with spaces between the slats. The distance between slats is approximately equal to the slat width (about 1.5 inches). Other materials such as discarded Christmas trees have been used to capture sand, but trees must be securely fastened in place and spaced to touch each other in the row.

3. Erect sand fences in parallel rows 20 to 40 ft apart and 2 to 4 ft high. The number of rows installed depends on the degree of protection needed. When fences are approximately two-thirds full, erect another series of fences.

In dune building, when the elevation of other mature dunes in the area is almost reached or when the building process slows significantly, stabilize the dune immediately with appropriate vegetation.

Maintenance

Maintain sand fences and erect additional fences as needed until the eroding area has been permanently stabilized or, in the case of dune building, until the dune has reached the desired height and is properly vegetated.