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Storm Water Management Fact Sheet
Dust Control

DESCRIPTION

Dust controls reduce the surface and air transport of dust, thereby preventing pollutants from infiltrating into storm water. Control measures are often instituted in industrial areas or in areas where land is being disturbed.

Dust control for industrial activities normally involves mechanical systems designed to reduce dust emissions from in-plant processing activities and/or materials handling. These may include hoods, cyclone collectors, bag-type collectors, filters, negative pressure systems, or mechanical sweepers.

Dust control measures for construction activities include windbreaks, minimization of soil disturbance, spray-on adhesives, tillage, chemical treatment, and water spraying.

While there are a number of temporary alternatives for dust control, one option is to permanently modify the site to eliminate dust generation. Modifications could include such measures as covering exposed areas with vegetation, stone, or concrete.

APPLICABILITY

Dust control measures may be applied to any site. However, application of dust controls is especially critical in arid areas, where exposed soil is more likely to be transported into receiving water bodies through runoff or wind action. Dust control measures should also be applied to any industrial activity that generates large quantities of dust, particularly if this dust could be transported to a nearby water body.

ADVANTAGES AND DISADVANTAGES

There are several advantages to using dust control measures.

- Dust control reduces the surface and air transport of dust, which minimizes pollutants from infiltrating into the storm water.
- Dust control methods are widely applicable.
- Most dust control methods are inexpensive, non-intrusive, and promote natural growth.
- The majority of dust control methods are easy to install and maintain.

Some disadvantages to dust control may include the following.

- Some temporary dust controls must be reapplied or replenished on a regular basis.
- Some controls are expensive (e.g., chemical treatment), may be ineffective under certain conditions or have their own associated impacts.
- Industrial dust control is typically labor and equipment intensive (i.e., using conventional street sweepers), and may not be effective for all sources of pollution.

- Some dust control measures (i.e., windbreaks) may require land space that is not be available at all locations.

- If a chemical dust control treatment is over-applied, excess chemicals could potentially cause both surface and groundwater contamination.

PERFORMANCE

In order to determine which dust control measures to implement at a specific site, it is necessary to consider the performance objectives required at that site. Some examples of performance objectives include:

- Preventing wind and water-based erosion of disturbed areas.

- Reducing employee respiratory problems.

- Implementing the control rapidly and at low cost and effort.

- Causing little or no impact on the environment.

- Permanently controlling the dust problem.

Determination of the objectives for the dust control program will often determine the appropriate control measure. For example, simply sweeping the impervious areas for larger dust particles on a daily basis may provide an efficient and reliable method of dust control that can be quickly implemented. However, this method would not permanently control the dust problem. If the objective was to permanently control the dust problem, then another alternative, such as constructing vegetative windbreaks, would be more appropriate.

DESIGN CRITERIA

The design of any dust control project should limit the amount of soil or dust particulates exposed at one time, and reduce the potential for dust generation. The performance objectives established for the particular project should also be considered during the design stage. Additionally, some project sites may require solutions to both industrial and land disturbance dust control problems. Realistically, it may not be practical or possible to develop a design that meets all of the project goals and objectives at one time. Therefore it may be more appropriate to develop a phased design approach that utilizes a combination of temporary, permanent, and mechanical measures for dust control.

Temporary Measures

- *Vegetative Coverings*: Temporary seeding and mulching may be applied to cover bare soil and to prevent wind erosion. The soil must be kept moist to establish cover.

- *Barriers*: Solid board fences, snow fences, burlap fences, crate walls, bales of hay, and similar material can be used to control air currents and blown soil. Barriers placed at right angles to prevailing wind currents at intervals of about 15 times the barrier height are effective in controlling wind erosion.

- *Calcium Chloride*: This material is applied at a rate that will keep the surface moist. Pretreatment may be necessary due to varying site and climatic conditions.

- *Irrigation*: This is generally done as an emergency treatment. The site is sprinkled with water until the surface is wet and repeated as necessary. If this method is to be employed at a construction site, it is recommended that a temporary gravel rock entrance be created to prevent mud from spreading onto local streets.

- *Tillage*: This practice roughens the soil and brings clods to the surface. It is an emergency measure that should be used before wind erosion starts. Plowing should begin on the windward side of the site using chisel-type plows spaced about 12 inches apart, spring-tooth harrows, or similar plows.

- *Adhesives*: Use spray-on adhesives according to Table 1. These adhesives form fairly impenetrable surfaces, and should be used only if other methods prove to be difficult to work with.

TABLE 1 DESIGN OF ADHESIVE MEASURES

Type of Emulsion	Water Dilution	Nozzle Type	Application Rate (gpa)
Anionic Asphalt	7-1	Coarse	1,200
Latex	12.5- 1	Fine	235
Resin and Water	4-1	Fine	300

Source: City of Eagan, 1984.

Permanent Site Modification Measures

- *Permanent Vegetation*: Seeding and sodding should be done to permanently stabilize exposed areas against wind erosion. It is recommended that existing trees and large shrubs be allowed to remain in place to the greatest extent possible during site grading processes.

- *Stone*: Coarse gravel or crushed stone may be placed over highly erodible soils.

- *Topsoiling*: This method is recommended when permanent vegetation cannot be established on a site. Topsoiling is a process in which less erosive soil material is placed on top of highly erodible soils.

Dust Collection Methods

- *Cyclone Collectors*: Cyclone collectors use centrifugal force to separate dry dust and chemical pollutants in the air.

- *Bag Collectors/Fabric Filters*: Bag collectors and fabric filters remove dust by filtration. Storage and disposal of collected dust should be carefully considered so that it does not become a source of fugitive dust. Negative Pressure Systems: These systems minimize the release of dust from an operation by maintaining a small negative pressure or suction to confine the dust to a particular operation.

- *Water Spraying*: This temporary mechanical method confines and settles the dust from the air by dust and water particle adhesion. Water is sprayed through nozzles over the problem area.

- *Street Sweepers*: Recent studies have shown that street sweepers effectively remove the smallest dust particles and achieve meaningful runoff quality benefits. Two kinds of street sweepers are common in mechanical dust collection systems. The brush system has proven to be efficient at an industrial facility generating dust on a daily basis. It has proven to be extremely dependable and picks up the majority of generated dust. Vacuum sweepers may be the best choice for areas that are prone to storm water overflow. This is because they are more efficient at picking up the smaller particles that are typically associated with contaminated storm water. Other technologies include the tandem sweeping operation, the regenerative air sweeper, and the "EnviroWhirl." The tandem operation involves two successive cleaning passes, first by a mechanical sweeper and then followed by a vacuum assisted sweeper. The regenerative air sweeper blows air onto the pavement and immediately vacuums it up. The "EnviroWhirl" is a vacuum-assisted dry sweeper. It is able to remove debris and dust down to 2.5 microns. Independent studies conducted in Oregon and Washington report that the EnviroWhirl sweeper alone was able to remove 99.6 percent of all particulates over 10 microns. A series of once-a-week sweepings resulted in a 76 percent reduction of suspended solids in downstream receiving waters.

OPERATION AND MAINTENANCE

Typically, dust control measures require periodic and diligent maintenance. For example, mechanical equipment should be operated according to the manufacturers' recommendations and inspected regularly as part of an industrial site's preventive maintenance program. Temporary dust control measures, such as chemical spraying, watering, etc., require periodic renewal. Permanent solutions such as vegetation, wind barriers, and impervious surfaces, also require upkeep and maintenance in order to remain effective.

COSTS

The costs associated with dust control measures are generally lower for more temporary methods such as vegetative and barrier methods. This is attributed to the availability of the materials and the common practices associated with them. Other dust control methods, such as using street sweepers, cost considerably more because of the investment in specialized equipment. For example, a mechanical brush sweeper can range from $60,000 to $120,000 and will last for about five years while vacuum-assisted sweepers can range from $75,000 to $180,000 and have a life of eight years. The City of Lakeland (Florida) has determined their costs to be $33.38 per curb-mile of street sweeping. This cost includes equipment costs (for a vacuum assisted street sweeper), maintenance costs (i.e., fuel), the employee's salary (not including benefits), and transferring the collected debris to a landfill. The City of Lakeland also has an arrangement whereby they are not charged for sending the sweeping debris to a landfill because it is then used as ground cover for the landfill.

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