



State of Utah

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Environmental Quality

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MEMORANDUM

TO: Permitting Branch

FROM: Regg Olsen

DATE: March 10, 2008

SUBJECT: Emission Factors for Paved and Unpaved Haul Roads

1. The question of how to deal with the emission factors for paved and unpaved haul roads has risen when using AP-42 emission factors. Using current AP-42 emission factors shows higher emission rates for paved roads than unpaved roads. This does not seem practical; we also want to encourage sources to pave roads when appropriate, not remove paved haul roads to get lower calculated emissions!
2. With these problems, sources have taken the task upon themselves to search out the best solution which at times has developed additional problems as they try to document and we try to validate their approach. We have also been concerned with consistency across industry. This memo is intended to provide some assistance on the issue for permit engineers and sources alike. Every Approval Order is a case-by-case determination and site specific with conditions unique to the site; implementation of this document will be likewise.
3. Beginning with the date of this memo, permit engineers should allow applicants to use the recommended equation found in AP-42 13.2.2 for Unpaved Haul Roads and add the appropriate control efficiencies outlined below to that equation. Due to the flexibility this approach provides, the UDAQ will strictly adhere to the outlined control efficiencies. A source can still choose to use the AP-42 equation for Paved Haul Roads found in AP-42, 13.2.1 if they choose, but the approach outlined in this memo can serve as an alternative.

4. The equation for unpaved haul roads is found in AP-42 13.2.2 and is:

$$E = k (s/12)^a (W/3)^b$$

where,

k, a and b are empirical constants found in AP-42

E = size-specific emission factor (lb/VMT)

s = surface material silt content (%)

W = mean vehicle weight (tons)

The "s" factor above, the surface material silt content should be determined for each site for Option 1 and 2 below. For Options 3, 4, and 5, due to the nature of the control, the default value of 4.8% shall be used.

5. Control Options

Control	Control Efficiency (%)
Basic Watering	70
Basic Watering and Road Base	75
Chemical Suppressant and Watering	85
Pave Road Surface with Sweeping and Watering	90
Pave Road with Vacuum Sweeping and Watering	95

OPTION 1. Basic Watering, 70% -

This option is performed with natural soil in place and applying water, when warranted to obtain and never exceed a 20% opacity limit at the densest point of the plume behind the vehicle.

OPTION 2. Basic Watering and Road Base, 75% -

Cover unpaved roads with low silt content material (i.e., recycled asphalt, recycled concrete, recycled road base, or gravel to a minimum depth of four inches) and watering occurs as needed to adhere to a 20% opacity limit at the densest point of the plume behind the vehicle.

OPTION 3. Chemical Suppressant and Watering, 85% -

In AP-42, Section 13.2.2 Unpaved Roads on page 13.2.2-13 it states:

The control effectiveness of chemical dust suppressants appears to depend on (a) the dilution rate used in the mixture; (b) the application rate (volume of solution per unit road surface area); (c) the time between applications; (d) the size, speed and amount of traffic during the period between applications; and (e) meteorological conditions (rainfall, freeze/thaw cycles, etc.) during the period. Other factors that affect the performance of dust suppressants include other traffic characteristics (e. g., cornering, track-on from unpaved areas, etc.) and road characteristics (e. g., bearing strength, grade, etc.). The variables in

the above factors and differences between individual dust control products make the control efficiencies of chemical dust suppressants difficult to estimate. Past field testing of emissions from controlled unpaved roads has shown that chemical dust suppressants provide a PM-10 control efficiency of about 80 percent when applied at regular intervals of 2 weeks to 1 month.

This paragraph states that chemical suppression can obtain 80% control efficiency. By adding water as needed, we can add an additional 5% control, bringing the total control efficiency to 85%.

OPTION 4. Pave Road Surface with Sweeping and Watering, 90% -

Paving of the road surface would involve applying a surface of asphalt or concrete in order to make a relatively flat surface that can easily be swept and flushed with water. This option would involve having a sweeper on site and sweeping of the road surface followed by a water flush.

OPTION 5. Pave Road with Vacuum Sweeping and Watering, 95% -

Paving of the road surface would involve applying a surface of asphalt or concrete in order to make a relatively flat surface that can easily be swept, vacuumed, and flushed with water. This option would involve having a vacuum sweeper on site that would travel each paved road surface followed by a water truck to flush the surface.

6. The greatest variable in applying these controls is the frequencies of watering, sweeping, and/or vacuuming. Factors such as the number of vehicles passing across different segments of road and seasonal conditions, such as evaporation rate, precipitation and temperature can dictate when a surface is or is not controlled. The frequencies of watering, vacuuming, and sweeping will be on a case by case basis as conditions warrant and based on the location of the source (attainment area vs. non-attainment area, etc).

7. These factors and the controls associated with them are established as a minimum requirement. Along with the controls stated above, additional site specific controls could be required. For example, due to the size and location a source, they could be required to add a cattle guard or rumble strips in between the sections of unpaved and paved roads to minimize track out. Installing road base on the shoulders of paved road could also be added to control track out onto the paved haul road sections.

8. In addition to each of the factors and controls above, a 15 mph speed limit should also be required on all haul roads at the facility.

9. Questions concerning this memo should be directed to either your Section or Branch Manager.

cc: Air Standards Branch
Technical Analysis Section (Inventory)