Montana Department of Transportation
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Memorandum

To: Distribution

From: Mark Wissinger, P.E.
Construction Engineer

Date: August 22, 2003

Subject: Density Acceptance on Pulverized Plant Mix Surfacing

On June 13, 2003 a revised Pavement Pulverization special provision was submitted to the Contract Plans Bureau (see attachment). The purpose of this Construction Memo is to clarify and provide instructions on in-place density testing and density acceptance of pulverized plant mix surfacing.

In-Place Pulverized Plant Mix is normally a non-uniform material. The non-uniformity is caused by the changing ratios of virgin aggregate and pulverized plant mix material.
As per the Pavement Pulverization Special Provision, MT-219 is the method to be used to develop the target density. In order to help this process one point proctors are to be run while the pulverization is in progress. A one-point proctor will provide current moisture content, identify physical changes in the material, and confirm the density control standard. A running average of one-point proctors will also identify when the control density should be adjusted. At this time the sampling frequency of the one-point proctors will be left to the inspector's judgment. It is suggested that a one-point proctor be run every 4,000 feet (1,220m) or minimum of one, one-point proctor per day.

Along with density control, identifying the correct moisture content is important. Methods to help determine moisture content are oven-dried moisture tests and correcting the nuclear gauge moisture reading, using the moisture off-set mode. Enter the oven-dried moisture content into the nuclear device, using the moisture off-set mode. Follow the moisture-offset instructions in the user manual for the model of the nuclear gauge being used.

The one-point proctor test procedure described above is similar to the testing methods used to control moisture/density when placing Cement Treated Base (see Subsection 304.03.6 and MT-216).

Density Acceptance on Pulverized Plant Mix Surfacing

The Pavement Pulverization special provision was written to address two different construction processes that may exist when using pulverized plant mix material to construct a base.

1. Pulverized In-Place (non-pugmilled)

This material is normally non-uniform with varying thickness and types of existing plant mix being mixed with underlying base course materials. This creates a material with varying percentages of pulverized plant mix and base course. Depending on the planned profile of the new roadway additional crushed aggregate course may be added to raise the grade. Other variables are the lowering of the grade, moisture contents, maintenance patch areas, and super elevation areas where the percent of pulverized material will vary widely with relation to the centerline. The standard method for attaining the target density in these situations is the Control Strip Method (MT-219).

2. Pugmilled Pulverized Material

The ratio of pulverized material, crushed base aggregate, and moisture is normally more uniform than in-place pulverized material. The existing plant mix surface is pulverized, picked up, transported to the pugmill, ran through the pugmill, then taken back to the roadway and placed. This process is very similar to our Crushed Aggregate Course (Crushed Base Course) process. The standard method for density acceptance is the proctor method.

When using the Control Strip Method (MT-219) to determine a target density:

- Assure MT-219 is followed.
- Document the attainment of the target density by plotting the dry density verses the number of roller passes on a chart.
- If the plotted curve does not break, chances are the roller being used is not heavy enough.
- A new target density must be established by a new Control-Strip if:
    - The ratio of pulverized material and Crushed Aggregate Course change significantly, or the Engineer determines the pulverized material characteristics or site conditions change. A significant change would be a ratio change of 20 percent or greater.
    - A different roller is used.
    - A different nuclear device is used.
    - Aggregate characteristics change appreciably.
    - Aggregate is produced from another source.
    - Each new lift.

MW:bw:pj

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District Construction Operations Engineers
District Administrators
Materials Bureau
District Materials Supervisors
Engineering Project Managers
Construction Engineering Bureau

Attachment

1. PAVEMENT PULVERIZATION (Revised 6-13-03)

A. Description. Pulverization consists of processing the existing plant mix surfacing and adding Crushed Aggregate Course material necessary to restore the roadway section. Construction.

Pulverize the bituminous surfacing to the full depth of the existing mat. The existing plant mix depths on the project are as follows:

From	To	Average Width	Depth

Pulverize the existing bituminous material so that 100% by weight passes a 2-inch (50 mm) sieve. Equipment used to pulverize the existing surfacing must not reduce the aggregate size in the existing surfacing.

Furnish Crushed Aggregate Course meeting the requirements of Subsection 701.02.1 and one of the following:

Crushed Aggregate Course Type "A" Grade 5	Subsection 701.02.4
Crushed Aggregate Course Type "A" Grade 6	Subsection 701.02.4

Add Crushed Aggregate Course as necessary to construct the roadway to the dimensions shown on the typical sections. Uniformly mix the pulverized material and crushed aggregate course using the pulverization equipment.

Rescind and replace subsection 301.03.5.D with the following:

Compact the pulverized mixture to 98 percent of the target density.

The target density will be determined by one of the following methods:

1) When pulverized plant mix and Crushed Aggregate Course are blended at a constant ratio by pugmill, maximum density will be determined by MT 230. The initial target density is the average of the maximum density of at least two tests on samples representing the material to be compacted.

2) . When in-place (non-pugmilled) pulverized plant mix and Crushed Aggregate Course mixtures are combined at varying ratios, maximum density is determined by MT 219.

Target densities and moisture corrections will be established by the Project Manager. A new target density will be established if the ratio of pulverized material and Crushed Aggregate Course change by more than 20 percent or the Engineer determines the pulverized material characteristics or site conditions change.

Each lift of pulverized mixture material will be divided into 2000-foot long (610 m) sections. The in-place dry density of each lift will be determined within each section at 10 randomly selected locations. The average of the 10 tests must exceed 98 percent of the target with not more than 2 out of the 10 tests being less than 98 percent of the target.

Be responsible for controlling compaction and all necessary control testing.

Notify the Project Manager once compaction is complete on a section so it may be tested.

Re-compact sections not meeting density requirements.

Re-compacted sections will be tested at 10 new random locations.

Compaction and testing will continue until the section meets density requirements.

B. Measurement and Payment. Measurement and payment for Crushed Aggregate Course will be by the ton in accordance with the Standard Specifications.

Measurement for pavement pulverization will be by the square yard (square meter). If the average pavement depth varies by more than 0.10 foot (30 millimeters) from plan, the pulverization quantity will be adjusted by the ratio of the actual pavement depth in excess of 0.10 foot (30 millimeters) divided by the plan depth. Payment will be at the contract price per square yard (square meter) of pavement pulverization and is full compensation for pulverizing, mixing, placing, compacting and any other work required to complete this item.