Section 7:

Compacted Aggregate and Pavement Recycling

SECTION 7 – COMPACTED AGGREGATE AND PAVEMENT RECYCLING

7.1 SUBGRADE OR SUBBASE

In general, the following will apply to subgrade prior to placing compacted aggregate:

(a) The subgrade shall be treated in accordance with 207.04. Refer to the typical sections to determine the required type of subgrade treatment.

(b) The subgrade should be brought to proper grade and cross section at least 500 ft ahead of the placing of the aggregate. See that side ditches are adequate to provide proper drainage for the subgrade.

7.2 MATERIALS

Unless otherwise provided, compacted aggregate bases, surfaces, and shoulders should be in accordance with 904.02 and 904.03 of the SS.

The percent of moisture must be recorded on the weigh tickets by the supplier as required by 109 of the SS. The SS allow for a maximum percentage of moisture over which, deductions must be made.

7.3 PLACING AND COMPACTING AGGREGATE

In general, the aggregate must be laid to the depth specified by the contract typical sections and in accordance with 301 or 303 of the SS, as appropriate. Frequent checks must be made to determine whether the quantity being placed is appropriate, based on the planned quantity. On compacted aggregate base, surfaces, and shoulders, depth determinations must be made and permanently recorded by date, location, and depth.

Roller compaction should follow immediately behind the spreading operation to take full advantage of the moisture content in the aggregate mix. When directed, some additional wetting may be necessary for proper compaction. Compaction testing of aggregates is obtained by utilizing Light Weight Deflectometer, LWD, testing, in accordance with ITM 508 and the SS. Visual inspection may be used for acceptance in areas inaccessible to compaction equipment such as private drives and mailbox approaches.

During all placing and compaction, care should be taken to prevent segregation. Segregated areas should be removed and replaced. “Tailgating” of material is not permitted, except in limited areas inaccessible to the spreader. The finished course should be checked for proper cross section and smoothness longitudinally with a rolling 16 ft straightedge set to 1/2 in. clearance. Any variations exceeding the 1/2 in. clearance shall be corrected.

7.4 PAVEMENT RECYCLING

7.4.1 Pavement Recycling Process

Pavement recycling involves the removal of existing degraded or deteriorating pavements and utilizing the existing materials, along with additional additive components, to create a more

homogeneous and viable pavement structure. Portland cement may be used as a stabilizing material. Corrective aggregate may be used to supplement material volume.

Once placed and compacted, the new pavement structure will be capable of supporting the normal required loadings of the roadway. The re-use of existing materials has the potential to save time, money, and energy. The processes used by the Department are described below.

(a) Cold In-Place Recycling (CIR)

A process for milling and pulverizing a portion of the existing asphalt pavement to a depth specified within the plans. Normally, the treatment depth should not exceed an in-place depth of 5 inches. The process involves mixing the milled and pulverized pavement with asphalt emulsion, water and, if necessary, additional additive components. Additional components such as portland cement or corrective aggregate may be incorporated into the mix when needed. The goal is to produce a homogenous recycled material for re-application. This process is achieved by in-place mixing without the addition of heat.

For CIR mixtures, pulverization is required to produce a gradation that meets the SS.

When required, corrective aggregate may be spread on the existing surface using a mechanical spreader or conventional paver.

Pulverized material, asphalt emulsion and any additives are required to pass through a mixing unit capable of producing a homogeneous recycled mixture.

(b) Cold Central Plant Recycling (CCPR)

A similar process to CIR and intended to be used for a portion of the existing pavement depth, this process removes milled materials from the roadway and transports that material to a nearby centralized mixing plant. At this location, and without the addition of heat, the milled materials are processed and mixed with asphalt emulsion, water, and any additional components such as portland cement or corrective aggregate. The uniform mixture is then transported back to the site and placed using a paver.

For CCPR mixtures, pulverization is required to produce a gradation that meets the SS. Crushed and screened material is required to be stockpiled and maintained to prevent reconsolidation.

Corrective aggregate, if required, may be either mixed with the recycled asphalt material during stockpiling or fed into mixing apparatus at the rate determined by the mix design.
Prepared materials should be processed through a mixing unit capable of combining all the materials and producing a homogeneous recycled mixture.

(c) Full Depth Reclamation (FDR)

A process for pulverizing and stabilizing an existing asphalt pavement for the full depth of the pavement section including the existing base and subgrade materials for the purpose of constructing a fully reclaimed base course (RBC). Processing of FDR occurs on site. As with all pavement recycling methods described above, this process does not involve the addition of heat.

1. Pulverization

When required, corrective aggregate is spread on the existing surface using a mechanical spreader, conventional paver, or tailgating with end dump trucks. The corrective aggregate is required to be spread to a uniform thickness with a motor grader.

The pre-determined full depth of asphalt pavement, base, subgrade materials, and any corrective aggregate is required to be pulverized to produce a homogeneous mixture. For cement or asphalt stabilized mixtures, the pulverization must produce a gradation that meets SS requirements.

2. Stabilization

The cement or asphalt additives used to stabilize the mixture may be dry powder or slurry. The pulverized surface is required to be scarified prior to applying materials in slurry form to prevent runoff or ponding. Dry additives are required to be spread onto the pulverized surface using a mechanical spreader.

7.4.2 Roadway Preparation

All snowplowable raised pavement markers are required to be removed from the roadway. Grass and other vegetation are also required to be removed from the roadway edges prior to beginning any of the pavement recycling processes to prevent contamination of the pulverized material. All areas of soft or yielding subgrade are required to be corrected before pavement recycling operations begin. In addition, prior to pavement recycling operations, existing structures should be lowered, properly covered, and filled with material compatible with the submitted mix design to maintain traffic.

7.4.3 Quality Control Plan

A quality control plan is required to be submitted by the Contractor a minimum of five calendar days prior to the required Just-in-Time Training for any of the pavement recycling methods utilized.

The plan should include:

- the proposed mix design,
- a start to finish process description including discussion on corrective actions,
- a list of proposed equipment,
- a list of proposed QC tests and testing frequencies to be used based on the Specification requirements,
- a description of the curing methods to be applied,
- corrective action measures in case of failed proofroll when using FDR.

7.4.4 Just-in-Time Training (JITT)

The PEMS, or designated representative, and the Contractor are required to attend a JITT course for the pavement recycling treatments specified for the project. The training class should be conducted at the project field or another convenient location for all contract construction personnel responsible for the recycling treatment and inspection of the work.

The JITT course shall be held during normal working hours and be completed not more than 14 days prior to the start of recycling operations.

The Contractor is to provide a JITT instructor, mutually agreeable to the PEMS or AE, who is experienced in the construction methods, materials, and test methods associated with the recycling treatments specified for the contract. A copy of the course syllabus, handouts, and presentation materials is required to be submitted to the PEMS, AE, or designated representative at least five calendar days before the course is taught.

All discussions, questions, processes, and sequencing should be discussed during the training session. The intent of the training is to provide clear and concise information on the construction process and methods utilized for the pavement recycling work. Once completed, the Contractor and the PEMS should have a clear understanding of what, how, and when specific pavement recycling activities will occur.

It may also prove useful to have early discussions on how areas of the recycled material may need to be rectified prior to the final surface course. It is important to highlight distinctions between failing recycled materials or locations of failing subgrade. See section 7.4.8 below.

7.4.5 Weather Limitations

Pavement recycling operations must only be performed per allowable SS weather conditions. The PEMS or AE may restrict pavement recycling operations due to weather conditions.

7.4.6 Control Strip and Compaction

A test control strip is required to be constructed on the first day of production. This control strip will allow the Contractor to:

- Demonstrate the proposed equipment, materials, and processes.
- Determine the optimal rates of asphalt emulsion, water, and any additives.
- Determine the sequence and manner of rolling needed to obtain strength or density requirements.

In place density must be achieved using the same equipment, materials, construction methods, and density requirements used for the control strip. A new control strip should be constructed if there are changes made beyond the tolerances of the original mix design, equipment, or construction methods. The Contractor is required to determine and provide a rolling sequence from initial lay down through optimum field density using the nuclear gauge. After control strip approval, production may continue.

(a) CIR and CCPR

CIR and CCPR density must be achieved using an optimal rolling pattern, obtained from the control strip. Compaction should be monitored using a nuclear gauge in direct transmission mode. Rolling operations causing cracking, displacement, or other pavement distresses must be stopped and resolved, to the approval of the Department, before allowed to re-start.

(b) FDR

FDR processed material is required to be compacted in one layer. Compaction should be monitored using a nuclear gauge in direct transmission mode. Passes must continue until light is seen between the pad-foot roller drum and the mixture or when there are no wheel impressions from the pneumatic roller remaining in the placed FDR mixture. Stabilized material should be bladed and shaped with a motor grader then leveled to produce a finished grade tolerance of ±1/2 in. from the plan elevation prior to profile milling.

7.4.7 Curing

Before the placement of final HMA surface overlay, all types of pavement recycling must cure and remain in place for a minimum of three days and meet SS moisture requirements.

7.4.8 Final Surface Preparation and Overlay

The Contractor shall maintain all recycled material placed. Damage to the placed and completed recycled material must be repaired in accordance with the SS. The PEMS should determine the limits of material to be replaced by proofrolling or by directing the Contractor. Proofrolling requirements are specified within the SS.

If locations of failing subgrade are found, The PEMS should ensure the Contractor repairs them. The repair effort typically is included in the cost of subgrade treatment. The PEMS should utilize the Dynamic Cone Penetrometer (DCP) to help determine where failure has occurred and whether the Department should pay for additional subgrade treatment.

All monuments are to be re-established after the placement of the surface course.

(a) CIR

Once placed and after proper curing, CIR should be scarified in order to assure that the treatment has sufficient texture and shear strength for the intended HMA surface overlay. Scarification also provides sufficient uniformity of grade for a smoother overall pavement surface finish.

After scarification, the CIR should be lightly swept of all loose material and standing water using a rotary power broom immediately before placing tack and application of HMA surface. A tack coat is required only for the HMA surface overlay and applied immediately following the sweeping operation.

(b) CCPR

After placement and proper curing, the CCPR is required to meet straightedge smoothness and correction requirements.

In addition, the CCPR is required to be lightly swept of all loose material and standing water using a rotary power broom immediately before placing the required tack coat. Placement of the HMA surface course follows the tack coat.

(c) FDR

After placement and proper curing of FDR, proofrolling is required. Deflections over 1/2 in. are required to be corrected.

The Contractor is required to rework failed proofrolled areas by re-pulverizing and re-stabilizing. Subgrade failures are required to have the FDR removed, proper subgrade treatment placed, and HMA patching used to replace removed FDR.

FDR should be scarified to ensure that the treatment has sufficient texture and shear strength for the intended HMA surface overlay. Scarification also provides sufficient uniformity of grade for a smoother overall pavement surface finish.

The FDR is required to be lightly swept of all loose material and standing water using a rotary power broom immediately before placing the required tack coat.

Overlays over FDR should be as indicated within the plans. A tack coat is required over the FDR prior to placement of the planned HMA surface course.