

MNDOT

Pre-paving Meeting

Bituminous Paving

Bituminous Materials Unit

3/20/2017

This information is provided as 1) a guide for a pre-paving meeting and 2) a training tool to improve the quality of material incorporated in construction paving activities. It is not meant to be a totally inclusive document for contract requirements and does not change or modify the contract documents. The Appendix is a listing of suggested best practices for Bituminous paving.

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I. Introduction/Agenda:

A. PROCEDURES FOR MEETING

The meeting agenda is meant to be very open meeting set to provide real time training and an understanding of best practices procedures. If you have any questions during the meeting, stop and ask for additional information as we proceed.

B. INTRODUCTION OF INDIVIDUALS

MnDOT should submit a listing of personnel assigned to the activity (project) and their roles, responsibilities and phone numbers.

The Contractor should submit a listing of lead personnel and phone numbers assigned to an activity (project) along with any other contractor and subcontractors.

C. BACKGROUND/PURPOSE OF A PRE-ACTIVITY MEETING

A pre-paving meeting should be held as close to actual production time as possible. MnDOT representatives should discuss the scope of the activities and the contract requirements. Any aspects of plant and roadway operation that may be controversial or unusual should be discussed to help avoid confusion in the field.

The Contractor should provide a proposed schedule with enough detail to illustrate the methods that will be used to complete the activity (project) on schedule.

The Contractor should explain in detail the activities associated with the paving activities including the material to be used, plant operations, hauling routes and distances and number of trucks, paving operations and rolling patterns including any specialized equipment or operations,

The Contractor should discuss topics as materials and their sources, plant production rates, hauling distances and routes, paving widths and speed, types and operation of compaction equipment, traffic control, and safety.

Finally MnDOT should present Best and Improvement Practices that affect the quality of materials incorporated into the project.

D. BITUMINOUS: ADDENDUMS AND SPECIAL PROVISIONS REQUIREMENTS

MnDOT will discuss Special Provisions and Addendum requirements for the project.

E. CONTRACT REQUIREMENTS

MnDOT will discuss Specific Contract Requirements for the project.

F. QUESTIONS/CONCERNS WITH DESIGN, MATERIALS AND/OR SPECIFICATION

Open discussion on any concerns with contract documents, designs and/or procedures, etc.

G. CONTRACTOR PAVING OPERATIONS ACTIVITIES.

The contractor should explain in detail the activities associated with the paving activities including the material to be used, plant operations, hauling routes and distances and number of trucks, paving operations and rolling patterns including any specialized equipment or operations.

Including topics such as; project mix design, materials and their sources, plant production rates, hauling distances and routes, paving widths and speed, types and operation of compaction equipment, traffic control, and safety.

H. SPECIALTY ACTIVITIES DISCUSSION

Highlight specialty activities that are opportunities for improvement in the quality of materials incorporated in the project.

I. BEST PRACTICES HANDOUTS

Additional best practices within bituminous activities.

J. ADDITIONAL DISCUSSIONS

K. END OF MEETING

II. Bituminous: Addendums and Special Provisions Requirements.

A. Addendum(s)

Address any addendums

B. SPECIAL PROVISIONS (SAMPLE LIST, WILL VARY BY PROJECT)

- S-27 (2016) Quality Management – Paver Mounted Infrared Temperature Equipment for Thermal Profiles
- S-28 (2016) Quality Management Special – Intelligent Compaction (IC) Method
- S-39 (2231) Bituminous Patching Mixture
- S-40 (2232) Milled Rumble Strips
- Milling shall be the only acceptable method of constructing the rumble strips.
 - Rumble strips shall be coated with an asphalt emulsion fog seal per MnDOT 2355 prior to final striping. This work shall be incidental.
- S-41 (2255) Bituminous Longitudinal Joint Fog Sealing Treatment
- CSS-1 or CSS-1h (diluted 1 part emulsion to 1 part water) at the place of manufacture
- S-42 (2356) Bituminous Underseal
- Pave within 48 hours of placement
 - FA-3 aggregate
- S-43 (2357) Bituminous Tack Coat
- Furnishing and application is incidental
- S-44 (2357) Bituminous Material for Shoulder Tack
- CSS-1 or CSS-1h diluted 1:1 (diluted by supplier, no field dilution)
 - Apply water to surface immediately prior to placing asphalt emulsion
- S-45 (2360) Plant Mixed Asphalt Pavement (MSCR)
- Asphalt Binder must meet AASHTO M332
 - Pavement Smoothness requirements using equation HMA-B
 - Modified Longitudinal Joint Density Requirement
- S-46 (2399) Pavement Surface Smoothness
- Ramps, Loop, Bridges are excluded from smoothness, but measured for ALR
 - Shoulders are not measured
 - New Table 2399-4 (Smoothness Pay Adjustments)
 - New Table 2399-7 (ALR Monetary Deductions)

III. Contract Requirements

A. 1401 INTENT OF CONTRACT

The intent of the Contract is to provide for construction of the Project and compensation for the Work in accordance with the Contract documents.

The titles and headings of the various sections and subsections of the Contract are intended for convenience of reference.

The Contractor shall construct and complete the Project in every detail as described in the Contract. The Department will require the Contractor to perform the Work diligently and vigorously to completion. The Contractor shall consider the public interests and the obligations and rights of all other parties concerned. The Contractor shall assume full responsibility for performance of the Work and shall furnish all labor, materials, equipment, tools, supplies, transportation, and other incidentals necessary or convenient for successful completion of the Project.

The Contract may not fully describe every detail or make specific allowances for all probable exceptions and contingencies. When the Contract is silent or omits a detailed description, the Contractor shall perform in accordance with the best general practice and provide materials and workmanship meeting the quality specified in the Contract. The Department's failure to itemize every allowable exception or condition in the Contract does not mean that the Contract provisions will be enforced equally under all conditions or on all parts of the Work.

In the interest of avoiding repetitious wording in the Specifications, certain words and phrases have been omitted where reference is clearly related by expressions of authority or intention. Where certain words and terms appear, they are to be construed with reference to the definitions, abbreviations, heading, titles, item names, and other pertinent provisions of the Contract documents, as may be implied.

B. 1402 CONTRACT REVISIONS

1402.4 SUSPENSIONS OF WORK ORDERED BY THE ENGINEER

If the performance of all or any portion of the work is suspended or delayed by the Engineer in writing for an unreasonable period of time (not originally anticipated, customary, or inherent to the construction industry) and the Contractor believes that additional compensation, or contract time, or both are due as a result of such suspension or delay, the Contractor shall submit to the Engineer in writing a request for adjustment no later than 7 calendar days after receipt of notice to resume work. The request shall set forth the reasons and support for such adjustment.

Upon receipt, the Engineer will evaluate the Contractor's request. If the Engineer agrees that the cost, or time required for the performance of the Contract, or both have increased as a result of such suspension and the suspension was caused by conditions beyond the control of and not the fault of the Contractor, its suppliers, or subcontractors approved under 1801 —Subletting of Contract, and not caused by weather, the Engineer will make an adjustment (excluding profit)

and modify the contract in writing accordingly. The Engineer will notify the Contractor of the determination whether or not an adjustment of the contract is warranted.

The Department will not allow a contract adjustment unless the Contractor has submitted the request for adjustment within the time prescribed.

The Department will not allow a contract adjustment under this clause to the extent that performance would have been suspended or delayed by any other cause, or for which an adjustment is provided for or excluded under any other term or condition of this Contract.

C. 1501 AUTHORITY OF THE ENGINEER

1501.1 DECIDING QUESTIONS

The Engineer will, in the Engineer's sole discretion, decide all questions regarding:

- (1) Quality and acceptability of Materials provided and Work performed,
- (2) Manner of performance and rate of progress of the Work,
- (3) Interpretation of the Contract,
- (4) Measurement, control of quantities, and the amount of any payment deductions or adjustments, and
- (5) Acceptable fulfillment of all Contract provisions on the part of the Contractor.

The Engineer's acceptance does not waive the Department's right to pursue legal remedies for defective Work or Work performed by the Contractor in an unworkmanlike manner.

1501.2 SUSPENDING WORK

The Engineer may suspend the Work if the Contractor fails to:

- (1) Correct conditions unsafe for the Project personnel or the general public,
- (2) Carry out the Contract provisions,
- (3) Carry out any lawful orders, or
- (4) Comply with the requirements of all permits for the Project.

The Engineer may also suspend work for the following:

- (1) Unsuitable weather,
- (2) Conditions unsuitable for prosecution of the Work, or
- (3) Other conditions or reasons deemed to be in the best public, State, Department, or national interest.

1501.3 BASIS OF DECISION

The Engineer will make decisions based on engineering judgment in accordance with the following:

- (1) Facts and inferences,
- (2) Inherent variations of Materials and processes,

- (3) Risks associated with drawing inferences from test results on small samples that may not truly represent the Material or workmanship provided,
- (4) Past experiences relating to the question at issue,
- (5) Regulations, instructions, and guidelines established by the Department to administer the Work, and
- (6) Other factors the Engineer determines to have a bearing on the issue.

The Engineer may require additional tests to provide a statistically sound basis for judgment. The Engineer may accept satisfactory evidence of proper and adequate process control if the end result characteristics cannot be practically measured.

D. 1510 AUTHORITY AND DUTIES OF THE INSPECTOR

Inspectors have the authority to do the following:

- (1) Inspect the Work and the preparation, fabrication, or manufacture of Materials;
- (2) Notify the Contractor of non-conforming Work;
- (3) Reject non-conforming materials; and
- (4) Suspend portions of the Work for the following reasons that require a decision by the Engineer:
 - (4.1) Interpretation of requirements in the Contract,
 - (4.2) Use of unapproved material, or
 - (4.3) Safety.

Inspectors do not have authorization to alter or waive requirements of the Contract or to issue instructions contrary to the Contract.

Inspectors do not have an obligation or have authorization to provide direction, superintendence, or guidance to the Contractor, its crews, its Subcontractors, or suppliers to accomplish the Work.

Any action or inaction of the Inspector does not waive the Department's right to pursue any and all legal remedies for defective Work or Work performed by the Contractor in an unworkmanlike manner.

E. 1511 INSPECTION OF WORK

The Engineer may inspect Materials and the Work. The Contractor shall provide the Engineer or the Engineer's representative access to the Work, information, and assistance necessary to conduct a complete inspection. The Contractor shall notify the Engineer at least 24 h before required inspections.

The purpose of Department inspections is to determine whether the Work meets the requirements of the Contract. The Department inspections do not supplement or replace the Contractor's own quality control and do not relieve the Contractor of its responsibility to correct nonconforming Work.

If directed by the Engineer, the Contractor shall remove or uncover completed Work to allow inspection. After the Engineer's inspection, the Contractor shall restore the Work as required by the Contract. If the inspected Work meets the Contract requirements, the Department will consider the Work to uncover or remove and restore the Work as Extra Work in accordance with

1402, —Contract Revisions. If the inspected Work does not meet the Contract requirements, the Department will not pay for the Work to uncover or remove and restore the Work. The Department is not responsible for Contractor losses if the removals or uncovering of completed Work revealed nonconforming Work or Materials.

The Department will determine the level of inspection for any item of Work. The Contractor is responsible for the quality of Work and compliance with the Contract requirements regardless of the Department's level of inspection.

The Department will consider any Work performed or Materials used without the required certification, approval, or inspection by the Department as unauthorized Work in accordance with 1512.2, "Unauthorized Work."

The Engineer's failure to reject nonconforming Work or Materials, from lack of discovery of the nonconforming Work or Materials or for any other reason, will not:

- (1) Prevent the Department from rejecting the nonconforming Work or Materials upon later discovery, or
- (2) Obligate the Department to grant final acceptance of the Contract in accordance with 1516.4, "Final Contract Acceptance".

Inspection of Work may include inspection by representatives of other government agencies, railroad corporations, or utility owners that pay a portion of the cost of the Work. This inspection will not make these other government agencies, railroad corporations, or utility owners a party to the Contract and will not interfere with the rights of the Contractor or Department.

F. 1512 UNACCEPTABLE AND UNAUTHORIZED WORK

1512.1 UNACCEPTABLE WORK

The Department will consider all Work and Materials that do not meet the Contract requirements to be unacceptable.

For unacceptable Work resulting from poor workmanship, use of nonconforming materials, damage through carelessness, or any other cause existing before final acceptance of the Work, the Department will take one of the following actions, at the Engineer's sole discretion:

- (1) Require the Contractor to acceptably correct the Work and Materials, immediately upon receipt of written order to do so; or
- (2) Allow the work to remain in place at an adjusted Contract Unit Price; or
- (3) Decide the extent of acceptance for the Work to remain in place if a Contract Item fails to meet Contract requirements but is adequate to serve the design purpose, and document the basis of acceptance by change order to adjust the Contract Unit Price; the adjusted Contract Unit Price will be determined at the Engineer's sole discretion; or
- (4) Require the Contractor to remove and replace the unacceptable Work at the Engineer's sole discretion.

The Department may provide notice of default in accordance with 1808, —Default of Contractor, after the Contractor has been given proper notice to acceptably correct the Work and Materials, and has failed to do so.

1512.2 UNAUTHORIZED WORK

The Department will consider Work performed contrary to the direction of the Engineer, or any work performed beyond that specified in the Contract or directed by the Engineer to be unauthorized.

The Department may consider the following as unauthorized Work:

- (1) Work performed before the Engineer provides lines or grades or required inspections of Materials,
- (2) Work performed before the Department's approval of the Contract as required by law,
- (3) Extra Work performed before Engineer approval of a Supplemental Agreement, and
- (4) Minor Extra Work performed before the Engineer has issued a Work Order/Minor Extra Work.

The Contractor shall remove unauthorized Work upon receipt of a written order to do so, at no additional cost to the Department.

The Department may pay for unauthorized Work only if the Engineer determines the work to be acceptable, and one of the following authorizes the Work.

- (1) The Contract,
- (2) A Supplemental Agreement, or
- (3) Work Order/Minor Extra Work

1512.3 NON-COMPLIANCE

If the Contractor fails to comply immediately with any order issued by the Engineer in accordance with the requirements in this section, the Engineer may direct the following and deduct the costs from moneys due or becoming due to the Contractor under the Contract or any other contract with the Department:

- (1) The correction or removal and replacement of unacceptable Work and
- (2) The removal of unauthorized Work.

IV. Concerns with design, materials or specification

A. PROJECT SPECIFIC ISSUES/QUESTIONS:

Any aspects of plant and roadway operation that may be controversial or unusual should be discussed to help avoid confusion in the field.

V. Contractor Paving Operations Activities

The contractor should explain in detail the activities associated with the paving activities including the material to be used, plant operations, hauling routes and distances and number of trucks, paving operations and rolling patterns including any specialized equipment or operations,

The pre-paving agenda should topics as materials and their sources, plant production rates, hauling distances and routes, paving widths and speed, types and operation of compaction equipment, traffic control, and safety.

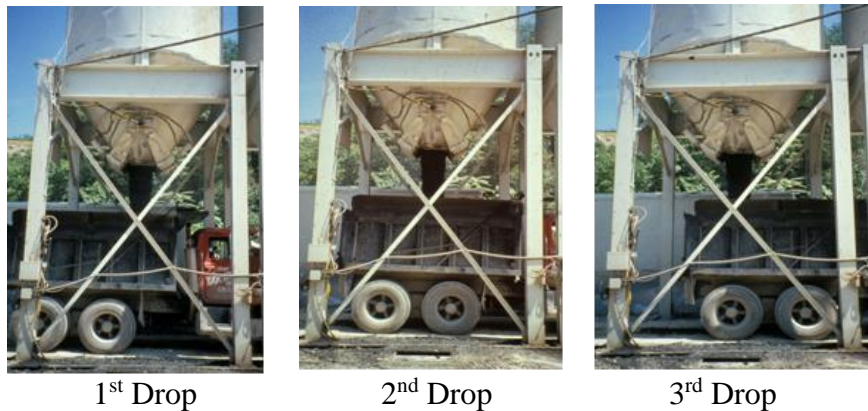
VI. Specialty Activities Discussion

A. PLANT – (PLANT ALREADY CERTIFIED)

- 1) Contact chart with names, phone numbers, and responsibilities.
 - a. Project Supervisor/Engineer (MnDOT)
 - b. Mixture QC/QA (MnDOT/Contractor)
 - c. Superintendent Plant/Road (Contractor)
 - d. Density Q/C (Contractor)
- 2) Site map of stockpiles.
- 3) Stockpile moisture content. Should be checked daily but at a minimum after rain event.
- 4) Plant operations to prevent oversize material (scalping screen).
- 5) Adequate dividers between cold feed bins to prevent co-mingling of aggregate.



- 6) Truck Bed Release Agent (non-petroleum product).
- 7) Truck Box Sampling. If truck box sampling is utilized use proper sampling techniques and sample must be allowed to cure for a minimum 30 minute before testing.
 - a. Sample Splitting – ensure representative fraction for MnDOT and Contractor.
- 8) Segregation. To minimize segregation the 3-drop truck loading method is recommended.





Slight



Moderate



Severe

Slight: Very little separation of coarse and fine aggregate particles. The mastic is in-place between the aggregate particles but the surface has a slightly coarser appearance. Generally, slightly segregated pavement is accepted by the Engineer without any corrective action required.

Moderate: significantly more separation of the coarse and fine aggregate particles. There is also a lack of the surface mastic making the segregation more noticeable. Generally, medium segregated pavement is left in-place for lower lifts. However, surface courses are subject to a price adjustment, removal and replacement, or resurfacing at the Contractor's cost.

Severe: Complete separation of the coarse and fine aggregate particles. There is little or no surface mastic making the segregation very noticeable. Typically, low density and high permeability are associated with severely segregated pavements. Because of the potential for raveling and further disintegration of the pavement full lane removal and replacement, at the Contractor's expense, is oftentimes required.

- 9) Silos. Do not have excessive storage of mix in silos (< 18 hours).
- 10) Produce mixture at temperature according to Asphalt supplier's mixture and compaction temperature chart.

B. ROADWAY PREP & TACK

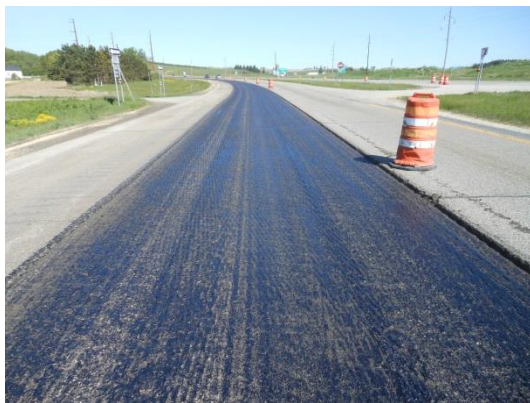
- 1) Complete all patching and removal of loose material as required by contract.
- 2) Milled surfaces must be swept (sometimes more than one brooming required) and loose material removed before paving is allowed.
- 3) Tack. Is tack diluted 70/30 or undiluted (these are the only options). Shot rate depends on dilution. See 2357 for shot rates. What shot rate will be used?
 - a. Field dilution is not allowed. Dilution at supplier only.
 - b. Make sure samples are taken from spray bar or distributor tank. When sampling from spray bar prevent contamination of tack from diesel fuel by wasting tack before sampling.
 - c. Tack must break before paving is allowed; brown to black.
 - i. Keep haul trucks off fresh tack.
 - d. Tack must fully cover the roadway surface, 100% coverage. No corn rows.

C. TACK (SPEC. 2357)

- **Dilution:** Field Dilution is not allowed. (2357.2), Manufactured Undiluted or Diluted 7 parts emulsion to 3 parts water of either CSS-1 or CSS-1h is allowed (2357.2.A)



- **Storage Tank:** If Contractor uses diluted emulsion and is storing the product, a recirculation system or agitator is required (2357.2.A)
- **Surface:** Clean the surface before applying tack. (2357.3.C)
- **Lifts:** Tack between each lift (2357.3.D)
- **Coverage:** Apply a uniform application (complete coverage of the surface) Compare to brown/black sheet of construction paper. (2357.3.D) [We do not want corn rows.]



- **Yield Check:** Do a yield check at the beginning of each project (2357.2.D)
- **Sample:** Obtain from the distributor (2357.2.F) and submit to MnDOT Chemical lab for testing.

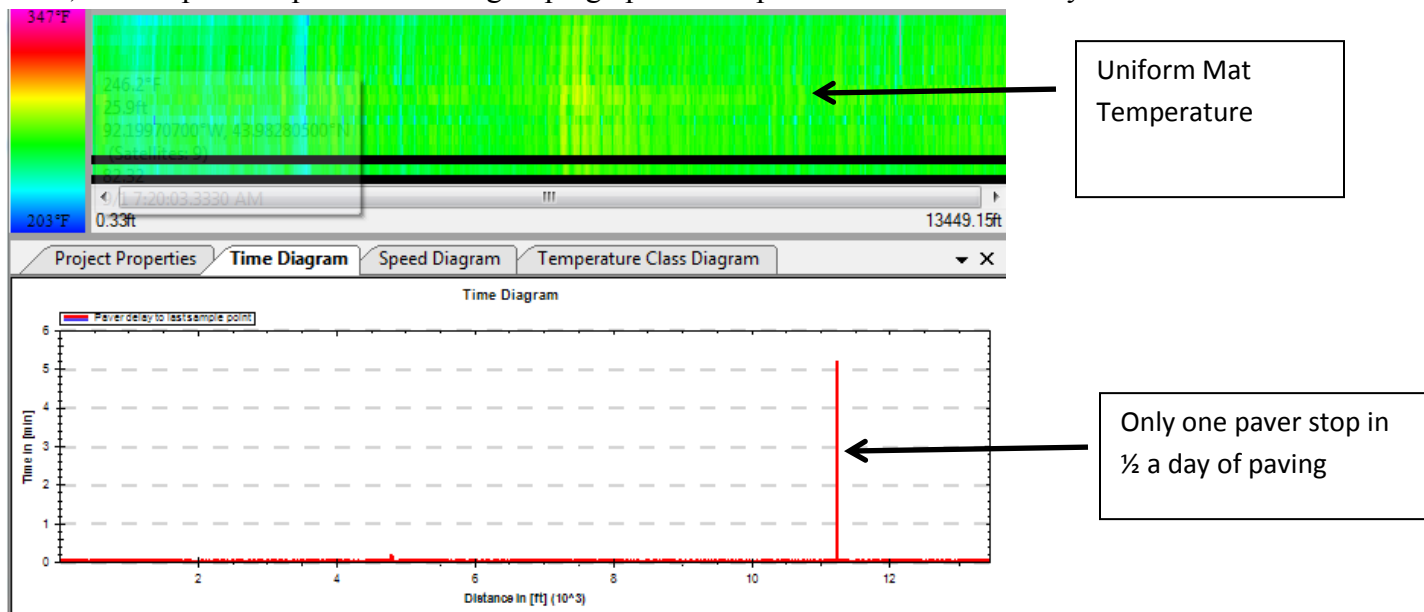
Deduction If the material fails (3151) or workmanship/application, then a monetary deduction of 5% is taken against the price of the mix.

D. PRE-PAVING STRATEGIES

- 1) If segregation occurs, what actions will be taken to eliminate it?
- 2) If minimum density (mat and longitudinal joint) is not met, what actions or modifications will be taken to improve density?
- 3) If poor workmanship, in any aspect, is observed, what actions will be taken to improve it?
- 4) If thermal segregation is observed, what actions will be taken to eliminate it?
- 5) How will rolling operations be modified if a tender zone is observed during compaction process.
- 6) How will bumps be eliminated at transverse joints? What is your construction technique?
- 7) How will tolerance issues between MnDOT and Contractor mixture samples be addressed?
- 8) If tack paddies are observed on the finished mat how will this be corrected?

E. DELIVERY TRUCKS:

- 1) Delivery trucks are not allowed to dump any remaining mix in front of the Material Transfer Device.
- 2) Keep delivery trucks out of fresh tack.
- 3) Tarp loads when directed by Engineer necessary.
- 4) Attempt to keep trucks from “grouping up” so that paver can run continually.



F. PAVING:

- 1) Try to maintain uniform paver speed by matching paver speed to availability of delivery trucks.
- 2) MTD and hopper insert should help minimize or eliminate any segregation that might be attributed to loading trucks at plant.
- 3) Keep a constant head of material at the augers: A consistent flow of material to the augers will prevent them from spinning too fast or too slow, which can cause longitudinal segregation. As a

rule of thumb a proper head of material is ½ up the auger. Constant changes in the head of material make bumps in the mat.

- 4) Ensure mixture is placed at proper thickness and cross-slope.
 - a. Perform occasional yield checks to verify quantity.
- 5) Use auger extensions when directed by the Engineer. If the paving width is greater than the basic screed, auger and mainframe extensions, which meet manufacturer's recommendations for the paving width, are required unless otherwise directed by the Engineer.



Notice large head of material in front of screed without tunnel or auger extensions

- 6) Monitor density with a nuclear gauge.
- 7) Utilize Maryland Joint method for longitudinal joint construction.
- 8) Set string line as guide reference for paver.



- 9) Vibrating screed gives 70-80% of maximum theoretical density.

G. DENSITY

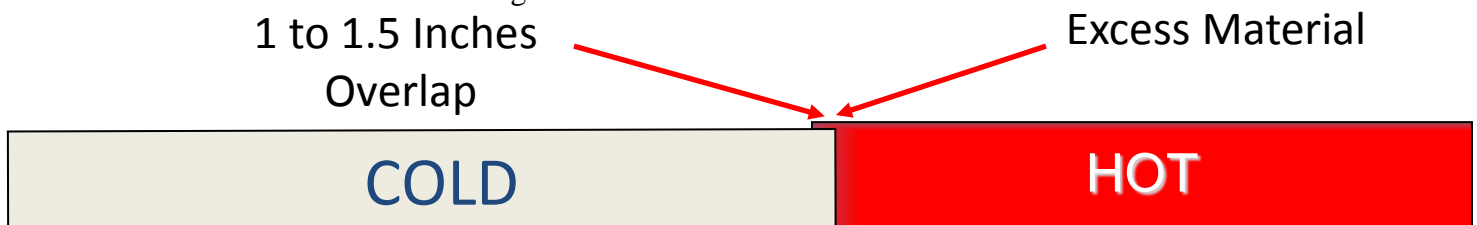
- 1) Bumps at joints? Rubber tired roller can be used to minimize occurrence of bumps.
- 2) Keep rubber tires clean and keep rubber tired roller moving to prevent mixture pickup.
- 3) Rollers shall not be parked on the hot mat.
- 4) For mat thickness 3" or less typical settings on steel roller are high frequency and low amplitude.

H. PLANT MIXED ASPHALT PAVEMENT (SPEC. 2360)

- **Plant Certification:** All plants must be certified each year and/or if they are moved during the year (2360.2.G.1).
- **Quality Assurance (QA):** QA testing is done to accept the work, therefore the following are required (2360.2.G.2):
 - Conduct QA and verification sampling and testing
 - Observe the Quality Control (QC) sampling, splitting, and testing
 - Verify calibration of the QC laboratory testing equipment
 - Communicate test results on a daily basis
- **Verification Sample:** Test a minimum of one of the Contractor's QC samples as a verification sample each day or random sample at any time from behind the paver or from the truck box (2360.2.G.3).
- **Quality Control (QC):** The Contractor will take samples at random tonnage or locations, and must be quartered from a larger sample (2360.2.G.4.b).
- **Small Tonnage:** The Department will not require mixture volumetric property tests if the mix production is no greater than 300 tons. As soon as the cumulative tonnage is over 300 tons then testing is required (2360.2.G.5).
- **Documentation:** Complete the required mix volumetric documentation (i.e. Test Summary Sheet) (2360.2.G.8).
- **Scale Checks:** Weekly truck scale spot checks are required (2360.2G.8).
- **Recordation:** A summary of the plant's blending control system is required on 20 minute intervals when the plant is producing mix. This information is used to verify proportions, temperatures, and % AC (2360.2.G.8).
- **Maximum Mixing Temperature:** Mix cannot be produced at more than 30°F above the recommended mixing temperature given by the asphalt supplier to minimize asphalt aging in the plant and reduce the likelihood of damaging any polymers in the asphalt. (2360.3.A.5)
- **WMA:** If using Warm Mix Asphalt (WMA), the Contractor must notify the Engineer of any additive or process that is being used (2360.2.C.4) and documented on the Test Summary Sheet (2360.2.G.8(18)).
- **Quality Management:** Make sure that all Mixture Quality Management tests/documentation is being done (2360.2.G & Schedule of Materials Control)

- **Additional Samples:** “The Engineer may obtain additional samples at any time and location during production, to determine quality levels...” (2360.2.G.2) Therefore, if you see areas that you would like to take an additional sample, go ahead.
- **Road Conditions:** “Do not place asphalt mixtures when weather or roadbed conditions or moisture conditions or the roadway surface are judged unfavorable by the Engineer. (2360.3.A.4)
- **Asphalt Release Agent:** Do not use petroleum distillates (i.e. Diesel fuel) as release agents (2360.3.A.1)
- **Auger Extensions:** Auger and mainframe extensions are required if the paving width is greater than the basic screed, auger and mainframe extensions, which meet the manufacturer’s recommendations for the paving width, are required unless otherwise directed by the Engineer. (2360.3.B.2.a) This is to minimize segregation and higher air voids on the outside of the mat, and improve longitudinal joint performance.
- **Tarps:** You can require the trucks to be covered with tarps that extend at least 1 foot over the sides of the bed and attached with tie downs, if truck is not equipped with a mechanical or automated covering system. (2360.3.B.2.b)
- **Pneumatic Roller:** Make sure that if pneumatic (rubber) tired roller is used that the Contractor warms up the tires before it is used on the hot mix to minimize pickup and has the tires clean and sprayed with a non-petroleum based release agent.
- **Rollers Standing on Mat:** Do not allow rollers to stand on pavement that has a surface temperature of 140°F or greater. (2360.3.D)
- **Density:** Maintain the density requirements in the contract. Therefore, the Contractor may need to modify their rolling pattern or add an additional roller depending on weather conditions. The program PaveCool is available to aid in determining the amount of time for compaction. (2360.3.D)
<http://www.dot.state.mn.us/app/pavecool/>
- **Segregation:** Material segregation is always taking place to one degree or another as the material is moved, handled, and placed. Table 2360-26 states that the surface “must be free of segregated and open and torn sections and deleterious material”. If you see segregation, discuss the issue with the Contractor to find ways to correct the problem or use spec. 1510 (Authority and Duties of the Inspector). For isolated locations the area can be corrected by remove and replacement or a monetary adjustment at the discretion of the Engineer, depending on the severity of the issue. (2360.3.D & 2360.3.E)
- **Ordinary Compaction Projects:** The specification does not allow paving when the air temperature is below 32°F. Table 2360-26 specifies the minimum laydown temperature as measured behind the paver for different combinations of air temperature and lift thickness. (2360.3.D.2.c)

- **Longitudinal Joint:** To aid the performance of our longitudinal construction joints the following are recommended best practices.
 - Use a string line to assure the first pass is straight
 - Vibratory screed should always be on
 - Have screed end gate seated flat on the existing surface
 - Maintain a uniform head of material across the width of the screed
 - Use auger extensions/tunnels
 - Don't starve the joint of material
 - Don't bump (rake) the joint
- **Maryland Joint** This is a name given to make sure that paver is not starving the longitudinal joint for material and thereby creating an area of high air voids. It is therefore recommended when matching lifts on a longitudinal joint that the screed overlaps the previously placed mat by 1 to 1.5 inches. There will be extra material at the joint when it is compacted and aggregate may be broken during compaction and leave a streak on the joint, but this will make sure there is enough material to compact properly and have better density. Both MnDOT and the Minnesota Asphalt Pavement Association (MAPA) recommend this technique. We would recommend you ask at the precon if the contractor will be using this method.



- **Surface Requirements:** The surface must be free of segregation, open and torn sections, to tolerance of 1/4 inch across a 10 foot straight edge parallel and transverse to centerline and over longitudinal and transverse joints. If paving next to concrete curb, pavement or fixed structures, the surface must be slightly higher, but not to exceed 1/4 inch. Note Table 2360-26 for all the surface requirements (2360.3.E).



I. PAVEMENT SURFACE SMOOTHNESS (SPEC. 2399)

- **Ride Equation:** Know if your project has a surface smoothness requirement that specifies a ride equation (i.e. HMA-A, HMA-B, or HMA-C) or if spec. 2399 does not apply and only Table 2360-26, Surface Requirements apply. This can be found in your special provisions under 2360.
- **Inertial Profiler:** A profiler that has been certified for 2015 is required. (They will have a green tab like your MN license tab.) 2399.2.A.
- **Operator:** A certified operator is required to be used from the list posted on the MnDOT Smoothness website (2399.2.C).
- **Day of Profiling:** A printout of the inertial profiler settings, each segments (left & right) IRI values, signature of operator, and electronic *.ERD files are required on the day of profiling (2399.2.D.2).
- **Corrective Work:** If there are areas that require corrective work then a summary report of these areas is required within 5 calendar days after all pavement placement is required and a written corrective work plan submitted to the Engineer (2399.2.D.3&4).
- **More than 25% Failing Density Lots?:** The Engineer will not pay any positive Total Pay Adjustments if greater than 25% of the mainline density lots for the project fail to meet the minimum density requirements in accordance with spec. 2360 (2399.3.D.1.a)

VII. Appendix

Developed from the Colorado Asphalt Pavement Association - Hot Mix Asphalt Pre-Paving Conference Agenda

JOB SET UP – BEST PRACTICES

Partnering

All personnel involved in the construction planning and design need to meet before the job so we can all “be on the same page” and resolve possible problems before they arise.

Pre Paving Planning Meeting

Meet with your crew every day to review the plan for the day’s construction and expectations. Plan the truck route, plan the job layout, and assign people to required tasks.

Communication

Constant communication with all the elements of the paving process from design engineers to the lute man. This keeps all phases of the job on schedule and free of “Uh Ohs”.

Mix Selection

Insure the mix is of an adequate design for both strength and workability. Mind your temperatures.

Machine Maintenance

Not only does well maintained iron contribute to a more pleasant work environment it shows your people that you care enough about them to give them the best tools. It provides for a safer work environment and a more productive and profitable organization.

Smoothness-Thickness-Yield

The inspectors and field personnel need to be aware of the paving fundamental that yield, minimum thickness and smoothness cannot be obtained at the same time.

Crew Training

Not only in the operation of the equipment but in the art of reading mat defects. The sooner these defects are identified the sooner remedial action can be taken. Remember when the only tool you have is a hammer every problem looks like a nail.

Know the Consequences

Of improperly operating the machines, improper principles and techniques of paving, rolling and trucking of poor safety awareness. Designate a “job site safety man” know the way to emergency medical care.

SUGGESTED BEST PRACTICES FOR MINIMIZING SEGREGATION

1. *Aggregate Stockpiles:*

- Build in Layers
- Avoid any procedure that will allow the aggregate to be pushed or dumped over the side of a stockpile
- Separate to prevent intermingling
- Aggregate Handling:
 - o Loader operator works full face of stockpile
 - o Install dividers on the “cold feed” bins to prevent the material from flowing into an adjacent bin
 - o DO NOT pile the aggregate so high it flows over the dividers

2. *Loading the Surge Silo: (if the plant has a “batcher or “Gob Hopper” at the top of the silo)*

- Adjust the conveying devices to deposit the material in the center of the batcher or gob hopper
- Keep the gates on the batcher or gob hopper closed unless dropping a load of mix
- Close the gate on the batcher or gob hopper before it is empty to prevent the material from dribbling into the silo

3. *Loading Trucks:*

- Keep the gates on the bottom of the silo closed so the material does not dribble into the trucks
- Take care to center the trucks (left to right) when loading
- Load trucks in multiple drops with the first drop at the rear, second at the front and then alternate dumps
- If the mix is prone to segregation, you should avoid loading the trucks by “slowly” driving forward while dropping the mix from the silo

4. *Dumping Trucks:*

- To provide as surge of material to the paver, when using end dump type trucks, the box should be raised until the mix moves to the rear of the bed charging the tail gate prior to releasing the load
- If any mix is spilled on the roadway, in front of the paver while dumping the truck, the spilled mix should be removed from the roadway before the paver moves forward across the mixture on the grade

5. *Laydown Operations:*

- Only dump the wings on the paver hopper at the end of the paving day and utilize this material in the night taper joint or waste the material
- To provide consistent flow of material to the screed and avoid gradual deceleration/acceleration, the paver should be started and stopped quickly at normal operating speed
- Keep the hopper more than half full at all times and maintain the height within 1 inch the entire paving day
- The auger height should be adjusted so the bottom of the auger is at least two (2) inches above the finished surface of the HMA mat
- Adjust the feed sensors to keep the material near the center of the auger at all times
- Correctly adjust the lead and tail crown of the screed so that the surface of the HMA behind the paver is uniform in appearance and texture

- Install or verify the material management kits are installed and functioning properly. This includes the “kick back” paddles under the gear box and outer edges of the auger
- Adjust the flow control; gates at the rear of the hopper so that:
 - o The slat conveyors run continuously
 - o The amount of material being presented to the augers allows for them to run almost continually, (minimum of 80% of the time)

6. *Windrow Elevators:*

- When using pickup machines they should be adjusted so that all of the HMA is removed from the surface

7. *Troubleshooting:*

- If segregation is observed behind the paver, check the trucks as they arrive and are dumping to see if the mix in the truck is segregated
- The risk of causing thermal segregation is increased when paving in cooler temperatures

SUGGESTED BEST PRACTICES FOR PAVEMENT SMOOTHNESS

PAVER OPERATIONS – BEST PRACTICES and INNOVATIONS

Keep the hopper full: If you are not using a hopper insert leave as much surge as possible between truck exchanges and do not run the hopper empty. This will minimize “truck fans” by allowing hot, uniform material from the next truck to blend with mix from the previous dump. Keeping your mat as thermally uniform as possible will result in better densities.

Controlled hopper wing cycling: The wings are where the large, cooler stone tends to collect if not properly reintroduced back to the mix. Regular cycling, where allowed by spec, will reduce large buildups of this segregated material. Don't wait until you are “out of material” to cycle the wings.

Use a hopper insert: If you are using pick up machines and windrow paving use a hopper insert. It will reduce or eliminate segregation.

Keep a constant head of material at the spreading augers: A consistent flow of material to the spreading augers will prevent them from spinning too fast or too slow, which can cause longitudinal segregation. As a rule of thumb a proper head of material is ½ up the spreading auger. Constant changes in the head of material make waves in the mat. If allowed to rotate too fast, longitudinal stripes will occur in line with the reversing augers; too low a rate and the larger stone will drop and collect at the bearing support

Time the conveying and spreading systems: Ensure the ratio pots or flow gates are set to deliver enough material to the spreading augers to keep them running continuously. Set your sonic feeds and leave them there.

Keep your paver speed steady: Drag race paving may be entertaining but stops and starts cause the head of material to rise and fall changing the mat thickness. This not only affects ride but can detrimentally affect density.

Correct lead crown setting and proper strike off adjustment: Equipment fine-tuning issues will help eliminate longitudinal segregation. String line your screed before every job and introduce the correct amount of lead crown; usually 1/8 - 1/4 inches. Make sure your strike offs are correctly aligned. Refer to your owner's manual for the recommended procedure.

Correct spread auger length: Once you have the job planned out if you need to build up the spreading augers then DO IT. Trying to compensate for spreading augers that are too short by running them faster will only result in segregation. This only gets worse with more gap graded mixes. If you have a 20' screed and the job calls for wide paving then BUILD UP THE SCREED; use the auger extensions, wide mat grade supports and the outboard bearing supports. The finished jobs will more then compensate for the time involved in the build up. Then plan the layout so you can maximize the use of the built up screed.

Use Thermal guns: Equip your paver operator and roller hands with thermal (infrared) handheld thermometers and use them to monitor changes in the mat temperature. Establishment of a thermal range during the test strip process gives you a working range to be used through out the paving project.

Don't broadcast material across the mat: This just gives the appearance of a segregation problem. Don't rake material off the joint onto the new mat. Don't walk on the fresh mat.

Train your personnel: Not only in the operation of the equipment but in the art of reading mat defects. The sooner these defects are identified the sooner remedial action can be taken. Remember when the only tool you have is a hammer every problem looks like a nail.

Pave predominately uphill: On steep grades in mountainous terrain, pave uphill when possible. Control of material and speed of equipment is easier to maintain when paving uphill. Paving downhill may be problematic with paver and roller speeds. This may cause "ripples" in the mat that are difficult to remove. The mat may shove and tear more when operations proceed downhill, requiring patching or other undesired corrective work. QC should be onsite to monitor densities when steep grades require a change in the roller pattern. NOTE: It is not intended to change the direction of the paving operation in rolling terrain. If the roadway grade is predominately in the uphill or downhill direction on mountain passes or other significant elevation changes, paving uphill provides a better product.

BEST PRACTICES FOR LONGITUDINAL JOINT CONSTRUCTION

1. **BE CONSISTANT:** Decide on a plan and stick with it.
2. **COMMIT TO A GOOD JOINT:** Quality contractors build quality joints.
3. **MAINTAIN A PROPER TAPER:** Tapers range from near vertical to 12:1. Regardless of what taper is used, keep it consistent. Vertical edges and notches as vertical as possible. Keep edges confined as long as possible. Maintain a Proper “Head of Material”
4. **MAINTAIN PROPER OVERLAP:** Keep overlap consistent typically from 0-1.5 inches. Place proper amount of HMA at the joint: Too little will allow water to enter the joint. Too much will cause a ridge which will carry water and interfere with compaction. **DO NOT RAKE THE JOINT!** If raking to correct improper amount of material, just bump the joint, **DO NOT BROADCAST** loose material across the mat.
5. **USE PROPER ROLLING TECHNIQUES!**

BEST PRACTICES FOR BREAK DOWN ROLLER OPERATORS

1. Communicate – with paving crew and foreman for job requirements prior to the arrival of asphalt.
2. Confirm maintenance and water system checks – done on a daily basis to rollers.
3. Determine lift thickness – base or surface riding course.
4. Be aware of material temperature – at delivery to paver and behind screed.
5. Determine rolling drum mode – vibratory or static.
6. Make required amplitude adjustments both roller drums – depending on mix design, material thickness, and temperature zone.
7. Optimize water system controls – to avoid material pick-up and eliminate excessive water usage.
8. Establish proper rolling pattern – determined by paving width, roller drum width, unsupported edges, and drum overlap.
9. Determine rolling speed – to achieve proper impact spacing and meet smoothness requirements.
10. Monitor rolling temperature – and work within optimum temperature zones.
11. Make required rolling coverages – to achieve density requirements.
12. Adjust rolling operations – to satisfy density, smoothness, and production rates.
13. Maintain consistency throughout the entire shift.

BEST PRACTICES FOR FINISH ROLLER OPERATION

1. Communicate – with paving crew, foreman and breakdown roller operator for job requirements.
2. Confirm maintenance and water system checks – done on a daily basis to rollers.
3. Be aware of material temperature – avoid “tender zone.”
4. Determine rolling drum mode – vibratory or static depending upon requirements to achieve density and smoothness.
5. Optimize water system controls – to avoid material pick-up and eliminate excessive water usage.
6. Establish proper rolling pattern, – determined by paving width, roller drum width, unsupported edges, and drum overlap.
7. Coordinate final rolling process with QA / QC personnel.
8. Monitor rolling temperature – and work within optimum temperature zones.
9. Make required rolling coverage’s – to achieve density requirements and to remove drum edge marks.
10. Maintain consistency throughout the entire shift.