

MICHIGAN  
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION  
FOR  
**ACCEPTANCE OF LONGITUDINAL JOINT DENSITY IN HOT MIX ASPHALT  
PAVEMENTS**

CFS:CJB

1 of 8

APPR:KPK:DBP:10-10-13

FHWA:APPR:10-11-13

**Delete the second and third paragraphs of subsection 501.03.F.2.b, page 242 of the Standard Specifications for Construction, when using this specification.**

**a. Description.** This special provision establishes acceptance procedures for density of longitudinal joints in hot mix asphalt (HMA) pavement. In cases where this special provision conflicts with another special provision or supplemental specification, this special provision prevails. This special provision provides the sampling procedure for determining core locations, acceptance parameters, and quality adjustment. This special provision applies to all HMA trunkline projects that require the construction of an HMA longitudinal joint. This special provision does not apply to HMA wedging courses, joints constructed using an asphalt stabilized crack relief layer (ASCRL), or joints formed by paving perpendicular or at a skew to the mainline paving (i.e. approaches, hand work, gores, etc.).

Longitudinal joints will either be a Type 1 or Type 2 as defined below.

Type 1. A longitudinal joint made up of new HMA that abuts up or will abut up to new HMA pavement or new HMA shoulder. If echelon paving is called for on the plans the hot joint will not be considered a Type 1 or Type 2 joint and will be subject to density requirements in accordance with 12SP-501U Superpave Hot Mix Asphalt Percent Within Limits or 12SP-501V Superpave Hot Mix Asphalt Percent Within Limits For Capital Preventive Maintenance Mill & Resurface Projects and Capital Preventive Maintenance One Course Overlay Projects

Type 2. A longitudinal joint that, in its final condition abuts up to an existing HMA pavement, Portland Cement Concrete pavement or curb and gutter section.

Staging requirements that require a subsequent lift to be placed prior to placing the abutting lane to form the longitudinal joint without a minimum of 12 inch lift offset will be considered a Type 2 joint.

If two abutting lifts of the same mix designation are being placed at different thicknesses per plan or approved field changes then the longitudinal joint core will be taken 4 inches off the center of the joint on the cold side of the joint.

In those situations where the longitudinal joint is a Type 2 the entire adjoining HMA mat being paved will be subject to density requirements in accordance with 12SP-501U Superpave Hot Mix Asphalt Percent Within Limits or 12SP-501V Superpave Hot Mix Asphalt Percent Within Limits For Capital Preventive Maintenance Mill & Resurface Projects and Capital Preventive Maintenance One Course Overlay Projects. The density acceptance requirements of this special

provision will not apply to Type 2 joints.

At the time any Quality Assurance (QA) or Quality Control (QC) cores are taken, remove free standing water from the core hole, apply bond coat, fill with hot mix asphalt, and compact. Obtain and document approval for the specific method of filling holes and for obtaining compaction at the pre-production meeting.

The center of any random density mat core required within 12SP-501U Superpave Hot Mix Asphalt Percent Within Limits or 12SP-501V Superpave Hot Mix Asphalt Percent Within Limits For Capital Preventive Maintenance Mill & Resurface Projects and Capital Preventive Maintenance One Course Overlay Projects must not be less than 15 inches from the visible mainline lane line longitudinal joint on a tapered side of a tapered joint. If the center of the core is within 15 inches, another transverse random number will be selected and the core sample site moved to the new location.

#### 1. Definitions.

**Longitudinal Joint Section.** A section is made up of a discrete length of Type 1 longitudinal joint. Each section is typically made up of five Type 1 longitudinal joint subsections.

**Longitudinal Joint Subsection.** A portion of a Type 1 longitudinal joint section represented by one random core every 2,000 feet. The Contractor and the Engineer may agree to reduce the typical 2,000 foot joint subsection based on project staging or other project conditions.

#### b. Materials.

Type 2 Joints. Bond Coat.....section 501

#### c. Construction.

Type 1 Joints. When constructing a Type 1 joint the Contractor may elect to overpave the joint by up to 2 inches (measured from the top of the mat) in order to cut back the vertical face of the joint. This cut back should not exceed 2 inches and will be aligned with the proposed lane line, center line or edge line.

Type 2 Joints. All existing surfaces abutting up to a Type 2 joint will receive a double bond coat (rate of 0.10 gallons per square yard per application) on the vertical face of the surface prior to the new HMA mat being placed.

**d. Quality Control.** In addition to requirements for QC in the percent within limits (PWL) specification, the Contractor must describe the procedures to be followed to ensure that test results are properly reviewed and that corrective action based on the test results is taken and documented when necessary to control HMA quality and ensure longitudinal joint density.

One informational longitudinal joint core is allowed per day of production of the longitudinal joint to aid the Contractor in their control of operations. Obtain a minimum of 3 cores for any project having only one subsection per course of paving. Obtain a minimum of 4 cores, 2 per subsection, for any project having only two subsections per course of paving. Any additional informational cores require the approval of the Engineer. The Contractor may also take up to one random core for quality control for each subsection of constructed longitudinal joint.

### e. Quality Assurance.

1. Sampling and Testing. Using an approved random number procedure, the Engineer randomly identifies one core location within every Type 1 longitudinal joint subsection of constructed Type 1 longitudinal joint. The core locations will be marked after final rolling. Core sample locations will be marked at the completion of a subsection, prior to traffic staging changes, or at another time that is independent of paving operations. The Contractor must provide and pay for traffic control and coring as required in the Special Provision for Maintaining Traffic for all coring procedures, including dispute resolution.

Ensure these cores are approximately 6 inches in diameter, taken after finish rolling and after the final paving pass of each course. Ensure cores are centered on the line where the joint between the two adjacent lifts abut at the surface. For Type 1 joints in which different mix designations (5E3, 5E10, 4E3, 4E10, GGSP, etc.) are used on either side of the longitudinal joint the cores will be taken 4 inches off the center of the joint on the cold side of the joint. If different mix designations are used on either side of the longitudinal joint, the corresponding subplot JMF Gmm for the mixture on the cold side of the joint will be used in the joint density. For Type 1 joints, longitudinal joint density is calculated using the in place core specific gravity divided by the subplot JMF Gmm (average if more than one JMF is applicable including different air void targets) of the corresponding subplot on either side of the joint. The Engineer will mark each core location with an approximate 2 inch diameter paint dot which represents the center of the core. Longitudinal joint cores will be identified with a "J" and the numbering is successive. Notify the Engineer sufficiently in advance of the coring to ensure that MDOT has a representative to witness the coring operation and take immediate possession of the cores. Do not damage cores during removal from the roadway. Measure core thickness at the time they are extracted from pavement.

The minimum core thickness for each mixture type is:

Hot Mix Asphalt <u>Mixture No.</u>	Minimum Core <u>Thickness</u>
2	3 inch
3	2¼ inch
4 & GGSP	1½ inch
5	1⅛ inch
LVSP	1¼ inch

Any core disqualified based on the minimum thickness criteria will be discarded and a new random core location will be selected by the Engineer. All previous pavement, base aggregate or bond coat material will be sawed off the bottom of the core samples by the Engineer.

Longitudinal joint density will be based on five consecutive longitudinal joint cores. The resulting average of these five consecutive cores will become the longitudinal joint density representative for that length of longitudinal joint section. If only one or two cores remain at the end of production of the longitudinal joint, the test results for these cores will be combined with the previous set of five consecutive cores for determination of longitudinal joint density at the end of production. If only three or four consecutive cores remain at the end of production of the longitudinal joint, the resulting average of these three or four cores will become the longitudinal joint section density. Obtain a minimum of 3 cores for any project having only one sub section per course of paving. Obtain a minimum of 4 cores, 2 per subsection, for any

project having only two subsections per course of paving.

In-Place Joint Density Quality Assurance Testing. Longitudinal joint density acceptance testing will be completed by the Engineer within 4 calendar days after the Engineer has taken possession of the cores at the project site. Testing will be in accordance with *MTM 315*. The Engineer and Contractor will mutually agree to use either vacuum dry or oven dry method as outlined in *MTM 315*. This agreement will be documented at the Pre-production meeting. The Engineer's test results on the compacted HMA will be used as a basis of acceptance and payment.

When the resulting average of the cores of a longitudinal joint section is less than 89.00 percent, the Engineer will issue a Notice of Non-Compliance with Contract Requirements (Form 1165) and HMA production must stop. The Contractor must then stop and cannot resume production until all necessary adjustments are made to bring the mixture into conformance with all applicable specifications; documenting these adjustments as discussed in the HMA-QC Plan and receiving a Notice to Resume Work (Form 1165) from the Engineer. If the adjustments do not bring the average density above 89.00 percent and the joint is being constructed as a tapered joint, the Contractor will be required to mill the taper and no more than 2 inches of the existing mat creating a vertical joint before paving resumes at no additional cost or change their paving operation and demonstrate that they can achieve the 89.00 percent requirement.

## 2. Quality Adjustment.

A. Incentive. Any longitudinal joint section density equal to or greater than 90.50 percent will result in an incentive payment in accordance with section g of this special provision.

B. Negative Quality Adjustment. Any longitudinal joint section density less than 90.50 percent will be subject to a negative quality adjustment in accordance with section e and g of this special provision.

### C. Corrective Action.

#### (1) Top Courses.

(a) Any longitudinal joint in place with a joint subsection density less than 88.00 percent will require saw or route and seal in accordance with section 502 of the Standard Specifications for Construction.

(b) Any longitudinal joint subsection density less than 86.00 percent will be subject to removal and replacement as follows: Top courses require removal and replacement of the entire lane including 6 inches past the longitudinal joint(s). The resulting vertical face of the joints will receive a double tack coat prior to paving the repaired area. The repaired subsection will be checked for longitudinal joint and mat density. Take one random longitudinal joint density core for each longitudinal joint subsection, these will be Type 1 joints. The resulting longitudinal joint density must be a minimum of 86.00 percent. Density results less than 86.00 percent will require removal and replacement. Mat density and mix properties will be in accordance with Single Test Acceptance criteria contained in the 12SP-501U Superpave Hot Mix Asphalt Percent Within Limits. Longitudinal joint density

results for any subsection removed and replaced will be subject to quality adjustment in accordance with this special provision. All replacement subsection density results will replace the original longitudinal joint density results for the applicable subsections. The tonnage of the removal area will be deducted from the corresponding PWL Lots. No additional costs or extensions of time will be granted as a result of removal and replacement.

(2) Leveling and Base Courses. Any longitudinal joint subsection density less than 86.00 percent will be subject to removal and replacement as follows: Leveling and base courses require removal and replacement of 30 inches, centered on the joint. The longitudinal limits of the area to be removed will be saw cut to provide a neat vertical face. The resulting vertical face of the joints will receive a double tack coat prior to paving over the repaired area. The repaired area will receive a double tack coat prior to paving the subsequent lift. The repaired subsection will be checked for density. One random mat core location, within the repair, for each repaired longitudinal joint subsection will be identified in accordance with random methods. The resulting density must be a minimum of 86.00 percent. Density results less than 86.00 percent will require removal and replacement. Density results for any subsection removed and replaced will be subject to a negative quality adjustment when the subsection density falls between 86.00 percent and 90.50 percent. Removal and replacement subsections will not be eligible for Longitudinal Joint density incentive payment and will not be considered for averaging when determining the Longitudinal Joint Section. Mix properties for remove and replace areas will be in accordance with Single Test Acceptance criteria contained in the 12SP-501U Superpave Hot Mix Asphalt Percent Within Limits. No additional costs or extensions of time will be granted as a result of removal and replacement.

3. Identification of Removal and Replacement Limits. Once it has been determined that removal and replacement is required the following method will be used to determine the limits. The subsection in question will be divided into two sub-parts, one on each side of the failing core within the subsection. Each sub-part will be divided in two with one limiting core being located 5 feet inside the subsection limit and the other limiting core be taken midway between the subsection limit and the failing core location. If any of the two cores from the sub-part is below 86.00 percent that sub-part will be removed from the subsection limit to the original failing core for the subsection. If both cores are 86.00 percent or above the sub-part will remain in place. If one sub-part passes and one fails the limits of the failing sub-part side will be extended to where the passing midway core was taken on the other sub-part. If all of the verification cores are 86.00 percent or above the only portion requiring removal will be the area between the two passing cores adjacent to the failing original.

#### **f. Dispute Resolution.**

1. Automatic Dispute Resolution Process for Longitudinal Joint Subsection. The QA longitudinal joint density results will be automatically disputed when a longitudinal joint subsection density is less than 86.00 percent.

The Engineer will check the QA longitudinal joint density test results for data entry and mathematical errors. If there are errors, the Engineer will recalculate the longitudinal joint subsection density. If the recalculated test results match and the density is still less than 86.00 percent then a new core will be obtained in accordance with subsections f.3.B and f.3.C of this special provision except the new core will be 1 foot up station of the core in dispute and

tested in accordance with subsection f.4.B of this special provision.

The quality adjustment amount for the longitudinal joint subsection under Dispute Resolution will be applied according to section g of this special provision based on the dispute resolution test results.

2. Dispute Resolution Process and Criteria for Longitudinal Joint Section. The QA longitudinal joint density results may be eligible for Dispute Resolution if the longitudinal joint density results based on the five random (3 cores any project having only one subsection per course of paving and 4 cores, 2 per subsection, for any project having only two subsections per course of paving) core QC test results is larger than the corresponding longitudinal joint density on the QA test results. Only independent random QC test results from the corresponding 10,000 foot longitudinal joint section under Dispute Resolution will be used by the Engineer when processing the Dispute Resolution request. The Contractor will not be eligible for Dispute Resolution if the minimum number of random QC cores are not taken.

The request for Dispute Resolution must include the QC core results for the 10,000 foot longitudinal joint section. A signed statement certifying that the QC core results are true and accurate must accompany the request for Dispute Resolution.

The Engineer will document receipt of the request for Dispute Resolution.

The Engineer will check both the QC and QA longitudinal joint density test results for data entry and mathematical errors. If there are errors, the Engineer will recalculate the average longitudinal joint density. If the recalculated test results match, then the incentive or negative quality adjustment amount in section g of this special provision will be applied using the QA test results.

If dispute resolution testing is required, the incentive or negative quality adjustment amount for the 10,000 foot longitudinal joint section under Dispute Resolution will be applied according to section g of this special provision based on the Dispute Resolution test results.

If the average of the five Dispute Resolution longitudinal joint cores is less than or equal to the original QA resulting average, all testing costs associated with completing the Dispute Resolution sample testing will be borne by the Contractor.

If the average of the five Dispute Resolution longitudinal joint cores is greater than the original QA resulting average, all testing costs associated with completing the Dispute Resolution sample testing will be borne by the Department.

### 3. Dispute Resolution Schedule.

A. Submit a request for density Dispute Resolution testing in writing within 2 working days of receipt of the density test results from the 10,000 foot section in question.

B. If after test results are checked, it is determined that the test discrepancy has not been resolved (recalculated test results do not match), Dispute Resolution coring will be completed within 5 calendar days of the receipt of the request for Dispute Resolution. The Dispute Resolution cores will be delivered to the MDOT Construction Field Services HMA Laboratory within 1 work day after completion of the re-coring procedure.

C. The MDOT Construction Field Services HMA Laboratory will complete all Dispute Resolution testing and return test results to the Engineer within 7 calendar days after receiving Dispute Resolution samples.

4. Dispute Resolution Sampling and Testing Process.

A. The Engineer will check both the QC and QA density test results for data entry and mathematical errors. If there are errors, the Engineer will recalculate the average density. If the recalculated test results match, then the incentive or negative quality adjustment amounts in section g of this special provision will be applied.

B. If it is determined that the test discrepancy has not been resolved (recalculated test results do not match), the Engineer will locate and mark the new random Dispute Resolution core locations. The Engineer will take possession of the cores when cut and extracted by the Contractor and submit them to MDOT Construction Field Services HMA Laboratory for testing. The Dispute Resolution density cores will be tested in accordance with *MTM 315*. The density is calculated using the in place core specific gravity divided by the subplot JMF Gmm (average if more than one JMF is applicable including different air void targets) of the corresponding subplot on either side of the joint.

C. All Dispute Resolution core samples will be tested.

D. All Dispute Resolution core results will replace original QA test results.

**g. Measurement and Payment.** Separate payment will not be made for constructing or compacting longitudinal joints. All costs associated with the work described in this special provision will be included in the applicable unit prices for the related HMA mixtures. The completed work, as described, will be eligible for quality adjustment in accordance with the following and will be measured and paid for at the contract unit price using the following pay item:

<b>Pay Item</b>	<b>Pay Unit</b>
Longitudinal Joint Density Quality Initiative .....	Dollar

**Longitudinal Joint Density Quality Initiative** will be used to pay for any incentive payment due to the Contractor for meeting or exceeding 90.50 percent on Type 1 Joints only. The incentive payment will be determined based on the average QA Longitudinal Joint Section Density in accordance with the following pay adjustment equation and section e of this special provision. All values of density will be entered as percentages (i.e. 92.50, 91.45, etc.) and incentive dollar amounts will be rounded to the nearest penny. Initiative amounts are to be applied on a per foot basis. The maximum per foot initiative that can be obtained is limited to \$1.00 per foot.

Quality Adjustment Equation. If the average longitudinal joint density section is 88.00 percent or greater (maximum of 93.50 percent) use the following equation to determine the quality adjustment per foot:

EQ.1  $Quality\ Adjustment = (0.3333 \times Density) - 30.1635$

Quality Adjustment Equation. If the average longitudinal joint density section is less than 88.00 percent and greater than or equal to 86.00 use the following equation to determine the quality adjustment per foot:

$$\text{EQ. 2 Quality Adjustment} = (4.0850 \times \text{Density}) - 360.31$$

The maximum per foot negative quality adjustment that can be applied is limited to \$9.00 per foot for top courses.

The maximum per foot negative quality adjustment that can be applied is limited to \$4.00 per foot for base and leveling courses

Any work required for over paving a joint in order to cut it back will be at the Contractor's option and the cost for cutting back the HMA and disposal of waste will be considered included in the costs of other items of work. There will be no negative adjustment in tonnage for any cut back, up to 2 inches, of HMA placed for the HMA removed as part of the cutting back.

<b>LONGITUDINAL JOINT DENSITY SUMMARY (FOR INFORMATION ONLY – NOT TO BE USED FOR PAY CALCULATIONS)</b>			
<b><u>TOP COURSE QUALITY ADJUSTMENT</u></b>			
Density Range	Incentive/Negative Quality Adjustment	Dollar Value	Action Required
90.50% ≥ 93.50%	Incentive	\$0.00/foot - \$1.00/foot (max.) EQ. 1	N/A
88.00% – 90.49%	Negative Quality Adjustment	\$0.83/foot - \$0.00/foot EQ. 1	Stop production if below 89.00%
86.00% - 87.99%	Negative Quality Adjustment	\$9.00/foot - \$0.84/foot EQ. 2	All joints saw or route and sealed
< 86.00%			Full lane width removal plus 6 inches past the longitudinal joint(s)
<b><u>LEVELING AND BASE COURSE QUALITY ADJUSTMENT</u></b>			
Density Range	Incentive/Negative Quality Adjustment	Dollar Value	Action Required
90.50% ≥ 93.50%	Incentive	\$0.00/foot - \$1.00/foot (max.) EQ. 1	N/A
88.00% - 90.49%	Negative Quality Adjustment	\$0.83/foot - \$0.00/foot EQ. 1	Stop production if below 89.00%
86.00% - 87.99%	Negative Quality Adjustment	\$4.00/foot (max.) - \$0.84/foot EQ 2	N/A
< 86.00%			Remove 30 inches centered on the joint with saw cutting with double tack coat of vertical faces.