

## **C Joints**

### **C.1 Construction Joints**

Compact joints to produce a neat, tightly bonded joint that meets surface tolerances as described in 2360.3.E. Transverse and longitudinal joints are subject to the density requirement in accordance with 2360.3.D, —Compaction.||

### **C.2 Transverse Joints**

Construct a transverse joint, the full width of the paver, at right angles to the centerline when mixture placement operations are suspended. When work resumes, cut the end vertically for the full depth of the layer unless constructing a formed edge as approved by the Engineer.

### **C.3 Longitudinal Joint**

Construct the longitudinal joint between strips and parallel to the pavement centerline. In multiple lift construction, construct the longitudinal joints between strips in each lift at least 6 in [150 mm] measured transversely from the longitudinal joints in the previously placed lift. If constructing a wearing course in an even number of strips, place one longitudinal joint on the centerline of the road. When constructing a wearing course in an odd number of strips, locate the centerline of one strip on the centerline of the road, provided that no joint is located in the wheel path area of a traffic lane. The Contractor will align longitudinal joints in multiple lift construction over portland cement concrete pavements directly over the concrete pavement longitudinal joints as approved by the Engineer.

At longitudinal joints formed by placing multiple strips, ensure the adjoining surface is higher but does not exceed  $\frac{1}{8}$  in [3 mm], after final compaction of the previously placed strip. When constructing a strip adjoining a previously placed strip or a concrete pavement, remove to the longitudinal joint line, any fresh mixture that overlaps a previously placed strip or pavement before rolling.

## **D Compaction**

After spreading each course, compact in accordance with the maximum density method as described in 2360.3.D.1, unless the ordinary compaction method is called for in the special provisions or as described in 2360.3.D.2, —Ordinary Compaction.|| Do not allow rollers to stand on the uncompacted mixture or newly rolled pavement with a surface temperature greater than 140 °F [60 °C]. Do not roll with steel-wheeled rollers if rolling produces aggregate that is crushed, cracked, or pulverized or causes displacement of the mixture.

To maintain a true surface, correct the following by removing and replacing the material in the defective areas as directed by the Engineer at no additional cost to the Department:

Variations such as depressions or high areas, which may develop during rolling operations; and  
Lean, fat, or segregated areas.

When spreading mixtures with a motor grader, compact the mixture with pneumatic tired rollers simultaneously with the spreading operation.

### **D.1 Maximum Density**

Compact the pavement to at least the minimum required maximum density values in accordance with Table 2360-19, —Required Minimum Lot Density (Mat),|| and Table 2360-20, —Longitudinal Joint Density Requirement.|| Density evaluation will include compacted mat density and compacted longitudinal joint density. Density evaluation will not include longitudinal joint density on lifts with a 1 percent reduced density requirement.

Table 2360-19 Required Minimum Lot Density (Mat)				
	SP Wear Mixtures*	SP Non-Wear Mixtures*	SP Shoulders*	
			Designed at 3% Voids	Designed at 4% voids
% Gmm	92	93	93	92
Reduce the minimum by 1 percent on the first lift constructed over PCC pavements. Reduce the minimum by 1 percent for the first lift constructed on aggregate base (mainline and shoulder), reclaimed or cold in place recycled base courses and first lift of an overlay on roadway with a spring load restriction no greater than 7 ton [6.35 tonne], including shoulders.				

Table 2360-20 Longitudinal Joint Density Requirement		
Location	Confined Edge of Mat*	Unconfined Edge of Mat
Long joint wear and shoulder (4% air voids)	89.5	88.1
Long joint non-wear and shoulder (3% air voids)	90.5	89.1
* The Department defines —confined   as the edges of the placed mat abutting another mat, pavement surface, or curb and gutter.    The Department defines —unconfined   or —unsupported   as no abutment on the side of the mat being placed with another mat or pavement surface.		

#### D.1.a Shoulders Greater Than 6 ft [1.8 m]

Unless otherwise shown on the plans or required by the special provisions, compact shoulders wider than 6 ft [1.8 m] paved using the maximum density method. When shoulders are compacted by the maximum density method and are paved separately from the driving lane, or have a different required minimum density than the driving lane, delineate the lot tonnage placed on the shoulder in separate lots from the driving lanes for the day paving was conducted.

#### D.1.b Shoulders Equal to or Less Than 6 ft [1.8 m]

Unless otherwise shown on the plans or required by the special provisions, use the ordinary compaction method in accordance with 2360.3.D.2 to compact a narrow shoulder no wider than 6 ft [1.8 m] paved in the same pass as a driving lane or paved separately. The Department will exclude mixture compacted under ordinary compaction from lot density requirements and from incentive or disincentive payment.

When compacting a narrow shoulder using the maximum density method, compact to densities in accordance with Table 2360-19. If the minimum required density of the shoulder is different than the driving lane, delineate the tonnage placed on the shoulder in separate lots from the driving lane.

#### D.1.c Echelon Paving

The Department considers echelon paving, two pavers running next to each other in adjacent lanes, as separate operations.

#### D.1.d Density Determination (Core Bulk Density)

Calculate each individual lot's maximum density by averaging the results of the cores within the lot expressed as the percentage of the maximum specific gravity. Use Laboratory Test Method 1810 to determine core density unless the mixture is considered coarse graded. If 45 percent or less of the aggregate material passes the No. 4 [4.75 mm] sieve the Engineer may require bulk specific gravity be determined in accordance with Laboratory Manual Method 1816, Corelok.

Obtain the maximum specific gravity value for calculating the percentage density for the lot from the maximum gravity values taken from production tests during that day's paving. If the production tests during that day's paving result in only one or two maximum specific gravity values, use the moving average value at that test point. If production tests during that day's paving result in three or more maximum specific gravity values, use the average of those tests alone as indicated above.

#### D.1.e Timeline

Complete compaction within 8 h of mixture placement and before obtaining core samples. Only use pneumatic tired or static steel rollers for compaction performed between 6 h and 8 h after mixture placement. Do not reroll compacted mixtures with deficient densities.

#### D.1.f Stop Production

If all the lots in a day's production or greater than 50 percent of the lots on multiple days fail to meet the minimum density requirement stop production and determine the source of the problem. Discuss with the Engineer what corrective action will be taken to bring the work into compliance with specified minimum required density.

**D.1.g Lot Determination**

<b>Daily Production, ton [tonne]</b>	<b>Lots</b>
300* – 600 [270* – 545]	1
601 – 1,000 [546 – 910]	2
1,001 – 1,600 [911 – 1,455]	3
1,601 – 2,600 [1,456 – 2,360]	4
2,601 – 4,600 [2,361 – 4,175]	5
> 4,600 [4,175]	
* If producing no greater than 300 ton [270 tonne] of mix, establish the first lot when the total weight is greater than 300 ton [270 tonne].	
Add one lot for each additional 900 tons [820 tonne] or part thereof.	

**D.1.h Mat Density Cores**

Obtain four cores in each lot. Take two cores from random locations as directed by the Engineer. Take the third and fourth cores, the companion cores, within 1 ft [0.3 m] longitudinally from the first two cores. Submit the companion cores to the Engineer immediately after coring and sawing. If the random core location falls on a longitudinal joint, cut the core with the outer edge of the core barrel 1 ft [0.3 m] away laterally from the edge of the top of the mat. Do not take cores for compacted mat density within 1 ft [300 mm] of any longitudinal joint. The Contractor is responsible for maintaining traffic, coring, patching the core holes, and sawing the cores to the paved lift thickness before density testing.

The Engineer may require additional density lots to isolate areas affected by equipment malfunction, heavy rain, or other factors affecting normal compaction operations.

**D.1.i Contractor Core Testing**

Take and test cores at least 4 in [100 mm] in diameter at locations determined and marked by the Engineer.

Mark samples with the lot number and core number or letter. Transport the cores to the laboratory daily taking care to prevent damage to them. Schedule the approximate time of testing during normal project work hours to allow the Engineer to observe the test and to record the saturated surface dry and immersed weight of the cores.

Determine the density by the end of the next working day after compaction. Measure each core three times for thickness before saw cutting. Report the average lift thickness on the core sheet. If placing multiple layers in a single day, saw and separate cores for each layer, test, and report by the end of the next working day. Place and compact mix into the coring hole to restore the surface within 24 h after coring or the Department will fine the Contractor \$100 per working day per lot until restored.

**D.1.j Companion Core Testing**

The Department will select at least one of the two companion cores per lot to test for verification. For lots designated as longitudinal joint density lots, the Department will test at least one of the mat density companion cores and at least one of the longitudinal joint density companion cores.

**D.1.k Tolerance Comparison****D.1.k(1) Tolerance Comparison – Individual**

Compare the individual core bulk specific gravities obtained by the Contractor and by the Department. If the bulk specific gravity between the Contractor and the Department cores differ by more than 0.030, use the Department's bulk specific gravity.

**D.1.k(2) Tolerance Comparison – Day's Shrinking Tolerance**

For a second comparison of the cores that pass the individual tolerance criteria, compare the average of the Contractor's bulk specific gravities with the average of the Department's bulk specific gravities. Determine the tolerance by dividing 0.030 by the square root of the number of samples compared. Use all the Department's results for the day's paving if the cores do not fall within the determined tolerance.

**D.1.l Recoring**

The Engineer may allow the Contractor to re-core a sample if the sample was damaged in the coring process or damaged in transit to the laboratory through no fault of the Contractor.

**D.1.m One Percent Reduced Density**

The Department will exclude incentive payments for reduced minimum density in accordance with Table 2360-19, —Required Minimum Lot Density (Mat).|| The Contractor may elect to waive the reduced density requirement and reevaluate the density in accordance with Table 2360-19, —Required Minimum Lot Density (Mat),|| including incentives, for all cases except the first lift constructed over concrete pavement. The Contractor must notify the Engineer, in writing, after the first day's paving and by the end of the third day of paving of their intent to waive reduced density. Once reduced density has been waived the normal maximum density will remain in effect for the duration of mixture placement on that lift. For multi-year projects, the waiving of

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reduced density will be for that year only and will be re-evaluated for subsequent years on an annual basis. The Contractor is required to comply with any construction requirements on subsequent lifts.

### **D.1.n Longitudinal Joint Density**

Evaluate longitudinal joint density in one lot per day unless the total daily weight is greater than 5,000 ton [5,000 tonne]. If the total daily weight is greater than 5,000 ton [5,000 tonne], evaluate two lots per day. Randomly select the location to take cores for longitudinal joint density from the mat density core locations. Take six cores at this location. Take cores for longitudinal joint density with the outer edge of the core barrel within 6 in [150 mm] from the edge of the top of the mat for both sides of the mat. Take a companion core 1 ft [0.3 m] longitudinally from each core. Take two cores for mat density at either 2 ft [0.61 m] right or 2 ft [0.61 m] left of the center of the mat the Contractor is paving, regardless of random number generation.

### **D.1.o Imaginary Joint**

An actual longitudinal joint will not exist if pulling the shoulder and driving lane in the same paving pass. Do not cut a core on the imaginary line where a joint would have existed had the shoulder and the drive lane been paved separately.

### **D.1.p Shoulders**

#### **D.1.p(1) Shoulder – Ordinary Compaction**

If compacting the shoulder under the ordinary density specification, do not take longitudinal joint cores in shoulders. Core at the centerline longitudinal edge cores (6 in [150 mm] from the joint) and at the mat density cores (2 ft [0.61 m] right or left of the center of the paving pass).

#### **D.1.p(2) Shoulder-Maximum Density Specification**

Core at the following locations:

Centerline longitudinal edge cores (6 in [150 mm] from the joint),  
Mat density cores (2 ft [0.61 m] right or left of the center of the paving pass), and  
Edge of the shoulder (6 in [150 mm] from the outside edge).

Do not cut cores on the imaginary line at the edge of the shoulder adjacent to the driving lane. Move coring locations on imaginary lines to 6 in [150 mm] inside the edge of the shoulder.

### **D.1.q Payment Schedule**

<b>SP Wear and SP Shoulders (4% Void) Density, %*</b>	<b>SP Non-Wear and SP Shoulders (3% Void), Density, %*</b>	<b>Mat Density Pay Factor A</b>	
		<b>Traffic Level 2 &amp; 3</b>	<b>Traffic Level 4 &amp; 5</b>
≥ 93.6	≥ 94.6	1.03	1.05
93.1 – 93.5	94.1 – 94.5	1.02	1.04
92.0 – 93.0	93.0 – 94.0	1.00	1.00
91.0 – 91.9	92.0 – 92.9	0.98	0.98
90.5 – 90.9	91.5 – 91.9	0.95	0.95
90.0 – 90.4	91.0 – 91.4	0.91	0.91
89.5 – 89.9	90.5 – 90.9	0.85	0.85
89.0 – 89.4	90.0 – 90.4	0.70	0.70
< 89.0	< 90.0	†	†

\* Calculate the percent of maximum specific gravity to the nearest tenth.

|| Payment will only apply if the day's weighted average individual production air voids fall within - ½ percent of the target air void value. Base the weighted average air voids on all the mixture production tests in accordance with 2360.2.G.7, —Production Tests|| for the corresponding day and weight by the tons the corresponding test represents.

The Department will pay for the HMA material represented by the lot at 70 percent of the relevant contract unit price; unless a single core density in the lot is less than 87.0 percent of the maximum specific gravity ( $G_{mm}$ ). If a single core density is less than 87.0 percent of  $G_{mm}$ , the Engineer will decide if the mixture is subject to removal and replacement or if will be accepted at a reduced payment of 50 percent of the relevant contract unit price. If the Engineer decides the material is to be removed and replaced, the Contractor will do so at no additional cost to the Department. Take additional core samples to determine the limits of the removal and replacement area or 50% payment using the same offset from centerline as the original core. If the original low density core was taken within 1½ ft [0.45 m] of an edge of the paver pass, take the additional cores at 1½ ft [0.45 m] from the edge of the paver pass. Determine the densities at 50 ft

[15 m] intervals both ahead and behind the point of unacceptable core density until finding a point of acceptable core density (>89.0% for 4% void and 1% reduced voids and >90.0% for 3% voids). If the 50 ft (15 m) incremental testing extends into a previously accepted lot, removal and replacement may be required, but, these results will not be used to recalculate the previously accepted lot density.

Perform the additional coring and testing at no cost to the Department. The Department will calculate the area of unacceptable pavement as the product of the longitudinal limits as determined by the 50 ft [15 m] cores and the full width of the paver pass, laying in the traffic lane or lanes. The Department will exempt shoulders from this calculation unless density failure occurred in the shoulder area.

Establish an additional density lot for the pavement that has been removed and replaced. Cut 2 cores randomly with companions for the Department (total 4 cores) and determine average density. Make payment in accordance with Table 2360-22 or Table 2360-23 excluding any incentive payment.

Determine the density for the remainder of the lot by averaging the original acceptable core density value with the first two acceptable core densities taken ahead and behind the unacceptable core density. Make payment in accordance with Table 2360-22 or Table 2360-23 excluding any incentive payment.

<b>Table 2360-23*</b> <b>1 Percent Reduced Table</b>		
<b>SP Wear and SP Shld (4% Void) Maximum Specific Gravity, %</b>	<b>SP Non-Wear, and SP Shld (3% Void), Maximum Specific Gravity, %</b>	<b>Payment, %</b>
≥ 91.0	≥ 92.0	100
90.0 – 90.9	91.0 – 91.9	98
89.7 – 89.9	90.5 – 90.9	95
89.4 – 89.6	90.0 – 90.4	91
89.2 – 89.3	89.5 – 89.9	85
89.0 – 89.1	89.0 – 89.4	70
< 89.0†	< 89.0	†

Reduce the minimum by 1 percent for the first lift constructed on aggregate base (mainline and shoulder), reclaimed or cold in place recycled base courses and first lift of an overlay on a roadway with a spring load restriction (including shoulders) no greater than 7 ton [6.35 tonne]. Reduce the minimum by 1 percent on the first lift constructed on PCC pavements (reduced density cannot be waived on PCC).

|| Calculate the percent of maximum specific gravity to the nearest tenth.

The Department will pay for the HMA material represented by the lot at 70 percent of the relevant contract unit price; unless a single core density in the lot is less than 87.0 percent of the maximum specific gravity ( $G_{mm}$ ). If a single core density is less than 87.0 percent of  $G_{mm}$ , the Engineer will decide if the mixture is subject to removal and replacement or if will be accepted at a reduced payment of 50 percent of the relevant contract unit price. If the Engineer decides the material is to be removed and replaced, the Contractor will do so at no additional cost to the Department. Take additional core samples to determine the limits of the removal and replacement area or 50% payment using the same offset from centerline as the original core. If the original low density core was taken within 1½ ft [0.45 m] of an edge of the paver pass, take the additional cores at 1½ ft [0.45 m] from the edge of the paver pass. Determine the densities at 50 ft [15 m] intervals both ahead and behind the point of unacceptable core density until finding a point of acceptable core density (>89.0% for 4% void and 1% reduced voids and >90.0% for 3% voids). If the 50 ft (15 m) incremental testing extends into a previously accepted lot, removal and replacement may be required, but, these results will not be used to recalculate the previously accepted lot density. Perform the additional coring and testing at no cost to the Department. The Department will calculate the area of unacceptable pavement as the product of the longitudinal limits as determined by the 50 ft [15 m] cores and the full width of the paver pass, laying in the traffic lane or lanes. The Department will exempt shoulders from this calculation unless density failure occurred in the shoulder area.

Establish an additional density lot for the pavement that has been removed and replaced. Cut 2 cores randomly with companions for the Department (total 4 cores) and determine average density. Make payment in accordance with Table 2360-22 or Table 2360-23 excluding any incentive payment.

Determine the density for the remainder of the lot by averaging the original acceptable core density value with the first two acceptable core densities taken ahead and behind the unacceptable core density. Make payment in accordance with Table 2360-22 or Table 2360-23 excluding any incentive payment.

<b>Table 2360-24*</b> <b>Payment Schedule for Longitudinal Joint Density</b> <b>(SP Non-wear and SP Shoulders, 4% Void)</b>					
<b>Longitudinal Joint (Confined Edge) Density, %</b>	<b>Pay Factor B Longitudinal (Confined Edge)</b>		<b>Longitudinal Joint (Unsupported Edge) Density, %</b>	<b>Pay Factor C (Unsupported Edge)</b>	
	Traffic Level 2 & 3	Traffic Level 4 & 5		Traffic Level 2 & 3	Traffic Level 4 & 5
≥ 92.1	1.02†	1.03†	≥ 91.0	1.02†	1.03†
91.6 – 92.0	1.01†	1.02†	90.1 – 90.9	1.01†	1.02†
89.5 – 91.5	1.00	1.00	88.1 – 90.0	1.00	1.00
88.5 – 89.4	0.98	0.98	87.0 – 88.0	0.98	0.98
87.7 – 88.4	0.95	0.95	86.0 – 86.9	0.95	0.95
87.0 – 87.6	0.91	0.91	85.0 – 85.9	0.91	0.91
< 87.0	0.85	0.85	< 85.0	0.85	0.85

\* The Department will limit incentive payment for longitudinal joint density to lots with evaluated longitudinal joint densities.

|| Calculate the percent of maximum specific gravity to the nearest tenth.

† Payment will only apply if the day's weighted average individual production air voids fall within - ½ percent of the target air void value. Base the weighted average air voids on all the mixture production tests in accordance with 2360.2.G.7, —Production Tests|| for the corresponding day and weight by the tons the corresponding test represents.

<b>Table 2360-25*</b>					
<b>Payment Schedule for Longitudinal Joint Density (SP Non-wear and SP Shoulders, 3% Void)</b>					
<b>Longitudinal Joint (Confined Edge) Density, %   </b>	<b>Pay Factor B Longitudinal (Confined Edge)</b>		<b>Longitudinal Joint (Unsupported Edge) Density, %   </b>	<b>Pay Factor C (Unsupported Edge)</b>	
	Traffic Level 2 & 3	Traffic Level 4 & 5		Traffic Level 2 & 3	Traffic Level 4 & 5
≥ 93.1	1.02†	1.03†	≥ 92.0	1.02†	1.03†
92.6 – 93.0	1.01†	1.02†	91.1 – 91.9	1.01†	1.02†
90.5 – 92.5	1.00	1.00	89.1 – 91.0	1.00	1.00
89.5 – 90.4	0.98	0.98	88.0 – 89.0	0.98	0.98
88.7 – 89.4	0.95	0.95	87.0 – 87.9	0.95	0.95
88.0 – 88.6	0.91	0.91	86.0 – 86.9	0.91	0.91
< 88.0	0.85	0.85	< 86.0	0.70	0.85

\* The Department will limit incentive payment for longitudinal joint density to lots with evaluated longitudinal joint densities.

|| Calculate the percent of maximum specific gravity to the nearest tenth.

† Payment will only apply if the day's weighted average individual production air voids fall within ½ percent of the target air void value. Base the weighted average air voids on all the mixture production tests in accordance with 2360.2.G.7, —Production Test|| for the corresponding day and weight by the tons the corresponding test represents.

**D.1.r Pay Factor Determination**

Determine the pay factor in accordance with the following:

Case 1: Total Pay Factor = (Pay Factor A) × (Pay Factor B) × (Pay Factor C)

Case 2: Total Pay Factor = (Pay Factor A) × (Pay Factor B) × (Pay Factor B)

Case 3: Total Pay Factor = (Pay Factor A) × (Pay Factor C) × (Pay Factor C)

Where:

Pay Factor A = Mat density,

Pay Factor B = Confined edge density,

Pay Factor C = Unsupported edge density.

Use a pay factor of 1.00 for Pay Factor B, Pay Factor C, or both in lots where no cores are taken at the longitudinal joint.

**D.2 Ordinary Compaction**

Perform ordinary compaction for the following:

Layers identified in the typical sections with a minimum planned thickness less than 1½ in [40 mm],  
Thin lift leveling,  
Wedging layers,  
Patching layers,  
Driveways, and  
Areas the Contractor cannot compact with standard highway construction equipment and practices.  
Bike paths, walking paths, and other similar non-traffic paving areas

If using the ordinary compaction method to evaluate density, use a control strip to establish a rolling pattern. Use the rolling pattern to compact the asphalt mixture for the layer on which the control strip is constructed or until constructing a new control strip. The Engineer may waive the control strip requirement in small localized areas or other areas not conducive to its establishment.

**D.2.a Control Strip**

Construct a control strip at least 395 sq. yd [330 sq. m] and of the same thickness as the lift the control strip represents at the beginning of the work on each lift of each course. Begin compacting immediately after spreading the mixture. Continue compacting until additional roller coverage does not produce appreciable increase in density. Determine densities by means of a portable nuclear testing device or approved alternate and create a growth curve to determine the optimum rolling pattern. Provide documentation of the growth curve to the Engineer. Roll the remainder of that course in accordance with the pattern developed in the test strip for that roller. Provide a new control strip in accordance with the following:

If using a new JMF with a proportion change greater than 10 percent when compared to the currently produced mixture for a single stockpile aggregate,  
If changing the source of either aggregate or binder, or  
After 10 days of production.

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### D.2.b Equipment

Use rollers that meet the requirements in 2360.3.B.2.e. Use the same equipment type and weight on the remainder of the pavement course that was used to construct the control strip. Provide at least two rollers. Provide a tandem steel wheeled roller for final rolling. The Contractor may use trench rollers or mechanical tampers to compact areas inaccessible to the conventional type rolling equipment.

### D.2.c Mixture Temperature

Refer to Table 2360-26, —Minimum Temperature Control|| for the minimum laydown temperatures in all courses of the asphalt mixture as measured behind the paver or spreading machine. Do not pave when the air temperature is less than 32° F [0° C] unless otherwise directed by the Engineer in writing.

Air Temperature, °F [°C]	Compacted Mat Thickness, †			
	1 in [25 mm]	1½ in [40 mm]	2 in [50 mm]	≥3 in [75 mm]
32 – 40 [0-5]	—	265[129]	255 [124]	250 [121]
41 – 50 [6-10]	270 [130]	260 [127]	250 [121]	245 [118]
51 – 60 [11-15]	260 [127]	255 [124]	245 [118]	240 [115]
61 – 70 [16-21]	250 [121]	245 [118]	240 [115]	235 [113]
71 – 80 [22-27]	245 [118]	240 [115]	235 [113]	235 [113]
81 – 90 [28-32]	235 [113]	230 [110]	230 [110]	230 [110]
≥ 91 [33]	230 [110]	230 [110]	230 [110]	225 [107]

\* Not applicable if using a Warm Mix Asphalt (WMA) additive or process  
 || Use at least one pneumatic-tire roller for intermediate rolling unless otherwise directed by the Engineer. The Engineer may specify or modify the minimum laydown temperature in writing.  
 † Based on the lift thicknesses shown on the plans.

### D.3 Mat Density Cores (Optional Department Only Core Testing)

The Contractor can request all density cores be tested by the Department. The written request should be made at the pre-construction meeting and a written response, from the Department, either approving or denying the request will be made within 5 calendar days from the date of the request. Once approval is granted, Department Only Core Testing will remain in effect for the duration of the project. For multi-year projects, Department core testing will be for that year only. Cores will be tested in either the Department's Field Lab or in the Contractor's Field Lab. The Contractor is permitted to observe and record all weighing of the cores.

#### D.3.a Contractor Coring Responsibilities

Obtain two cores in each lot. Take cores of at least 4 in [100 mm] in diameter at locations determined and marked by the Engineer. If the random core location falls on a longitudinal joint, cut the core with the outer edge of the core barrel 1 ft [0.3 m] away laterally from the edge of the top of the mat. Do not take cores for compacted mat density within 1 ft [300 mm] of any longitudinal joint. Label samples with the lot number and core number or letter. The Contractor is responsible for maintaining traffic, coring, patching the core holes.

Measure each core three times for thickness before saw cutting. Report the average lift thickness to the Engineer. If placing multiple layers in a single day, measure and record lift thickness and then saw and separate cores for each layer. Place and compact mix into the coring hole to restore the surface within 24 h after coring or the Department will fine the Contractor \$100 per working day per lot until restored.

The Engineer may require additional density lots to isolate areas affected by equipment malfunction, heavy rain, or other factors affecting normal compaction operations.

#### D.3.b Department Testing Responsibilities

The Department will take possession of the cores after they have been measured and cut. The Department will test all cores. Density results will be determined by the end day in which the cores were cut provided they are in the Department's possession by 10:00am, otherwise, results will be available the next working day. Test results will be reported on the Core Density Sheet.

#### D.3.c Longitudinal Joint Density

Evaluate longitudinal joint density in one lot per day unless the total daily weight is greater than 5,000 ton [5,000 tonne]. If the total daily weight is greater than 5,000 ton [5,000 tonne], evaluate two lots per day. Randomly select the location to take cores for longitudinal joint density from the mat density core locations. Take three cores at this location. Take cores for longitudinal joint density with the outer edge of the core barrel within 6 in [150 mm] from the edge of the top of the mat for both sides of the mat. Take one core for mat density at either 2 ft [0.61 m] right or 2 ft [0.61 m] left of the center of the mat the Contractor is paving, regardless of random number generation.



**E Surface Requirements**

After compaction, the finished surface of each lift shall be reasonably free of segregated, open and torn sections, and shall be smooth and true to the grade and cross section shown on the plans with the following tolerances:

<b>Course/Location</b>	<b>Description</b>	<b>Tolerance</b>
Leveling/1 <sup>st</sup> lift using automatics	Tolerance also applies to 1 <sup>st</sup> lift placed other than leveling when automatics are used.	½ in [15 mm]
Wear	Tolerance of final 2 lifts from the edge of a 10 foot [3 m] straightedge laid parallel to or at right angles to the centerline.	¼ in [6 mm]
Shoulder Wear, Temporary Wear & Bypasses	Tolerance from the edge of a 10 foot [3 m] straightedge laid parallel to or at right angles to the centerline.	¼ in [6 mm]
Transverse joints/construction joints	Tolerance from the edge of a 10 foot [3 m] straightedge centered longitudinally across the transverse joint. Correction by diamond grinding required when directed by the Engineer.	¼ in [6 mm]
Transverse Slope	Tolerance for surface of each lift exclusive of final shoulder wear.	Not to vary by more than 0.4 % from plans.
Distance from edge of each lift and established centerline.	No less than the plan distance or more than 3 inches [75 mm] greater than the plan distance. The edge alignment of the wearing lift on tangent sections and on curve sections of 3 degrees or less can't deviate from the established alignment by more than 1 inch [25 mm] in any 25 foot [7.5 m] section.	See Description
Final wear adjacent to concrete pavements.	After compaction the final lift wear adjacent to concrete pavements must be slightly higher but not to exceed 1/4" [6mm] than the concrete surface.	See Description
Final wear adjacent to fixed structures.	After compaction the final lift wear adjacent to gutters, manholes, pavement headers, or other fixed structures must be slightly higher but not to exceed 1/4" [6mm] than the surface of the structure.	See Description
Finished surface of each lift.*	Must be free of segregated and open and torn sections and deleterious material. *Excluding tight blade and scratch courses.	See Description

Cut or saw and then remove and replace material placed outside the described limitations at no additional cost to the Department. If the Engineer determines the material can remain in place outside the limits, the Department will pay for the material at a reduced cost of \$10 per sq. yd [\$12 per sq. m]. The Department will consider any single occurrence of material outside the limitations to have a minimum dimension of at least 1 sq. yd [1 sq. m] in any dimension.

In addition to the list the above the pavement surface must meet requirements of 2399 (Pavement Surface Smoothness) requirements.

**E.1 Lift Thickness**

After compaction, the thickness of each lift shall be within a tolerance of ¼ in [6 mm] of the thickness shown on the plans, except that, if automatic grade controls are used, this thickness requirement will not apply to the first lift placed. This thickness requirement will not apply to a leveling lift whether or not automatic grade controls are required. The Engineer may require removal and replacement of any part of any lift that is constructed to less than the minimum required thickness, at no additional cost to the Department.

Measure cores taken for density determination for thickness also. Measure each core three times for thickness before sawing. Report the average of these three measurements. Document each lot's average core thickness and submit to the Engineer. If the average of the two Contractor cores exceed the specified tolerance, an additional two cores may be taken in the lot in question. The Engineer will use the average of all core thickness measurements per day per lift to determine daily compliance with thickness specifications.

On that portion of any lift constructed to more than the maximum permissible thickness, the materials used in the excess mixture above that required to construct that portion of the lift to the plan thickness plus ¼ in [6 mm] may be excluded from the pay quantities or at the discretion of the Engineer and at the Contractor's expense may be required to be removed and replaced.

**F Asphalt Mixture Production (FOB Department Trucks)**

Produce asphalt mixture for the Department. Load the mixture being produced onto Department furnished trucks at the mixing plant at a time agreed on by the Engineer and Contractor. The Engineer will notify the Contractor of the total quantity of mixture required not less than 2 weeks prior to completion of the final wearing course. The Engineer will not accept the asphalt mixture if it is unsuitable for the intended use.

### 2360.3

#### G Small Quantity Paving

A MDR is not required for planned project quantities less than 9,000 sq. yd inches (4,500 sq. yd per 2-inch thickness, etc) [191,200 m<sup>2</sup> mm] or 500 ton [450 tonne]. Verify in writing that the asphalt mixture delivered to the project meets the requirements of Table 3139-3 and Table 2360-7, —Mixture Requirements.|| The Department will obtain samples, as determined by the Engineer, to verify mixture requirements and to perform material acceptance in accordance with 2360.2.G.14.b, —Isolated

Failures at Mixture Start-Up — Production Air Voids,|| 2360.2 G.14.c, —Individual Failure — Gradation, Percent Asphalt Binder, Production Air Voids, and Adj. AFT,|| and 2360.2.G.14.h, —Coarse and Fine Aggregate Crushing Failure.||

#### 2360.4 METHOD OF MEASUREMENT

When paying for material by weight, the Engineer will measure separately asphalt mixture of each type by weight based on the total quantity of material hauled from the mixing plant. The Engineer will not make deductions for the asphalt materials.

When paying for material by area, the Engineer will separately measure asphalt mixture of each type and for each specific lift by area and by thickness on the basis of actual final dimensions placed.

#### 2360.5 BASIS OF PAYMENT

The contract unit price for asphalt mixture used in each course includes the cost of constructing the asphalt surfacing and providing and incorporating asphalt binder, mineral filler, hydrated lime. Anti-stripping additives may be permitted or required as indicated in 2360.2.C.

The Department will pay for additives required by the contract at the relevant contract unit price for the mixture. The Department will pay for additives incorporated as directed by the Engineer as extra work in accordance with 1402.5, —Extra Work.||

The Department will apply reduced payment if the mixture includes steel slag as one of the aggregate proportions and the production lab density at the design gyrations at the recommended or established asphalt content is greater than 160 lb per cu. ft [2,565 kg per cu. m]. The Department will pay for the mixture at the contract unit price, calculated as follows:

$$\%Payment = \frac{100 - (100 \times (\frac{\text{production density at design gyrations} - 160}{160}))}{100 - (100 \times (\frac{\text{production density at design gyrations} - 2,565}{2,565})}$$

If the plans do not show a contract pay item for shoulder surfacing and other special construction, the Department will include payment for the quantities of material used for these purposes in the payment for the wearing course materials.

Complete yield checks and monitor thickness determinations to construct the work as shown on the plans. Use the tolerances for lift thickness in accordance with 2360.3.E, —Surface Requirements|| and surface smoothness requirements in accordance with 2399 for occasional variations and not for continuous over-running or under-running, unless otherwise required by the Engineer.

The contract unit price for asphalt mixture production includes the cost of the material and loading onto Department-provided trucks at the mixing plant.

The Department will pay for plant mixed asphalt pavement on the basis of the following schedule:

Item No.:	Item:	Unit:
2360.501	Type SP* Wearing Course Mixture †‡	ton [metric ton]
2360.502	Type SP* Non-Wearing Course Mixture †‡	ton [metric ton]
2360.503	Type SP*    Course Mixture †‡# in [mm] thick,	square yard [square meter]
2360.504	Type SP*    Course Mixture †‡	square yard [square meter]
2360.505	Type SP * Bituminous Mixture for Specified Purpose	ton [metric ton]
2360.506	Type SP * Bituminous Mixture Production	ton [metric ton]
*	Aggregate size Designation, 9.5, 12.5 or 19 as appropriate, see 2360.1.A.3. —Wearing   or —Non Wearing   as appropriate.	
	Traffic level in accordance with Table 2360-1, —Traffic Levels.	
†	AC binder grade designation (Table 2360-2).	
	Lift thickness shown on the plans.	