

1 **Replace Section 401- HOT MIX ASPHALT (HMA) PAVEMENT to read as**  
2 **follows:**

3  
4 **“SECTION 401 – DENSE GRADED HMA PAVEMENT**

5  
6 **401.01 Description.** This section describes furnishing and placing dense graded  
7 HMA pavement (herein referred to as HMA) on a prepared surface.

8  
9 **401.02 Materials.**

10  
11 Asphalt Binder (PG 64-16) 702.01A

12 Use for non-surface mixes, unless otherwise specified in the project documents

13  
14 Asphalt Binder (PG 64E-22) 702.01B

15 Use for all surface mixes, except for on Lanai and Molokai, and unless otherwise  
16 specified in the project documents

17 Emulsified Asphalt 702.04

18  
19 Warm Mix Asphalt (WMA) Additive 702.06

20  
21 Aggregate for Hot Mix Asphalt Pavement 703.09

22  
23 Filler 703.15

24  
25 Hydrated Lime or a liquid anti-strip approved by the engineer 712.03

26  
27 **(A) General.** HMA pavement shall be plant mixed and shall include  
28 mixture of aggregate and asphalt binder and may include reclaimed asphalt  
29 pavement (RAP) or filler, or both.

30  
31 The manufacture of HMA may include warm mix asphalt (WMA)  
32 processes in accordance with these specifications. WMA processes include  
33 combinations of organic additives, chemical additives, and foaming.

34  
35 HMA pavement shall include surface course and may include one or  
36 more binder courses, depending on HMA pavement thickness indicated in  
37 the contract documents.

38  
39 RAP is defined as removed or reprocessed pavement materials  
40 containing asphalt and aggregates. Process RAP by crushing until 100  
41 percent of RAP passes 3/4-inch sieve. Size, grade uniformly, and combine  
42 materials such that blend of RAP and aggregate material conforms to grading  
43 requirements of Subsection 703.09 - Aggregate for Hot Mix Asphalt  
44 Pavement.

45  
46 In surface and binder courses, aggregate for HMA may include RAP

quantities up to 20 percent of total mix weight.

Quantity of filler material to correct deficiencies in aggregate gradation passing the No. 200 sieve shall not exceed 3 percent by weight of fine aggregates.

**(B) Job-Mix Formula and Tests.** Design job-mix formula in accordance with procedures contained in current edition of Asphalt Institute's *Mix Design Methods for Asphalt Concrete and Other Hot Mix Types*, Manual Series No. 2 (MS-2) for either Marshall Method or Hveem Method of Mix Design.

Limit compacted lift thickness and asphalt content of job-mix formula as specified in Table 401.02-1 - Limits of Compacted Lift Thickness and Asphalt Content.

**TABLE 401.02-1 - LIMITS OF COMPACTED LIFT THICKNESS AND ASPHALT CONTENT**

MIX NO.	II	III	IV, PMA	V
Minimum to Maximum Compacted Thickness for Individual Lifts (Inches)	2-1/4 to 3	2 to 3	1-1/2 to 3	1-1/4 to 3
Asphalt Content Limits (Percent of Total Weight of Mix)	3.8 to 6.1	4.3 to 6.1	4.3 to 6.5	4.8 to 7.0

Asphalt content limits for porous aggregate may be exceeded only if it is requested ahead of placement and is reviewed then accepted in writing by the Engineer.

Meet job-mix formula design criteria specified in Table 401.02-2 - Job-Mix Design Criteria.

**TABLE 401.02-2 - JOB-MIX FORMULA DESIGN CRITERIA****Hveem Method Mix Criteria (AASHTO T 246 and AASHTO T 247)**

Stability, minimum	37
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Air Voids (percent) <sup>1</sup>	3 - 5
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**Marshall Method Mix Criteria (AASHTO T 245)**

Compaction (number of blows each end of specimen)	75
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Stability, minimum (pounds)	1,800
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Flow (x 0.01 inch)	8 - 16
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Air Voids (percent) <sup>1</sup>	3 - 5
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**Notes:**

1. Air Voids: AASHTO T 166 or AASHTO T 275; AASHTO T 209, AASHTO T 269.

Minimum percent voids in mineral aggregates (VMA) of job-mix formula shall be as specified in Table 401.02-3 - Minimum Percent Voids in Mineral Aggregates (VMA).

**TABLE 401.02-3 - MINIMUM PERCENT VOIDS IN MINERAL AGGREGATES (VMA)**

Nominal Maximum Particle Size, (Inches)	1-1/2	1	3/4	1/2	3/8
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VMA, (percent) <sup>1</sup>	11.0	12.0	13.0	14.0	15.0
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**Notes:**

1. VMA: See Asphalt Institute Manual MS-2,

**(C) Submittals.** Establish and submit job-mix formula for each type of HMA pavement mix indicated in the contract documents a minimum of 30 days before paving production. Job mix shall include the following applicable information:

- (1) Design percent of aggregate passing each required sieve size.

(2) Design percent of asphalt binder material (type determined by type of mix) added to the aggregate (expressed as % by weight of total mix),

(3) Design proportion of processed RAP.

(4) Design temperature of mixture at point of discharge at paver.

(5) Source of aggregate.

(6) Grade of asphalt binder.

(7) Test data used to develop job-mix formula.

Except for item (4) in this subsection, if design requirements are modified after the Engineer accepts job-mix formula, submit new job-mix formula before using HMA produced from modified mix design. Submit any changes to the design temperature of mixture at point of discharge for acceptance by the Engineer.

Submit a certificate of compliance for the asphalt binder, accompanied by substantiating test data from a certified testing laboratory.

**(D) Range of Tolerances for HMA.** Provide HMA within allowable tolerances of accepted job-mix formula as specified in Table 401.02-4 - Range of Tolerances. These tolerances are not to be used for the design of the job mix, they are solely to be used during the testing of the production field sample of the HMA mix.

TABLE 401.02-4 - RANGE OF TOLERANCES HMA	
Passing No. 4 and larger sieves (percent)	± 7.0
Passing No. 8 to No. 100 sieves (inclusive) (percent)	± 4.0
Passing No. 200 sieve (percent)	± 3.0
Asphalt Content (percent)	± 0.4
Mixture Temperature (degrees F)	± 20

The tolerances shown are the allowable variance between the physical characteristics of laboratory job mix submitted mix design and the production or operational mix, i.e., field samples.

120  
121 **401.03 Construction.**  
122

123 **(A) Weather Limitations.** Placement of HMA shall not be allowed under  
124 the following conditions:  
125

126 **(1)** On wet surfaces, e.g., surface with ponding or running water,  
127 surface that has aggregate or surface that appears beyond surface  
128 saturated dry, as determined by the Engineer.  
129

130 **(2)** When air temperature is below 50 degrees F and falling. **HMA**  
131 may be applied when air temperature is above 40 degrees F and  
132 rising. Air temperature will be measured in shade and away from  
133 artificial heat.  
134

135 **(3)** When weather conditions prevent proper method of  
136 construction.  
137

138 **(B) Equipment.**  
139

140 **(1) Mixing Plant.** Use mixing plants that conform to AASHTO M  
141 156, supplemented as follows:  
142

143 **(a) All Plants.**  
144

145 **1. Automated Controls.** Control proportioning,  
146 mixing, and mix discharging automatically. When RAP  
147 is incorporated into mixture, provide positive controls for  
148 proportioning processed RAP.  
149

150 **2. Dust Collector.** AASHTO M 156, Requirements  
151 for All Plants, Emission Controls is amended as follows:  
152

153 Equip plant with dust collector. Dispose of  
154 collected material. In the case of baghouse dust  
155 collectors, dispose of collected material or return  
156 collected material uniformly.  
157

158 **3. Modifications for Processing RAP.** When RAP  
159 is incorporated into mixture, modify mixing plant in  
160 accordance with plant manufacturer's recommendations  
161 to process RAP.  
162

163 **(b) Drum Dryer-Mixer Plants.**  
164

165 **1. Bins.** Provide separate bin in cold aggregate

feeder for each individual aggregate stockpile in mix. Use bins of sufficient size to keep plant in continuous operation and of proper design to prevent overflow of material from one bin to another.

**2. Stockpiling Procedures.** Separate aggregate for Mix II, Mix III and Mix IV into at least three stockpiles with different gradations as follows: coarse, intermediate, and fine. Separate aggregates for Mix V into at least two stockpiles. Stockpile RAP separately from virgin aggregates.

**3. Checking Aggregate Stockpile.** Check condition of the aggregate stockpile often enough to ensure that the aggregate is in optimal condition.

**(c) Batch and Continuous Mix Plants.**

**1. Hot Aggregate Bin.** Provide bin with three or more separate compartments for storage of screened aggregate fractions to be combined for mix. Make partitions between compartments tight and of sufficient height to prevent spillage of aggregate from one compartment into another.

**2. Load Cells.** Calibrated load cells may be used in batch plants instead of scales.

**(2) Hauling Equipment.** Use trucks that have tight, clean, smooth metal beds for hauling HMA.

Thinly coat truck beds with a minimum quantity of non-stripping release agent to prevent mixture from adhering to beds. Diesel or petroleum-based liquid release agents, except for paraffin oil, shall not be used. Drain excess release agent from truck bed before loading with HMA.

Provide a designated clean up area for the haul trucks.

Equip each truck with a tarpaulin conforming to the following:

**(a)** In good condition, without tears and holes.

**(b)** Large enough to be stretched tightly over truck bed, completely covering mix. The tarpaulin shall be secured in such a manner that it remains stretched tightly over truck bed and

HMA mix until the bed is about to be raised up in preparation for discharge.

**(3) Asphalt Pavers.** Use asphalt pavers that are:

**(a)** Self-contained, power-propelled units.

**(b)** Equipped with activated screed or strike-off assembly, heated if necessary.

**(c)** Capable of spreading and finishing courses of HMA mixtures in lane widths applicable to typical section and thicknesses indicated in the contract documents.

**(d)** Equipped with receiving hopper having sufficient capacity for uniform spreading operation.

**(e)** Equipped with automatic feed controls to maintain uniform depth of material ahead of screed.

**(f)** Equipped with automatic screed controls with sensors capable of sensing grade from outside reference line, sensing transverse slope of screed, and providing automatic signals to control screed grade and transverse slope.

**(g)** Capable of operating at constant forward speeds consistent with satisfactory laying of mixture.

**(h)** Equipped with a means of preventing the segregation of the coarse aggregate particles from the remainder of the bituminous plant mix when that mix is carried from the paver hopper back to the paver augers. The means and methods used shall be approved by the paver manufacturer and may consist of chain curtains, deflector plates, or other such devices and any combination of these.

The following specific requirements shall apply to the identified bituminous pavers:

**1. Blaw-Knox Bituminous Pavers.** Blaw-Knox bituminous pavers shall be equipped with the Blaw-Knox Materials Management Kit (MMK).

**2. Cedarapids Bituminous Pavers.** Cedarapids bituminous pavers shall be those that were manufactured in 1989 or later.

258  
259 **3. Barber-Green/Caterpillar Bituminous Pavers.**

260 Barber-Green/Caterpillar bituminous pavers  
261 shall be equipped with deflector plates as  
262 identified in the December 2000 Service  
263 Magazine entitled "New Asphalt Deflector Kit  
264 {6630, 6631, 6640}".

265  
266 Bituminous pavers not listed above shall have similar  
267 attachments or designs that shall make them equivalent to the  
268 bituminous pavers listed above. The Engineer will solely  
269 decide if it is equal to or better than the setups described for the  
270 equipment listed above.

271  
272 Submit for review and acceptance, prior to the start of  
273 using the paver for the placing of plant mix, a full description in  
274 writing of the means and methods that will be used to prevent  
275 the bituminous paver from having both aggregate and  
276 temperature segregation. Use of any paver that has not been  
277 accepted is prohibited until acceptance of the paver is received  
278 from the Engineer. Any pavement placed with an unaccepted  
279 paver will be regarded as not compliant work and may not be  
280 paid for and may require removal.

281  
282 Supply a Certificate of Compliance that verifies that the  
283 manufacturer's approved means and methods used to prevent  
284 bituminous paver from having both aggregate and temperature  
285 segregation have been implemented on all pavers used on the  
286 project and are working in accordance with the manufacturer's  
287 requirements and Contract Documents.

288  
289 **(4) Rollers.** Rollers shall be self-propelled, steel-tired tandem,  
290 pneumatic-tired, or vibratory-type rollers capable of reversing without  
291 shoving or tearing the just placed HMA mixture. Provide sufficient  
292 number, sequencing, type, and rollers of sufficient weight to compact  
293 the mixture to required density while mixture is still in workable  
294 condition unless otherwise indicated in the Contract Documents.  
295 Equipment shall not excessively crush aggregate. Operate rollers in  
296 accordance with manufacturer's recommendations and Contract  
297 Documents. The use of intelligent compaction is encouraged and may  
298 be required elsewhere in the Contract Documents.

299  
300 **(a) Steel-Tired Tandem Rollers.** Steel-tired tandem rollers  
301 used for initial breakdown or intermediate roller passes shall  
302 have minimum gross weight of 12 tons and shall provide  
303 minimum 250-pound weight per linear inch of width on drive



304 wheel.

305  
306 Steel-tired tandem rollers used for finish roller passes  
307 shall have minimum total gross weight of 3 tons.

308  
309 Do not use roller with grooved or pitted rolling drum or  
310 worn scrapers or wetting pads. Replace excessively worn  
311 scrapers and wetting pads before use.

312  
313 **(b) Pneumatic-Tired Rollers.** Pneumatic-tired rollers shall  
314 be oscillating-type, equipped with smooth-tread pneumatic tires  
315 of equal size and diameter. Maintain tire pressure within 5  
316 pounds per square inch of designated operational pressure  
317 when hot. Space tires so that gaps between adjacent tires are  
318 covered by following set of tires.

319  
320 Pneumatic-tired rollers used for breakdown or  
321 intermediate roller passes shall have a ballast capable of  
322 establishing an operating weight per tire of not less than 3,000  
323 pounds. Equip rollers with tires having minimum 20-inch wheel  
324 diameter with tires inflated to 70 to 75 pounds per square inch  
325 pressure when cold and 90 pounds per square inch when hot.  
326 Equip rollers with skirt-type devices to maintain temperature of  
327 tires during rolling operations.

328  
329 Pneumatic-tired rollers used for kneading finished  
330 asphalt surfaces shall have a ballast capable of establishing an  
331 operating weight per tire of not less than 1,500 pounds. Equip  
332 rollers with tires having minimum 15-inch wheel diameter with  
333 tires inflated to 50 to 60 pounds per square inch pressure. If  
334 required, equip rollers with skirt-type devices to maintain  
335 temperature of tires during rolling operations.

336  
337 **(c) Vibratory Rollers.** Vibratory rollers shall be steel-tired  
338 tandem rollers having minimum total weight of 3 tons. Equip  
339 vibratory rollers with amplitude and frequency controls and  
340 speedometer. Operate vibratory roller in accordance with  
341 manufacturer's recommendations. For very thin lifts, 1 inch or  
342 less in thickness, vibratory rollers shall not be used in the  
343 vibratory mode. Instead, operate the unit in the static mode.

344  
345 **(5) Hand Tools.** Keep hand tools used in production, hauling, and  
346 placement of HMA clean and free of contaminants. Diesel or mineral  
347 spirits or other cleaning material that is potentially deleterious to HMA  
348 may be used to clean hand tools providing:

- 350 (a) It does not contaminate HMA with cleaning material.  
351  
352 (b) Clean hand tools over catch pan with capacity to hold all  
353 the cleaning material.  
354  
355 (c) Remove all diesel or mineral spirits or other cleaning  
356 material that is potentially deleterious to HMA from hand  
357 tools before using with HMA.  
358  
359 (a) Hand tools used shall be in a condition such that it meets  
360 the requirements that it was manufactured for, e.g., a  
361 straightedge shall meet the straightness requirement of the  
362 manufacturer.

363  
364 **(6) Material Transfer Vehicle (MTV).**  
365

366 (a) **Usage.** MTV usage applies to surface courses of paving  
367 projects on all Islands except Lanai, unless otherwise indicated  
368 in the Contract Documents. When placing HMA surface course  
369 use MTV to independently deliver mixtures from hauling  
370 equipment to paving equipment. MTV usage will not be  
371 required for the following:

- 372  
373 1. Projects with less than 1,000 tons of HMA.  
374  
375 2. Temporary pavements.  
376  
377 3. Bridge deck approaches.  
378  
379 4. Shoulders.  
380  
381 5. Tapers.  
382  
383 6. Turning lanes.  
384  
385 7. Driveways.  
386  
387 8. Areas with low overhead clearances.  
388

389 (b) **Equipment.** When using MTV, install minimum 10-ton-  
390 capacity hopper insert in conventional paver hopper. Provide  
391 the following equipment:

- 392  
393 1. High-capacity truck unloading system in MTV  
394 capable of receiving HMA from hauling equipment.  
395

396                               2.       MTV storage bin with minimum 15-ton capacity.

397  
398                               3.       An auger mixing system in one of the following:  
399       the MTV storage bin, or paver hopper insert, or paver  
400       hopper to continuously mix HMA prior to discharging to  
401       the paver's conveyor system.

402  
403                               Avoid stop-and-go operations by coordinating plant  
404       production rate, number of haul units, and MTV and paver  
405       speeds to provide a continuous, uniform, segregation-free  
406       material flow and smooth HMA pavement. Maintain uniform  
407       paver speed to produce smooth pavements.

408  
409       **(c) Performance Evaluation.** Evaluate the performance  
410       of MTV and mixing equipment by measuring mat temperature  
411       profile immediately behind paver screed on first day of paving  
412       and when it feels the need to do so due to perceived changes  
413       in performance or as directed by the Engineer.

414  
415                               Use a hand-held temperature device that has been  
416       calibrated within the past 12 months. It shall be an infrared  
417       temperature gun is capable of measuring in one degree or finer  
418       increments between the temperatures of 80 degrees to 400  
419       degrees F with a laser to indicate where the temperature  
420       reading is being taken. Six temperature profile measurements  
421       shall be taken of mat surface using infrared temperature gun at  
422       50-foot intervals behind paver. Each temperature profile shall  
423       consist of three surface temperature measurements taken  
424       transversely across the mat in approximately a straight line  
425       from screed while paver is operating. For each profile,  
426       temperatures shall be measured approximately 1 foot from  
427       each edge and in middle of mat. The difference between  
428       maximum and minimum temperature measurements for each  
429       temperature profile shall not exceed 10 degrees F. If any two  
430       or more temperature profiles exceeds the allowable 10-degree  
431       F temperature differential, halt paving operation and adjust  
432       MTV or mixing equipment to ensure that material placed by  
433       paver meets specified temperature requirements. Redo the  
434       measuring of mat temperature profile until adjustment of the  
435       MTV or mixing equipment is adequate. Submit all temperature  
436       profiles to the Engineer by next business day. Information on  
437       the report shall show location and temperature readings and  
438       time test was performed. Enough information shall be given,  
439       so the Engineer will be able to easily locate the test site of the  
440       individual measurement.

When requested temperature profile measurements shall be done in the presence of the Engineer.

Once adjustments are made, repeat measurement procedure for the next two placements to verify that material placed by paver meets specified temperature requirements. Terminate paving if temperature profile requirements are not met during repeated measurement procedure. If equipment fails to meet requirements after measurement procedure is repeated once, replace equipment before conducting any further temperature profile measurements

The Engineer may perform surface temperature profile measurements at any time during project. The Engineer may in lieu of a hand-held infrared temperature device use an infrared camera or device that is capable of measuring temperatures to locate cold spots. If such cold spots exist, the Engineer may require adjustments to the MTV.

If bleeding or fat spots occur in the pavement adjust means and methods to eliminate such pavement defects and perform remedial repair to pavement acceptable to the Engineer. Bleeding is defined as excess binder occurring on the surface of the pavement. It may create a shiny, glass-like, reflective appearance and may be tacky to the touch. Fat spots are localized bleeding.

**(d) Transport.**

**1. Trailered MTV.** Transport MTV by means of truck-tractor/trailer combination in accordance with Chapter 104 of Title 19, Department of Transportation, entitled "The Movement by Permit of Oversize and Overweight Vehicles on State Highways".

**2. Crossing Bridges for Self-Powered MTV.** When self-powered MTV exceeds legal axle or total weight limits for vehicles under the HRS, Chapter 291, conform to the following when crossing bridges within project limits unless otherwise indicated in the Contract Documents:

- a. Completely remove mix from MTV.
- b. Move MTV at relatively constant speed not exceeding 5 miles per hour. MTV will not be

488 allowed to stop on bridge.

489  
490 **c.** No other vehicle or equipment will be  
491 allowed on bridge.

492  
493 **d.** The MTV shall not attempt to cross a  
494 bridge where the posted load limit is less than or  
495 equal to the weight of the MTV empty.  
496 Permission to cross the bridge shall be obtained  
497 from the Engineer and HWY-DB in writing.

498  
499 **(C) Preparation of Surface.** Clean existing pavement in accordance with  
500 Section 310 - Brooming Off. Apply tack coat in accordance with Section 407  
501 - Tack Coat. Tack coat shall not be applied to surfaces to receive an  
502 application of joint adhesive.

503  
504 Where indicated in the Contract Documents, bring irregular surfaces  
505 to uniform grade and cross section by furnishing and placing one or more  
506 leveling courses of HMA Mix V. Spread leveling course in variable  
507 thicknesses to eliminate irregularities in existing surface. Place leveling  
508 course such that maximum depth of each course, when thoroughly  
509 compacted to the Contract Documents' requirements, does not exceed 3  
510 inches.

511  
512 In multiple-lift leveling course construction, spread subsequent lifts  
513 beyond edges of previously spread lifts in accordance with procedures  
514 contained in current edition of the Asphalt Institute's *Construction of Hot Mix*  
515 *Asphalt Pavements*, Manual Series No. 22 (MS-22) for leveling wedges.

516  
517 Notify the Engineer of existing surfaces that may not be in a condition  
518 that will have enough strength to be a good bonding surface or foundation  
519 and should be removed or have remedial repairs done before new pavement  
520 placement.

521  
522 **(D) Plant Operation.**

523  
524 **(1) Preparation of Asphalt Binder.** Uniformly heat asphalt binder  
525 and provide continuous supply of heated asphalt cement from storage  
526 to mixer. Do not heat asphalt binder above the recommendation of  
527 the supplier for modified binders or above 350 degrees F for neat  
528 binders.

529  
530 **(2) Preparation of Aggregate.** Dry and heat aggregate material  
531 at temperature sufficient to produce design temperature of job-mix  
532 formula. Do not exceed 350 degrees F. Adjust heat source used for  
533 drying and heating to avoid damage to and contamination of

aggregate. When dry, aggregate shall not contain more than 1 percent moisture by weight.

For batch plants, screen aggregates immediately after heating and drying into three or more fractions. Convey aggregates into separate compartments ready for batching and mixing with asphalt binder.

**(3) Mixing.** Measure aggregate and asphalt; or aggregate, RAP, and asphalt into mixer in accordance with an accepted job-mix formula. Mix until components are completely mixed and adequately coated with asphalt binder in accordance with AASHTO M 156. Percent of coated particles shall be 95 percent when tested in accordance with AASHTO T 195.

**(4) Plant Inspection.** For control and acceptance testing during periods of production, provide a testing laboratory that meets the requirements of AASHTO M 156. Provide space, utilities, and equipment required for performing specified tests.

**(E) Spreading and Finishing.** Prior to each day's paving operation, check screed or strike-off assembly surface with straight edge to ensure straight alignment and there is no damage or wear to the machine that will affect performance. Provide screed or strike-off assembly that produces finished surface without tearing, shoving, and gouging HMA. Discontinue using spreading equipment that leaves ridges, indentations, or other marks, or combination thereof in surface that cannot be eliminated by rolling or affects the final smoothness of the pavement or be prevented by adjustment in operation.

Maintain HMA at minimum 250 degrees F temperature at discharge to paver. The Engineer shall observe the contractor measuring the temperature of mix in hauling vehicle just before depositing into spreader or paver or MTV.

Deposit HMA in a manner that minimizes segregation. Raise truck beds with tailgates closed before discharging HMA.

Lay, spread, and strike off HMA upon prepared surface. Where practical, use asphalt pavers to distribute mixture.

Where practical, control horizontal alignment using automatic grade and slope controls from reference line, slope control device. Existing pavements or features shall not be used for grade control alone.

Obtain sensor grade reference, horizontal alignment by using established grade and slope controls. For subsequent passes, substitution

of one ski with joint-matching shoe riding on finished adjacent pavement is acceptable. Use of a comparable non-contact mobile reference system and joint matching shoe is acceptable.

Avoid stop-and-go operation. Maintain a constant forward speed of paver during paving operation and minimize other methods that impact smoothness.

Offset longitudinal joint in successive lifts by approximately 6 inches. Incorporate into paving method an overlap of material of 1-inch +/- 0.5 inches at the longitudinal joint. The HMA overlap material shall be left alone when initially placed and shall not be bumped back or pushed back with a lute or any other hand-held device. If the overlap exceeds the maximum amount, remove the excess with a flat shovel, allowing recommended amount of overlap HMA material to remain in place to be compacted. Do not throw the removed excess HMA material on to the paving mat. The longitudinal joint in a surface course when total roadway width is comprised of two lanes shall be near the centerline of pavement or near lane lines when roadway is more than two lanes in width. The longitudinal joint shall not be constructed in the wheel path. Every effort should be made to not locate the longitudinal joint under the longitudinal lane lines. Make a paving plan drawing showing how the longitudinal joint will not be located in these areas.

Control the horizontal alignment of the longitudinal edge of the HMA mat being installed so that the edge is parallel to the centerline or has a uniform alignment, e.g., the edge of the mat is straight line or uniform curve, no wavy edge, etc. to have a consistent amount of HMA material at the joint.

Check the compaction of the longitudinal joint during paving often enough to ensure that it will meet the compaction requirements.

If nuclear gauges and ground penetrating radar are used as the contractor's quality control method, they shall be properly calibrated and periodically checked by comparison to cores taken from the pavement. The use of sand as an aid in properly seating the gauge may also be considered for improving the accuracy of the gauge.

In areas where irregularities or unavoidable obstacles make use of mechanical spreading and finishing equipment impracticable, spread, rake, and lute mixture by hand tools. For such areas, deposit, spread evenly, and screed mixture to required compacted thickness.

Demonstrate competence of personnel operating grade and crown control device before placing surface courses. If automatic control system becomes inoperative during the day's work, the Engineer will permit the Contractor to finish day's work using manual controls. The Engineer may

also allow additional HMA to be ordered and placed using manual controls if it will provide a safer work site for the public to travel through. Do not resume work until automatic control system is made operative. The Engineer may waive requirement for electronic screed control device when paving gores, shoulders, transitions, and miscellaneous reconstruction areas where the use of the devices is not practical.

When production of HMA can be maintained and when practicable, use pavers in echelon shall be used to place surface course in adjacent lanes.

At the end of each workday, HMA pavement that is open to traffic shall not extend beyond the panel of the adjacent new lane pavement by more than the distance normally placed in one workday. At end of each day's production, construct tapered transitions along all longitudinal and transverse pavement drop-offs; this shall apply to areas where existing pavement is to meet newly placed pavement. Use slopes of 6:1 for longitudinal taper transitions and 48:1 for transverse tapered transitions. Maximum drop-off height along the joints shall be 3 inches. Also, using a 48:1 slope provides a taper around any protruding object, e.g., manholes, drain boxes, survey monuments, inlets, etc., that may be above pavement surface when opened to the public. If the object is below the surface of the pavement then fill the depression until it is level with the surrounding pavement or raise depressed objects to the finish grade of the placed pavement. Remove and dispose of all transition tapers before placing adjoining panel or next layer of HMA. Notify traveling public of pavement drop-offs or raised objects with signs placed in every direction of traffic that may use and encounter pavement drop-offs or protruding objects or holes.

Use the same taper rates for areas where there is a difference in elevation due to construction work.

At end of each workweek, complete full width of the roadway's pavement, including shoulders, to same elevation with no drop-offs.

**(F) Compaction.** Immediately after spreading and striking off HMA and adjusting surface irregularities, uniformly compact mixture by rolling.

Initiate compaction at highest mix temperature allowing compaction without excessive horizontal movement. Temperature shall not be less than 220 degrees F.

Finish rolling using tandem roller while HMA temperature is at or above 175 degrees F.

On superelevated curves, begin rolling at lower edge and progress to



higher edge by overlapping of longitudinal trips parallel to centerline.

If necessary, repair damage immediately using rakes and fresh mix. Do not displace line and grade of HMA edges during rolling.

Keep roller wheels properly moistened with water or water mixed with small quantities of detergent. Use of excess liquid, diesel, and petroleum-based liquids will not be allowed on rollers.

Along forms, curbs, headers, walls and other places not accessible to rollers, compact mixture with hot hand tampers, smoothing irons, or mechanical tampers. On depressed areas, trench roller or cleated compression strips under roller may be used to transmit compression.

Before the start of compaction or during compaction or both remove pavement that is loose, broken, or contaminated, or combination thereof; pavement that shows an excess or deficiency in asphalt binder content; and pavement that is defective in any way. Replace with fresh HMA pavement of same type, and compact. Remove and replace defective pavement and compact at no increase in contract price or contract time.

Operate rollers at slow and uniform speed with no sudden stops. The drive wheels shall be nearest to the paver. Continue rolling to attain specified density and until roller marks are eliminated.

Rollers shall not be parked on the pavement placed that day or shift.

**(1) HMA Pavement Courses One and a Half Inches Thick or Greater.** Where HMA pavement compacted thickness indicated in the Contract Documents is 1-1/2 inches or greater, compact to not less than 93.0 percent nor greater than 97.0 percent of the maximum specific gravity determined in accordance with AASHTO T 209, modified by deletion of Supplemental Procedure for Mixtures Containing Porous Aggregate.

Place HMA pavement in individual lifts that are within minimum and maximum allowable compacted thickness for various types of mixture as specified in Table 401.02-1 - Limits of Compacted Lift Thickness and Asphalt Content.

**(2) HMA Pavement Courses Less Than One and a Half Inches Thick.** Where HMA pavement compacted thickness indicated in the contract documents is less than 1-1/2 inches, compaction to a specified density will not be required.

Use only non-vibratory, steel-tired, tandem roller. Roll entire

surface with minimum of two roller passes. A roller pass is defined as one trip of the roller in one direction over any one spot.

For intermediate rolling, roll entire surface with minimum of four passes of roller.

Finish rolling using steel-tired, tandem roller. Continue rolling until entire surface has been compacted with minimum of three passes of roller, and roller marks have been eliminated.

Do not use rollers that will excessively crush aggregate.

**(3) HMA Pavement Courses One and a Half Inches Thick or Greater In Special Areas Not Designated For Vehicular Traffic.**

For areas such as bikeways that are not part of roadway and other areas not subjected to vehicular traffic, compact to not less than 90.0 percent of maximum specific gravity determined in accordance with AASHTO T 209, modified by deletion of Supplemental Procedure for Mixtures Containing Porous Aggregate. Increase asphalt content by at least 0.5 percent above that used for HMA pavements designed for vehicular traffic. Paved shoulders shall be compacted in the same manner as pavements designed for vehicular traffic.

**(G) Joints, Trimming Edges and Utility Marking.** At HMA pavement connections to existing pavements, make joints vertical to depth of new pavement. Saw cut existing pavement and cold plane in accordance with Section 415 - Cold Planing of Existing Pavement to depth equal to thickness of surface course or as indicated in the Contract Documents.

At HMA connections to previously placed lifts, form joints by cutting back on previous run to expose full depth of course. Dispose of material trimmed from edges. Protect end of freshly laid mixture from rollers.

Before and after paving, identify and mark location of existing utility manholes, valves, and handholes on finished surface. Adjust existing frames and covers and valve boxes to final pavement finish grade in accordance with Section 604 - Manholes, Inlets and Catch Basins and Section 626 - Manholes and Valve Boxes for Water and Sewer Systems.

**(1)** Longitudinal joints. Submit for review the means and methods that will be used to install longitudinal joints at the required compaction and density. The Engineer may allow a waiver to the Contract Documents by allowing the compaction of the HMA at the longitudinal joints to be no lower than 90.0 percent of the maximum specific gravity determined in accordance with AASHTO T 209, modified by deletion of Supplemental Procedure for Mixtures Containing Porous

Aggregate. The air voids at the longitudinal joints shall not exceed 10 percent. Verify the compaction of the longitudinal joints meets the Contract Documents' requirements by using non-destructive testing methods during paving and submit the results on the daily quality control test reports.

Overband all longitudinal joints within the entire lot represented by the non-compliant core, PG binder seal coat, or other type of joint enrichment accepted by the Engineer when the longitudinal joints are found to have less than 93.0 percent but is no less than 90 percent of the maximum specific gravity or has an air void that exceeds 10 percent. The overband shall not decrease the skid resistance of the pavement under any ambient weather condition. Submit overband material's catalog cuts, test results and application procedure for review and acceptance by the Engineer before use. Center the overband over the longitudinal joint. The overband shall be placed in a uniform width and horizontal alignment. The overband shall have no holidays or streaking in its placement. The width of the overband shall be based on how the longitudinal joint was constructed or as directed by the Engineer. If a butt joint is used, the overband width shall be a minimum of 12-inches. For butt wedge or wedge joints the overband width shall be the width of the wedge plus an additional six-inches minimum. Replace any pavement markings damaged or soiled by the overband remedial repair process.

For longitudinal joints that have a compaction of less than 90 percent of the maximum specific gravity; removal may be required by the Engineer instead of overbanding the non-compliant joint. The Engineer will solely decide if removal or overbanding is required. If removal is required, it shall be the material on one side of the longitudinal joint for the full width of the mat for the paving day. The Engineer will solely decide which material shall be used.

Persistent low compaction results may be cause to suspend work and remove non-conforming work. During the suspension of paving, revise means and methods used in constructing longitudinal joints and submit to the Engineer for review and acceptance. Suspension may occur when:

- (1) Two or more longitudinal joints tests fail to meet the minimum compaction
- (2) One sample reveals that the joint compaction is 90 percent or less.
- (3) The maximum air void requirement exceeds 10 percent.

Test for compaction and density regardless of layer thickness.

810 Compaction and density shall be determined by using six-inch diameter or  
811 larger cores instead of four-inch diameter cores. For longitudinal joints made  
812 using butt joints cores shall be taken over the joint with half of the core being  
813 on each side of the joint. For longitudinal joints using butt wedge joints,  
814 center core over the center of the wedge so that 50 percent of the material is  
815 from the most recently paved material and the remaining 50 percent of the  
816 core is from the material used to pave the previous layer. One core shall be  
817 taken at a maximum of every 250 tons of longitudinal joint and any fraction  
818 of that length for each day of paving with a minimum of one core taken for  
819 each longitudinal joint per day. Cores taken for the testing of the longitudinal  
820 joint may be used to determine pavement thickness.

821  
822 Compaction results for longitudinal joints until January 1, 2023 will not  
823 be included in any Sliding Scale Pay Factor for Compaction payment  
824 calculation. After, January 1, 2023 it will be included.

825  
826 **(H) HMA Pavement Samples.** Obtain test samples from compacted  
827 HMA pavement within 72 hours of lay down. Provide minimum 4-inch  
828 diameter cores consisting of undisturbed, full-depth portion of compacted  
829 mixture taken at locations designated by the Engineer in accordance with the  
830 "Sampling and Testing Guide for Acceptance and Verification" in Hawaii DOT  
831 Highways Division, *Quality Assurance Manual for Materials*, Appendix 3.  
832 Cores shall be taken in the presence of the Engineer. Turn cores over to  
833 Engineer immediately after cores have been taken.

834  
835 For pavement samples for longitudinal joints provide 6-inch diameter  
836 cores minimum. For pavement samples for other than longitudinal joints  
837 4-inch diameter cores minimum shall be taken. All cores shall consist of  
838 undisturbed, full-depth of the lift of the compacted mixture taken at locations  
839 designated by the Engineer in accordance with the "Sampling and Testing  
840 Guide for Acceptance and Verification" in Hawaii DOT Highways Division,  
841 *Quality Assurance Manual for Materials*, appendix 3. Coring of longitudinal  
842 joints shall use a modified HDOT Sampling and Testing Guide as required  
843 by the Contract Documents.

844  
845 Cores that separate shall indicate to the Engineer that there is  
846 insufficient bonding of layers. Modify the previously used paving means and  
847 methods to prevent future debonding of layers. Debonding of a core sample  
848 after adjustment of the Contractor's methods will be an indication of  
849 continued non-conforming work and the Engineer may direct removal of the  
850 layer at no additional cost or contract time.

851  
852 Restore HMA pavement immediately after obtaining samples. Clean core  
853 hole and walls of all deleterious material that will prevent the complete filling  
854 of the core hole and the bonding of the new HMA to the existing. Apply tack  
855 coat to vertical faces of sample holes. Fill sampled area with new HMA

pavement of same type as that removed. If hand compaction is used; fill in layers not exceeding the minimum thickness stated in Table 401.02-1 - Limits of Compacted Lift Thickness And Asphalt Content. Compact each layer to compaction requirements. If Mechanical Compaction methods are used, then layers may be the maximum layer thickness stated in Table 401.02-1 - Limits of Compacted Lift Thickness And Asphalt Content. Using tires or hand tamping to compact the HMA material to restore the pavement shall not be considered as mechanical compaction.

Only sample and test leveling course if 1-1/2 inches or greater. No compaction requirements for less than 1-1/2 inches.

**(I) HMA Pavement Thickness Tolerances.**

The Engineer will measure thickness of pavement by cores obtained by the Contractor in accordance with HDOT TM 09-19 Field Sampling Bituminous Material after Compaction (Obtaining Cores). The Engineer will measure cores in accordance with HDOT TM 09-19, except that measurement will be taken to nearest one thousandth of an inch; and average of such measurements will be taken to nearest one hundredth of an inch.

Thickness of finished HMA pavement shall be within 0.25 inch of thickness indicated in the Contract Documents. Pavement not meeting the thickness requirements of the Contract Documents may be required by the Engineer to be removed and replaced.

Corrective methods taken on pavement exceeding specified tolerances, e.g., insufficient thickness by methods accepted by the Engineer, including removal and replacement, shall be at no increase in contract price or contract time.

The checking of pavement thickness shall be done after all remedial repairs, e.g., smoothness compliance repairs, compaction, have been completed, reviewed, and accepted by the Engineer.

**(J) Quality Control Using New Technology.** The Engineer and MTRB reserves the right to utilize new technology and methods to improve the detection of noncompliant work on the project. The technology or method may be used to locate defects in the work, e.g., ground penetrating radar to locate delaminations, moisture damage, thin sections, voids, non-compliant compaction, other non-destructive testing to locate flaws. The defect will be verified by the methods stated in the Contract Documents or by other established conventional means. If the technology or method has already been accepted elsewhere or has standardized testing procedures the results may be judged acceptable by the Engineer and no further testing will be

required. These new technologies and methods may be used for the selection of sampling locations.

**(K) Protection of HMA Pavement.** Except for construction equipment directly connected with paving operations, keep traffic off HMA pavement.

Protect HMA pavement from damage until it has cooled and set.

Do not refuel equipment or clean equipment or hand tools over paved surfaces unless catch pan or device that will contain spilled fuel and other products is provided. After completion of refueling or cleaning, remove catch pan or device without spilling any of the collected content.

Do not park roller or other paving equipment on HMA pavement paved within 24 hours of laydown.

**(L) Pavement Joint Adhesive**

**(1) Pavement Joint Adhesive on Joints.** Use on all asphalt pavement construction where joints are formed at such locations but not limited to the following:

**(a)** Adjacent asphalt pavements, e.g., trafficked lanes, shoulders, etc.

**(b)** Asphalt pavement and adjacent concrete pavement or curb and gutter or any other surface where the bonding of the asphalt pavement and concrete surface is desired,

**(c)** Transverse joints between asphalt pavements not placed at the same time or if the pavement's temperature on one side of the joint is below the minimum temperature the mix can be at, during asphalt pavement compaction or installation.

**(d)** Cut face of an existing pavement where it will have new HMA pavement placed against it, e.g., utility trenches, partial or full depth repairs, etc.

Pavement joint adhesive is not required on a longitudinal construction joint between adjacent hot mix asphalt pavements formed by echelon paving. Echelon paving is defined as paving multiple lanes side-by-side with adjacent pavers slightly offset at the same time.

A longitudinal construction joint between one shift's work and

another shall have pavement joint adhesive applied at the joint. Any longitudinal construction joint formed, with the temperature on one side of the joint that is below the minimum temperature the mix can be when compacted to contract requirements during asphalt pavement installation, shall have pavement joint adhesive applied at the joint.

**(2) Material requirements.** Asphalt joint adhesive shall meet requirements as specified in Table 401.03-1 - Asphalt Joint Adhesive Specifications.

<b>TABLE 401.03-1 – ASPHALT JOINT ADHESIVE SPECIFICATIONS</b>		
<b>TEST</b>		<b>SPECIFICATION</b>
Brookfield Viscosity, 204 °C [400 °F]	ASTM D 3236	4,000-10,000 cp
Cone Penetration, 25 °C [77 °F]	ASTM D 5329	60-100 dmm
Resilience, 25 °C [77 °F]	ASTM D 5329	30% minimum
Ductility, 25 °C [77 °F]	ASTM D 113	30 cm minimum
Ductility, 4 °C [39.2 °F]	ASTM D 113	30 cm minimum
Tensile Adhesion, 25 °C [77 °F]	ASTM D 5329	500% minimum
Softening Point	ASTM D 36	77 °C [170 °F] min.
Asphalt Compatibility	ASTM D 5329	Pass

### **(3) Construction Requirements for Asphalt Joint Adhesive**

**(a) Equipment Requirements.** Use a jacketed double boiler type melting unit, with both agitation and recirculation systems. Provide a pressure feed wand application system.

**(b) Material Handling.** Submit a copy of the manufacturer's recommendations for heating, re-heating, and applying the joint adhesive material. Follow manufacturer's recommendations. Do not remove the joint adhesive from the package until immediately before it is placed in the melter. Joint adhesive boxes must be clearly marked with the name of the manufacturer, the trade name of the adhesive, the manufacturer's batch and lot number, the application/pour temperature, and the safe heating temperature. Feed

additional material into the melter at a rate equal to the rate of material used.

Verify the pouring temperature of the joint adhesive at least once per hour at the point of discharge. Stop production if the adhesive falls below the recommended application/pour temperature. When the temperature of the adhesive exceeds the maximum safe heating temperature, stop production, empty the melter, and dispose of that adhesive in an environmentally safe method. No payment will be made for this material or its disposal.

Do not blend or mix different manufacturer's brands or different types of adhesives.

**(c) Joint Adhesive Application:** The face of the joint that the new asphalt pavement will bind to shall be clean and dry before the joint adhesive is applied. Apply the pavement joint adhesive material to the entire face of the surface where HMA pavement shall be installed. The thickness of the asphalt adhesive application shall be approximately 1/8 inch. Use an application shoe attached to the end of application wand. Do not overlap the joint by greater than 1/2-inch at the top of the joint or two-inches at the bottom of the joint. Apply the joint adhesive immediately in front of the paving operation. If the adhesive is tracked by construction vehicles, repair the damaged area, and restrict traffic from driving on the adhesive.

**(d) Field Sampling.** Take a sample during each shift from the application wand during the first 20 minutes of placing sealant from each melter on the Project in the presence of the Engineer.

Each sample shall consist of two aluminum or steel sample containers with the capacity to hold five pounds of sealant each. The two sampling containers shall be labeled with Contractor's name; project name and number; date and time sample taken; location of where material was used at, e.g., from where to where it was used at in stations; manufacturer and lot number of the sealant. Each container shall be numbered one of two, or two of two. Turn over samples to Engineer without Engineer losing sight of the sample. The Engineer reserves the right to conduct supplementary sampling and testing of the sealant material.



1. Document the locations where the material came from, each lot number of sealant that is placed and submit the document to the Engineer within 2 working days of placement.

2. If a field sample fails to meet any or all of the requirements in Table 401.03-1 - Asphalt Joint Adhesive Specifications; the work completed using the material from the lot that the field sample represents, shall be subject to a five percent reduction in the contract price of the lift of the HMA pavement it was used on; for example, if two lanes are paved and the longitudinal joint between the two lanes uses material not meeting the contract requirements both of the lanes' asphalt pavement used for both lanes will be subject to a price reduction. If the joint was between an existing pavement and a new the price reduction will be based on the new pavement.

3. Overband with PG binder seal coat or other type of joint enrichment material over the entire length of the joint where the use of non-compliant material occurred.

4. Width of the overband shall follow the criteria used for low density longitudinal joints. In areas where the joint was formed with a curb or gutter use a joint sealer acceptable to the Engineer.

**(M) Pavement Smoothness Rideability Test.** Perform surface profile tests frequently to ensure that the means and methods being used produces pavement that is compliant with the Contract Document's surface profile smoothness requirement. Test the pavement surface for smoothness with High-Speed Inertial Profiler to determine the International Roughness Index (IRI) of the pavement. For the locations determined by the Engineer, a 12-foot straightedge shall be used to measure smoothness.

All smoothness testing must be performed with the presence of the Engineer. The High-Speed Inertial Profiler operator shall be a certified operator by MTRB or the manufacturer.

The High-Speed Inertial Profiler operator's certification shall be no older than five years old at the date of the Notice to Proceed and at the day of the pavement profile measurement.

All submittals shall be sent directly to MTRB.

The finished pavement shall comply to all the following requirements:

1067  
1068 **(a) Smoothness Test using 12-Foot Straightedge (Manual or**  
1069 **rolling)** The 12-foot straightedge is used to Identify the locations that  
1070 vary more than ¼ inch from the lower edge when the 12-foot  
1071 straightedge is laid on finished pavement on the direction parallel with  
1072 the centerline or perpendicular to centerline. Remove the high points  
1073 that cause the surface to exceed that ¼ inch tolerance by grinding.

1074  
1075 The Contractor shall use a 12-foot straightedge for the following  
1076 locations:

1077  
1078 1. Construction joints where a day's paving ended and  
1079 another day's began.

1080  
1081 2. Longitudinal profiling parallel to centerline, when within  
1082 15 feet of a bridge approach or existing pavement which is  
1083 being joined.

1084  
1085 3. Transverse profiling of cross slopes, approaches, and as  
1086 otherwise directed with respect to the requirements below:

1087  
1088 a) Lay the straightedge in a direction perpendicular  
1089 to the centerline.

1090  
1091 b) When pavement abuts bridge approaches or  
1092 pavement not under this Contract, ensure that the  
1093 longitudinal slope deviations of the finished pavement  
1094 comply with Contract Document's requirements.

1095  
1096 c) Short pavement sections up to 250 feet long,  
1097 including both mainline and non-mainline sections on  
1098 tangent sections and on horizontal curves with a  
1099 centerline radius of curve less than 1,000 feet.

1100  
1101 d) Within a superelevation transition on horizontal  
1102 curves having centerline curve radius less than 1,000  
1103 feet, e.g., curves, turn lanes, ramps, tapers, and other  
1104 non-mainline pavements.

1105  
1106 e) Within 15 feet of transverse joint that separates  
1107 pavement from existing pavement not constructed under  
1108 the contract, or from bridge deck or approach slab for  
1109 longitudinal profiling.

1110  
1111 f) As otherwise directed by the Engineer.  
1112

4. The Engineer may confine the checking of through traffic lanes with the straightedge to joints and obvious irregularities or choose to use it at locations not specifically stated in this Section.

**(b) High-Speed Inertial Profiler**

There shall be a minimum 3 profile runs per lane, for each wheel path (left and right) which is approximately three feet from edge lane line. The segment length shall be 0.1 mi. The final segments in a lane that are less than 0.1 mi shall be evaluated as an independent segment and pay adjustments will be prorated for length. The profiles shall be taken in the direction of traffic only.

The latest version of FHWA ProVal software shall be used to conduct profile analysis to determine IRI and areas of localized roughness. The IRI values shall be reported in units of in/mi. For localized roughness, apply 250-mm filter on ProVal on Smoothness.

Additional runs may be required by the Engineer if the data indicate a lack of repeatability of results. A 92% agreement is required for repeatability and IRI values shall have at minimum a 95% confidence level.

**(N) Required Pavement Smoothness**

The IRI for the left and right wheel paths in an individual lane will be computed and then averaged to determine the Mean Roughness Index (MRI) values. The MRI will be used to determine acceptance and pay adjustment. Each lane shall be tested and evaluated separately.

There are three (3) categories of acceptable MRI values:

Category	Description	MRI
Type A	Three or more HMA Lifts	Shall not exceed 60 in/mi
Type B	Two HMA Lifts	Shall not exceed 70 in/mi
Type C	One HMA Lift	Shall not exceed 75 in/mi

For the location where a 12-foot manual straightedge is required, the surface shall not vary more than 1/4 inch from the lower edge of a straightedge.

For any pavement segments not able to meet the above requirements and not waived by the Engineer, remedial repair acceptable to the Engineer

or removal of pavement shall be performed. No reduction of contract price for these areas will be an acceptable remedy.

No pre-final inspection, final inspection, and substantial completion granted will be made until the pavement meets smoothness requirement and other Contract Document requirements and all required profile reports are submitted to the Engineer and MTRB and are accepted.

**(O) Request for Acceptance Profile Testing by the Department.**

The Contractor shall submit a written request to the Engineer to perform an acceptance profile test.

The request shall be made at least 30 days before desired testing date and shall include an approximate acceptance profile testing date, a plan view drawing of the area to be tested with the limits of the test area highlighted. The Contractor's profile test results of the area to be tested shall be submitted to the Engineer at least 15 days before the scheduled profile testing date.

No acceptance testing will be made without the submittal of the Contractor pavement profile test results and required drawing. Failure to submit the pavement profile results and required drawing by the stated deadline or by an Engineer accepted deadline date will be considered a cancellation of the acceptance test and the Contractor shall request another profile test date. The Contractor shall reimburse HDOT for any incurred cost related to any Contractor-caused cancellation or a deduction to the monthly payment will be made.

**(P) Department Requirements for Acceptance Profile Testing.** When a request for testing is made, the requested area to be tested shall be 100% of the total area indicated to be paved in the Contract Documents unless the requirement is waived by the Engineer and MTRB.

Department acceptance surface tests will not be performed earlier than 14 days after HMA placement.

Clean debris and clear obstructions from area to be tested, as well as a minimum of 100 feet before and beyond the area to be tested before testing starts for use as staging areas. Provide traffic control for all profile testing.

The Engineer or MTRB or both may cancel the profile testing if the test area is not sufficiently clean, traffic control is unsatisfactory, or the area is not a safe work environment or test area does not meet Contract Document requirements. This canceled profile test will count as one profile test.

**(Q) Cost of Acceptance Profile Testing by The Department.** The Engineer, MTRB, or State's Third-Party Consultant will perform one initial profile test, at no cost to the Contractor for each area to be tested.

The Department's High-Speed Inertial Profiler pavement profile will be used to determine if the pavement's profile, i.e., smoothness is acceptable.

If the profile of the pavement does not meet the requirements of the Contract Documents, the Contractor shall perform remedial work, i.e. corrective work then retest the area to ensure that the area has the required MRI, i.e., smoothness, before requesting another profile test by the Engineer.

**(1) Additional testing.** Additional testing, by the Department beyond the initial test will be performed at cost to the Contractor as follows:

**(a)** \$2,500 per test will be required when Department personnel or State's Third-Party Consultant is used.

**(R) Remedial Work for Pavements.**

**(1)** The Contractor shall notify the Engineer at least 24 hours prior to commencement of the corrective work. The Contractor shall not commence corrective work until the methods and procedure have been approved in writing by the Engineer.

**(2)** All smoothness corrective work for areas of localized roughness shall be for the entire lane width. Pavement cross slope shall be maintained through corrective areas.

**(3)** The remedial repair areas shall be neat, rectangular areas having a uniform surface appearance.

**(4)** If grinding is used on HMA pavement, the surface shall have nearly invisible grinding marks to passing motorist. Coat surface with a coating acceptable to the Engineer or MTRB to restore original impermeability level.

**(5)** Other methods may include milling and overlaying HMA pavement. The length, depth of the milling and the replacement material will be solely decided by the Engineer.

**(6)** The finished repaired pavement surface shall leave no ridges or valleys or fins of pavement other than those allowed below.

(7) Remedial repairs shall not leave any drainage structures' inlets higher than the surrounding pavement or alter the Contract Document's drainage pattern.

(7) For items in the pavement other than drainage structures, e.g., manhole frame and covers, survey monuments, expansion joints etc., the finish pavement, ground or not, shall not be more than 1/4 inch in elevation difference. Submit to the Engineer remedial repair method to correct these conditions for acceptance.

(8) Do not grind pavement to smooth or polished finish, i.e., do not decrease the friction coefficient of the pavement.

(9) When the Engineer determines that the ground pavement surface is smooth or has a polished finish, i.e., has the appearance to the Engineer that the roadway surface's coefficient of friction has decreased, submit remedial repair method to correct the condition.

(11) Pick up immediately grinding operation residue by using a vacuum attached to grinding machine or other method acceptable to the Engineer.

(a) Any remaining residue shall be picked up before the end of shift or before the area is open to traffic, whichever is earlier.

(b) Prevent residue from flowing across pavement or from being left on pavement surface or both.

(c) Residue shall not be allowed to enter the drainage system.

(d) The residue shall not be allowed to dry or remain on the pavement.

(e) Dispose of all material that is the result of the remedial repair operation, e.g., HMA residue, wastewater, and dust at a legal facility.

(12) Use of bush hammers and other impact devices shall not be used for pavement surface remediation.

(13) Complete corrective work before determining pavement thickness for HMA pavements in accordance with Subsection 401.03(I) – HMA Pavement Thickness Tolerances.

(14) All HMA wearing surface areas that have been ground shall receive a coating, e.g., a coating material that will restore any lost impermeability of the HMA due to the grinding of the surface. The coating used shall not be picked up or tracked by passing vehicles or be degraded after a short period of time has passed, i.e., it shall have a service life equal to or greater than the HMA pavement. The coating shall not decrease the pavement's friction value. The coating's limits shall be the full width of the lane regardless how small. If the remedial repair area extends into the next lane, then the repair area will be full lane width also. Extend the length of coating areas in order for the coating area to look like the rest of the road and does not have patches on it, i.e., make the road look uniform in color. The coating shall be of a color that matches the surrounding pavement. The areas receiving the coating shall not be open to traffic until it has cured enough so that it cannot be picked up or tracked by passing vehicles or degrade. Submit means and methods of the coating and type of coating to the Engineer or MTRB for review and acceptance. Do not proceed with the coating without acceptance from the Engineer.

(15) Recompacting cold HMA, i.e., HMA that has reached ambient temperature is not an acceptable remedial repair method.

(16) Replace all pavement markings damaged or discolored by remedial repairs.

**(S) Pavement Smoothness and Acceptance.**

(1) Price and payment in various paving sections, e.g., 401 (Hot Mix Asphalt Pavement), shall be full compensation for all work and materials specified in the various paving sections and this section, including but not limited to furnishing all labor, materials, tools, equipment, testing, incidentals and for doing all work involved in micro milling, milling, (cold planing), grinding existing or new pavement, removing residue, cleaning the pavement, necessary disposal of residue, furnishing of any water or air used in cleaning the pavement and any other related ancillary work or material or services. Also, it includes any remedial work, e.g., re-paving, surface grinding, application of a coating, curing compound, and replacement of damaged pavement markings.

(2) The contract price in those sections may be adjusted for pavement smoothness by the Engineer. The pavement smoothness contract unit price adjustments and work acceptance will be made in accordance with the following schedules

Category	MIRI (in/mi)	Pay Adjustment \$ per 0.1 mi
Type A (Three or more HMA Lifts)	<30.0	\$580
	30.0- less than 35.0	\$480
	35.0- less than 40.0	\$380
	40.0- less than 45.0	\$280
	45.0- less than 50.0	\$180
	50.0- less than 55.0	\$80
	55.0- less than 60.0	\$0
	> 60.0	Corrective Work
Type B (Two HMA Lifts)	<35.0	\$420
	35.0- less than 40.0	\$360
	40.0- less than 45.0	\$300
	45.0- less than 50.0	\$240
	50.0- less than 55.0	\$180
	55.0- less than 60.0	\$120
	60.0 less than 65.0	\$60
	65.0 less than 70.0	\$0
	> 70.0	Corrective Work
Type C (One HMA Lift)	<40.0	\$280
	40.0- less than 45.0	\$240
	45.0- less than 50.0	\$200
	50.0- less than 55.0	\$160
	55.0- less than 60.0	\$120
	60.0- less than 65.0	\$80
	65.0- less than 70.0	\$40
	70.0- less than 75.0	\$0
	> 75.0	Corrective Work

(3) Pay Pavement Smoothness Incentive will be based on the initial measured MIRI for both left and right wheel path, prior to any corrective work for the 0.10-mile section.

(a) The Pavement Smoothness Incentive will be computed using the plan surface area of pavement shown in the Contract Documents. This Pavement Smoothness Incentive will apply to the total area of the 0.10-mile section for the lane width represented by MIRI for the same lane. It does not include any other price adjustments specified in the Contract Documents. Those price adjustments will be, for each adjustment, calculated separately using the original contract price to



determine the amount of adjustment to be made to the contract price.

**(b)** There will be no disincentive price adjustments to the contract prices since a remedial repair is required in lieu of a reduction of contract prices since pavement smoothness and ride quality is of utmost importance.

**(c)** Localized Roughness. The Engineer will determine areas of localized roughness using the average profile from both wheel paths. The Engineer may waive localized roughness requirements for deficiencies resulting from manholes or other similar appurtenances. Adjust manholes or other similar appurtenances so that using a 12-ft. straightedge the area around that manhole or other similar appurtenance shall not have more than 1/4-in. variation between any 2 contacts on the straightedge.

**1)** Corrective Action. Use an Engineer accepted method to remove localized roughness. For asphalt concrete pavements, fog-seal the aggregate exposed from diamond grinding.

**2)** Reprofile the corrected area and provide the Engineer the results that show the corrective action, i.e., remedial repairs were successful.

**(d)** Incentives will not apply to areas where payment deductions or remedial repairs could be made or has been made for non-compliant work, e.g., low compaction, thin pavement, thermal segregation, low compressive or flexural strength, non-compliant alignment. Incentives will also not apply to areas where corrective work was required to meet contract smoothness requirements. All areas where corrective work was performed shall be tested again to ensure the smoothness requirements are met. Corrective work shall be repeated until it meets the smoothness requirement of the Contract Documents and any other Contract Documents' requirement. Removal of non-compliant work will be tested for compliance until it is determined by the Engineer to be compliant to the requirements of the Contract Documents.

**(e)** There will be no incentive price adjustments to the contract prices regardless of the pavement meeting the Contract Documents' requirements for incentive contract price adjustment, when 25% of the total area paved of that particular

type of pavement on the project has failed to meet any of the Contract document requirements, e.g., smoothness, thickness, unit weight, asphalt content, pavement defects, compaction, flexural or compressive strength. Areas exempt from the smoothness requirements may not be included in the total area calculation unless it is non-compliant.

(f) For contracts using lump sum the method described in Subsection 104.08 Methods of Price Adjustment paragraph (3), will be used to calculate proportionate unit price, i.e., the Engineer's calculated theoretical unit price. This calculated proportionate unit price will be used to calculate the unit price adjustment.

#### **401.04 Measurement.**

(A) The Engineer will measure HMA pavement per ton in accordance with the Contract Documents.

(B) The Engineer will measure leveling course and HMA pavement overlay per ton in accordance with the Contract Documents.

(C) Engineer will measure additional State pavement profiling work when applicable on a cost-plus basis as specified in this section and as ordered by Engineer. The Engineer will issue a billing for the pavement profile work done for the time period with the invoices and receipts that the billing was based on attached to the Contractor for each contract item. The Contractor's pavement profile work required in this section will not be measured and will be considered incidental to the various paving items unless stated otherwise.

**401.05 Payment.** The Engineer will pay for the accepted HMA pavement at the contract price per pay unit, as shown in the proposal schedule. Payment will be full compensation for the work prescribed in this section and the contract documents.

(A) Price and payment in Section 401 – Dense Grade HMA Pavement will be full compensation for all work and materials specified in this Section including furnishing all labor, materials, tools, equipment, testing, pavement profiles and incidentals and for doing all work involved in grinding existing or new pavement, removing residue, and cleaning the pavement, including necessary disposal of residue and furnishing any water or air used in cleaning the pavement and remedial work needed to conform to the requirements of the Contract Documents.

(B) No payment for the Contractor's pavement profile work required in this section will be made. The Contractor's pavement profile work shall be

considered incidental to the various paving items unless stated otherwise.

**(C)** Engineer will pay or deduct for the following pay items when included in proposal schedule:

Pay Item	Pay Unit
Pavement Smoothness Incentive	Allowance
HMA Pavement, Mix No. IV	Ton
PMA Pavement	Ton

**(1)** 70% of the contract unit price or the theoretical calculated unit price upon completion of submitting a job-mix formula acceptable to the Engineer; preparing the surface, spreading, and finishing the mixture; and compacting the mixture.

**(2)** 20% of the contract unit price or the theoretical calculated unit price upon completion of cutting samples from the compacted pavement for testing; placing and compacting the sampled area with new material conforming to the surrounding area; protecting the pavement; and compaction acceptance. Maintain temporary pavement markings and other temporary work zone items, maintain a clean work site.

**(3)** 10% of the contract unit price or calculate the unit price when the final configuration of the pavement markings is in place.

The Engineer will pay for adjusting existing frames and covers and valve boxes in accordance with and under Section 604 – Manholes, Inlets and Catch Basins. Adjustments for existing street survey monument frames and covers will be paid for as if each were a valve box frame and cover.

The Engineer may, at its sole discretion, in lieu of requiring removal and replacement, use the sliding scale factor to accept HMA pavements compacted below 93.0 percent and above 97.0 percent. The Engineer will make payment for the material in that production day, if the Engineer decides to use a sliding scale factor, at a reduced price arrived at by multiplying the contract unit price by the pay factor. The Engineer is not obligated to allow non-compliant work to remain in place and may at any time chose not to use a sliding scale factor method of payment and instead require removal of the noncompliant pavement that is greater than 97.0 or less than 93.0.

1487  
1488 In compliance with Subsection 105.12 Removal of Non-Conforming and  
1489 Unauthorized Work remove and replace HMA compacted below 90.0 percent.  
1490

1491 The Engineer will solely decide if the noncompliant work would be acceptable  
1492 if a reduced payment for the noncompliant work is made. The Engineer is not  
1493 obligated to allow noncompliant work to remain in place and may at any time choose  
1494 not to use a sliding scale factor method of payment as a method of resolution.  
1495 Instead, utilize the remedy allowed in Subsection 105.12 Removal of Non-  
1496 Conforming and Unauthorized Work, requiring removal of the noncompliant  
1497 pavement, shall be used.  
1498

1499 Such a reduced payment, if made and accepted by the Contractor, shall be  
1500 a mutually agreeable resolution to the noncompliant work being addressed. If it is  
1501 not mutually acceptable, the noncompliant work shall be removed. If the reduced  
1502 payment is acceptable; the Engineer will make the reduced payments for the  
1503 noncompliant work in accordance with Table 401.05-2 - Sliding Scale Pay Factor  
1504 for Compaction. The amount of tonnage to be reduced will be determined by the  
1505 Engineer by using the initial cores taken on the mat. No additional cores shall be  
1506 taken to determine the limits of the non-compliant area unless requested by the  
1507 Engineer.  
1508

1509 The Engineer, for determining the reduced tonnage for noncompliant work,  
1510 will assume the level of compaction is linear and will proportion the compaction level  
1511 from the last core that indicated an acceptable compaction level to the nearest core  
1512 indicating a noncompliant compaction level to determine the calculated limit of  
1513 acceptable compaction. The length will be the linear distance between the cores  
1514 measured along the baseline. If there is no core that was taken for the shift's or  
1515 day's work that were compliant then the limit will be the end or start of the day's or  
1516 shift's work. The width will be the nominal paving width. Use the day's specific  
1517 gravity of the mix to determine tonnage. The thickness will be the nominal paving  
1518 thickness.  
1519

1520 The total reduced noncompliant tonnage to be paid will be determined by  
1521 multiplying the applicable percent of reduction by the computed tonnage of the  
1522 noncompliant work. Percent of Quantity Paid shall be the percentage shown in  
1523 Table 401.05-2 - Sliding Scale Pay Factor for Compaction. The reduced tonnage  
1524 shall be used as the payment quantity for the noncompliant work. The reduced  
1525 quantity paid that is used for the monthly payment will be arrived at by multiplying  
1526 the contract unit price by the reduced tonnage.  
1527

<b>Table 401.05-2 – Sliding Scale Pay Factor for Compaction</b>	
<b>"Percent Compaction</b>	<b>Percent of Quantity Paid</b>
> 98.0	Removal
>97.0 - 98.0	95
93.0- 97.0	100
90.0 - <93.0	80
<90.0	Removal

1532  
1533  
1534

**END OF SECTION 401”**