

1 and by observation of the Contractor's total density quality control process conducted in
2 accordance with Specifications.

3 **609-11 MEASUREMENT AND PAYMENT**

4 Any mix produced that is not verified may be assessed a price reduction at the Engineer's
5 discretion in addition to any reduction in pay due to mix or density deficiencies.

6 Produce and construct all asphalt mixtures and pavements in accordance with these *Standard*
7 *Specifications*. There will be no direct payment for work covered by this Specification.
8 Payment at the contract unit prices for the various asphalt items will be full compensation for
9 all work covered by these specifications.

10 If the mix or pavement represented by the falsified results is removed and replaced, payment
11 will be made for the actual quantities of materials required to replace the falsified quantities,
12 not to exceed the original amounts.

13 **SECTION 610** 14 **ASPHALT CONCRETE PLANT MIX PAVEMENTS**

15 **610-1 DESCRIPTION**

16 Perform the work covered by this section including, but not limited to, the construction of one
17 or more courses of asphalt mixture placed on a prepared surface in accordance with these
18 Specifications and in reasonably close conformity with the lines, grades, thickness and typical
19 sections shown on the plans. This work includes producing, weighing, transporting, placing
20 and compacting the plant mix; furnishing aggregate, asphalt binder, anti-strip additive and all
21 other materials for the plant mix; furnishing and applying tack coat as specified; furnishing
22 scales; maintaining the course until final acceptance of the project; making any repairs or
23 corrections to the course that may become necessary; providing and conducting QC as
24 specified in Section 609; and surface testing of the completed pavement. The design
25 requirements for the various mix types are given in Section 610 for dense-graded mix types,
26 Section 650 for OGFC, Section 652 for PADC and Section 661 for UTBWC.

27 Perform all activities in accordance with the Department's *Asphalt Quality Management*
28 *System (QMS) Manual* in effect on the date of contract advertisement

29 Provide and conduct the QC and required testing for acceptance of the asphalt mixture in
30 accordance with Section 609.

31 Define "warm mix asphalt (WMA)" as additives or processes that allow a reduction in the
32 temperature at which asphalt mixtures are produced and placed. Use only WMA additives or
33 processes listed on the NCDOT APL maintained by the Materials and Tests Unit.

34 **610-2 MATERIALS**

35 Refer to Division 10.

Item	Section
Anti-Strip Additives	1020-8
Asphalt Binder, Performance Grade	1020-2
Coarse Aggregate	1012-1(B)
Fine Aggregate	1012-1(C)
Mineral Filler	1012-1(D)
Reclaimed Asphalt Pavement (RAP)	1012-1(F)
Reclaimed Asphalt Shingles (RAS)	1012-1(E)
Silicone	1020-9

Section 610

1 610-3 COMPOSITION OF MIXTURES (MIX DESIGN AND JOB MIX FORMULA)

2 (A) Mix Design-General

3 Prepare the asphalt mix design using a mixture of coarse and fine aggregate, asphalt
4 binder, mineral filler and other additives when required. Size, uniformly grade and
5 combine the several aggregate fractions in such proportions that the resulting mixture
6 meets the grading and physical requirements of the Specifications for the specified mix
7 type. Materials that will not produce a mixture within the design criteria required by the
8 Specifications will be rejected, unless otherwise approved.

9 At least 10 days before start of asphalt mix production, submit the mix design and
10 proposed JMF targets for each required mix type and combination of aggregates to the
11 Engineer for review and approval. Prepare the mix design using a Department certified
12 mix design technician in an approved mix design laboratory and in accordance with the
13 procedures outlined in Section 4.5 of the *Asphalt QMS Manual*.

14 For the final surface layer of the specified mix type, use a mix design with an aggregate
15 blend gradation above the maximum density line on the 2.36 mm and larger sieves.

16 The Contractor has the option to use a recycled plant mix in lieu of virgin plant mix.
17 However, all provisions of the Specifications for virgin mixes apply to recycled mixes.
18 This means that the same design criteria tests, test frequencies, and quality control
19 requirements will apply.

20 Reclaimed Asphalt Pavement (RAP) or Reclaimed Asphalt Shingles (RAS) may be
21 incorporated into asphalt plant mixes in accordance with Article 1012-1 and the
22 following applicable requirements. However, use of RAP materials is not allowed in
23 Open Graded Friction Course (OGFC) mixes or Ultra-Thin Bonded Wearing Course
24 (UBWC) mixes. Use of RAS materials is not allowed in Ultra-Thin Bonded Wearing
25 Course (UBWC) mixes.

26 RAS material may constitute up to 6% by weight of total mixture, except for Open
27 Graded Friction Course (OGFC) mixes, which are limited to 5% RAS by weight of total
28 mixture. Also, when the percentage of RAP is greater than 30% by weight of total
29 mixture, use Fractionated RAP (FRAP) meeting the requirements of Subarticle 1012-
30 1(F)(c).

31 When RAP, RAS, or a combination of both is used in asphalt mixtures, the recycled
32 binder replacement percentage (RBR%) shall not exceed the amounts specified in Table
33 610-4 for the mix type. For recycled mixtures, the virgin binder Performance Grade (PG)
34 grade to be used is specified in Table 610-5 for the mix type based on the recycled binder
35 replacement percentage (RBR%).

36 If the Contractor wishes to submit mix designs containing recycled material amounts
37 exceeding the specified maximums, additional testing will be required to verify the
38 Performance Grade (PG) of the reclaimed binder. Also, the Contractor has the option to
39 have additional testing performed to determine if the mix can be approved using a virgin
40 binder grade different than specified in Table 610-5. The Engineer will determine if the
41 binder grade is acceptable for use based on the test data submitted with the mix design. If
42 the mix design is acceptable, the Engineer will establish and approve the grade and
43 percentage of virgin asphalt binder to be used.

44 If a change in the source of RAP or RAS be made, a new mix design and JMF may be
45 required in accordance with Article 1012-1. Samples of the completed recycled mixture
46 may be taken by the Department on a random basis to determine the PG grading on the
47 recovered asphalt binder in accordance with AASHTO M 320. If the grading is
48 determined to be a value other than required for the specified mix type, the Engineer may
49 require the Contractor to adjust any combination of the grade, the percentage of

1 additional asphalt binder or the blend of reclaimed material to bring the grade to the
2 specified value.

3 **(B) Mix Design Criteria**

4 Design and produce asphalt concrete mixtures that conform to the gradation requirements
5 and design criteria in Table 610-2 and Table 610-3 for the mix type specified. The mix
6 type designates the nominal maximum aggregate size and the design traffic level.

7 Surface mix designs will be tested by the Department for rutting susceptibility. Rut depth
8 requirements for each surface mix type and traffic level are specified in Table 610-3.
9 Mix designs that fail to meet these requirements will be unacceptable and shall be
10 redesigned by the Contractor such that rut depths are acceptable.

11 Table 610-2 provides gradation control points to be adhered to in the development of the
12 design aggregate structure for each mix type. Aggregate gradations shall be equal to or
13 pass between the control points. Table 610-3 provides the mix design criteria for the
14 various mix types.

15 Use an anti-strip additive in all asphalt mixes. It may be hydrated lime or a chemical
16 additive or a combination of both as needed to meet the retained strength requirements as
17 specified in Table 610-3. When a chemical additive is used, add at a rate of not less than
18 0.25% by weight of binder in the mix, or as approved by the Engineer. When hydrated
19 lime is used, add at a rate of not less than 1.0% by weight of the total dry aggregate.

20 **(C) Job Mix Formula (JMF)**

21 Establish the JMF gradation target values within the design criteria specified for the
22 particular type of asphalt mixture to be produced. Establish the JMF asphalt binder
23 content at the percentage that will produce voids in total mix (VTM) at the midpoint of
24 the specification design range for VTM, unless otherwise approved. The formula for
25 each mixture will establish the following: blend percentage of each aggregate fraction,
26 the percentage of reclaimed aggregate, if applicable, a single percentage of combined
27 aggregate passing each required sieve size, the total percentage and grade of asphalt
28 binder required for the mixture (by weight of total mixture), the percentage and grade of
29 asphalt binder to be added to the mixture (for recycled mixtures), the percentage of
30 chemical anti-strip additive to be added to the asphalt binder or percentage of hydrated
31 lime to be added to the aggregate, the temperature at that the mixture is to be discharged
32 from the plant, the required field density and other volumetric properties.

33 When WMA is used, document the additive or process used and recommended rate on
34 the JMF submittal. Verify the JMF based on plant produced mixture from the trial batch.

35 The mixing temperature at the asphalt plant will be established on the JMF. The JMF
36 mix temperature shall be within the ranges shown in Table 610-1 unless otherwise
37 approved.

TABLE 610-1	
MIXING TEMPERATURE AT THE ASPHALT PLANT	
Binder Grade	JMF Temperature
PG 58-28; PG 64-22	250 - 290°F
PG 70-22	275 - 305°F
PG 76-22	300 - 325°F

38 When using RAP or RAS with a different binder than specified, use mixing temperatures
39 in Table 610-1 based on the original binder grade for that mix type shown in Table 610-3.

40 When RAS is used, the JMF mix temperature shall be established at 275°F or higher.

41 Have on hand at the asphalt plant the approved mix design and JMF issued by the
42 Department, before beginning the work.

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1 The JMF for each mixture will remain in effect until modified in writing, provided the
 2 results of QMS tests performed in accordance with Section 609 on material currently
 3 being produced conform with specification requirements. When a change in sources of
 4 aggregate materials is to be made, a new mix design and JMF will be required before the
 5 new mixture is produced. When a change in sources of RAP or RAS material is to be
 6 made, a new JMF is required and a new mix design may be required. When
 7 unsatisfactory results or other conditions make it necessary, the Engineer may revoke the
 8 existing JMF or establish a new JMF.

**TABLE 610-2
 AGGREGATE GRADATION CRITERIA
 (Percent Passing Control Points)**

Standard Sieves (mm)	Mix Type (Nominal Max. Aggregate Size)							
	4.75 mm		9.5 mm ^A		19.0 mm		25.0 mm	
	Min	Max	Min	Max	Min	Max	Min	Max
50.0	-	-	-	-	-	-	-	-
37.5	-	-	-	-	-	-	100	-
25.0	-	-	-	-	100	-	90.0	100
19.0	-	-	-	-	90.0	100	-	90.0
12.5	100	-	100	-	-	90.0	-	-
9.50	95.0	100	90.0	100	-	-	-	-
4.75	90.0	100	-	90.0	-	-	-	-
2.36	-	-	32.0 ^B	67.0 ^B	23.0	49.0	19.0	45.0
1.18	30.0	60.0	-	-	-	-	-	-
0.075	6.0	12.0	4.0	8.0	3.0	8.0	3.0	7.0

- 9 **A.** For the final surface layer of the specified mix type, use a mix design with
 10 an aggregate blend gradation above the maximum density line on the 2.36 mm and
 11 larger sieves.
 12 **B.** For Type SF9.5A, the percent passing the 2.36 mm sieve shall be a minimum of 60%
 13 and a maximum of 70%.

**TABLE 610-3
 MIX DESIGN CRITERIA**

Mix Type	Design ESALs ^A millions	Binder PG Grade ^B	Compaction Levels		Max. Rut Depth (mm)	Volumetric Properties			
			G _{mm} @			VMA % Min.	VTM %	VFA Min.-Max.	%G _{mm} @ N _{ini}
			N _{ini}	N _{des}					
S4.75A	< 1	64 - 22	6	50	11.5	16.0	4.0 - 6.0	65 - 80	≤ 91.5
SF9.5A	< 0.3	64 - 22	6	50	11.5	16.0	3.0 - 5.0	70 - 80	≤ 91.5
S9.5B	0.3 - 3	64 - 22	7	65	9.5	15.5	3.0 - 5.0	65 - 80	≤ 90.5
S9.5C	3 - 30	70 - 22	7	75	6.5	15.5	3.0 - 5.0	65 - 78	≤ 90.5
S9.5D	> 30	76 - 22	8	100	4.5	15.5	3.0 - 5.0	65 - 78	≤ 90.0
I19.0B	< 3	64 - 22	7	65	-	13.5	3.0 - 5.0	65 - 78	≤ 90.5
I19.0C	3 - 30	64 - 22	7	75	-	13.5	3.0 - 5.0	65 - 78	≤ 90.0
I19.0D	> 30	70 - 22	8	100	-	13.5	3.0 - 5.0	65 - 78	≤ 90.0
B25.0B	< 3	64 - 22	7	65	-	12.5	3.0 - 5.0	65 - 78	≤ 90.5
B25.0C	> 3	64 - 22	7	75	-	12.5	3.0 - 5.0	65 - 78	≤ 90.0
Design Parameter					Design Criteria				
All Mix Types	Dust to Binder Ratio (P _{0.075} / P _{be})				0.6 - 1.4 ^E				
	Tensile Strength Ratio (TSR)				85% Min. ^{C,D}				

- 14 **A.** Based on 20 year design traffic.
 15 **B.** Volumetric Properties based on specimens compacted to N_{des} as modified by the
 16 Department.
 17 **C.** TSR for Type S4.75A and Type B 25.0X mixes is 80% minimum.
 18 **D.** AASHTO T 283 Modified (No Freeze-Thaw cycle required).
 19 **E.** Dust to Binder Ratio (P_{0.075} / P_{be}) for Type S4.75A is 1.0 - 2.0.

Recycled Material	Intermediate & Base Mixes	Surface Mixes	Mixes Using PG 76-22
RAS	23%	20%	18%
RAP or RAP/RAS Combination	45%	40%	18%

Mix Type	%RBR ≤ 20%	21% ≤ %RBR ≤ 30%	%RBR > 30%
S4.75A, SF9.5A, S9.5B, I19.0B, I19.0C, B25.0B, B25.0C	PG 64-22	PG 64-22 ^A	PG 58-28
S9.5C, I19.0D	PG 70-22	PG 64-22	PG 58-28
S9.5D, OGFC	PG 76-22 ^B	n/a	n/a

- 1 **A.** If the mix contains any amount of RAS, the virgin binder shall be PG 58-28.
2 **B.** Maximum Recycled Binder Replacement (%RBR) is 18% for mixes using PG 76-22
3 binder.

4 **610-4 WEATHER, TEMPERATURE AND SEASONAL LIMITATIONS FOR**
5 **PRODUCING AND PLACING ASPHALT MIXTURES**

6 Do not produce or place asphalt mixtures during rainy weather, when the subgrade or base
7 course is frozen or when the moisture on the surface to be paved would prevent proper bond.
8 Do not place asphalt material when the air or surface temperatures, measured at the location
9 of the paving operation away from artificial heat, do not meet Table 610-6.

10 Do not place surface course material that is to be the final layer of pavement between
11 December 15 and March 16 of the next year if it is 1 inch or greater in thickness, or between
12 November 15 and April 1 of the next year if it is less than 1 inch in thickness, unless
13 otherwise approved.

14 As an exception to the above, when in any day's operations the placement of a layer of asphalt
15 base course material or intermediate material 2 inches or greater in thickness has started, it
16 may continue until the temperature drops to 32°F.

17 Do not place plant mix base course that will not be covered with surface or intermediate
18 course during the same calendar year or within 15 days of placement if the plant mix is placed
19 in January or February. Failure by the Contractor to cover the plant mix as required above
20 will result in the Engineer notifying the Contractor in writing to cover the plant mix with a
21 sand seal. Apply the sand seal in accordance with Section 660, except that Articles 660-3 and
22 660-12 will not apply. In the event the Contractor fails to apply the sand seal within 72 hours
23 of receipt of such notice, the Engineer may proceed to have such work performed with
24 Department forces and equipment.

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Asphalt Concrete Mix Type	Minimum Surface and Air Temperature
B25.0B, C	35°F
I19.0B, C, D	35°F
SF9.5A, S9.5B	40°F ^A
S9.5C	45°F ^A
S9.5D	50°F

1 **A.** For the final layer of surface mixes containing RAS, the minimum surface and air
2 temperature shall be 50°F.

3 **610-5 ASPHALT MIXTURE PRODUCTION**

4 Use plants that are either of the batch mixing, continuous mixing or drum mixing type,
5 and so designed, equipped and operated that the weighing, proportioning and mixing of
6 the materials will result in a uniform and satisfactory asphalt mixture meeting these
7 Specifications. All plants shall conform to requirements of Sections 5 and 6 of the
8 *Asphalt QMS Manual*.

9 Before production of the mix, stockpile aggregates for a sufficient period of time to
10 facilitate the drainage of free moisture. Keep the different aggregate sizes separated until
11 they have been delivered to the cold feeders. Keep the separate stockpiles readily
12 accessible for sampling. When mineral filler is required in the mix, feed or weigh-in
13 separately from the other aggregates.

14 Introduce the asphalt binder and other additives, when required, into the mixture at the
15 amounts and percentages specified by the JMF. No working tolerance will be allowed.
16 Introduce the hot and dry aggregates, mineral filler, and recycled materials, in amounts
17 and at temperatures such that the mixture produced is within the production control limits
18 of Subarticle 609-6(D). Provide a positive means of controlling mixing time to obtain
19 complete and uniform coating of the aggregate particles and thorough distribution of the
20 asphalt binder throughout the aggregate. Produce the mixture at the asphalt plant within
21 ±25 °F of the JMF mix temperature. The temperature of the mixture, when discharged
22 from the mixer, shall not exceed 350°F.

23 All asphalt plants shall be certified by the Department. Certification is effective from the
24 date of issuance and is non-expiring subject to continued compliance. The Department
25 will check the plant on an annual basis or as deemed necessary by the Engineer. Any
26 plant that is relocated, modified or changes ownership shall be recertified before use.

27 Any completely automatically controlled asphalt plant that, due to the basic design of the
28 plant, does not meet all these Specifications for conventional batch mixing, continuous
29 mixing or drum mixing may be used on a project by project basis provided a uniformly
30 consistent mix meeting all mix requirements can be produced and the plant has been
31 approved in writing.

32 Any asphalt plant that cannot consistently produce a high quality mix meeting these
33 Specifications will be in non-compliance with these Specifications and may have its
34 certification revoked.

35 Upon a malfunction of required automatic equipment on a batch mixing plant, the plant
36 may continue to operate manually for the following 2 consecutive working days,
37 provided acceptable mixture is being produced.

38 When a malfunction of required automatic equipment on a drum mixer or continuous
39 plant occurs, manual operation of the plant will not be allowed except that if, in the
40 opinion of the Engineer, an emergency traffic condition exists, the plant may be allowed
41 to operate manually until the unsafe traffic condition is corrected. All mix produced by
42 manual operation will be subject to Section 609.

610-6 HOT MIX STORAGE SYSTEMS

When a storage system is used, provide a system capable of conveying the mix from the plant to the storage bin and storing the mix without a loss in temperature, segregation or oxidation of the mix. Limit storage time to the ability of the storage system to maintain the mix within the Specification requirements. Material may be stored in storage bins without an approved heating system for no more than 24 hours.

Provide a continuous type or skip bucket type conveyor system. Enclose continuous type conveyors so that the mix temperature is maintained within specification requirements. Provide a system designed in such manner as to prevent segregation of the mix during discharge from the conveyor into the bins and equipped with discharge gates that will not cause segregation of the mix while loading the mix into trucks.

610-7 HAULING OF ASPHALT MIXTURE

Transport the mixture from the mixing plant to the point of use in vehicles that have tight, clean, smooth beds approved by the Department, that have been sprayed with an approved release agent material to prevent the mixture from adhering to the beds. Remove excess release agent before loading. Cover each load of mixture with a solid, waterproof tarp constructed of canvas, vinyl, or other suitable material. Provide a 3/8 inch to 5/8 inch diameter hole on each side of the vehicle body near the center of the body and above the bed of the vehicle for the purpose of inserting a thermometer.

Assure temperature of the mixture immediately before discharge from the hauling vehicle is within a tolerance of $\pm 25^{\circ}\text{F}$ of the specified JMF mix temperature.

610-8 SPREADING AND FINISHING

Apply tack coat in accordance with Section 605.

Mixtures produced simultaneously from different plant sources cannot be intermingled by hauling to the same paver on the roadway unless the mixtures are being produced from the same material sources and same JMF.

As referenced in Section 9.6.3 of the *Asphalt QMS Manual*, use the automatic screed controls on the paver to control the longitudinal profile. Where approved by the Engineer, the Contractor has the option to use either a fixed or mobile string line.

Perform this work in accordance with and using equipment meeting Section 9 of the *Asphalt QMS Manual*.

Use a material transfer vehicle (MTV) when placing all asphalt concrete plant mix pavements which require the use of asphalt binder grade PG 76-22 and for all types of OGFC, unless otherwise approved. Use a MTV for all surface mix regardless of binder grade placed on Interstate and US routes that have 4 or more lanes and median divided. Where required above, use the MTV when placing all full width travel lanes and collector lanes. Use MTV for all ramps, loops, Y-line travel lanes, full width acceleration lanes, full width deceleration lanes and full width turn lanes that are greater than 1,000 feet in length. Use a MTV meeting Section 9.5(E) of the *Asphalt QMS Manual*.

Place asphalt concrete base course material in trench sections with asphalt pavement spreaders made for the purpose or with other equipment approved by the Engineer.

Request the Engineer to waive the requirement for use of pavers for spreading and finishing where irregularities or obstacles make their use impractical. Spread, rake and lute the mixture by hand methods or other approved methods in these areas.

Operate the paver as continuously as possible. Pave intersections, auxiliary lanes and other irregular areas after the main line roadway has been paved, unless otherwise approved. Place a wedge course at locations ahead of the paving operation as required by the Engineer.

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1 Repair any damage caused by hauling equipment across structures at no additional cost to the
2 Department.

3 **610-9 COMPACTION**

4 Immediately after the asphalt mixture has been spread, struck off and surface and edge
5 irregularities adjusted, thoroughly and uniformly compact the pavement. Compact the mix to
6 the required degree of compaction for the type of mixture being placed.

7 Provide sufficient number and weight of rollers, except as noted, to compact the mixture to
8 the required density while it is still in a workable condition. Obtain approval of equipment
9 used in compaction from the Engineer before use. Where uniform density is not being
10 obtained throughout the depth of the layer of material being tested, change the type and/or
11 weight of the compaction equipment as necessary to achieve uniform density even though
12 such equipment has been previously approved.

13 Compact all final wearing surfaces, except OGFC, using a minimum of two steel-wheel
14 tandem rollers, unless otherwise approved. Pneumatic-tire rollers with two tandem axles and
15 smooth tread tires may be used for intermediate rolling.

16 Limit rolling for OGFC to one coverage with a tandem steel-wheel roller weighing a
17 maximum of 10 tons, with additional rolling limited to one coverage with the roller where
18 necessary to improve the riding surface.

19 Steel-wheel tandem vibratory rollers specifically designed for the compaction of asphalt
20 pavements may be used on all layers 1 inch or greater in thickness during the breakdown and
21 intermediate rolling phase. Do not operate vibratory rollers in the vibratory mode during the
22 finish rolling phase on any mix type or pavement course, OGFC or on PADC.

23 When vibratory rollers are used, use rollers that have variable amplitude and frequency
24 capabilities and that are designed specifically for asphalt pavement compaction. Provide
25 rollers equipped with controls that automatically disengage the vibration mechanism before
26 the roller stops when being used in the vibratory mode.

27 The Engineer may prohibit or restrict the use of vibratory rollers where damage to the
28 pavement being placed, the underlying pavement structure, drainage structures, utilities or
29 other facilities is likely to occur or is evident.

30 Do not use rolling equipment that results in excessive crushing of the aggregate or excessive
31 displacement of the mixture.

32 In areas inaccessible to standard rolling equipment, thoroughly compact the mixture by the
33 use of hand tampers, hand operated mechanical tampers, small rollers or other approved
34 methods.

35 Use rollers that are in good condition and capable of being reversed without backlash to
36 compact the mixture. Operate rollers with the drive wheels nearest the paver and at uniform
37 speeds slow enough to avoid displacement of the mixture. Equip steel-wheel rollers with
38 wetting devices that will prevent the mixture from sticking to the roller wheels.

39 Begin compaction of the material immediately after the material is spread and shaped to the
40 required width and depth. Carry out compaction in such a manner as to obtain uniform
41 density over the entire section. Perform compaction rolling at the maximum temperature at
42 which the mix will support the rollers without moving horizontally. Complete the compaction
43 (including both intermediate rolling) before the mixture cooling below a workable
44 temperature. Perform finish rolling to remove roller marks resulting from the compaction
45 rolling operations.

1 **610-10 DENSITY REQUIREMENTS**

TABLE 610-7 DENSITY REQUIREMENTS	
Mix Type	Minimum % G_{mm} (Maximum Specific Gravity)
S4.75A	85.0 ^A
SF9.5A	90.0
S9.5X, I19.0X, B25.0X	92.0

2 A. Compaction to the above specified density will be required when the S4.75A
3 mix is applied at a rate of 100 lbs/sy or higher.

4 Compact the asphalt plant mix to at least the minimum percentage of the maximum specific
5 gravity listed in Table 610-7, except as noted in Section 10.3.4 of the *Asphalt QMS Manual*.

6 Compaction with equipment other than conventional steel drum rollers may be necessary to
7 achieve adequate compaction. Occasional density sampling and testing to evaluate the
8 compaction process may be required. The Contractor shall maintain minimum test frequencies
9 as established. Should the Contractor's density testing frequency fail to meet the minimum
10 frequency as, all mix without required density test representation shall be considered
11 unsatisfactory and if allowed to remain in place, will be evaluated for acceptance in
12 accordance with Article 105-3.

13 **610-11 JOINTS**14 **(A) Transverse Joints**

15 When the placing of the mixture is to be suspended long enough to permit the mixture to
16 become chilled, construct a transverse joint.

17 If traffic will not pass over the end of the paving, a butt joint will be permitted, provided
18 proper compaction is achieved. If traffic will pass over the joint, construct a sloped
19 wedge ahead of the end of the full depth pavement to provide for proper compaction and
20 protection of the full depth pavement. Construct the joint square to the lane alignment
21 and discard all excess material. Place a paper parting strip beneath this wedge to
22 facilitate joint construction unless waived by the Engineer.

23 Before paving operations are resumed, remove the sloped wedge and cut back into the
24 previously constructed pavement to the point of full pavement depth. Coat the exposed
25 edge of the previously constructed pavement with tack coat.

26 When laying of the mixture is resumed at the joint, complete and then test the
27 construction of the joint in accordance with Article 610-12 while the mixture is still in
28 a workable condition.

29 **(B) Longitudinal Joints**

30 Tack the exposed edge of all longitudinal joints before placing the adjoining pavement.

31 Form longitudinal joints by allowing the paver to deposit the mixture adjacent to the joint
32 to such depth that maximum compaction can be obtained along the joint. Pinch the joint
33 by rolling immediately behind the paver.

34 When multi-lane multi-layer construction is required, offset the longitudinal joints in
35 each layer from that in the layer immediately below by approximately 6 inches.
36 Construct the joints in the final layer, where possible, between designated travel lanes of
37 the final traffic pattern.

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1 610-12 SURFACE REQUIREMENTS AND ACCEPTANCE

2 Construct pavements using quality-paving practices as detailed herein. Construct the
3 pavement surface smooth and true to the plan grade and cross slope. Immediately correct any
4 defective areas with satisfactory material compacted to conform with the surrounding area.

5 Pavement imperfections resulting from unsatisfactory workmanship such as segregation,
6 improper longitudinal joint placement or alignment, non-uniform edge alignment or excessive
7 pavement repairs will be unsatisfactory. Pavement imperfections will be evaluated for
8 acceptance in accordance with Article 105-3.

9 When directed due to unsatisfactory laydown or workmanship, operate under the limited
10 production procedures. Limited production for unsatisfactory laydown is defined as being
11 restricted to the production, placement, compaction and final surface testing (if applicable) of
12 a sufficient quantity of mix necessary to construct only 2,500 feet of pavement at the laydown
13 width.

14 Remain on limited production until such time as satisfactory laydown results are obtained or
15 until three consecutive 2,500 feet sections have been attempted without achieving satisfactory
16 laydown results. If the Contractor fails to achieve satisfactory laydown results after
17 three consecutive 2,500 feet sections have been attempted, cease production of that mix type
18 until such time as the cause of the unsatisfactory laydown results can be determined.
19 As an exception, the Engineer may grant approval to produce a different mix design of the
20 same mix type if the cause is related to mix problems rather than laydown procedures.

21 Mix placed under the limited production procedures for unsatisfactory laydown or
22 workmanship will be evaluated for acceptance in accordance with Article 105-3.

23 Each pavement layer will be tested by the Contractor and the Engineer using a 10 foot
24 stationary straightedge furnished by the Contractor. Any location on the pavement selected
25 by the Department shall be tested as well as all transverse joints. Apply the straightedge
26 parallel to the centerline of the surface. Do not exceed 1/8 inch variation of the surface being
27 tested from the edge of the straightedge between any two contact points. Correct areas found
28 to exceed this tolerance by removal of the defective work and replacement with new material,
29 unless other corrective measures are permitted. Provide the work and materials required in
30 the correction of defective work.

31 610-13 FINAL SURFACE TESTING AND ACCEPTANCE

32 On portions of this project where the typical section requires two or more layers of new
33 pavement, perform smoothness acceptance testing of the longitudinal profile of the finished
34 pavement surface using either an Inertial Profiler or a North Carolina Hearne Straightedge
35 (Model No. 1). Smoothness acceptance testing using the inertial profiler is not required on
36 ramps, loops and turn lanes.

37 Use an Inertial Profiler (Option 1) to perform smoothness acceptance testing of the
38 longitudinal profile of the finished pavement surface. Furnish an inertial profiler(s) necessary
39 to perform this work. Maintain responsibility for all costs related to the procurement,
40 handling, and maintenance of these devices.

41 Furnish and operate the Hearne straightedge (Option 2) to determine and record the
42 longitudinal profile of the pavement on a continuous graph.

43 Before beginning any paving operations, the Contractor shall select one of the above options
44 and submit documentation to the Engineer on the selected option for smoothness acceptance.

45 (A) Option 1 - Inertial Profiler

46 Use an Inertial Profiler to measure the longitudinal pavement profile for construction
47 quality control and smoothness acceptance. Use a profiler with line laser technology as
48 single-point laser technology will not be allowed. Produce International Roughness
49 Index (IRI) and Mean Roughness Index (MRI) values for measuring smoothness.

1 Use testing and recording software to produce electronic inertial road profiles in a format
2 compatible with the latest version of FHWA's ProVAL (Profile Viewing and Analysis)
3 software.

4 The Inertial Profiler shall be calibrated and verified in accordance with the most current
5 version of AASHTO M 328. Provide certification documentation that the profiler meets
6 AASHTO M 328 to the Engineer before the first day the Inertial Profiler is used on the
7 project.

8 Configure the profiler to record the actual elevation of the pavement surface. Do not use
9 the profiler's internal IRI calculation mode. The profile data shall be filtered with
10 a cutoff wavelength of 300 feet. The interval at which relative profile elevations are
11 reported shall be 2 inches.

12 Provide IRI data in accordance with most current version of ASTM E1926. Use
13 personnel trained to record and evaluate IRI data.

14 Provide a competent operator, trained in the operation of the Inertial Profiler Operation of
15 the Inertial Profiling system shall conform to AASHTO R 57.

16 Provide the user selected Inertial Profiler settings to the Engineer for the project records.
17 Certification of the Inertial Profiling system shall conform to AASHTO R 56.

18 Remove all objects and foreign material on the pavement surface prior to longitudinal
19 pavement profile testing.

20 Operate the profiler at any speed as per the manufacturer's recommendations to collect
21 valid data. Operate the Inertial Profiler in the direction of the final traffic pattern.
22 Collect IRI data from both wheel paths during the same run. Define a "wheel path" as
23 the 3 feet from the edge of the travel lane. MRI values are the average of the IRI values
24 from both wheel paths. When using an inertial profiler that collects a single trace per
25 pass, take care to ensure that the measurements from each trace in a travel lane start and
26 stop at the same longitudinal locations. Unless otherwise specified, multiple runs are not
27 necessary for data collection.

28 Operate the automatic triggering method at all times unless impractical. A tape stripe or
29 traffic cone wrapped with reflective material may be used to alert the profiler's automatic
30 triggering sensor to begin data collection. The profiler shall reach the intended operating
31 speed before entering the test section. The runup and runout distances should be
32 sufficient to obtain the intended operating speed and to slow down after testing is
33 completed.

34 Divide the pavement surface for the project into sections which represent a continuous
35 placement (i.e. the start of the project to bridge, intersection to intersection). Terminate
36 a section 50 feet before a bridge approach, railroad track, or similar interruption.
37 (Separate into 0.10-mile sections).

38 The evaluation of the profiles will be performed on a section basis. A section is
39 0.10 mile of a single pavement lane. For any section, which is less than 0.10 mile in
40 length, the applicable pay adjustment incentive will be prorated on the basis of the actual
41 length.

42 Mark the limits of structures and other special areas to be excluded from testing using the
43 profiler's event identifier such that the exact locations can be extracted from the profile
44 data file during processing.

45 Unless otherwise authorized by the Engineer, perform all smoothness testing in the
46 presence of the Engineer. Perform smoothness tests on the finished surface of the
47 completed project or at the completion of a major stage of construction as approved by
48 the Engineer. Coordinate with and receive authorization from the Engineer before starting
49 smoothness testing. Perform smoothness tests within 7 days after receiving authorization.

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Any testing performed without the Engineer’s presence, unless otherwise authorized, may be ordered retested at the Contractor’s expense.

After testing, transfer the profile data from the profiler portable computer’s hard drive to a write once storage media (Flash drive, USB, DVD-R or CD-R) or electronic media approved by the Engineer. Label the disk or electronic media with the Project number, Route, file number, date, and termini of the profile data. Submit the electronic data on the approved media to the Engineer immediately after testing and this media will not be returned to the Contractor.

Submit a report with the documentation and electronic data of the evaluation for each section to the Engineer within 10 days after completion of the smoothness testing. The report shall be in the tabular format for each 0.10 segment or apportion thereof with a summary of the MRI values and the localized roughness areas including corresponding project station numbers or acceptable reference points. Calculate the pay adjustments for all segments in accordance with the formulas in Sections (1) and (2) shown below. The Engineer shall review and approve all pay adjustments unless corrective action is required. Submit the electronic files compatible with ProVAL and the evaluation in tabular form with each 0.10 mile segment occupying a row. Include each row with the beginning and ending station for the section, the length of the section, the original IRI values from each wheel path, and the MRI value for the section. Each continuous run for a section will occupy a separate table and each table will have a header that includes the following: the project contract number, county, the roadway number or designation, a lane designation, the JMF used for the final lift, the dates of the smoothness runs, and the beginning and ending station of the continuous run. Summarize each table at the bottom.

Traffic control and all associated activities included in the pavement smoothness testing of the pavement surface will be the responsibility of the Contractor.

(1) Acceptance for New Construction

IRI and MRI numbers recorded in inches per mile will be established for each 0.10 mile section for each travel lane of the surface course designated by the contract. Areas excluded from testing by the profiler will be tested using a 10 foot straightedge in accordance with Article 610-12.

Table 610-7 provides the acceptance quality rating scale of pavement based on the final rideability determination.

TABLE 610-8	
MRI PRICE ADJUSTMENT PER 0.10-MILE SECTION	
MRI after Completion (Inches Per Mile)	Price Adjustment Per Lane (0.10-Mile Section)
45.0 and Under	\$200.00
45.1-55.0	PA = 600 – (10 * MRI)
55.1-70.0	Acceptable (No Pay Adjustment)
70.1-90.0	PA = 650 – (10 * MRI)
Over 90.1	Corrective Action Required

This price adjustment will apply to each 0.10-mile section or prorated for a portion thereof, based on the Mean Roughness Index (MRI), the average IRI values from both wheel paths.

When corrections to the pavement surface are required, the Engineer shall approve the Contractor’s method of correction. Methods of correction shall be milling and inlay, remove and replace or other methods approved by the Engineer. To produce a uniform cross section, the Engineer may require correction to the adjoining traffic lanes or shoulders. Corrections to the pavement surface, the adjoining traffic lanes and shoulders will be at no cost to the Department.

1 Where corrections are made after the initial smoothness testing, the pavement will be
 2 retested by the Contractor to verify that corrections have produced the acceptable
 3 ride surface. No incentives will be provided for sections on which corrective actions
 4 have been required. The Contractor will have one opportunity to perform corrective
 5 action(s).

6 (2) Localized Roughness

7 Areas of localized roughness shall be identified through the “Smoothness Assurance
 8 Module (SAM)” provided in the ProVAL software. Use the SAM report to optimize
 9 repair strategies by analyzing the measurements from profiles collected using inertial
 10 profilers. The ride quality threshold for localized roughness shall be 165 inches per
 11 mile for any sections that are 15 feet to 100 feet in length at the continuous short
 12 interval of 25 feet. Submit a continuous roughness report to identify each section
 13 with project station numbers or reference points outside the threshold and identify all
 14 localized roughness, with the signature of the Operator included with the submitted
 15 IRI trace and electronic files.

16 The Department will require that corrective action be taken regardless of final IRI.
 17 Re-profile the corrected area to ensure that the corrective action was successful.
 18 If the corrective action is not successful, the Department will assess a penalty or
 19 require additional corrective action.

$$\text{PA} = (165 - \text{LR\#}) 5$$

Where:

PA = Pay Adjustment (dollars)

LR# = The Localized Roughness number determined from
 SAM report for the ride quality threshold

20 Corrective work for localized roughness shall be approved by the Engineer before
 21 performing the work and shall consist of either replacing the area by milling and
 22 inlaying or other methods approved by the Engineer. Any corrective action
 23 performed shall not reduce the integrity or durability of the pavement that is to
 24 remain in place. Milling and inlay or any corrective actions shall meet the
 25 specifications requirements for ride quality over the entire length of the correction.
 26 Notify the Engineer five days before commencement of the corrective action.

27 Localized roughness correction work shall be for the entire traffic lane width.
 28 Pavement cross slope shall be maintained through corrective areas.

29 **(B) Option 2 - North Carolina Hearne Straightedge**

30 Push the straightedge manually over the pavement at a speed not exceeding 2 miles per
 31 hour. For all lanes, take profiles in the right wheel path approximately 3 feet from the
 32 right edge of pavement in the same direction as the paving operation, unless otherwise
 33 approved due to traffic control or safety considerations. As an exception, lanes adjacent
 34 to curb and gutter, expressway gutter, or shoulder berm gutter may be tested in the left
 35 wheel path. Make one pass of the straightedge in each full width travel lane. The full
 36 lane width should be comparable in ride quality to the area evaluated with the Hearne
 37 Straightedge. If deviations exist at other locations across the lane width, use a 10 foot
 38 non-mobile straightedge or the Hearne Straightedge to evaluate which areas may require
 39 corrective action. Take profiles as soon as practical after the pavement has been rolled
 40 and compacted, but no later than 24 hours following placement of the pavement, unless
 41 otherwise authorized by the Engineer. Take profiles over the entire length of final
 42 surface travel lane pavement exclusive of Y-line travel lanes less than or equal to
 43 1,000 feet in length, ramps less than or equal to 1,000 feet in length, turn lanes less than
 44 or equal to 1,000 feet in length, structures, approach slabs, paved shoulders, loops and
 45 tapers or other irregular shaped areas of pavement, unless otherwise approved by the
 46 Engineer. Test in accordance with this provision all mainline travel lanes, full width

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1 acceleration or deceleration lanes, Y-line travel lanes greater than 1,000 feet in length,
2 ramps, full width turn lanes greater than 1,000 feet in length and collector lanes.

3 At the beginning and end of each day's testing operations, and at such other times as
4 determined by the Engineer, operate the straightedge over a calibration strip so that the
5 Engineer can verify correct operation of the straightedge. The calibration strip shall be
6 a 100 foot section of pavement that is reasonably level and smooth. Submit each day's
7 calibration graphs with that day's test section graphs to the Engineer. Calibrate the
8 straightedge in accordance with the current NCDOT procedure titled *North Carolina*
9 *Hearne Straightedge - Calibration and Determination of Cumulative Straightedge Index*.
10 Copies of this procedure may be obtained from the Department's Pavement Section in the
11 Construction Unit.

12 Plot the straightedge graph at a horizontal scale of approximately 25 feet per inch with
13 the vertical scale plotted at a true scale. Record station numbers and references (bridges,
14 approach slabs, culverts, etc.) on the graphs. Distances between references/stations shall
15 not exceed 100 feet. Have the operator record the Date, Project No., Lane Location,
16 Wheel Path Location, Type Mix and Operator's Name on the graph.

17 Upon completion of each day's testing, evaluate the graph, calculate the Cumulative
18 Straightedge Index (CSI) and determine which lots, if any, require corrective action.
19 Document the evaluation of each lot on a QA/QC-7 form. Submit the graphs along with
20 the completed QA/QC-7 forms to the Engineer, within 24 hours after profiles are
21 completed, for verification of the results. The Engineer will furnish results of their
22 acceptance evaluation to the Contractor within 48 hours of receiving the graphs. In the
23 event of discrepancies, the Engineer's evaluation of the graphs will prevail for acceptance
24 purposes. The Engineer will retain all graphs and forms.

25 Use blanking bands of 0.2 inch, 0.3 inch and 0.4 inch to evaluate the graph for
26 acceptance. The 0.2 inch and 0.3 inch blanking bands are used to determine the
27 Straightedge Index (SEI), which is a number that indicates the deviations that exceed
28 each of the 0.2 inch and 0.3 inch bands within a 100 foot test section. The Cumulative
29 Straightedge Index (CSI) is a number representing the total of the SEIs for one lot, which
30 consist of not more than 25 consecutive test sections. In addition, the 0.4 inch blanking
31 band is used to further evaluate deviations on an individual basis. The CSI will be
32 determined by the Engineer in accordance with the current procedure titled *North*
33 *Carolina Hearne Straightedge - Calibration and Determination of Cumulative*
34 *Straightedge Index*.

35 The pavement will be accepted for surface smoothness on a lot by lot basis. A test
36 section represents pavement one travel lane wide not more than 100 feet in length. A lot
37 will consist of 25 consecutive test sections, except that separate lots will be established
38 for each travel lane, unless otherwise approved by the Engineer. In addition, full width
39 acceleration or deceleration lanes, ramps, turn lanes and collector lanes will be evaluated
40 as separate lots. For any lot that is less than 2,500 feet in length, the applicable pay
41 adjustment incentive will be prorated on the basis of the actual lot length. For any lot
42 which is less than 2,500 feet in length, the applicable pay adjustment disincentive will be
43 the full amount for a lot, regardless of the lot length.

44 If during the evaluation of the graphs, five lots require corrective action, then proceed on
45 limited production for unsatisfactory laydown in accordance with Article 610-12.
46 Proceeding on limited production is based upon the Contractor's initial evaluation of the
47 straightedge test results and shall begin immediately upon obtaining those results.
48 Additionally, the Engineer may direct the Contractor to proceed on limited production in
49 accordance with Article 610-12 due to unsatisfactory laydown or workmanship.

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1 Limited production for unsatisfactory laydown is defined as being restricted to the
2 production, placement, compaction and final surface testing of a sufficient quantity of
3 mix necessary to construct only 2,500 feet of pavement at the laydown width. Once this
4 lot is complete, the final surface testing graphs will be evaluated jointly by the Contractor
5 and the Engineer. Remain on limited production until such time as acceptable laydown
6 results are obtained or until three consecutive 2,500 foot sections have been attempted
7 without achieving acceptable laydown results. The Engineer will determine if normal
8 production may resume based upon the CSI for the limited production lot and any
9 adjustments to the equipment, placement methods, and/or personnel performing the work.
10 Once on limited production, the Engineer may require the Contractor to evaluate the
11 smoothness of the previous asphalt layer and take appropriate action to reduce and/or
12 eliminate corrective measures on the final surface course. Additionally, the Contractor
13 may be required to demonstrate acceptable laydown techniques off the project limits
14 before proceeding on the project.

15 If the Contractor fails to achieve satisfactory laydown results after three consecutive
16 2,500 foot sections have been attempted, cease production of that mix type until such
17 time as the cause of the unsatisfactory laydown results can be determined.

18 As an exception, the Engineer may grant approval to produce a different mix design of
19 the same mix type if the cause is related to mix problem(s) rather than laydown
20 procedures. If production of a new mix design is allowed, proceed under the limited
21 production procedures detailed above.

22 After initially proceeding under limited production, the Contractor shall immediately
23 notify the Engineer if any additional lot on the project requires corrective action. The
24 Engineer will determine if limited production procedures are warranted for continued
25 production.

26 If the Contractor does not operate by the limited production procedures as specified
27 above, the 5 lots, which require corrective action, will be considered unacceptable and
28 may be subject to removal and replacement. Mix placed under the limited production
29 procedures for unsatisfactory laydown will be evaluated for acceptance in accordance
30 with Article 105-3.

31 The pay adjustment schedule for the Cumulative Straightedge Index (CSI) test results per
32 lot is in Table 610-8.

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TABLE 610-9				
PAY ADJUSTMENT SCHEDULE FOR CUMULATIVE STRAIGHTEDGE INDEX				
(Obtained by adding SE Index of up to 25 consecutive 100 ft test sections)				
CSI^A	Acceptance Category	Corrective Action	Pay Adjustment Before Corrective	Pay Adjustment After Corrective Action
0-0	Acceptable	None	\$300 Incentive	None
1-0 or 2-0	Acceptable	None	\$100 Incentive	None
3-0 or 4-0	Acceptable	None	No Adjustment	No Adjustment
1-1, 2-1, 5-0 or 6-0	Acceptable	Allowed	\$300 Disincentive	\$300 Disincentive
3-1, 4-1, 5-1 or 6-1	Acceptable	Allowed	\$600 Disincentive	\$600 Disincentive
Any other Number	Unacceptable	Required	Per CSI after Correction(s) (not to exceed 100% Pay)	

- 1 **A.** Either Before or After Corrective Actions
- 2 Correct any deviation that exceeds a 0.4 inch blanking band such that the deviation is
- 3 reduced to 0.3 inch or less.
- 4 Corrective actions shall be performed at the Contractor's expense and shall be presented
- 5 for evaluation and approval by the Engineer prior to proceeding. Any corrective action
- 6 performed shall not reduce the integrity or durability of the pavement that is to remain in
- 7 place. Corrective action for deviation repair may consist of overlaying, removing and
- 8 replacing, indirect heating and rerolling. Scraping of the pavement with any blade type
- 9 device will not be allowed as a corrective action. Provide overlays of the same type mix,
- 10 full roadway width, and to the length and depth established by the Engineer. Tapering of
- 11 the longitudinal edges of the overlay will not be allowed.
- 12 Corrective actions will not be allowed for lots having a CSI of 4-0 or better. If the CSI
- 13 indicates Allowed corrective action, the Contractor may elect to take necessary measures
- 14 to reduce the CSI instead of accepting the disincentive. Take corrective actions as
- 15 specified if the CSI indicates required corrective action. The CSI after corrective action
- 16 shall meet or exceed Acceptable requirements.
- 17 Where corrective action is allowed or required, the test section(s) requiring corrective
- 18 action will be retested, unless the Engineer directs the retesting of the of the entire lot.
- 19 No disincentive will apply after corrective action if the CSI is 4-0 or better. If the
- 20 retested lot after corrective action has a CSI indicating a disincentive, the appropriate
- 21 disincentive will be applied.
- 22 Test sections and/or lots that are initially tested by the Contractor that indicate excessive
- 23 deviations such that either a disincentive or corrective action is necessary, may be
- 24 re-rolled with asphalt rollers while the mix is still warm and in a workable condition, to
- 25 possibly correct the problem. In this instance, reevaluation of the test section(s) shall be
- 26 completed within 24 hours of pavement placement and these test results will serve as the
- 27 initial test results.
- 28 Incentive pay adjustments will be based only on the initially measured CSI, as
- 29 determined by the Engineer, before any corrective work. Where corrective actions have
- 30 been taken, payment will be based on the CSI determined after correction, not to exceed
- 31 100% payment.

1 Areas excluded from testing by the N.C. Hearne Straightedge will be tested by using
 2 a non-mobile 10-foot straightedge. Assure that the variation of the surface from the
 3 testing edge of the straightedge between any 2 contact points with the surface is not more
 4 than 1/8 inch. Correct deviations exceeding the allowable tolerance in accordance with
 5 the corrective actions specified above, unless the Engineer permits other corrective
 6 actions.

7 Furnish the North Carolina Hearne Straightedge(s) necessary to perform this work.
 8 Maintain responsibility for all costs relating to the procurement, handling, and
 9 maintenance of these devices. The Department has entered into a license agreement with
 10 a manufacturer to fabricate, sell and distribute the N.C. Hearne Straightedge. The
 11 Department's Pavement Construction Section may be contacted for the name of the
 12 current manufacturer and the approximate price of the straightedge.

13 **610-14 DENSITY ACCEPTANCE**

14 The Department will evaluate the asphalt pavement for density acceptance after the asphalt
 15 mix has been placed and compacted using the Contractor's QC test results, the Department's
 16 QA test results (including verification samples) and by observation of the Contractor's density
 17 QC process conducted in accordance with Section 610 of the *Asphalt QMS Manual*.
 18 Minimum density requirements for all mixes will be as specified in Table 610-7. Density
 19 acceptance will be as provided in Section 10 of the *Asphalt QMS Manual*.

20 A failing lot for density acceptance purposes is defined as a lot for which the average of all
 21 test sections, and portions thereof, fails to meet the minimum specification requirement. If
 22 additional density sampling and testing, beyond the minimum requirement, is performed and
 23 additional test sections are thereby created, then all test results shall be included in the lot
 24 average. In addition, any lot or portion of a lot that is obviously unacceptable will be rejected
 25 for use in the work.

26 If the Engineer determines that a given lot of mix that falls in the New category does not meet
 27 the minimum specification requirements but the work is reasonably acceptable, the lot will be
 28 accepted at a reduced pay factor in accordance with the following formula. The reduced pay
 29 factor will apply only to the mix unit price.

$$\text{Reduced Pay Factor} = 100 + \left[\left(\frac{\text{Actual Density} - \text{Specified Density}}{2} \right) \times 30 \right]$$

Where:

Actual Density = the lot average density, not to exceed 2.0% of the specified density

Specified Density = the density in Table 610-6 or as specified in the contract

30 All failing lots in the Other category will be evaluated for acceptance in accordance with
 31 Article 105-3.

32 Any density lot not meeting minimum density requirements detailed in Table 610-6 will be
 33 evaluated for acceptance in accordance with Article 105-3. If the lot is determined not to be
 34 acceptable, the mix will be removed and replaced with mix meeting and compacted to the
 35 requirement of these *Standard Specifications*.

36 **610-15 MAINTENANCE**

37 Maintain the plant mix pavement in an acceptable condition until final acceptance of the
 38 project. Immediately repair any defects or damage that may occur. Perform maintenance to
 39 damaged or defective pavement and repeat as often as may be necessary to keep the base or
 40 pavement in an acceptable condition.

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1 **610-16 MEASUREMENT AND PAYMENT**

2 *Hot Mix Asphalt Pavement* will be paid at the contract unit price per ton that will be the actual
3 number of tons of each type of hot mix asphalt pavement incorporated into the completed and
4 accepted work in accordance with Article 106-7.

5 No direct payment will be made for providing and using the materials transfer vehicle or any
6 associated equipment, as the cost of providing same will be included in the contract unit bid
7 price per ton for the mix type to be placed.

8 Any reduction in pay due to failing density will be in addition to any reduction in pay due to
9 failing mix property test results on the same mix.

10 A high frequency of asphalt plant mix or density deficiencies may result in future deficient
11 asphalt being excluded from acceptance at an adjusted contract unit price in accordance with
12 Article 105-3. This acceptance process will apply to all asphalt produced or placed and will
13 continue until the Engineer determines a history of quality asphalt production and placement
14 is reestablished.

15 Furnishing asphalt binder will be paid as provided in Article 620-4 for *Asphalt Binder for*
16 *Plant Mix* for each grade required.

17 Provide the work and materials required in the correction of defective work or sand seal base
18 course as required at no cost to the Department. If the Engineer has such work performed
19 with Department forces and equipment, the cost of such work performed by Department
20 forces will be deducted from monies due or to become due to the Contractor.

21 No direct payment will be made for final surface testing covered by this section. Payment at
22 the contract unit prices for the various items covered by those sections of the *Standard*
23 *Specifications* directly applicable to the work constructed will be full compensation for all
24 work covered by Article 610-13 including, but not limited to, performing testing in
25 accordance with this Specification, any corrective work required as a result of this testing and
26 any additional traffic control as may be necessary.

27 Payment will be made under:

Pay Item	Pay Unit
Asphalt Concrete Base Course, Type B25.0B	Ton
Asphalt Concrete Base Course, Type B25.0C	Ton
Asphalt Concrete Intermediate Course, Type I19.0B	Ton
Asphalt Concrete Intermediate Course, Type I19.0C	Ton
Asphalt Concrete Intermediate Course, Type I19.0D	Ton
Asphalt Concrete Surface Course, Type S4.75A	Ton
Asphalt Concrete Surface Course, Type SF9.5A	Ton
Asphalt Concrete Surface Course, Type S9.5B	Ton
Asphalt Concrete Surface Course, Type S9.5C	Ton
Asphalt Concrete Surface Course, Type S9.5D	Ton

28 **SECTION 620**
29 **ASPHALT BINDER FOR PLANT MIX**

30 **620-1 DESCRIPTION**

31 Perform the work covered by this section including, but not limited to, furnishing of asphalt
32 binder, with anti-strip additive when required, at an asphalt plant and incorporating the asphalt
33 binder and anti-strip additive into the asphalt plant mix.