CITY OF LINCOLN, NEBRASKA, STANDARD SPECIFICATIONS

CHAPTER 6

ASPHALTIC CONCRETE CONSTRUCTION

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CHAPTER 6

ASPHALTIC CONCRETE CONSTRUCTION

6.00 GENERAL

This Work shall be defined as the construction of a completely new pavement structure or reconstruction of an existing pavement including earthwork, appurtenances, and all related construction required to connect to existing pavement around the limits of construction.

Patching shall be defined as pavement replacement of areas requiring small quantities of asphaltic concrete per placement such as utility crossing repair or larger quantity placements such as longitudinal cuts for utility work not requiring curb to curb asphalt replacement, and for other similar situations.

Asphaltic Concrete Pavement shall be defined as Class 1, an asphaltic concrete wearing surface placed on a Portland Cement Concrete (PCC) base or Class 2, an asphaltic concrete wearing surface placed on an asphaltic concrete base. The pavement structure shall be designed in conformance with Lincoln Standard Plans. The wearing surface and asphaltic concrete base shall be of a type or types of asphaltic concrete as shown on the plans and which meet the Mix Design and Aggregate Criteria requirements described below unless otherwise specified.

The thickness of the wearing surface or overlay shall be as shown on the plans or approved by the City's Project Manager. The base shall be of a thickness as shown on the plans. Lift thickness of the first asphaltic concrete base lift shall be between 3" and 5" after compaction to required density. All subsequent asphaltic concrete base lifts shall be between 1 1/2" and 3" in thickness after compaction to required density. PCC base shall meet the requirements of Chapters 3 and 5 of these Standard Specifications.

Asphaltic Concrete shall consist of an intimate mixture of naturally occurring mineral aggregates of required gradations and asphalt binder content as hereinafter specified. Unless otherwise specified or approved by the City Engineer, neither industrial nor manufacturing byproducts will be allowed in the mixture. Reclaimed Asphalt Pavement (RAP) and Recycled Asphalt Shingles (RAS) shall be allowed as described later in these Standard Specifications.

Asphaltic Concrete mixtures shall be classified as:

Type 1 - for use as surface course on arterial streets
Type 2 - for use as surface course on non-arterial streets
Type 3 - for use as surface and base on streets, parking lots, temporary pavement, and patching
Type 4 - for use as thin lift course when directed by the City Engineer

The factor of 141 pounds per cubic foot shall be used to compute asphaltic concrete quantities of all types for design purposes.

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6.01 MATERIALS

A. ASPHALT BINDER

The suppliers for asphalt binder used in City of Lincoln projects shall be certified by the Nebraska Department of Transportation (NDOT) to supply Performance Graded Binder in Nebraska.

The asphalt binder for all mixes shall conform to the requirements of AASHTO M 320 or AASHTO M 332 for Performance Graded Asphalt Binder and must meet all requirements for use on NDOT projects. The PG Binder shall meet or exceed both the upper and lower temperature targets of the PG Binder grades as shown in Table 6.02 A of these Standard Specifications unless directed otherwise by the City Engineer.

In addition, unless otherwise specified or directed by the City Engineer, the PG Binder shall be a binder which incorporates a blend of base asphalt and elastomeric modifiers of styrene-butadiene (SB), styrene-butadiene-styrene (SBS) or styrene-butadiene-rubber (SBR).

The composite material shall be thoroughly blended at the asphalt refinery or terminal prior to being loaded into the transport vehicle. The polymer modified binder shall be heat and storage stable and shall not separate when handled and stored per the supplier's storage and handling recommendations.

A Material Certification from the PG Binder Supplier shall be submitted prior to construction. The Material Certification must state that acid has not been used. The Material Certification must also state that the material has not been air blown or oxidized.

If, based on moisture susceptibility test results, the Contractor elects to use a City Engineer approved anti-stripping additive in the mix, it shall be added to the binder by the PG Binder Supplier at the rate which will result in a minimum TSR value of 80 in the mix and shall be subsidiary to the bid price of the asphaltic concrete. The type and percentage of additive shall be shown on the material certification accompanying the binder delivered to the plant.

B. TACK COATS

1. Rapid-Curing Cut-Back Asphalts

The rapid curing cut back asphalts to be used as tack coats shall conform to the requirements of AASHTO M 81, Cut Back Asphalt (Rapid Curing Type).

This Specification covers liquid petroleum products, produced by fluxing an asphaltic base with suitable petroleum distillates.

2. Emulsified Asphalts

Emulsified asphalts shall conform to the following Specifications:

ASTM D977	-	Standard Spec. for Emulsified Asphalts
ASTM D2397	-	Standard Spec. for Cationic Emulsified Asphalts
ASTM D140	-	Standard Practice for Sampling Bituminous Materials
ASTM D244	-	Standard Testing Emulsified Asphalts

Emulsified asphalts covered by these Standard Specifications shall be diluted in the distributor with sufficient potable water to reduce the asphalt residue in the mixture to approximately 30%. Emulsified asphalt shall be homogeneous within 30 days after delivery. If separation of the emulsified asphalt has not been caused by freezing, thorough mixing shall be used to achieve a homogeneous mixture.

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6.01 MATERIALS (Continued)

C. MINERAL AGGREGATES

1. General

Mineral aggregates for asphaltic concrete shall conform to the following requirements except where modified herein:

ASTM D692	-	Standard Specification for Coarse Aggregate for Bituminous Paving Mixture
ASTM D1073	-	Standard Specification for Fine Aggregate for Bituminous Paving Mixture
ASTM D242	-	Standard Specification for Mineral Filler for Bituminous Paving Mixture

Mineral aggregates shall be crushed rock, broken stone, crushed gravel, sand-gravel, coarse sand, fine sand or a mixture of these materials composed of clean, hard, durable, and non-coated particles, free from injurious quantities of clay, dust, soft or flaky particles, loams, shale, alkali, organic matter, or other deleterious material. Chat or coal sand will not be allowed in any mix.

Crushed rock shall be crushed limestone, granite, quartzite, or other ledge rock approved for the intended purpose by the City Engineer and shall not contain deleterious substances in a quantity exceeding 3.5% of any combination of shale, clay lumps, coal, or soft particles with shale and clay lumps not to exceed one and 1.5%.

The absorption of water by crushed rock for use in asphaltic concrete shall not exceed 3.2% by weight.

The mineral aggregate from different sources of supply shall not be mixed or stored in the same pile, nor used alternately in the same class of construction or mixed without permission from the City's Project Manager. All fractions of a crushed rock gradation shall be produced from the same type of material.

The chemical and physical characteristics of the fraction passing the #4 sieve shall be substantially the same as those of the material which may be produced in the laboratory from the fraction which is retained on the #4 sieve.

Mineral aggregates shall have a soundness loss of not more than 12% by weight at the end of 5 cycles using sodium sulfate solution.

Mineral aggregates shall be tested prior to use and shall conform to the above requirements based on the following test designations.

ASTM C127	-	Specific Gravity & Absorption of Coarse Aggregates
ASTM D75	-	Standard Practice for Sampling Aggregates
ASTM C136	-	Standard Test Method for Sieve Analysis of Fine & Coarse Aggregates
ASTM D546	-	Standard Test Method for Sieve Analysis of Mineral Filler for Bituminous Paving Mixtures
ASTM C128	-	Specific Gravity & Absorption of Fine Aggregates
ASTM C131	-	Standard Test Method for Resistance to Degradation of Small Size Coarse Aggregate by Abrasion Impact in the Los Angeles Machine

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C. MINERAL AGGREGATES (Continued)

1. General (Continued)

ASTM C88 - Standard Test Method for Soundness of Aggregate
ASTM D693 - Standard Spec. for Crushed Aggregate for Macadam Pavements

2. Mineral Fillers

Mineral filler shall consist of pulverized soil, pulverized crushed rock, broken stone, gravel, sand-gravel, sand, or a mixture of these materials that conforms to the following requirements:

TABLE 6.01A – MINERAL FILLER REQUIREMENTS

Criteria	Minimum	Maximum
Total Percent Passing the #50 (300 µm) Sieve	95	100
Total Percent Passing the #200 (75 µm) Sieve	80	100
Plasticity Index non-soil material passing #200 (75 µm)	0	3
Plasticity Index for Soil	0	6

D. RECLAIMED ASPHALT PAVEMENT (RAP)

Reclaimed Asphalt Pavement (RAP) may come from the job site or the Contractor's stockpile. In either case, the Contractor will be responsible for quality and for testing the RAP prior to use. Tests shall include at a minimum, AC content and gradation. Test results shall be reported to the City's Project Manager for approval prior to use.

E. RECYCLED ASPHALT SHINGLES (RAS)

Recycled Asphalt Shingles (RAS) may be used in Asphaltic Concrete and must meet Nebraska Department of Transportation (NDOT) requirements.

F. NON-WOVEN PAVEMENT OVERLAY FABRIC

Non-woven overlay fabric shall be furnished by an ISO approved manufacturer of polypropylene or polyester geo-synthetic fabric and shall be needle punched and heat treated on one side, recyclable, millable, and shall conform to the following requirements:

TABLE 6.01B – NON-WOVEN PAVEMENT OVERLAY FABRIC

PROPERTY	MINIMUM	ASTM
Mass, oz./sq. yd.	4.1	D 5261
Tensile Strength, lb.	90	D 4632
Elongation at Break, %	>25%	D 4632
Melting Point	320° F	D 276
Asphalt Retention, gal./sq. yd.	0.2	D 6140

Acceptance shall be based upon manufacturer's certification of conformity.

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6.02 ASPHALTIC CONCRETE MIXTURES

A. GENERAL

Asphaltic concrete mixtures shall be designed by the Contractor to meet the Mix Design Criteria for the appropriate mix types as shown in these Standard Specifications.

Unless otherwise specified or approved by the City Engineer, Asphaltic Concrete for Type 1 Mix shall meet or exceed all of the requirements for "Superpave-SPH" as described in these Standard Specifications.

Unless otherwise specified or approved by the City Engineer, Asphaltic Concrete for Mix Types 2 and 3 shall meet or exceed all of the requirements for "Superpave-SPR" as described in these Standard Specifications.

Unless otherwise specified or approved by the City Engineer, Asphaltic Concrete for Mix Type 4 shall meet or exceed all of the requirements for "Superpave-SLX" as described in these Standard Specifications.

TABLE 6.02A – ASPHALTIC CONCRETE MIX REQUIREMENTS SUMMARY

Type (Use)	* Mix Requirements	AC Grade M320 M332	Aggregate Blend		
			% RAP	Virgin Agg.	Gradation Requirements
1 Surface Course Arterial Streets	SPH (Superpave) 5.3%@1/2" 5.5%@3/8"Min. AC by weight of mix	PG 70-34 PG 58E-34	25% Max	Limestone 90% Max.	1/2"(0.500) Band Or 3/8"(0.375) Band (Superpave)
2 Surface Course Non-Arterial Streets	SPR (Superpave) 5.2% Min. AC by weight of mix	PG 64-34 PG 58V-34	35% Max	Limestone 95% Max.	SPR Band (Superpave)
** 3 Surface and Base Lifts, Parking Lots, Temporary Pavement, and Patching	SPR (Superpave) 5.2% Min. AC by weight of mix	PG 64-34 PG 58V-34	50% Max	Limestone 95% Max.	SPR Band (Superpave)
4 Thin Lift	SLX (Superpave) 5.5% Min. AC by weight of mix	*** PG 64-34 PG 58V-34	20%Min 35%Max	**** Crushed Rock Chips 20% Min.	SLX Band (Superpave)

* % AC shall be determined by ignition oven results.
** Type 3 mixtures will not require mix design verification testing by the City but Contractor's mix design data must be approved by the City Engineer prior to use.
*** 0.7% of an approved amine-base WMA additive.
***** Min. 45% Retained on #4 sieve/ Max 5% passing #200 sieve.

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B. SUPERPAVE VOLUMETRIC MIX DESIGN

The Contractor will be required to define properties using a gyratory compactor that has met the Superpave evaluation test procedures, according to the gyration levels indicated for the mix type specified.

The mix formula shall be determined by the Contractor from a mix design for each mixture. A volumetric mixture design in conformance with the latest edition of the Asphalt Institute Publication, SP-2 will be required. However, the mixture for the Superpave specimens and maximum specific gravity mixture shall be short-term aged for two hours. Mixing and compaction temperatures shall be in conformance with the latest NDOT specifications.

The following test procedures shall apply:

AASHTO R 30	-	Practice for Short and Long-Term aging of Hot Mix Asphalt
AASHTO R 35	-	Superpave Volumetric Design For Hot Mix Asphalt (HMA)
AASHTO T 84	-	Specific Gravity and Absorption of Fine Aggregate
AASHTO T 85	-	Specific Gravity and Absorption of Coarse Aggregate
AASHTO PP 19	-	Practice for Volumetric Analysis of Compacted Hot Mix Asphalt
AASHTO T 312	-	Method for Preparing and Determining the Density of Hot Mix Asphalt Specimens by Means of the Superpave Gyratory Compactor
AASHTO T 209	-	Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
AASHTO T 283	-	Resistance of Compacted Bituminous Mixture to Moisture induced Damage

The optimum binder content shall be the binder content that produces required air voids, at Ndes, in the plant produced mix. The design shall have at least four points, including a minimum of two points above and one point below the optimum. The amount of un-compacted mixture shall be determined in conformance with AASHTO T 209.

Each Superpave mixture shall be tested by the Contractor for moisture susceptibility in conformance with AASHTO T 283. The loose mixture shall be short-term aged for 2 hours in conformance with AASHTO R30. The 6" specimens shall be compacted in conformance with AASHTO T 312 to 7% air voids at 95-mm in height and evaluated to determine if the minimum Tensile Strength Ratio (TSR) of 80% has been met. If the mixture has not met the minimum TSR value, the Contractor shall have the option of modifying the mixture, as approved by the City Engineer, and retesting to verify that the minimum TSR of 80% has been achieved or by having an approved liquid anti-stripping additive added to the PG Binder, by the PG Binder Supplier, at a dosage rate, such that the mix will meet the minimum TSR of 80%.

All data shall be submitted with the mix design for approval. During production, the Contractor may be required by the City's Project Manager, to provide and test additional specimens of the plant produced asphaltic concrete for moisture susceptibility. A TSR test result of less than 80% will require mixture modification(s) and a sample from subsequent lots will be tested by the Contractor until a TSR value of at least 80% is achieved.

Changes in the types or sources of aggregates or binder may require a new job mix formula, mix design, and moisture susceptibility test. If required, the new proposed job mix formula shall be in conformance with the requirements as stated above and submitted 5 working days prior to use for approval.

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B. SUPERPAVE VOLUMETRIC MIX DESIGN (Continued)

1. MATERIALS SAMPLING AND TESTING

At the beginning of each year and at least 14 days before production of asphaltic concrete, the Contractor shall submit, in writing, a tentative job mix formula and material samples as described below, for approval, to the City Engineer. The job mix formula shall identify the mineral aggregates and mineral filler, if needed, with the value of the percent passing each specified sieve for the individual and blended materials.

A 65-pound bag of each of the individual mineral aggregates and RAP, if used, shall also be submitted to the City Engineer at this time. Each sample shall be marked to clearly indicate the type of material, name of the producer, and the pit location.

The Contractor shall submit, to the City Engineer, three proportioned 10,000-gram samples of the blended aggregates and a 1-gallon sample of the asphalt binder to be used in the mixture. Whenever RAP is used, it shall be processed through an ignition oven and then combined proportionally with the virgin aggregate in one of the 10,000-gram samples. The remaining two 10,000-gram samples shall be made up of the unprocessed RAP combined proportionally with the virgin aggregate. Submitted with these samples shall be a copy of the mix design values obtained from tests performed by the Contractor. This mix design shall include at a minimum, the following information:

- The bulk specific gravity (Gsb) of the blended aggregate (The specific gravity shall be determined for the combined blend from the unwashed portion of the - #4 and the + #4 material in conformance with AASHTO T 84 & T 85 respectively)
- The target asphalt binder content by total mix
- The supplier, grade, and specific gravity of the PG Binder
- The maximum specific gravity of the combined mixture (Rice)
- The average bulk specific gravity and air voids at N initial (Nini), N design (Ndes), and N maximum (Nmax) of the compacted gyratory specimens
- Voids in the Mineral Aggregate (VMA) and Voids filled with Asphalt (VFA) at Ndes
- Fine Aggregate Angularity (FAA), Coarse Aggregate Angularity (CAA), Flat and Elongated Particles and Clay Content of the aggregate blend

2. MIX DESIGN CRITERIA

The design criteria for each mixture shall be determined from the following Tables.

The optimum binder content shall be the binder content that produces 4.0% air voids at Ndes for SPH mixes and 3.0% at Ndes for SPR and SLX mixes in the plant produced mix. Binder content shall be determined by ignition oven.

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B. SUPERPAVE VOLUMETRIC MIX DESIGN (Continued)

2. MIX DESIGN CRITERIA (Continued)

TABLE 6.02B – MINIMUM BINDER REQUIREMENTS

Mix Type	Minimum Binder Content (% by wt. of mix)
SPH	5.3%@1/2" and 5.5%@3/8"
SPR	5.2%
SLX	5.5%

TABLE 6.02C – GYRATORY COMPACTION EFFORT

Asphaltic Concrete Type	Nini	Ndes	Nmax
SPH	8	95	150
SPR	7	65	100
SLX		50	

Average Design High Air Temperature = <39° C (102° F)

TABLE 6.02D – GYRATORY COMPACTION TEMPERATURE

Mix Type	% RAP	COMPACTION TEMP. ° F
SPH	0-35	300 ± 5
SPR	0-35	280 ± 5
	36-50	290 ± 5
SLX	20-35	280 ± 5

TABLE 6.02E – VOIDS IN MINERAL AGGREGATE*

Nominal Maximum Aggregate Size	Recommended VMA, Percent (Criteria at Ndes)
SPH	14.0
SPR	12.0
SLX	16.0

*For Design purposes only

TABLE 6.02F – VOIDS FILLED WITH ASPHALT*

Asphaltic Concrete Type	Recommended VFA, Percent
SPH	65 - 75
SPR	70 - 80
SLX	N/A

*For Design purposes only

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B. SUPERPAVE VOLUMETRIC MIX DESIGN (Continued)

3. AGGREGATE BLEND CRITERIA

a. Coarse Aggregate Angularity (CAA)

The coarse aggregate angularity value of the blended aggregate material shall meet or exceed the minimum values for the appropriate asphaltic concrete type shown in Table 6.02 G.

TABLE 6.02G – COARSE AGGREGATE ANGULARITY (ASTM D5821)

Asphaltic Concrete Type	CAA (minimum)
SPH	95/90*
SPR	83
SLX	N/A

*Denotes two faced crushed requirements

Aggregate obtained from the residue of the ignition process shall not be used for the determination of CAA for mix design approval except when RAP material is specified and must be combined with the proportioned amount of virgin aggregate as defined by the mix design.

b. Fine Aggregate Angularity (FAA)

The fine aggregate angularity value of the blended aggregate material shall meet or exceed the minimum values for the appropriate asphaltic concrete type shown in Table 6.02 H.

The specific gravity for calculation of the FAA shall be based on a combined aggregate sample of material passing the No. 8 sieve and retained on the No. 100 sieve.

TABLE 6.02H – FINE AGGREGATE ANGULARITY (AASHTO T304 METHOD A)

Asphaltic Concrete Type	FAA (minimum)
SPH	45.0
SPR	43.0
SLX	43.0

Aggregate obtained from the residue of the ignition process shall not be used for the determination of FAA for mix design approval except when RAP material is specified and must be combined with the proportioned amount of virgin aggregate as defined by the mix design.

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B. SUPERPAVE VOLUMETRIC MIX DESIGN (Continued)

3. AGGREGATE BLEND CRITERIA (Continued)

c. Flat and Elongated Particles

The coarse aggregate shall not contain flat and elongated particles exceeding the maximum value for the appropriate asphaltic concrete type shown in Table 6.02 I.

TABLE 6.02I – FLAT AND ELONGATED PARTICLES* (ASTM D4791)

Asphaltic Concrete Type	Percent, Maximum
SPH	10
SPR	10
SLX	10

*Criterion based on a 5:1 maximum to minimum ratio

d. Clay Content

The Clay Content of the blended aggregate material shall be such that the Sand Equivalent Minimum value for the appropriate asphaltic concrete type as shown in Table 6.02 J shall be met or exceeded.

TABLE 6.02J – SAND EQUIVALENT CRITERIA (AASHTO T176)

Asphaltic Concrete Type	Sand Equivalent, Minimum
SPH	45
SPR	45
SLX	45

e. Gradation

The blended aggregate shall conform to the gradation requirements specified below for the appropriate nominal size.

The dust to binder ratio is the ratio of the percentage by weight of aggregate finer than the No. 200 sieve to the asphalt content expressed as a percent by weight of total mix. The dust to binder ratio shall be between 0.7 and 1.7. This shall be verified during mix design approval and production sample testing.

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B. SUPERPAVE VOLUMETRIC MIX DESIGN (Continued)

3. AGGREGATE BLEND CRITERIA (Continued)

e. Gradation (Continued)

TABLE 6.02K – GRADATION CONTROL POINTS FOR SPH

	Control Points 0.500 Inch (% Passing)		Control Points 0.375 Inch (% Passing)	
Sieve	**Minimum**	**Maximum**	**Minimum**	**Maximum**
3/4 inch	100.0			
½ inch	90.0	100.0	100.0	
3/8 inch		90.0	90.0	100.0
No. 8	28.0	58.0	32.0	67.0
No. 16				
No. 30				
No. 50				
No. 200	2.0	10.0	2.0	10.0

TABLE 6.02L – GRADATION CONTROL POINTS FOR SPR

	Control Points (% Passing)	
Sieve	**Minimum**	**Maximum**
1/2 inch	100.0	
3/8 inch	81.0	96.0
No. 8	46.0	56.0
No. 50	12.0	21.0
No. 200	4.0	9.0

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B. SUPERPAVE VOLUMETRIC MIX DESIGN (Continued)

3. AGGREGATE BLEND CRITERIA (Continued)

e. Gradation (Continued)

TABLE 6.02M – GRADATION CONTROL POINTS FOR SLX

	Control Points (% Passing)	
Sieve	**Minimum**	**Maximum**
1/2 inch	98.0	100.0
3/8 inch	93.0	100.0
No. 4	70.0	87.0
No. 8	45.0	65.0
No. 16	25.0	41.0
No. 30	15.0	31.0
No. 50	10.0	21.0
No. 200	4.0	10.0

C. PRODUCTION SAMPLING AND TESTING

During production, asphaltic concrete shall be sampled and tested for acceptance by the City's Materials Lab on a lot basis. A minimum of one sample shall be required for each lot of asphaltic concrete. A lot is defined as each 500 tons or fraction thereof of each day's production. The location of the required samples shall be determined by the City's Project Manager.

Tests shall include the following:

AASHTO T209	-	Maximum specific gravity of the mix (Rice)
ASTM C136	-	Standard Test Method for Sieve analysis of Fine and Coarse Aggregate
AASHTO T312	-	Method for Preparing and Determining the Density of Hot Mix Asphalt (HMA) Specimens by Means of the Superpave Gyratory Compactor
AASHTO T166	-	Bulk Specific Gravity of compacted Bituminous Mixtures using saturated surface-dry specimens
AASHTO T308	-	Determining the Asphalt Binder Content of Hot Mix Asphalt (HMA) by the ignition method

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C. PRODUCTION SAMPLING AND TESTING (Continued)

TABLE 6.02N – ASPHALTIC CONCRETE PRODUCTION TOLERANCES

Test	Mix Type		
	SPH	**SPR**	**SLX**
AC(None)	5.3%@1/2" Min, 5.5%@3/8" Min.	5.2% Min.	5.5% Min.
Air Voids	4% (+/- 1%)	3% (+/- 1%)	3% (+/- 1%)
FAA (cold feed)	45 Min. (-0.50)	43 Min. (-0.20)	43 Min. (-0.20)
FAA (ignition oven)	45 Min (-1.00)	43 Min. (-0.50)	43 Min. (-0.50)

If at the end of the day's production, the tolerances in Table 6.02 N are exceeded, the Contractor will not be allowed to resume production until corrective adjustments are made to the mix design.

Mix adjustments at the plant are authorized within the limits shown in Table 6.02 O without redesigning the initially approved mix.

The adjustment must produce a mix with the percent air voids and all other properties as stated in these Standard Specifications.

All adjustments must be reported to the City Engineer.

The adjustment values in Table 6.02 O will be the tolerances allowed for changes indicated by production or mix design test results, but cannot deviate from Superpave gradation criteria.

Mix adjustments for individual aggregates, including RAP, greater than 25% of the original verified mix design proportion or greater than 5% change in the original verified mix design percentage, whichever is greater, may require the Contractor to submit a new mix design, as determined by the City Engineer. The Contractor is responsible for requesting new mix design targets as they approach these tolerances, failure to do so may result in a suspension of operations until a new mix design is approved.

TABLE 6.02O – AGGREGATE ADJUSTMENT TOLERANCE

Aggregate Adjustments	
Sieve Size	**Adjustment Range**
1", 3/4", 1/2", 3/8", No. 4	± 6%
No. 8, No. 16, No. 30, No. 50	± 4%
No. 200	± 2%

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6.03 EQUIPMENT

A. GENERAL

All equipment, tools and machinery shall be adequate for the purpose for which it is to be used, and shall be maintained in satisfactory working condition at all times. The equipment shall be at the Work site sufficiently in advance of construction operations to be thoroughly examined and approved by the City's Project Manager. The Contractor shall furnish the necessary accessories, equipment data, and assistance required by the City's Project Manager for making tests and calibrations on equipment.

The Contractor shall furnish the necessary accessories and personnel and shall perform calibrations on the equipment. Copies of the calibration data shall be provided to the City's Project Manager before production of Asphaltic Concrete. In the event problems are encountered during the calibrations, the Contractor shall arrange for a trained technician or company representative of the company from which the equipment was obtained to make the necessary repairs and/or adjustments to the equipment. Calibrations shall be made as often as is deemed necessary by the City's Project Manager to ensure accuracy of the equipment.

In the event that a Contractor elects to obtain asphaltic concrete from a commercial plant not under his direct control, he shall reach agreement with the commercial producer to perform the above functions in the same manner as though the plant was under his direct control. The Contractor shall also reach agreement with the producer to furnish or shall arrange to have furnished an approved building for use by the City Engineer if deemed necessary by the City's Project Manager.

B. MIXING PLANT

1. General

The equipment that is used for heating, proportioning, and mixing the aggregates and asphalt cement shall be able to produce a uniform mixture.

The dryers shall be able to dry and heat all aggregates to the required temperatures with positive control. Aggregates shall be agitated continuously during the process of heating. Damage to the asphalt cement in dryer-drum type mixing plants shall be avoided.

Salvaged bituminous material shall not be exposed to open flame.

Continuous temperature and time readings of the asphaltic materials shall be electronically recorded whenever the plant is operated. A copy of the temperature reading shall be made available to the City's Project Manager. Temperature and time displays shall be easily accessible. Temperature and time sensors will be provided at the following locations:

a. Inside the asphaltic concrete mixture discharge chute.
b. Inside the surge bin.
c. Inside the asphalt cement storage tank.

During storage, the asphalt cement temperature shall be maintained between 250° F and 350° F or at the storage temperature range recommended by the binder supplier. All plants shall be equipped with a circulating system for asphalt cement which is designed to assure proper and continuous circulation during the operating period. Storage tanks shall have sufficient capacity to provide for continuous operation. The tanks shall be situated and constructed to allow the volume of the asphalt cement to be safely and accurately determined at any time.

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6.03 EQUIPMENT (Continued)

B. MIXING PLANT (Continued)

1. General (Continued)

If the plant is equipped with a surge bin for the temporary storage of asphaltic concrete, the asphaltic concrete taken from the surge bin will not differ significantly from the material taken directly from the plant. The first material entering the bin will be the first material removed. The surge bin shall be completely emptied at the end of each operating day unless insulated or heated.

All plants shall be equipped with a continuously operated dust collector. The collected material may be wasted or returned to the mix.

Mineral filler bins shall be protected from moisture.

2. Pug-mill Plants

a. General

Pug-mill plants shall include cold aggregate feeders, oversize screens, storage bins for dried aggregate, ingredient proportioning devices, and all other equipment necessary to produce the specified mixture. The pug-mill blades shall have a minimum clearance of 3/4" from all fixed and moving parts. The mixer shall be equipped with a discharge hopper holding approximately 1 ton of hot mixture and capable of intermittent discharge.

b. Batch Plants

Batch plants shall have an accurate time lock to control the operations during a complete mixing cycle. They shall lock the scale box gate after the charging of the mixer until the closing of the mixer gate at the completion of the cycle. They shall lock the bituminous material bucket throughout the dry mixing period and shall lock the mixer gate throughout the dry and wet mixing periods.

The dry mixing period is defined as the time between the opening of the scale box gate and the addition of bituminous material. The wet mixing period is the interval of time between the addition of bituminous material and the opening of the mixer gate.

The control of the timing shall be flexible and capable of being set at 5-second intervals or less throughout a total cycle of not less than 3 minutes. A mechanical batch counter shall be installed as a part of the timing device and shall be designed and constructed to register only upon the release of the bituminous material. It shall not register any dry batches or any material wasted through the bins. The timing device shall have a suitable case with a locking door that shall always be kept closed and locked except when adjustments or repairs are required.

All batch plants shall be equipped with an asphalt cement volume meter or a heated or insulated asphalt bucket with scales.

Scale hoppers and scales for proportioning aggregates and asphalt to the batch plant's mixer shall be accurate within 0.5%; and they shall be sensitive within 0.2% or 2 pounds, whichever is greater, throughout the range of use.

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6.03 EQUIPMENT (Continued)

B. MIXING PLANT (Continued)

2. Pug-mill Plants (Continued)

c. Continuous Type

Plants shall be equipped with a pump synchronized to the feeding mechanism so that the required percentage of asphalt cement is applied continuously and uniformly. The feeding system shall be synchronized to the rest of the plant.

3. Dryer-Drum Plants

These plants shall include cold aggregate feeders, vibratory screening units for removing oversize material from both virgin and reclaimed material, proportioning devices for controlling the quantity of each ingredient in the mixture, and any other equipment necessary to produce the mixture as specified.

Plants shall be equipped with a pump synchronized to the feeding mechanism so that the required percentage of asphalt cement is applied continuously and uniformly. The feeding system shall be synchronized to the rest of the plant.

C. TRUCK SCALES

Truck scales shall be furnished by the Contractor for weighing loaded trucks at the plant site, and shall be installed on adequate foundations and in conformance with the manufacturer's recommendations. The scales shall have sufficient capacity to weigh the maximum axle, combination of axles or gross load used and shall be accurate to 0.5% of the total axle load or total load.

Scales shall be properly calibrated by the Contractor in the presence of the City's Project Manager unless the scales have current Nebraska Department of Agriculture inspection approval or unless calibration and adjustment by a recognized scale company service crew has been performed during the current season, and attested to by the City's Project Manager. The scales shall be periodically cross checked for accuracy during the course of the Work by checking the net weight of loads of the material being produced on commercial scales in the vicinity of the project which have current agriculture inspection approval. The Contractor shall furnish at least (10) 50-pound weights for checking the accuracy of the scales. If the scale is not capable of weighing all axles at one time, the approaches shall be extended so the entire hauling unit will be level during weighing. Chuck holes, ruts or high spots in the approaches which develop during hauling operations shall be immediately repaired as directed by the City's Project Manager.

All weighing shall be done with the hauling unit stationary, level, and out of gear. Suitable protection shall be provided against wind currents that may affect the accuracy of the scales. The platform of the scale shall be kept clean and free from accumulations of materials, as directed by the City's Project Manager.

Serially numbered duplicated scale tickets shall be furnished to accompany each truck load of material to the unloading point. Scale tickets shall reflect the date, time, load number, total weight, tare weight, project number, mix type, destination, and net weight.

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6.03 EQUIPMENT (Continued)

D. DISTRIBUTORS

Whenever the use of a distributor is required, that piece of equipment shall be manufactured expressly for the purpose of applying heated asphaltic materials by pressure spray applications. Improvised equipment, such as converted road oilers, will not be acceptable. The distributor shall be so designed as to permit the application of heated asphaltic material in a uniform spray without atomization at the rate, temperature, and pressure required. The distributor shall be equipped with a tachometer registering revolutions per minute and so located as to be visible to the driver in order that the driver may maintain the constant speed required for the specified rate of application. The distributor shall be mounted on a motor truck or trailer, equipped with pneumatic tires. The pump shall be equipped with a meter registering the number of gallons (liters) per minute passing through the nozzle and this meter must be visible to the operator. The distributor shall be equipped with an accurate thermometer which indicates the temperature of the asphaltic materials at all times. The distributor shall be equipped with a full circulating spray bar and shall be provided with hand nozzles to permit application to areas not accessible to the spray bar. The distributor shall be equipped with a drip tray or other suitable means of preventing the dripping of material after the flow has been shut off.

E. ASPHALT SPREADER AND FINISHER

The mechanical asphalt spreader and finisher shall be self-propelled and shall be designed and equipped to spread upon the prepared surface without segregation of the mixture, a tamped and finished wearing surface of asphaltic concrete free from hollows and humps.

The machine shall be equipped with a hopper to receive the asphaltic concrete as it is dumped from the trucks and shall be designed so as to prevent the mixture from being deposited directly on the base or previously laid courses. The hopper shall have a suitable device to distribute the mix evenly across the full width of the screed. The machine shall be equipped with means of adjusting the thickness of the mat, and the transverse and longitudinal grade. It shall be equipped with a tamping or vibrating screed which shall be operated during the lay down process to compact the applied material to a uniform density. No part of the machine shall travel on the freshly laid material. There shall be auxiliary attachments for the machine so that it may be adjusted to lay widths as approved by the City's Project Manager.

F. ROLLERS

The number and type of rollers furnished shall be adequate to produce the specified density and a satisfactory surface. Rubber tire rollers will not be allowed for compaction of SLX Asphaltic Concrete.

Wheels of all rollers shall be smooth and free from openings or projections which would mar the surface of the Work. They shall be equipped with suitable devices necessary to prevent adhesion of bituminous material to the wheels. The rollers shall be equipped with water tanks for wheel sprinkling devices that extend the full width of each roller, and drip pans designed so as to prevent oil, grease, gas or diesel oil from spilling or dripping onto the asphaltic concrete surface.

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6.03 EQUIPMENT (Continued)

G. SURFACE MILLING MACHINE

The milling shall be done with a commercially manufactured machine able to perform this work to the City's Project Manager's satisfaction. The milling machine shall be self-propelled and shall have sufficient power, traction, and stability to maintain an accurate depth of cut. Pavement removal by scarifying, motor grading or heating will not be allowed as milling.

The milling machine shall be equipped with automatic controls for establishing profile grades at each edge of the machine. The reference shall be the existing pavement or taut reference lines erected and maintained by the Contractor true to line and grade. A single reference may be used if the machine can maintain the designated transverse slope.

When referenced from existing pavement, the cold milling machine shall be controlled by a self-contained grade reference system provided by the machine's manufacturer for that purpose. The sensing point shall react to compensate for 25% of the actual change in elevation due to a hump or dip that is 3' (900 mm) or less in length. The self-contained grade reference system shall be used at or near the centerline of the street. On the adjacent pass with the milling machine, a joint matching shoe may be used.

Broken, missing, or worn teeth shall be replaced if the machine is unable to maintain the surface texture requirements.

The machine shall be equipped with a loading elevator to remove the milled material from the street surface.

The machine shall be equipped with means to effectively control dust generated by the cutting operation.

H. TRUCKS

Numbered trucks having tight, clean, smooth beds shall be used for transporting the freshly prepared asphaltic concrete to the site of the Work. The beds shall be sprayed, when necessary, to prevent the asphaltic concrete mixture from adhering to the bed, with a minimum quantity of approved lubricant. The equipment used and the frequency of spraying shall be determined by the City's Project Manager.

All trucks shall be equipped with a suitable waterproof canvas cover to protect the material as required by the City's Project Manager. Any truck that causes excessive segregation of materials by the action of its spring suspension or other contributing factors, or that causes undue delays, shall not be used for transporting the asphaltic concrete mixtures. All truck beds shall be so constructed that they may be insulated, when necessary. All truck boxes shall be equipped with box vibrators.

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6.04 CONSTRUCTION METHODS

A. SUBGRADE

No measurement or direct payment shall be made for preparation of subgrade. The cost of preparation of subgrade shall be considered subsidiary to the other items of Work for which direct payment is made. Subgrade shall be prepared as described in Chapter 2 of these Standard Specifications.

B. CLEANING

Prior to the application of asphaltic materials on existing base, the surface on which the asphalt is to be placed shall be thoroughly cleaned by means of mechanical sweepers, street flushers, shovels, scrapers, and hand brooms as is necessary to remove all mud, matted earth, dust and other foreign materials. Power sweeping shall be conducted in such a manner as to keep dust and debris under control and cause a minimum of disturbance to surrounding areas. Material cleaned from the surface shall be removed and disposed of by the Contractor.

The cost of cleaning the existing surfaces to which asphalt is to be applied shall be considered subsidiary to other items for which payment is made.

C. SURFACE MILLING

Surface milling, where required, shall consist of removing and salvaging existing surfacing material to a depth and width as shown in the plans or as directed by the City's Project Manager. Surface milling shall not take place until all curb and gutter and all curb ramps adjacent to the area to be milled are complete unless otherwise approved by the City's Project Manager. Unless otherwise stated in the contract documents, the Contractor shall take possession of and promptly remove from the project all pavement millings which result from the performance of this work.

The interface between the surface milled area and the concrete gutter pan shall be cleaned of all old asphalt and maintained to provide a smooth, straight, and vertical surface.

The Contractor shall be responsible for location and protection of all manholes, valve boxes, and all other appurtenances, some of which may be below the surface of the street, and to protect equipment from the danger of striking same. Claims for any and all damages arising from hitting these appurtenances shall be the Contractor's responsibility. The Contractor shall have access to applicable records; however, the Contractor shall not rely upon these records to reveal all such hidden appurtenances.

The Contractor shall be held responsible for all appurtenances in the pavement surface which have been damaged or disturbed by the Contractor. The cost of repairing or replacing these damaged appurtenances shall be made at the Contractor's expense.

1. BASIS OF PAYMENT

SURFACE MILLING, completed in conformance with the plans and Standard Specifications and accepted by the City's Project Manager, shall be measured and paid for at the contract unit price bid per square yard. Such payment shall be full compensation for all surface preparation, milling, removal of materials, labor, tools, equipment, clean up and incidentals necessary to complete the Work.

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D. CORRECTION OF PAVEMENT FAILURES

After the surface milling and cleaning have been accomplished, the City's Project Manager shall examine the pavement structure to which the asphaltic concrete is to be applied. Any pavement failures shall be repaired as designated by the City's Project Manager. The cost of repairing pavement failures shall be measured and paid for at the appropriate unit prices or shall be accomplished as an Extra Work Item.

E. TACKING

This Work shall consist of the application of asphaltic materials to previously prepared bases or existing surfaces.

After the surface is completely cleaned and dry it shall have a tack coat of rapid curing cut back asphalt or emulsified asphalt applied sufficiently in advance of the laying operation to break or cure prior to the application of the surface coat.

Traffic shall not be permitted on the tack coat without the permission of the City's Project Manager, and the asphalt surface course shall be applied as soon as the tack breaks and the water has evaporated. The rate of application generally should be from 0.05 to 0.2 gallons per square yard, with the rate of application to be approved by the City's Project Manager. Tack or asphaltic cement shall be applied by hand to all vertical edges.

The cost of supplying and applying tack coat will not be measured for payment. It shall be considered subsidiary for other items to which direct payment is made.

F. NON-WOVEN PAVEMENT OVERLAY FABRIC PLACEMENT

Non-woven pavement overlay fabric and asphaltic cement sealant shall be placed at locations called for on the plans. This Work shall consist of the application of an asphalt sealant and the placement of a non-woven pavement overlay fabric over the entire prepared surface of the pavement to be surfaced or resurfaced with asphalt. Sealants are applied both to seal the existing surface and to provide a cement to adhere to the fabric. Emulsified asphalts are not acceptable for sealant.

Sealant and fabric shall be placed only when the ambient air temperature is 50° F or above. The pavement surface on which the sealant fabric is to be placed shall be dry and free of dirt, debris and other foreign matter. Joint and crack openings of 1/8" and larger shall be filled with a suitable material as directed by the City's Project Manager. The asphalt sealant shall be applied with distributor equipment at a rate of 0.25 to 0.30 gallons per square yard. The width of the asphalt sealant application shall be the fabric width plus 2" to 6" or the entire width of the pavement to be surfaced. Temperature of the sealant shall be not less than 280° F at the time of application to ensure a uniform spray pattern.

No drilling or skipping shall be permitted. Asphalt drools or spills shall be cleaned from the pavement surface to avoid flushing and possible fabric movement at these asphalt rich areas. Fabric lay-down equipment shall be used for placement of the fabric. Overlap of fabric joints shall be 1 to 3 inches.

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F. NON-WOVEN PAVEMENT OVERLAY FABRIC PLACEMENT (Continued)

Immediately after the placement, the fabric shall be embedded into the asphalt cement sealant with a pneumatic roller, unless otherwise directed by the City's Project Manager. The construction of the asphaltic concrete overlay shall follow closely the placement of the fabric. In the event the sealant bleeds through the fabric before the overlay is placed, the Contractor shall be required to spread a thin layer of sand or asphaltic concrete over the affected areas in order to prevent the fabric from being picked up by the construction equipment. The application of tack coat will not be required on the fabric prior to the placement of the asphaltic concrete unless a delay in the placement of the overlay results in the fabric becoming dry or dirty.

1. BASIS OF PAYMENT

Placement of the non-woven pavement overlay fabric shall be measured and paid for at the contract unit price bid per square yard for the item NON-WOVEN PAVEMENT OVERLAY FABRIC. Such payment shall be full compensation for cleaning and preparing the pavement surface, filling joint and crack openings; for furnishing, heating, and applying the asphalt sealant; for placement and rolling of the fabric; for furnishing and applying material for blotting the surface of the fabric as required; and for all equipment, labor, tools, and incidentals required to complete the Work.

G. HAULING

Every truck used to haul asphaltic concrete shall be equipped with a suitable water proof cover. The truck beds shall be clean and shall be constructed so that all materials remain in the bed while the truck is in transit.

H. JOINTING

Longitudinal and transverse joints shall be made in such a manner that well bonded and sealed joints are achieved. Joints between old and new pavement shall be made in such a manner as to insure a thorough and continuous bond between the old and new surface.

Cold joints shall be painted with a light application of asphalt cement before the adjacent material is placed. When placing surface course, a hot joint between lane placements shall be maintained as directed by the City's Project Manager.

Joints in the surface course shall be formed by any approved method that will produce a dense vertical joint; otherwise the previously laid surface course shall be cut back to its full depth so as to expose a fresh surface, after which the hot mixture shall be placed in contact with it and raked to proper depth and grade.

I. SPREADING

Asphaltic concrete used in the construction of sections having a uniform width as shown in the typical cross section of the plans, shall be spread and finished with an approved mechanical spreading and finishing machine. The operation of placing mixtures shall be continuous, as nearly as possible.

The asphaltic concrete mixture shall be dumped in the center of the hopper of the spreading machine. Care shall be exercised to avoid overloading and slopping over of the mixture on the base, pavement, or previously laid asphaltic concrete. The operating speed and depth of strike off of the spreading and finishing machine shall be regulated so as to produce a well-knit, uniform layer of the required compacted thickness.

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I. SPREADING (Continued)

The asphaltic concrete mixture shall be laid only upon a surface which is dry and free from frost.

When the asphaltic concrete mixture is placed in irregular or narrow sections, intersections, or other areas where it is impractical to spread and finish the mixture by methods previously specified, the Contractor may use other equipment or acceptable hand methods for spreading the mixtures, as approved by the City's Project Manager.

The cost of hauling, jointing and spreading the asphaltic concrete mixture shall be considered subsidiary to other items for which payment is made.

J. COMPACTION

Immediately after spreading, the mixture shall be compacted thoroughly by rolling. The number, weight, types of rollers, sequence of rolling operations and compaction procedures shall be such that the required density and a satisfactory surface are attained consistently while the mixture is in a workable condition.

The initial rolling shall begin as soon as the material will bear the weight of the roller without displacing the material. The final compaction and finishing shall be performed by rollers while the material is still hot and responds to the action of the roller. Rolling shall not be carried on in such a manner or at such a time as will cause shoving or cracking. No additional rolling or compaction will be allowed after final compaction.

The asphaltic concrete shall be compacted to required density such that the completed surface is slightly above the surface of the concrete at the gutter pan joint. This compaction shall be attained without the roller coming into contact with the concrete gutter pan and shall be smooth, true and conform to the grade, cross section and contour required without any irregularities that exceed 1/8" when tested with a 10' straightedge. All variations in excess of 1/8", measured from the surface of the pavement in place with a 10' straightedge or other device used for measuring deviations from a plane, shall be plainly marked. The Contractor shall eliminate such variations. When the surface finish of the pavement has been disturbed by grinding, the surface shall be repaired with the use of an approved sealant. The use of mechanical grinders will be permitted if their use does not, in the opinion of the City's Project Manager, damage the pavement. Sections of pavement containing depressions which cannot be corrected by grinding shall be repaired or replaced by the Contractor to the satisfaction of the Engineer.

All areas not accessible to the equipment specified shall be compacted and finished by other equipment and methods that will provide a satisfactory surface and the specified density. Any areas determined by the City's Project Manager to be defective, shall be immediately reworked to the satisfaction of the City's Project Manager.

No measurement or direct payment shall be made for the operation of rolling asphaltic concrete pavement. The cost thereof shall be considered subsidiary to other items for which direct payment is made.

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K. ASPHALTIC CONCRETE CURB

Asphaltic concrete curb shall be constructed of a mix as shown on the plans or approved by the City's Project Manager. The curb shall conform to the shape and dimensions that are shown on the plans.

Whenever possible the asphaltic concrete curb shall be shaped and compacted with a curb machine capable of constructing the curb true to line, grade, and cross section and to a density and with a surface texture which is satisfactory to the City's Project Manager.

Special precautions shall be taken to provide a proper bond between the surface course and the curb. The surface shall be thoroughly cleaned and tacked with hot asphalt cement. If performed during cool weather, the surface course shall be heated so that it is sufficiently plastic to form a bond with the hot asphaltic concrete curb.

1. BASIS OF PAYMENT

ASPHALTIC CONCRETE CURB shall be paid for at the contract unit price bid per linear foot.

L. COLD WEATHER PLACEMENT

Asphaltic concrete shall not be placed on frozen or frost covered sub-grade or base. The Cold Weather Placement table shown below shall be used by the City's Project Manager to restrict the routine placement of asphaltic concrete as a result of cold temperatures. Wind velocity, cloud cover, and other project specific conditions will be considered by the City's Project Manager if deviating from Table 6.04A.

TABLE 6.04A – COLD WEATHER PLACEMENT

Lift Thickness	Minimum Surface Temperature
Less than 2"	45° F
2 to 3"	37° F
Greater than 3"	35° F

Tarping and insulation of haul trucks will be required if it is determined by the City's Project Manager that minimum and uniform temperature control of the mixture is not being maintained. Each surface of the haul truck's bed shall be insulated and have an "R" value of approximately 1.0. All insulating material shall be firmly attached to the truck box, either inside or outside, and shall have no bulges, rips, gaps or uneven seams.

M. ASPHALTIC CONCRETE TEMPERATURE REQUIREMENTS

The minimum temperature of the asphaltic concrete for placement for SLX shall be 285º F and 250º F for all other mixes unless otherwise approved by the City's Project Manager.

No traffic or additional construction shall be allowed on the compacted asphaltic concrete until it has cooled beyond 150º F unless otherwise approved by the City's Project Manager.

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6.05 DENSITY CORE SAMPLES

A. GENERAL

During the construction of asphaltic concrete pavement, the Contractor shall obtain core samples from each pavement lift for the determination of density. A minimum of one sample shall be required for each lot of asphaltic concrete. These samples shall be taken not later than two working days after the date of placement of the asphaltic concrete at locations designated by the Engineer. Cores shall be a minimum of 4" in diameter and shall be taken under direct supervision of the City's Project Manager and given to him/her immediately after removal from the pavement. The surfaces from which the samples have been taken shall be cleaned, dried, filled and compacted by the Contractor with hot asphaltic concrete mixture immediately after core removal. Density samples shall be tested in conformance with the Nebraska Standard Method of Tests for specific gravity of compressed bituminous mixtures, AASHTO T 166.

B. COMPACTION REQUIREMENTS

Asphaltic concrete shall be compacted to a density of not less than 92.5% of the void-less density for that mixture. The void-less density for each lot sample shall be tested in conformance with the Nebraska Standard method of test for Maximum Specific Gravity of Bituminous Paving Mixtures, AASHTO T 209. If any density test result indicates a compaction value of less than 92.5% of the void-less density, two additional cores will be obtained from that lot by the Contractor at points designated by the City's Project Manager. These samples shall be taken and the surface restored as described above not later than seven days after the date of placement of the asphaltic concrete. The average density of the three samples shall be considered the density of the lot.

Regardless of layer thickness, Asphaltic Concrete Type SLX will be monitored for density. An initial rolling pattern test strip shall be completed to determine the rolling pattern that will target a minimum of 92.5% density. The Contractor shall monitor the density through a combination of rolling pattern and field testing as deemed necessary by the Engineer.

C. OVERLAYS

Overlays shall be sampled and tested for density when the average thickness of the overlay is greater than 1". The average overlay thickness shall be determined from the core samples located by the City's Project Manager as described above. The thickness of the samples shall be the average of four measurements made at four equally spaced locations on the perimeter of the sample. When the average thickness is 1" or less the testing of density for this layer shall be waived with the exception of the SLX requirements.

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6.06 BASIS OF PAYMENT

Asphaltic concrete shall be paid for on a lot basis, as described above, at the contract unit price bid per ton for ASPHALTIC CONCRETE, TYPE and subject to the payment tables for production density and air voids and AC content as described below. The amount of asphaltic concrete to be paid for shall be the net weight of the material actually incorporated into the work. Such payment shall be full compensation for all mixing, hauling, tack coats, spreading, compacting to required density, materials, equipment, tools, labor, and incidentals necessary to construct the asphaltic concrete surface course to the required thickness or as directed by the City's Project Manager.

TABLE 6.06A – DENSITY ACCEPTANCE SCHEDULE

Average Density	**Min. # Samples**	**% of Payment**
92.5 and above	1	100
92.0 to 92.4	3	95
91.5 to 91.9	3	90
91.0 to 91.4	3	85
90.5 to 90.9	3	80
90.0 to 90.4	3	70
89.9 or less	3	40 or reject

TABLE 6.06B – AIR VOID ACCEPTANCE SCHEDULE

Air Voids (SPR & SLX)	Air Voids (SPH)	% of Payment
Less than 0.5	Less than 1.5	50 or reject
0.5 to 0.9	1.5 to 1.9	50 or reject
1.0 to 1.4	2.0 to 2.4	95
1.5 to 1.9	2.5 to 2.9	98
2.0 to 4.0	3.0 to 5.0	100
4.1 to 4.5	5.1 to 5.5	98
4.6 to 5.0	5.6 to 6.0	95
5.1 to 5.5	6.1 to 6.5	90
5.6 to 6.0	6.6 to 7.0	50 or reject
More than 6.0	More than 7.0	50 or reject

TABLE 6.06C – AC CONTENT ACCEPTANCE SCHEDULE

% Below Minimum AC	% of Payment
0.00 to 0.14	100
0.15 to 0.24	80
0.25 to 0.34	70
0.35 to 0.40	60
Greater than 0.40	50 or reject

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6.07 JOINT AND CRACK REPAIR

This section details the requirements and types of repairs to be performed in the joints/cracks that have developed in Asphaltic Concrete Pavement. The use of an approved joint sealer as specified by Section 4.01F or the contract documents shall be required.

Following is a listing of the types of joint/crack and the method of repair.

Type 1	Less than 1/4"	Clean and Seal
Type 2	1/4" - <3/4"	3/4" X 3/4" Rout and Seal
Type 3	3/4" – 1 1/2"	Clean and Seal
Type 4	Greater than 1 1/2"	Crack repair as required in project documents

Sealing operations shall take place when pavement temperatures are between 40° F and 70° F to ensure that the openings are at their midpoint to maximum point of expansion.

A. JOINT AND CRACK SEALING

Unless otherwise approved by the City's Project Manager. Just prior to sealing, each joint/crack shall be thoroughly cleaned of all foreign material, using approved equipment, and the joint/crack faces shall be clean and surface dry when the sealer is applied.

The joint/crack shall be cleaned by high pressure compressed air or other approved methods to remove all residues. The use of a heat lance may be required to properly dry and warm the vertical edges with care being taken not to burn, scorch or ignite the adjoining pavement. The joint/crack shall be filled from the bottom to the top without formation of voids. At the time of application of the joint/crack sealant, the joint/crack and pavement shall be dry and acceptable to the City's Project Manager. No sealant shall be placed during unsuitable weather or when the atmospheric temperature is below 50° F or when weather conditions indicate that the temperature may fall below 32° F within 24 hours.

The joint/crack sealing filler shall be melted uniformly and with constant stirring in an asphalt kettle of the double boiler design with oil being used as the heating medium. The material shall be furnished or prepared in pieces of such size and shape that the material can be melted readily to the proper pouring consistency. The Contractor shall obtain from the supplier or from the manufacturer and furnish to the City's Project Manager the manufacturer's recommendations for mixing, application and temperature restrictions. These recommendations shall be followed strictly. In no case shall the temperature exceed the maximum recommended by the manufacturer. When proper pouring consistency is attained, the joints/cracks shall be filled as shown in the plans, through the use of pressure type applicator, of a design approved by the City's Project Manager and equipped with a nozzle which will fit into the joints/cracks. The use of an applicator disk or squeegee shall be required to maintain the final level of sealer flush with the surface of the pavement and not to exceed a 3 1/2" banding of the material. If the pavement is to be resurfaced within 12 months the sealer shall be left 1/4" – 3/8" below the surface.

All adjoining surfaces shall be carefully protected during the joint/crack sealing operations, and any stains, marks or damage thereto, as a result of the Contractor's operations, shall be corrected in a manner satisfactory to the City's Project Manager.

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B. BASIS OF PAYMENT

JOINT AND CRACK SEALING OF ASPHALTIC CONCRETE

JOINT/CRACK SEALING, shall be constructed in conformance with the Plans and the Lincoln Standard Specifications and accepted by the City's Project Manager, shall be measured and paid for at the contract unit price bid per linear foot for JOINT AND CRACK SEALING OF ASPHALTIC CONCRETE.

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