



City of Saint John

T E N D E R

2023-561002T

ASPHALT CONCRETE MIXES

Sealed tenders, hand delivered or couriered, addressed to Mike Lewis, Procurement Specialist, Supply Chain Management, 1st Floor – 175 Rothesay Avenue, Saint John, N.B., E2J 2B4 and marked on the envelope:

**"TENDER No. 2023-561002T –
ASPHALT CONCRETE MIXES"**

will be received until 2:30:00 p.m., Tuesday, April 4th, 2023, for the supply of various asphalt concrete mixes as per specifications and terms and conditions.

Tenders will NOT be opened publicly by the Tender Opening Committee due to the on-going pandemic. Registered bidders will receive an invite to join the tender opening via Teams meeting.

The lowest or any tender not necessarily accepted.

**Mike Lewis
Procurement Specialist
(506) 658-2930**

Issue Date: Monday March 20th, 2023

TENDER

2023-561002T ASPHALT CONCRETE MIXES CITY OF SAINT JOHN

SCOPE:

The City of Saint John is seeking prices for various Superpave asphalt concrete mixes, loaded at the plant, including: 19.5 mm, 9.5 mm and 4.75mm, all as presently supplied to the City. See Appendix B - Municipal Operations & Engineering, General Specifications, Division 27, Asphalt Concrete (material specifications can be found in this document).

GENERAL SPECIFICATIONS:

1. The City of Saint John recognizes the annual period commencing May 2nd and ending on November 5th to be the Construction Season.
2. Bidders have been advised that the City anticipates purchasing asphalt concrete mixes prior to the beginning and after the ending of the recognized construction season.
3. Bidders have been instructed to include the operating dates for their asphalt supply operations so as to establish a start date and end date for this supply agreement.
4. Bidders are further instructed to quote a price for the supply of asphalt concrete mixes, to the City of Saint John, for each of the three periods encompassed by this tender, (i.e.; a) for the period between the earliest start date and May 2nd b) the period of the construction season, and c) the period from November 6th until the final closing date of the plant, all as specified by the bidder and this tender).
5. Any award for the supply of asphalt concrete mixes shall be governed by the following conditions:
 - (A) The successful bidder shall abide by (i) the specifications of the Province of New Brunswick, Department of Transportation and Infrastructure, and (ii) the specifications of the City of Saint John as they relate to asphalt materials, asphalt plants and asphalt mix as well as any revision(s) which may be issued during the term of the contract.
 - (B) Inspection and testing of asphalt materials and practices shall be the responsibility of the City, and the successful bidder shall provide proper access and accommodations for such inspection staff. The City may reject any materials or mix, should they not be in conformity to the specification outlined in 6 (A).
 - (C) Bidders will need to provide the ability to load quantity ordered. Any costs borne by overages will be the responsibility of the successful bidder.
 - (D) In the event that an overage occurs, the successful bidder will need to provide area to offload the excess asphalt.

SPECIFICATIONS:

1) **PLANT SPECIFICATIONS:**

The requirements for drum mix and batch plant shall be in accordance with the latest edition of NB DTI Specification division 200, Item 260.

- (A) Successful bidder must have a modern asphalt type plant of a minimum of three (3) ton capacity or metric equivalent, with controls capable of supplying asphalt in sufficient quantities and all 3 variety as the City may require. The plant must include properly installed automatic truck scales that would provide punch slips showing gross, tare and net weights. The bidder shall submit with his bid, complete specifications for the plant to be used.
- (B) Should, during the term of this agreement, the successful bidder relocate the asphalt plant to another location, the City would reserve the right to either continue or terminate the agreement.
- (C) The award of the tender shall be subject to the location of the plant having been approved pursuant to the zoning by-law and all contractors shall comply with all regulations, ordinances, and by-laws of authorities having jurisdiction, including but not limited to:
 - Provincial Department of Labour
 - Provincial Department of Environment
 - Provincial Fire Marshal
 - Provincial Health and Safety Act
 - City of Saint John

2) **TIME FOR SUPPLY OF ASPHALT CONCRETE:**

- (A) The successful bidder shall be required to supply hot mix asphalt as early as possible in the spring of the year and shall remain open as long as possible in the fall. This is necessary to provide the City with the opportunity to commence road repairs with hot mix as soon as possible and to complete projects which run beyond the normally accepted construction season.
- (B) If necessary, the City reserves the right to purchase asphalt concrete from another supplier until such time as the successful bidder's plant is in operation and after it closes.

3) **FAILURE TO SUPPLY:**

In the event that the successful bidder cannot, or does not, supply asphalt in sufficient quantity or to an acceptable quality during the period identified by the bidder as his operating schedule, then the City may purchase asphalt from other suppliers and any additional costs, including haulage factor incurred by the City will be deducted from future contract payments or from the bid deposit at the City's option.

4) **WAIT TIME AT PLANT:**

A maximum wait time at the plant is to be specified on the "Form of Tender" page. All efforts are to be made to ensure this maximum wait time is adhered to by the plant operators.

5) **CONSTRUCTION CONTRACTS:**

This agreement shall not prevent the City from entering into construction contracts with other persons or companies involving paving of streets.

6) **ADDITIONAL MIXES:**

Prices for additional mixes may be negotiated, as required, from time to time.

7) **EMPLOYMENT STANDARDS ACT:**

The company shall pay fair wages in accordance with the Employment Standards Act of the Province of New Brunswick, and shall pay rates of wages and allowances to the various classes of labour not less favourable than those prevailing in the area where the work is being performed. Vacation with pay, Provincial Social Service and Education Taxes where applicable shall be the responsibility of the company. The company shall comply with all laws and regulations in any way affecting those engaged or employed upon or in the conduct of the works. The company shall protect and save harmless the City from and against all claims or demands arising out of or based on the violation of such laws or regulations.

8) **GENERAL:**

(A) Due to the variableness of City's work (patch work to overlays) and an inability to undertake ad hoc Superpave Hot Asphalt Mix testing in a timely and cost effective manner, the City of Saint John will not accept Hot Asphalt Mixes that contain:

- i. Reclaimed Asphalt Pavement (RAP) unless the vendor provides proof of compliance (satisfactory to the City) with the National Cooperative Highway Research Program Report 452 (NCHRP Report 452 and Table 27.1) is provided each and every time a batch is sold to the City; or
- ii. Recycled Asphalt Shingles (RAS).

9) **BASIS OF PAYMENT:** (City's General Specification # 27.6.02)

Payment shall be made at the Contract Unit Prices as contained in the Schedule of Quantities and

Unit Prices, Division 4 of the Contract Specifications.

Asphalt binder (termed performance graded asphalt cement, PGAC, in Ontario) payments will be adjusted based on the Ontario Ministry of Transportation Performance Graded Asphalt Cement Price Index. This Price Index is published monthly and is available on the Ontario Hot Mix Producers Association website as follows:

www.ohmpa.org

A payment adjustment for the change in price of PGAC (asphalt binder) between the month preceding the month in which tenders were opened for the Contract and the time of the placement of the HMA will apply to the quantity of asphalt binder (cement) accepted into the Work and will be calculated as follows if the price index between the two (2) months differs by more than 5 %:

PA = Payment adjustment for asphalt binder in dollars
T = PG asphalt binder price index for the month prior to tender opening
P = PG asphalt binder price index for the month of paving
Q = Quantity of asphalt binder in tonnes

When $P > 1.05 T$, the Contractor receives additional payment as follows:

$$PA = (P - 1.05T) \times Q$$

When $P < 0.95 T$, the Owner receives a credit as follows:

$$PA = (0.95T - P) \times Q$$

This payment adjustment for the change in the price of asphalt binder during the Work is not considered to be extra work.

TERMS AND CONDITIONS:

1. SUBMISSION INSTRUCTIONS

Sealed tenders, hand delivered or couriered, addressed to Mike Lewis, Procurement Specialist, Supply Chain Management, 1st Floor – 175 Rothesay Avenue, Saint John, N.B., E2J 2B4 and marked on the envelope:

**"TENDER No. 2023-561002T –
ASPHALT CONCRETE MIXES"**

will be received until 2:30:00 p.m., Tuesday April 4th, 2023, for the supply of various asphalt concrete mixes as per specifications and terms and conditions.

2. QUOTATION/TENDER TO BE SUBMITTED ON PRESCRIBED FORM

Bidders are to submit their tender on the prescribed form contained in this document. Failure to submit on this form may result in the disqualification of the tender.

3. ENQUIRIES

Bidders shall promptly examine the bid documents and report any errors, omissions or ambiguities and may direct enquiries or seek additional information in writing by email before the deadline for enquiries to the Authorized Enquiries Contact as set out below. No such communications are to be directed to anyone other than the Authorized Enquiries Contact.

4. AUTHORIZED ENQUIRIES CONTACT

Mike Lewis
Supply Chain Management
City of Saint John
Email: supplychainmanagement@saintjohn.ca

It is the Bidder's responsibility to seek clarification from the City on any matter it considers unclear. The City shall not be responsible for any misunderstanding on the part of the Bidder concerning this bid document or its process.

The City intends to confirm receipt of a bidder's communication by way of an email or facsimile in reply. If a bidder has not received a reply, the bidder may wish to resend its communication as the lack of reply may have resulted from a technical problem. The City is under no obligation to respond to enquiries or provide additional information but may do so at its sole discretion.

Responses to inquiries may be distributed to all bidders on the invitation list as having received the bid documents as of the date the response is prepared. The source of the question will not be identified in the response. Verbal information shall not be binding upon the City. Inquiries received after the deadline for enquiries will not receive a response.

All inquiries regarding this Tender shall be submitted in writing, before 1:00:00p.m., local time, on Monday, March 27th, 2023.

5. ADDENDA

Periodically, the City of Saint John is required to issue notification of changes or corrections to a bid document by way of addenda. Normally these notifications will have direct bearing on the cost of a project and will influence the way you bid. Therefore, it is important that the City have assurances that you in-fact received the notification.

Proponents are responsible for obtaining all addenda issued by the City. Addenda may be obtained from the City's website (www.saintjohn.ca) select "City Menu", under the header City Hall and the option "Tender and Procurements".

Bidders are required to sign and include all addenda with their bid submission.

Failure to include a copy of all signed addenda with the bid submission, may result in rejection of your bid regardless of whether the changes noted in the addendum are included in the bid submission or not.

6. ADVISORY NOTICE

Periodically, the City of Saint John is required to issue clarification notices to a bid document in the form of an Advisory Notice. Normally these notifications will not have direct bearing on the cost of a project and will not influence the way you bid.

Proponents are responsible for obtaining all advisory notice(s) issued by the City. Advisory Notice(s) may be obtained from the City's website (www.saintjohn.ca) select "City Menu", under the header City Hall and the option "Tender and Procurements".

Bidders are instructed to sign the Advisory Notice and return it either by fax to (506) 658-4742 or email to monic.macvicar@saintjohn.ca prior to the closing date. Failure to comply with the instructions on an advisory may result in rejection of your bid.

7. GOVERNING LAW, TRADE TREATIES AND POLICIES

This procurement will be in accordance with the laws of the province of New Brunswick and the federal laws of Canada.

This procurement is also subject to the following Policies, Legislation and Internal Trade Agreement(s) including:

- The Atlantic Trade and Procurement Partnership
- New Brunswick Procurement Act and Regulation 2014-93
- City of Saint John Policy for the Procurement of Goods, Services and Construction

8. SCHEDULE FOR THE BID PROCESS

Issue Date	Monday, March 20th, 2023
Deadline for Enquiries	Monday, March 27th, 2023, at 1:00:00 PM Atlantic Time
Deadline for Issuing Addenda	Tuesday, March 28th, 2023
Submission Deadline	Tuesday, April 4th, 2022, at 2:30:00 PM Atlantic Time
Date of Award (if applicable)	TBD

The Schedule for the bid process is tentative only and may be changed by the City in its sole discretion.

9. INVOICING REQUIREMENTS

All invoices submitted under the agreement resulting from this procurement shall bear the corresponding Request for Goods and Services number and/or Purchase order number. Invoices not bearing the applicable number(s) may not be paid. The City's payment terms as detailed in this document will not take effect until such time as the invoice(s) is/are received bearing the applicable number(s).

10. PAYMENT

Payment shall be based on Net 45 Days from date of invoice or receipt of goods, whichever is later. Invoices can either be mailed to: City of Saint John, Accounts Payable Department, P.O. Box 1971, Saint John, NB, E2L 4L1, or by email to the Accounts Payable department (accountspayable@saintjohn.ca). Vendors are to ensure invoices are not sent both ways.

11. AWARD

The City does not bind itself to accept the lowest or any tender submitted but reserves the right to accept any tender deemed to be in its best interest. The City also reserves the right to split this contract between two or more bidders based upon the overall best value to the City.

12. LENGTH OF AGREEMENT

The agreement shall be in force and in effect from the time of award and the earliest date of operation as specified by the bidder and expire on the date of plant closure during the same calendar year and subject to the suppliers' performance.

13. VERBAL AGREEMENT

No verbal agreement or conversation with any officer, agent or employee of the owner either before or after execution of the contract shall effect or modify any of the terms or obligations contained in any of the documents comprising the said contract.

14. FAX TENDERS

Tenders received by fax **WILL NOT** be accepted.

15. LATE BIDS

Bids received after the time and date as shown on the request for quotation shall not be considered.

16. TAXES

The City of Saint John is not exempt from the 15% harmonized sales tax. Prices are to be all taxes extra. The City of Saint John shall be invoiced for and pay all applicable taxes related to this bid.

17. MANDATORY REQUIREMENTS

Each submission will be evaluated to ensure that it complies with the mandatory requirements and

may be rejected if it does not comply. The evaluation of mandatory requirements will confirm that:

- the submission was received prior to the applicable Submission Deadline;
- the bid submission is signed;
- the bid submission is legible;
- the bid submission does not contain a substantive qualification or conditions that are contrary to the terms of the bid document;
- the bid submission does not contain a change in price that was not initialled by the person who signed the submission;
- the bid submission is in English;

18. CANCELLATION CLAUSE

In the event that the successful bidder does not comply with the specifications and terms and conditions of this tender, at any time throughout the duration of the contract, the City of Saint John reserves the right to cancel the contract in its entirety.

19. VALIDITY PERIOD

The bid submission constitutes an offer which shall remain open and irrevocable until 90 days after the submission deadline.

20. ORDERING INSTRUCTIONS

Goods and/or services ordered under the agreement resulting from this procurement shall be ordered using one or more of the following methods: Request for Goods and Services Form, Purchase Order and/or Mastercard. Vendors found to be providing goods and/or services without proper documentation may not be remunerated accordingly.

21. DELIVERY

Please BID your net price on each of the above commodities or services, F.O.B. Saint John, NB, prepaid.

22. ESTIMATED QUANTITIES

The quantities stated herein reflect the anticipated annual requirements of the City for the year; however, the City reserves the right to purchase more or less than the total quantity stated.

23. ACCEPTANCE, REVOCATION AND REJECTION OF TENDERS

The bidder agrees that his tender is a firm offer to supply the goods and/or services specified herein at the quoted price, and in accordance with the terms and conditions herein contained. The bidder may revoke his tender at any time prior to the time fixed for tender opening by delivering, or causing to be delivered, written notice of revocation to the designated official at the City of Saint John. Revocation will take effect from the time the notice is actually received. A notice of revocation will not be accepted after the time fixed for tender opening.

The bid shall not be restricted by a statement added to the Tender Form, or by a covering letter, or by alterations to the tender form as supplied, unless otherwise provided herein and further, a tender form that has been altered in any way may be deemed to be a non-confirming bid and, therefore, rejected. Bidders shall be allowed to attach descriptive literature, whose sole purpose is to amplify the bid.

24. PERFORMANCE DEPOSIT

- (A) A certified cheque, bank draft or money order, payable to the City of Saint John in the amount of \$10,000 will be requested after award from the successful bidder as a Performance Deposit.
- (B) The deposit will be retained by the City for the duration of the contract to ensure the contractor carries out the work in compliance with the enclosed specifications and conditions. The deposit will be returned upon successful completion of the agreement.

25. RESERVED RIGHTS

The City reserves the right to:

- a) Reject an unbalanced Tender. For the purpose of this section, an unbalanced tender is a tender containing a unit price which deviates substantially from, or does not fairly represent reasonable and proper compensation for the unit of work bid or one that contains prices which appear to be so unbalanced as to adversely affect the interests of the City. The City reserves the right to use tenders submitted in response to this Request for Tender or for other like or similar work as a guideline in determining if a bid is unbalanced.
- b) Amend or modify the scope of the Work, and/or cancel or suspend the Tender award, at any time for any reason;
- c) Require Bidders to provide additional information after the Tender Closing to support or clarify their Tender;
- d) Not accept any or all Tenders;
- e) Not accept a Tender from a Bidder who is itself, or whose principals, owners or directors are also principals, owners or directors of another entity which is, involved in litigation, arbitration or any other similar proceeding against the City;
- f) Reject any or all Tenders without any obligation, compensation or reimbursement to any Bidder or any of its team members;
- g) Withdraw this Request for Tender and cancel or suspend the Tendering Process;
- h) Extend, from time to time, any date, any time period or deadline provided in this Tender (including, without limitation, the Tender Closing), upon written notice to all Bidders;

- i) Assess and reject a Tender on the basis of:
 - (i) information provided by references;
 - (ii) the Bidder's past performance on previous contracts;
 - (iii) the information provided by a Bidder pursuant to the City exercising its clarification rights under this Tendering Process;
 - (iv) the Bidder's experience with performing the type and scope of work specified;
 - (v) other relevant information that arises during this Tendering Process;
- j) Waive formalities and accept Tenders which substantially comply with the requirements of this Request for Tender;
- k) Verify with any Bidder or with a third party any information set out in a Tender;
- l) Disqualify any Bidder whose Tender contains misrepresentations or any other inaccurate or misleading information;
- m) Disqualify any Bidder who has engaged in conduct prohibited by the Tender Documents;
- n) Make changes, including substantial changes, to the Tender Documents provided that those changes are issued by way of addenda in the manner set out in these Instructions to Bidders;
- o) Select any Bidder other than the Bidder whose Tender reflects the lowest cost to the City;
- p) Cancel this Tendering Process at any stage, for any reason;
- q) Cancel this Tendering Process at any stage and issue a new Request for Tender for the same or similar deliverables;
- r) Accept any Tender in whole or in part;
- s) Waive minor non-compliance with the mandatory requirements of the Tender Documents and accept the Tender; or
- t) Accept a Tender which contains the following errors:
 - (i) error in mathematics – whether this involves the extension of a unit price or an error in addition, the mistake will be corrected and the correct total will be used for evaluation purposes and will be binding on the Bidder.
 - (ii) conflict between the written and numerical bid prices. In all cases, the total bid price will be corrected to reflect the written bid price, whether lump sum or unit price.
 - (iii) failure to include the contingency allowance in the total Tender Price. If the contingency allowance was not included in the addition, the Tender Price shall be

corrected to reflect its inclusion.

and these reserved rights are in addition to any other express rights or any other rights which may be implied in the circumstances and the City shall not be liable for any expenses, costs, losses or any direct or indirect damages incurred or suffered by any Bidder or any third party resulting from the City exercising any of its express or implied rights under this Request for Tender.

By submitting a Tender, the Bidder authorizes the collection by the City of the information set out at paragraph i) in the manner contemplated in that subparagraph.

26. LIMITATION OF LIABILITY AND WAIVER

Each Bidder, by submitting a Tender, agrees that:

- a) Neither the City nor any of its employees, agents, advisors or representatives will be liable, under any circumstances, for any Claim arising out of this Tendering Process including but not limited to costs of preparation of the Tender, loss of profits, loss of opportunity or for any other Claim; and
- b) The Bidder waives any Claim for any compensation of any kind whatsoever, including Claims for cost of preparation of the Tender, loss of profit or loss of opportunity by reason of the City's decision to not accept the Tender submitted by the Bidder, to award a Contract to any other Bidder or to cancel this Tendering Process, and the Bidder shall be deemed to have agreed to waive such right or Claim.

FORM OF TENDER

The undersigned bidder hereby agrees to be bound by the award of this Tender.

- A) The undersigned bidder hereby agrees that the bidder has arrived at the accompanying tender independently from, and without consultation, communication, agreement or arrangement with, any competitor.
- B) The undersigned bidder hereby agrees to supply asphalt concrete mixes to the City of Saint John, NB in accordance with the tender as per the following unit prices (excluding the 15% Harmonized Sales Tax). The City of Saint John reserves the right to purchase more or less than the quantities suggested.

Item No.	Description	Unit	Estimated Quantities Before/During/After Construction Season	Before Season	Construction Season	After Season
				Start date till May 2 nd	May 3 rd till Nov 5 th	Nov 6 th till Close
1	SUPERPAVE 19.5mm (.3 to <3 million ESALS)	TONNE	Unknown Before 500 season Unknown After	Per Tonne	Per Tonne	Per Tonne
2	SUPERPAVE 9.5 mm (.3 to <3 million ESALS)	TONNE	100 Before 5,500 season 250 After	Per Tonne	Per Tonne	Per Tonne
3	SUPERPAVE 4.75mm (.3 to <3 million ESALS)	TONNE	0 Before 400 season 0 After	Per Tonne	Per Tonne	Per Tonne

C) OPENING DATE _____ CLOSING DATE _____

D) EXACT PLANT LOCATION (STREET ADDRESS AND/OR L.R.I.S. NUMBER)

D) SIZE AND TYPE OF PLANT _____

E) MAXIMUM WAIT TIME AT PLANT _____

COMPANY:	ADDRESS:
NAME:(print)	SIGNATURE:
TEL NO:	FAX NO:
DATE:	REMARKS:



City of Saint John

TENDER NO. 2023-561002T

APPENDIX A

PROVINCE OF NEW BRUNSWICK HAULAGE RATES

New Brunswick Haulage Rates

Table 802-1: Asphalt Concrete

· Effective May 1, 2022 ·

Distance (km)	Haul Rate (mt)	Distance (km)	Haul Rate (mt)	Distance (km)	Haul Rate (mt)
0 - 1	2.88	25 - 26	8.58	50 - 51	14.36
1 - 2	3.05	26 - 27	8.83	51 - 52	14.59
2 - 3	3.22	27 - 28	9.07	52 - 53	14.82
3 - 4	3.39	28 - 29	9.27	53 - 54	15.05
4 - 5	3.58	29 - 30	9.53	54 - 55	15.24
5 - 6	3.76	30 - 31	9.77	55 - 56	15.51
6 - 7	3.96	31 - 32	10.03	56 - 57	15.69
7 - 8	4.16	32 - 33	10.28	57 - 58	15.91
8 - 9	4.37	33 - 34	10.53	58 - 59	16.18
9 - 10	4.59	34 - 35	10.76	59 - 60	16.36
10 - 11	4.81	35 - 36	10.97	60 - 61	16.57
11 - 12	5.04	36 - 37	11.17	61 - 62	16.79
12 - 13	5.28	37 - 38	11.41	62 - 63	16.99
13 - 14	5.52	38 - 39	11.61	63 - 64	17.19
14 - 15	5.77	39 - 40	11.84	64 - 65	17.39
15 - 16	6.03	40 - 41	12.07	65 - 66	17.63
16 - 17	6.30	41 - 42	12.29	66 - 67	17.80
17 - 18	6.59	42 - 43	12.50	67 - 68	18.04
18 - 19	6.84	43 - 44	12.72	68 - 69	18.25
19 - 20	7.08	44 - 45	12.94	69 - 70	18.46
20 - 21	7.31	45 - 46	13.16	70 - 71	18.66
21 - 22	7.54	46 - 47	13.39	71 - 72	18.87
22 - 23	7.79	47 - 48	13.64	72 - 73	18.97
23 - 24	8.05	48 - 49	13.88	73 - 74	19.28
24 - 25	8.34	49 - 50	14.14	74 - 75	19.48

Each succeeding kilometer after 75 kilometers increases at a rate of \$ 0.20 per tonne
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City of Saint John

TENDER NO. 2023-561002T

APPENDIX B

ASPHALT SPECIFICATIONS



GENERAL SPECIFICATIONS

DIVISION 27

ASPHALT CONCRETE



City of Saint John

GENERAL SPECIFICATIONS

DIVISION 27

ASPHALT CONCRETE



City of Saint John

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City of Saint John

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ASPHALT CONCRETE

27.1 SCOPE OF WORK

The Work included in this Division 27 Specification (Specification) consists of site preparation and supplying, transporting, placing and compacting Superpave hot-mix asphalt (HMA) concrete for roadways, curbs and sidewalks in accordance with the Contract Documents and in conformity with the lines, grades, courses, types, thicknesses, and cross sections given in the Contract Documents and/or shown on the Plans, or as established by the Engineer. The City will accept the Work in accordance with the Quality Assurance requirements of this Specification.

REFERENCES

The following Superpave asphalt technology specifications and practices for engineering, materials, mix designs, testing, inspection, and construction, are referred to in this Specification.

New Brunswick Department of Transportation and Infrastructure Standard Specifications (Current)
Item 260 Asphalt Concrete

AASHTO Standards (Current)

- M 17 Mineral Filler for Bituminous Paving Mixtures
- M 332 Performance Graded Asphalt Binder Using Multiple Stress Creep Recovery (MSCR) Test
- M 323 Superpave Volumetric Mix Design
- R 35 Superpave Volumetric Design for Hot-Mix Asphalt (HMA)
- T 283 Resistance of Compacted Asphalt Mixture to Moisture-Induced Damage
- T 312 Preparing and Determining the Density of Hot-Mix Asphalt (HMA) Specimens by Means of the Superpave Gyrotory Compactor

Asphalt Institute Publication (Current)

- MS-22 Construction of Hot Mix Asphalt Pavements

Transportation Research Board Publication (Current)

- NCHRP Report 452, Recommended Use of Reclaimed Asphalt Pavement in the Superpave Mix Design Method: Technician's Manual. National Cooperative Highway Research Program, Transportation Research Board, Washington, DC.

27.2 DEFINITIONS

For the purpose of this Specification, the following definitions apply:

“**AMRL**” means the AASHTO Materials Reference Laboratory.

“**ATTRIBUTE**” means one of the following: Designated Large Sieve (DLS), 4.75 mm sieve, 600 µm sieve, 75 µm sieve, asphalt cement content, air voids, or compaction.

“**DESIGN ESALs**” means design equivalent (80 kN) single-axle loads.

“**DESIGNATED LARGE SIEVE (DLS)**” means the sieve size specifically designated for each mix type for gradation testing.

27.2 **DEFINITIONS (Cont'd)**

“FAT SPOT” means an area of pavement substantially blacker than the surrounding pavement.

“HOT-MIX ASPHALT (HMA)” means hot-mixed, hot-laid Superpave asphalt concrete.

“HOT-MIX ASPHALT MISCELLANEOUS” means HMA that is required in areas that cannot be placed by a machine and requires manual placement, such as slug work, but does not include the manual work required to be carried out concurrently with machine paving operations, as specified in the Contract Documents.

“HOT-MIX ASPHALT PADDING” means an HMA layer used for correcting crossfall and profile deficiencies in the existing pavement before placing the levelling, lower, or upper (surface) course, as specified in the Contract Documents.

“HOT-MIX ASPHALT PATCHING” means an HMA surface course placed over localized areas of distressed pavement, generally for the purpose of improving strength, rideability, or safety, as specified in the Contract Documents.

“JOB-MIX FORMULA (JMF)” means the percentage passing on each designated sieve of the total mass of aggregate and the amount of asphalt binder (cement) as a percentage by mass of the mix that are based on specified mix design procedures that, when mixed, result in an HMA that is according to this Specification.

“JOINT” means a vertical contact between an HMA pavement course and any HMA pavement or any rigid object that exists at the time the HMA is laid.

“LEVELLING COURSE” means an HMA course of variable thickness used to eliminate transverse and longitudinal irregularities on an existing surface prior to placing an HMA lower or upper course, as specified in the Contract Documents.

“LOT” means a specific quantity of material or a specific amount of construction, normally from a single source, and produced by the same process.

“LOWER COURSE” means a hot-mix asphalt (HMA) course between an upper (surface) course and either a granular base course or stabilized base course, an existing pavement, or another HMA lower course.

“MIX PROPERTIES” means the percent passing the DLS, 4.75 mm sieve, 600 µm sieve, and 75 µm sieve; the asphalt binder (cement) content; and the air voids.

“PAVING IN ECHELON” means two or more pavers are used to pave multiple adjacent lanes simultaneously, within 60 m of each other.

“PERFORMANCE GRADED ASPHALT CEMENT (PGAC)” means an asphalt binder (cement) that is an asphalt-based cement produced from petroleum residue, either with or without the addition of non-particulate modifiers, according to AASHTO M 332.

“QUALITY ASSURANCE (QA)” means a system or series of activities carried out by the Engineer to ensure that materials received from the Contractor meet the specified requirements.

27.2 **DEFINITIONS (Cont'd)**

“**QUALITY CONTROL (QC)**” means a system or series of activities carried out by the Contractor to ensure that materials supplied by the Contractor, and work completed by the Contractor, meet the specified requirements.

“**RANDOM SAMPLE**” means a sample from a location chosen by the Engineer based on random numbers such that any portion of a lot or subplot has an equal probability of being selected.

“**RANGE**” means the numerical difference between the maximum and minimum test results within a lot.

“**RECLAIMED ASPHALT PAVEMENT (RAP)**” means the processed HMA material that is recovered by partial or full depth removal.

“**REFEREE TESTING**” means testing by an independent laboratory selected by the Engineer and acceptable to the Contractor, the results of which are used for resolving differences between QC and QA testing.

“**SCREED**” means the unit of the paver that strikes off and imparts initial compaction to the HMA.

“**SEGREGATION**” means a condition of the asphalt concrete pavement characterized by areas with comparatively coarser or finer texture than that of the surrounding pavement.

“**SUBLOT**” means approximately equal divisions or portions of a lot.

“**SUPERPAVE**” means an acronym for Superior Performing Asphalt Pavements. It is an alternative system to the Marshall method for specifying material components and asphalt mix designs using the Superpave gyratory compactor.

“**UPPER COURSE**” means an HMA surface (wearing) course of any flexible or composite pavement.

“**VERTICAL SURFACE**” means all edges of concrete curbs, catch basins and other appurtenances, longitudinal joints, and transverse joints for application of tack coat.

27.3 **RELATED WORK UNDER OTHER SECTIONS**

- (a) General Administration of ContractDiv. 6
- (b) Construction of Municipal ServicesDiv. 7
- (c) Manholes, Catch Basins and Valve ChambersDiv. 12
- (d) Excavation, Trenching and Backfilling ProceduresDiv. 13
- (e) RestorationDiv. 21
- (f) Roadway ConstructionDiv. 24
- (g) Standard Drawings

27.4 MATERIALS

27.4.01 General

This Division refers to those portions of the Work that involve the supply and placement of Superpave hot-mix asphalt (HMA) concrete paving. This must be referenced to, and interpreted simultaneously with, all other Divisions related to the Work of this Division.

The Superpave HMA types, based on nominal maximum aggregate size, are: Superpave 19 mm (Superpave 19) – lower course; Superpave 12.5 mm (Superpave 12.5) – lower or upper course; Superpave 9.5 mm (Superpave 9.5) – upper course, curbs, and sidewalks; and Superpave 4.75 mm (Superpave 4.75) – fine mix.

The Superpave HMA mix designs are based on the current AASHTO Designation: R 35 Standard Practice for Superpave Volumetric Design for Hot-Mix Asphalt (HMA): materials selection to meet the environmental and traffic requirements applicable to the asphalt concrete paving; design of aggregate structure; design performance-graded asphalt binder (cement) content selection; and evaluation of moisture susceptibility. This mix design procedure uses aggregate and mix properties to develop a Superpave HMA job-mix formula (JMF) based on the volumetric properties of the HMA in terms of air voids (AV), voids in mineral aggregate (VMA), and voids filled with asphalt cement (VFA).

The Superpave HMA types (Superpave 19, 12.5, 9.5 and/or 4.75) for the Project are given in the Contract Documents along with the design ESALs, performance-graded (PG) asphalt binder (cement) grade and any special requirements for each of the Superpave HMA types for the Project. Selection of the Superpave HMA types, design ESALs, PG asphalt binder grades, and special requirements for the Project's flexible pavement design, environmental conditions, and traffic requirements are covered by the current AASHTO Designation: M 323 Standard Specification for Superpave Volumetric Mix Design. The overall Superpave asphalt technology engineering, materials, mix designs, testing, and the inspection for the Project must be in accordance with the requirements of AASHTO M 325 and R 35.

Superpave HMA production, transport, placement, and compaction processes and requirements guidance is given in the Asphalt Institute MS-22.

27.4.02 Submissions

Materials Certification

At least five (5) working days prior to commencing any asphalt paving work, the Contractor shall, in writing, submit to the Engineer:

- a) Producer or supplier test data and certification that the performance graded (PG) asphalt binder(s) for the Superpave HMA mix(es) meets the requirements of this Specification; and
- b) Producer or supplier test data and certification that the coarse aggregate(s), fine aggregate(s), and mineral filler (if any) for the Superpave HMA mix(es) meet the requirements of this Specification.

27.4.02 Submissions (Cont'd)

Superpave HMA Mix Design(s)

At least five (5) working days prior to commencing any asphalt paving work, the Contractor shall submit to the Engineer, in writing, for approval, Superpave mix design(s) and asphalt plant trial batch mix test(s) results, from a qualified asphalt testing laboratory(ies), meeting the requirements of this Specification. This submission, as a minimum for each Superpave HMA mix type design (AASHTO R 35) shall include:

- a) Project number and description, design ESALs, Superpave mix design number, laboratory name, responsible technician or engineer, and Report date;
- b) information on the design aggregate structure including the source(s) of aggregates, kind of aggregates, required quality characteristics, and gradations;
- c) information on the design asphalt binder (cement) content including the source of asphalt binder, and the performance grade; and
- d) information about the Superpave HMA including the percent of asphalt binder in the mix; the relative density; the number of initial, design, and maximum gyrations; the voids in mineral aggregate (VMA), the voids filled with asphalt (VFA), the effective binder volume (V_{bc}), the absorbed binder volume (V_{ba}), the air voids (V_a), and dust-to-binder ratio; and the tensile strength ratio (TSR) including details (source, type, and addition rate) of any required antistripping additive.

Approval of a Superpave HMA mix design(s) by the Engineer shall not alleviate the Contractor from full responsibility for the quality and applicability of the mix design(s) throughout the Work.

All costs associated with the completion of the mix design(s) shall be deemed to be included in the unit prices for hot-mixed, hot-laid asphalt concrete in the Schedule of Quantities and Unit Prices, Division 4 of the Contract Specifications.

Quality Control Plan (QCP)

At least five (5) working days prior to commencing any work, the Contractor shall provide the Engineer, in writing, for approval, a Contractor Quality Control Plan (QCP) for the Work that includes, as a minimum:

- (a) Elements of the materials and methods which affect the quality of the Superpave hot-mix asphalt (HMA). These elements include (Asphalt Institute MS-22):
 - .1 aggregate sources, types, gradations, transportation, stockpiling, moisture contents, handling, and quality (supplier quality control);
 - .2 asphalt binder sources, types, grades, transportation, storage, incorporation, and quality (supplier quality control), including mixing and compaction temperatures, and handling requirements for polymer modified asphalt cements, when applicable;

27.4.02 Submissions (Cont'd)

Quality Control Plan (QCP) (Cont'd)

- .3 asphalt mix (HMA) designs (Job-Mix Formula, JMF), including mix design laboratory and technician qualifications, and reporting;
- .4 antistripping additive source, type, amount and handling, when applicable;
- .5 asphalt mix production, including: overall process control for proper storage and handling of component materials; accurate proportioning and feeding of the aggregate; effective drying and heating of the aggregate to the proper temperature; proper dust and filler control; proper proportioning, addition and mixing of asphalt binder; and proper storage, handling, and weighing of the asphalt mix;
- .6 asphalt mix transportation, including truck box cleanliness (only non-petroleum release agents used) and tarpaulins;
- .7 asphalt mix placement, including segregation avoidance, thickness, texture, joints, and smoothness;
- .8 asphalt mix compaction, including rollers selection and roller patterns; and
- .9 procedures for the disposal of surplus materials, spilt materials and materials removed from the existing pavement.

(b) Truck Scales:

- .1 provide certification for the current year that the truck (weigh) scales being used for the Work meet the requirements of the Weights and Measures Act, Statute of Canada;
- .2 verification, every ten (10) working days, of the tare weights of any trucks being used for transporting asphalt mix; and
- .3 provide the location of an independent certified truck (weigh) scale, within the Greater Saint John area, that can be used for random spot checks of truck tare and gross vehicle weights, when instructed by the Engineer.

The Engineer reserves the right to place a City Inspector at the truck scale site(s) when materials are being weighed for the Work. The City will be responsible for the cost of the City Inspector.

If it is determined that the gross vehicle weight is incorrect, as indicated on the weigh slip, the use of the truck (weigh) scale shall be stopped immediately until such time as it is again certified according to the requirements of the Weights and Measures Act, Statute of Canada. The Engineer will make an appropriate adjustment to all weights accepted prior to the time the use of the truck scale was stopped.

27.4.02 Submissions (Cont'd)

Quality Control Plan (QCP) (Cont'd)

- (c) Processes to assure the quality of Superpave materials and work meet all Specification requirements. These quality control processes include (Asphalt Institute MS-22):
- .1 types of inspection and testing required;
 - .2 frequency of inspection, sampling, and testing required;
 - .3 inspection and testing equipment requirements and calibration procedures;
 - .4 qualification requirements for laboratories and inspection and testing staff;
 - .5 documentation and retention of inspection records and test results;
 - .6 procedures for reporting inspection records and test results to the Engineer;
 - .7 procedures for dealing with non-conformities in materials and work; and
 - .8 supplementary quality control plans and procedures for any subcontractors and materials suppliers.
- (d) Applicable Material Safety Data Sheets (MSDS).
- (e) Hot-Mix Plant(s) and Process Control:
- .1 location, type, model, nominal hourly capacity, manufacturer's rated capacity of drier or drum in tonnes per hour (t/hr) of dried aggregate for various percentages of moisture in the combined aggregate feed and process control procedures for the hot-mix plant(s).

A moisture content determination must be completed by the Contractor each morning and afternoon for each aggregate and reclaimed asphalt pavement (RAP), if any, being used in a drum mixing plant, with these moisture contents reported to the Engineer no later than by the next working day.

While the Engineer will make the results of quality assurance (QA) testing available to the Contractor, the Contractor shall be responsible for the necessary process control testing during the hot-mix production, placement and compaction, and any necessary adjustments, to produce uniform, acceptable hot mix meeting all the requirements of this Specification.

- (f) Traffic Control Plan for the Work.

27.4.02 **Submissions (Cont'd)**

Quality Control Plan (QCP) (Cont'd)

(g) Adjustment of Structures:

- .1 how frames and covers will be adjusted to meet the requirements of the Work.

This information will be reviewed jointly by the Contractor and the Engineer so that they are all familiar with the methods to be used in the Work.

In some cases, the appropriate utility must be notified before the necessary adjustment(s).

(h) Grade and Slope Control of Paver(s):

- .1 the number of pavers, type of grade and transverse slope control and all pertinent information with respect to setting grades and controlling the pavers to follow these grades.

This information will be reviewed jointly by the Contractor and the Engineer so that they are all familiar with the methods to be used in the Work.

(i) General:

Approval of the Quality Control Plan by the Engineer shall not alleviate the Contractor from full responsibility for the implementation, use, interpretation and applicability of the Quality Control Plan throughout the Work.

All costs associated with the development, implementation, use, and interpretation of the Quality Control Plan, including random spot checks of truck tare and gross vehicle weights, when instructed by the Engineer, shall be deemed to be included in the unit prices for hot-mixed, hot-laid asphalt concrete in the Schedule of Quantities and Unit Prices, Division 4 of the Contract Specifications.

27.4.03 **Performance-Graded Asphalt Binder**

Performance-graded (PG) asphalt binder(s) (cement) shall meet the requirements of AASHTO M 332. Laboratories completing asphalt binder testing shall have participated in the current AMRL Interlaboratory Program for Asphalt Binders, or equivalent program acceptable to the Engineer.

Unless otherwise specified in the Contract Documents, the performance-graded (PG) asphalt binder shall be PG 58S-28.

27.4.04 **Reclaimed Asphalt Pavement**

Reclaimed asphalt pavement (RAP) shall meet the processing, quality, and use requirements of NCHRP Report 452 and Table 27.1, with a maximum RAP incorporation limit of 25 percent in lower course Superpave HMA and 15 percent in upper course Superpave HMA.

27.4.05 Aggregates

Aggregates for use in Superpave HMA shall be from proven aggregate sources meeting the requirements of this specification. Regardless of compliance with the specified physical requirements, coarse and fine aggregates may be accepted or rejected by the Engineer on the basis of documented past field performance.

Coarse Aggregate

- a) The coarse aggregate shall be prepared by crushing rock or gravel and shall consist of hard, sound, durable particles, free from adherent coatings, shale, clay, loam, schist and other soft or disintegrating pieces, or other deleterious substances.
- b) Coarse aggregate is the portion retained on the 4.75mm sieve when tested in accordance with ASTM C136.

Table 27.1 Physical Requirements for Coarse Asphalt Aggregate

Test Method	Design ESAL's (Million)		
	<3.0	3.0 to < 10.0	> 10.0
Freeze/Thaw % (max), MTO LS-614	16.0	14.0	12.0
Micro-Deval %(max), MTO LS - 618	16.0	15.0	15.0
Petrographic No.(max), MTO LS - 609	200	180	180
Flat & Elongated Particle, (max @ 4:1 ratio) ASTM D4791	20.0	15.0	15.0
Crushed Particles, (min), ASTM D5821			
one crushed face	95	95	100
two crushed face	80	80	100
Aggregate absorption % (max), ASTM C 127	1.50	1.50	1.50

Fine Aggregate

- a) The fine aggregate shall be prepared by crushing rock or gravel or screening a manufactured sand and shall consist of hard, sound, durable particles, free from adherent coatings, shale, clay, loam, schist and other soft or disintegrating pieces, or other deleterious substances.
- b) Fine aggregate is the portion passing the 4.75mm sieve when tested in accordance with ASTM D136 and C117.

27.4.05 Aggregates (Cont'd)

Table 27.2 Physical Requirements for Fine Asphalt Aggregate

Test Method	Design ESAL's (Million)		
	<3.0	3.0 to < 10.0	> 10.0
Micro-Deval %(max), MTO LS - 619	20.0	17.0	17.0
Sand Equivalent (min), ASTM D2419	45	50	50
Uncompacted Void Content (min), ASTM D1252	45	45	45
Aggregate absorption % (max), ASTM C 128	2.00	2.00	2.00

Note: 1. The allowable Micro-Deval surface Fine Aggregate shall be Max % Loss=19.0, if the Micro-Deval on Coarse Aggregate is ≤ 12.0 , provided that the Coarse Aggregate is from the same source.

27.4.06 Blending Sand

- a) Blending sand shall be used to obtain acceptable physical HMA properties. The source shall be approved by the Engineer before the material is incorporated into the HMA.
- b) The maximum mass of blending sand to be used in the total asphalt mix shall not exceed 10 percent of the total mass.
- c) Blending sand shall have 100 percent passing the 9.5mm sieve prior to the introduction into the asphalt plant.

27.4.07 Mineral Filler

Mineral filler, if any, shall meet the requirements of AASHTO M 17.

Table 27.3: Asphalt Binder Selection Guidelines for Reclaimed Asphalt Pavement (RAP) Mixtures^{1,2,3}

Recommended New Asphalt Binder Grade ⁴	RAP Percentage ⁵
No change in asphalt binder selection	<15
Select new asphalt binder one grade softer than normal (select a PG 52S-34 if a PG 58S-28 would normally be used, for example)	15-25

- Notes:
1. Table 27.3 is adapted from AASHTO M 323.
 2. The recommended use of RAP is covered in detail in NCHRP Report 452.
 3. Asphalt binder is an asphalt-based cement that is produced from petroleum residue either with or without the addition of non-particulate organic modifiers (SBS, for instance – polymer modified asphalt binder).
 4. Performance-graded asphalt binder (cement) meeting the requirements of AASHTO M 332.
 5. Reclaimed asphalt pavement (RAP) is removed and/or processed pavement materials containing asphalt binder and aggregates.

27.4.07 Mineral Filler (Cont'd)

Table 27.4: Superpave HMA Aggregate Gradation Control Points^{1,2}

Sieve Size	Nominal Maximum Aggregate Size ³ — Control Points (Percent Passing)							
	19.0 mm		12.5 mm		9.5 mm		4.75 mm	
	Min	Max	Min	Max	Min	Max	Min	Max
50.0 mm	—	—	—	—	—	—	—	—
37.5 mm	—	—	—	—	—	—	—	—
25.0 mm	100 ⁴	—	—	—	—	—	—	—
19.0 mm	90	100	100 ⁴	—	—	—	—	—
12.5 mm	—	90	90	100	100 ⁴	—	100 ⁴	—
9.5 mm	—	—	—	90	90	100	95	100
4.75 mm	—	—	—	—	—	90	90	100
2.36 mm	23	49	28	58	32	67	—	—
1.18 mm	—	—	—	—	—	—	30	60
0.075 mm	2	6	2	6	2	6	6	8

- Notes:
1. Table 27.4 is adapted from AASHTO M 323.
 2. The combined aggregate shall conform to these gradation control point requirements.
 3. The nominal maximum aggregate size is one size larger than the first sieve that retains more than ten percent aggregate.
 4. The maximum aggregate size is one size larger than the nominal maximum aggregate size.

Table 27.5: Gradation Classification^{1,2}

Primary Control Sieve (PCS) Control Point for Mixture Nominal Maximum Aggregate Size (Percent Passing)			
Nominal Maximum Aggregate Size	19.0 mm	12.25 mm	9.5 mm
Primary Control Sieve (PCS)	4.75 mm	2.36 mm	2.36 mm
PCS Control Point (Percent Passing)	47	39	47

- Notes:
1. Table 27.5 is adapted from AASHTO M 323.
 2. The combined aggregate gradation shall be classified as coarse-graded when it passes below the primary control sieve (PCS). All other gradations shall be classified as fine-graded.

27.4.08 Superpave HMA Mix

The AASHTO M 323 Superpave HMA mix design(s) shall meet the requirements of Table 27.6 and Table 27.7. The HMA mix design shall be completed within the same calendar year as the work is to be completed unless otherwise approved by the Engineer.

27.4.08 Superpave HMA Mix (Cont'd)

Table 27.6: Superpave Gyrotory Compaction Effort¹

Design ESALs ² (million)	Compaction Parameters			Typical Roadway Applications
	$N_{initial}$	N_{design}	N_{max}	
<0.3 ³	6	50	75	Applications include roadways with very light traffic volumes such as local roads, country roads, and city streets where truck traffic is prohibited or at a very minimal level. Traffic on these roadways would be considered local in nature, not regional, intrastate, or interstate. Special purpose roadways serving recreational sites or areas may also be applicable to this level.
0.3 to <3	7	75	115	Applications include many collector roads or access streets. Medium-trafficked city streets and the majority of county roadways may be applicable to this level.
3 to <30 ⁴	8	100	160	Applications include many two-lane, multi-lane, divided, and partially or completely controlled access roadways. Among these are medium to highly trafficked city streets and many provincial routes.
≥30	9	125	205	Applications include major highways, both rural and urban in nature. Special applications such as truck-weighing stations or truck-climbing lanes on two-lane roadways may also be applicable to this level.

- Notes:
1. Table 27.6 is adapted from AASHTO R 35.
 2. The anticipated project traffic level expected on the design lane over a 20-year period. Regardless of the actual design life of the roadway, the design ESALs are determined for 20 years.
 3. When specified by the Engineer and the top of the design layer is ≥100 mm from the pavement surface and the estimated design traffic level is ≥0.3 million ESALs, decrease the estimated design traffic level by one, unless the mixture will be exposed to significant mainline construction traffic prior to being overlaid. If less than 25 percent of a construction lift is within 100 mm of the surface, the lift may be considered to be below 100 mm for mixture design purposes.
 4. When the estimated design traffic level is between 3 and <10 million ESALs, the Engineer may specify $N_{initial}$ at 7, N_{design} at 75, and N_{max} at 115.

27.4.08 Superpave HMA Mix (Cont'd)

Table 27.7: Superpave HMA Design Requirements^{1,7}

Design ESALs ² (Million)	Required Relative Density, Percent of Theoretical Maximum Specific Gravity			Voids in the Mineral Aggregate (VMA), Percent Minimum ⁶				Voids Filled with Asphalt (VFA) Range	Dust-to Binder Ratio
				Nominal Maximum Aggregate Size, mm					
	$N_{initial}$	N_{design}	N_{max}	19.0	12.5	9.5	4.75	Percent	Range ^{3,5}
<0.3	≤91.5	96.0	≤98.0	13.0	14.0	15.0	16.0	70-80	0.6-1.2
0.3 to <3	≤90.5	96.0	≤98.0	13.0	14.0	15.0	16.0	65-78	0.6-1.2
3 to <10	≤89.0	96.0	≤98.0	13.0	14.0	15.0	16.0	65-75 ⁴	0.6-1.2
10 to <30	≤89.0	96.0	≤98.0	13.0	14.0	15.0	16.0	65-75 ⁴	0.6-1.2
≥30	≤89.0	96.9	≤98.0	13.0	14.0	15.0	16.0	65-75 ⁴	0.6-1.2

- Notes:
1. Table 27.7 is adapted from AASHTO M 323.
 2. The anticipated project traffic level expected on the design lane over a 20-year period. Regardless of the actual design life of the roadway, the design ESALs are determined for 20 years.
 3. For 4.75 mm nominal maximum size mixes (Superpave 4.75), the dust-to-binder ratio shall be 0.9 to 2.0.
 4. For design traffic levels >3 million ESALs, 9.5 mm nominal maximum size mixes (Superpave 9.5) the specified VFA range shall be 73 to 76 percent, and for 4.75 mm nominal maximum size mixes (Superpave 4.75) shall be 75 to 78 percent.
 5. If the aggregate gradation passes beneath the PCS control point specified in Table 27.5, the dust-to-binder ratio range may be increased from 0.6-1.2 to 0.8-1.6 at the agency's discretion.
 6. Mixes with VMA exceeding the minimum value by more than 2 percent may be prone to flushing and rutting. Unless satisfactory experience with high VMA mixes is available, mixes with VMA greater than 2 percent above the minimum should be avoided.
 7. The Superpave HMA design, when compacted according to AASHTO T 312 at 7.0 ± 0.5 percent air voids, and tested in accordance with AASHTO T 283, shall have a minimum tensile strength ratio of 0.80.

27.4.09 Superpave HMA Job Mix Formula (JMF)

The Contractor shall submit a Job Mix Formula (JMF) to the Engineer representative prior to HMA production. The JMF submission shall include the following:

- (a) The JMF shall include the Asphalt Mix Design parameters including aggregate types, the combined aggregate percent by mass passing for each sieve size, asphalt content by percent of mass, air voids, VMA and VFA.
- (b) The asphalt cement grade, supplier and temperature-viscosity chart.

27.4.09 Superpave HMA Job Mix Formula (JMF) (Cont'd)

- (c) Target gradations for the DLS (see Table 27.14, Note 1), 4.75 mm, 600 µm and 75 µm sieve sizes. The JMF gradation targets shall be within the limits as provided in Table 27.4.
- (d) Target for the asphalt cement content.

The JMF targets shall not deviate from the HMA mix design by more than the following:

- ± 3% for material passing 4.75 mm sieve size
- ± 0.8% for material passing 75 µm sieve size
- ± 0.3% for asphalt cement content

A maximum five (5) JMF adjustments per mix type will be accepted. Additional JMF adjustments will require a new HMA mix design.

27.4.10 Tack Coat Material

Tack coat shall consist of RS-1 or CRS-1 Grade emulsified asphalt and shall conform to the provisions of ASTM D977 or D2397, respectively.

Non-tracking emulsified asphalt shall be diluted with 40% water and shall meet the requirements of Table 27.8. Dilution of the emulsified asphalt shall be permitted at the terminal only.

Table 27.8: Non-Tracking Emulsified Asphalt Requirements (Prior to Dilution)

Test Type	Specification Range	
	Minimum	Maximum
Test on Emulsion		
SF Viscosity, 25°C, SFs	20	
Sieve Test, 850 µm, %		0.1
Dist. Residue, 260°C	55	
Oil Portion of Dist., %		trace
Particle Charge	(-) or (+)	
Test on Residue		
Penetration, 25°C, dmm	20	55
Ash Content, %		1.0

27.5 **CONSTRUCTION METHODS**

27.5.01 **Equipment**

General

All equipment for the production, transportation, placement and compaction of Superpave HMA shall be designed and operated to produce HMA and asphalt concrete pavement meeting all of the requirements of this Specification. The equipment shall be of adequate rated capacity and shall be kept in good working order. The Engineer shall be provided safe access to all equipment in order to check for compliance with this Specification.

Hot-Mix Asphalt Plant

The HMA plant(s) and its (their) component shall conform to AASHTO M 156. The HMA plant(s) shall include an efficient dust collecting system to prevent the loss of fine material. The material collected may be returned to the mix at a uniform rate and/or be discarded.

Paving Equipment

Asphalt pavers shall be self-propelled and capable of laying a consistent satisfactory mat that is true to the crossfall, profile, cross-section, and alignment specified in the Contract Documents. Pavers shall be equipped with hoppers and distributing augers capable of placing the HMA evenly in front of the screeds. Screeds shall be capable of being heated and being adjustable as to level and crown. Pavers shall be capable of simultaneously placing the shoulder pavement and roadway pavement whether the shoulder pavement is at the same or different crossfall from the roadway pavement.

In all cases, pavers shall be equipped with automatic longitudinal and transverse grade and slope controls capable of being operated from either side of the paver. The longitudinal grade control shall be adjustable for mat thickness in small increments, without the necessity of stopping the paver. The paver shall be equipped to operate from either a 12 m ski or floating beam, a 3 m ski, or a joint matching shoe. Where the ski is a flexible unit, it shall be equipped with a spring-tensioned wire extending between brackets fitted on and slightly above each end of the ski. The sensing grid shall ride on the wire, not on the ski.

Plows or other edge ramping devices that are attached to or towed by the screed portion of the paver shall not be permitted.

A 3 m straight edge shall be provided on each paver. This straight edge shall be made of metal with a level recessed in its upper surface parallel to the lower edge.

Rollers

(a) Classification of Rollers

Rollers shall be classified into categories as follows:

Class S Self-propelled steel-drum, tandem, or three-wheel rollers according to Table 27.9.

27.5.01 Equipment (Cont'd)

Rollers (Cont'd)

Table 27.9: Requirements for Class S Rollers

Roller	Minimum Mass (t)	Minimum Mass Per mm Total Roll Width (kg)
S 1	7	3.5
S 2	9	4.5

Class R Self-propelled pneumatic-tired rollers according to Table 27.10.

Table 27.10: Requirements for Class R Rollers

Roller	Minimum Mass (t)	Minimum Mass Per Tire (kg)
R 1	8	900
R 2	18	2,500
R 3	25	3,600

Class V Self-propelled vibratory rollers specifically designed for HMA compaction having either dual vibratory rolls or a combination of vibratory roll and pneumatic tires with a contact area equal to or greater than 70% of the roll width according to Table 27.11.

Table 27.11: Requirements for Class V Rollers

Roller	Minimum Roll Diameter m	Minimum Roll Width m	Minimum Static Mass Per mm Total Roll/Tire Width kg
V 1	1.00	1.40	2.0
V 2	1.20	1.60	2.6
V 3	1.40	1.90	2.9

(b) Requirements for Rollers

All rollers shall be capable of reversing without backlash.

The Engineer shall be provided with the mass of the rollers. The Engineer may require the weighing of the rollers in his presence.

27.5.01 **Equipment (Cont'd)**

Rollers (Cont'd)

The rolls or drums shall be kept moist with water or non-petroleum based release agents to prevent adhesion of HMA to them. Excess water or release agents shall not be permitted.

(c) **Steel-Drum Rollers**

The drums of tandem steel-drum rollers shall not be less than 1.20 m in width.

(d) **Pneumatic-Tired Rollers**

Pneumatic-tired rollers shall be constructed such that the wheels on either the front or back oscillate either independently or in pairs. The wheels shall be mounted with smooth rubber tires. Tire inflation pressure shall be a minimum of 350 kPa when the tires are cold. All tires shall have equal pressure. Skirts or windbreaks shall be provided at all times to protect all tires from the cooling effects of atmospheric conditions. Each roller shall be equipped with a suitable tire pressure gauge for checking tire inflation pressure.

(e) **Vibratory Rollers**

Vibratory rollers shall be according to the following requirements:

- i. Frequency of vibrations of the vibratory roller shall be 2,200 vibrations per minute or greater;
- ii. Rollers shall be equipped with provision for automatic shutoff vibrations before coming to a stop; and
- iii. Vibration levels that could cause damage to services and other structures shall be avoided.

27.5.02 **Quality Control**

Quality control (QC) procedures shall be conducted by the Contractor to ensure the HMA meets the requirements of the Contract Documents and this Specification. The Contractor shall be responsible for the interpretation of the QC test results and the determination of any actions to be taken to ensure that all materials and work are according to the requirements of the Contract Documents and this Specification.

A qualified asphalt testing laboratory (Quality Control Laboratory) with AMRL, CCIL or equivalent qualifications acceptable to the Engineer shall be used. Testing of the samples in the Quality Control Laboratory shall be conducted by technicians qualified to perform the QC tests. All test result Reports shall be reviewed, signed and submitted to the Engineer by the Contractor, within one (1) working day of taking the sample(s) for testing.

27.5.03 Preparation of Foundation and Existing Pavement

Granular Grade

Prior to placing any course of Superpave HMA on a granular grade, a Class S roller of minimum mass of 7 t, or an equivalent Class V roller with a drum width of at least 1.2 m, shall be used to finish roll the granular grade ahead of the asphalt paver to ensure a compacted, smooth, and float-free surface.

The Contractor shall check grades, cross falls, surface tolerances, and compaction of the granular grade, and shall correct any deficiencies. All costs associated with the preparation of the granular grade will be deemed to be included in the unit prices for hot-mix, hot-laid asphalt concrete in the Schedule of Quantities and Unit Prices, Division 4 of the Contract Specifications.

HMA placement shall not be carried out if the roadbed is frozen. The granular grade shall be free of standing water at the time of HMA placement.

Frames and Appurtenances

The Contractor shall check and adjust all frames and appurtenances to grade, including longitudinal and transverse slopes. All costs associated with the adjustment of frames and appurtenances will be deemed to be included in the unit prices for structure adjustments in the Schedule of Quantities and Unit Prices, Division 4 of the Contract Specifications.

Existing Pavement

Prior to placing any HMA, all HMA and concrete surfaces shall be clean of all loose, broken, and foreign materials. Milled surfaces shall be swept with a power broom. The Contractor shall carry out such cleaning, brooming and flushing, as necessary. All costs associated with cleaning, brooming and flushing shall be considered incidental to the Work.

The surface of a pavement upon which HMA is to be placed shall be dry at the time of HMA placement. An HMA course shall not be placed on a previously laid course until a minimum of 4 hours have elapsed, following final compaction of the previous course, and the temperature of the previous course is 60°C or less, and the paving equipment does not damage the previously laid course.

27.5.04 Application of Tack Coat

Tack coat shall be used to treat the entire cold-milled asphalt concrete surface, or any other surface specified by the Engineer, prior to placing HMA.

Tack coat shall be used at all joints, curb lines, aprons, around street hardware, and catch basin frames, or any other vertical face(s) that the new asphalt concrete will terminate against, unless directed otherwise by the Engineer.

Immediately before the application of tack coat, and prior to delivery of any HMA to the paving location, the Contractor shall carry out power or hand brooming when deemed necessary by the Engineer.

27.5.04 Application of Tack Coat (Cont'd)

The tack coat shall be applied in a uniform manner without streaking by means of a pressure distributor at a minimum diluted rate of 0.4 l/m², or as directed by the Engineer. Tack coat shall not be applied during inclement (wet) weather. Care shall be taken during the application of tack coat to prevent the defacing of adjacent buildings, walls or signs. The tack coat shall be allowed to properly cure (break), with any traffic diverted until the tack coat has cured and the traffic will not cause any tracking.

27.5.05 Transportation of Hot-Mix Asphalt

The Superpave HMA shall be transported from the asphalt plant to the work in leak-proof truck boxes that have been previously cleaned of all foreign materials. If required, truck boxes shall be lightly coated with a uniform application of a non-petroleum based release agent. Truck boxes must be drained after each application and before loading. No release agents shall be used that can adversely affect the quality or performance of the HMA. Release agents shall be used according to their proprietary requirements.

Delivery of HMA to the site shall be scheduled such that placing and compacting of the HMA is completed by one-half hour after sunset.

Night paving shall only be as approved in writing by the Engineer. Approval of the Engineer for night paving shall not alleviate the Contractor from the responsibility of meeting all of the conditions of this Specification.

Each truck shall use a canvas tarpaulin of sufficient size to completely cover the load at all times.

27.5.06 Sampling

Asphalt Binder

When required by the Engineer, the Contractor shall take a sample of the PG asphalt binder (cement) in the presence of the Engineer for QA purposes. Typically a minimum of one sample will be randomly chosen for QA testing for each asphalt binder used on the Contract.

Hot-Mix Asphalt

The Contractor is responsible for obtaining QC HMA samples, and QA HMA plate samples at stratified random locations selected by the Engineer. For QC samples, the Contractor may determine the method of sampling. QA samples shall be taken in the presence of the Engineer and be placed in an appropriate container.

The minimum frequency for sampling and testing is the responsibility of the Contractor, but shall be no less than the requirements specified in Table 27.12. All samples shall be labelled with the location, date, time of sampling, and HMA type, using the labels provided by the Engineer for this purpose.

Cores

Cores of the HMA shall be extracted by the Contractor for the Engineer at stratified random sampling locations as determined by the Engineer.

27.5.06 Sampling (Cont'd)

Cores (Cont'd)

For 4.75 mm, 9.5 mm and 12.5 mm mixes, 100 mm diameter cores of the HMA shall be extracted and for 19.0 mm mixes, 150 mm diameter cores shall be extracted. Random numbers shall be generated to determine distance from section start and offset from centerline with no core taken closer than 0.3 m from curbs, structures or joints. Cores shall be taken no later than the next Business Day on which a lane closure is possible. The frequency of cores shall be a minimum of three cores per lift per street or one core per 300 tonnes of each HMA type, whichever is greater. The Engineer may reduce the frequency of core extractions to a minimum of one core per 500 tonnes of each HMA type if testing results indicate the compactive effort is consistently meeting this Specification.

Delivery

All HMA samples and cores for the Engineer shall be delivered by the Contractor, within 4 hours of sampling, to a Quality Assurance Laboratory designated by the Engineer.

Repair of Sampling Locations

HMA and compaction requirements for filling all sample holes shall be the same as the adjacent undisturbed pavement. All sample holes shall be cleaned, dried, and filled and then compacted using a mechanical, self-powered gas, electric, or air powered compactor immediately after sampling.

All costs associated with the sampling, delivery and repair of sampling locations for QA samples shall be deemed to be included in the unit prices for hot-mixed, hot-laid asphalt concrete in the Schedule of Quantities and Unit Prices, Division 4 of the Contract Specifications.

Table 27.12: Sampling and Testing Frequency of Hot-Mix Asphalt

Quantity Per Day Per HMA Type	Minimum Frequency of Sampling and Testing (Note 1)	Minimum Superpave Sampling Size kg
≤ 300 tonnes	One sample	25
>300 and ≤1200 tonnes	One sample per 300 tonnes or part thereof	
>1200 tonnes	One sample per 400 tonnes minimum of 3 (Note 1)	

Notes: 1. The Engineer may reduce the testing frequency for HMA that is consistently being produced to meet Specification requirements.

27.5.07 Placing Hot-Mix Asphalt

General

Prior to compaction, obvious defects in the HMA material placed shall be corrected. Irregularities in the alignment and grade along the outside edges shall be corrected.

A through lane paving course shall be completed prior to the placement of adjacent side roads, speed change lanes, and other paved areas. For all courses, each adjacent lane shall be completed to approximately the same location at the end of each day's paving.

At the end of each completed portion and prior to opening the lanes to traffic, the completed sections of HMA course shall be ramped transversely to the existing pavement for a minimum distance of 1.5 m. If at the end of a day's production two adjacent lanes are not completed to the same location, the longitudinal edges must be ramped down in a safe manner to the adjacent existing pavement. In all cases, the ramps shall not form part of the permanent asphalt pavement and shall be removed prior to continuing paving operations.

The temperature of the HMA immediately after spreading and prior to initial rolling shall not be less than 120°C.

Lower Course

Lower courses shall not be placed unless the air temperature at the surface of the road is a minimum of 2°C and rising.

Lower course paving operations shall not continue after October 31st, unless approved in writing by the Engineer.

Upper Course

Upper (surface) courses shall not be placed unless the air temperature at the surface of the road is at least 7°C and rising.

When single course pavement is laid on granular grade the minimum air temperature at the surface of the granular grade shall be at least 2°C and rising.

Upper coarse paving operations shall not continue after October 15th, unless approved in writing by the Engineer.

27.5.08 Use of Paving Equipment

Leveling, lower, and upper courses shall be laid by means of mechanical self-propelled asphalt pavers.

Pavers working in echelon shall maintain a distance of less than 60 m between them.

The longitudinal alignment of the paver shall be controlled by the use of a string line placed at each outer edge of the pavement. The paver is to be directed at

27.5.08 Use of Paving Equipment (Cont'd)

all times by the string line and not by the edge of the preceding course, except for the trailing paver when paving in echelon.

The automatic screed controls and all compaction aids on the paver shall be operational while the HMA is being placed, except that the automatic controls shall not be used when placing Superpave 9.5, Superpave 4.75, or a single course of HMA on granular grade.

Single pavers or the lead paver when paving in echelon shall be controlled for longitudinal grade by a 12 m ski or floating beam.

The pavers shall operate continuously at a uniform speed necessary to match the output of the HMA plant. However, in no case shall the speed of an asphalt paver exceed 18 m/min.

If the HMA for upper course paving comes from more than one asphalt plant, the HMA from each plant shall be placed by a separate asphalt paver.

27.5.09 Widenings and Irregular Sections

When it is necessary to hand-spread the HMA in sections adjacent to machine-laid areas, such hand-spreading shall be carried out concurrently with machine-laying operations.

Widenings

The HMA shall be placed in widenings such that the top of the compacted HMA is flush with the top of the existing pavement. When stepped joints are specified in the Contract Documents, the layers placed in the widening shall be placed to the top of each step in separate operations. HMA shall be placed in the widening using equipment specially designed for this purpose.

Irregular Sections

In turn-outs, driveways, and other irregular sections where it is impractical to use machine methods to spread and finish the lower, levelling, or upper courses, the Contractor shall use other spreading equipment or shall spread the HMA by hand.

27.5.10 Hot-Mix Asphalt Padding

When and where specified in the Contract Documents, HMA padding shall be carried out to correct geometric deficiencies on the surface of the existing pavement. All costs associated with HMA padding will be deemed to be included in the unit prices for HMA padding in the Schedule of Quantities and Unit Prices, Division 4 of the Contract Specifications.

27.5.11 Hot-Mix Asphalt Patching

Prior to HMA patching, any temporary patching material shall be removed from the locations designated for such removal in the Contract Documents. The

27.5.11 Hot-Mix Asphalt Patching (Cont'd)

resulting areas shall be filled and compacted with HMA, as specified in the Contract Documents. The HMA patching material shall be machine laid to the required thickness, grade, and crossfall. Transverse and longitudinal joints between the existing pavement and the patch shall be perpendicular butt joints formed by a milling process or keyed in, as specified in the Contract Documents. All costs associated with HMA patching will be deemed to be included in the unit prices for HMA patching in the Schedule of Quantities and Unit Prices, Division 4 of the Contract Specifications.

27.5.12 Longitudinal and Transverse Joints

General

All joints shall be made to ensure a full face bond and a smooth riding surface. Longitudinal and transverse butt or stepped joints between the new HMA pavement and the existing pavement shall be constructed by trimming the existing pavement edge to a straight clean vertical surface of at least 40 mm. All dirt or other foreign material and all loose material shall be removed from all vertical surfaces. When matching a compacted joint, the depth of the uncompacted mat shall be set to allow for compaction. The paver screed shall overlap the adjoining mat by no more than 50 mm.

Tack Coating of Joints

Vertical surfaces at which joints are made shall be tack coated with a thin, uniform and continuous coating of tack coat, except for longitudinal joints between lanes paved in echelon. All costs associated with the application of tack coat will be deemed to be included in the unit prices for hot-mix, hot-laid asphalt in the Schedule of Quantities and Unit Prices, Division 4 of the Contract Specifications.

Longitudinal Joints

Longitudinal joints shall be properly set up, with the back of a rake or lute, at the proper height and grade prior to rolling. For multiple lifts of HMA, the width of subsequent courses shall be staggered to an offset of 150 to 300 mm so that longitudinal joints do not coincide. This shall also apply to the joint between through lanes and speed change lanes and other similar longitudinal joints. The longitudinal joints in the upper course shall correspond to the demarcation between the driving lanes, speed change lanes, and tapers. During upper course paving, excess material shall not be cast on to the surface of the freshly laid mat. When resurfacing against a rigid object, a butt joint shall be constructed by milling the existing pavement to provide an exposed vertical surface of at least 25 mm at the face of the rigid object. The milling shall be feathered out to zero over a minimum length of 1.25 m from and parallel to the exposed face of the rigid object providing a minimum of 40 mm of resurfacing material over the area of removal.

Transverse Joints

The paver shall not move more than 15 m from any transverse joint until that joint has been rolled and checked with a straight edge. If the joint is not satisfactory, it shall be corrected immediately before the paver is allowed to proceed. Joints between HMA pavement laid under this Contract and existing

27.5.12 Longitudinal and Transverse Joints (Cont'd)

Transverse Joints (Cont'd)

HMA courses not laid under this Contract shall be constructed as follows:

- a) Where a lower course is placed flush against an existing HMA pavement and a butt joint is to be made, the existing pavement shall be trimmed back to form a straight vertical surface.
- b) Where an upper course is placed flush against an existing HMA pavement, a stepped joint shall be prepared by removing the existing surface course to its full depth for minimum length of 0.5 m and the remaining face shall be trimmed to form a straight vertical surface.
- c) Where a lower course and upper course are not placed flush against an existing HMA pavement, the lower course shall be feathered out and the upper course shall be butt jointed by removing the existing upper course to a minimum depth of 40 mm and for a longitudinal distance not less than 3 m.

27.5.13 Compaction

Rolling

(a) Static Rolling

Compaction shall be accomplished using the minimum combination number of rollers specified in Table 27.13. The Contractor shall determine the correct sequence of rollers used for compacting in order to achieve compaction requirements. The operating speed of steel drum rollers shall not exceed 5 km/h and shall be operated in a manner to avoid undue displacement of the mix. Rollers shall operate with the drive wheel forward in the direction of paving. Rolling procedures shall be as follows:

Breakdown Rolling

The mix shall be uniformly compacted as soon after placing as it can support the roller without checking or undue displacement. Rolling shall start longitudinally at the lower edge and proceed towards the higher edge of the course, overlapping on successive passes. Alternate passes of the roller shall be staggered.

Intermediate Rolling

The intermediate roller shall follow the breakdown roller as closely as possible. Passes shall overlap previous passes. The roller shall be operated to prevent pick-up of the HMA on the tires.

Finish Rolling

Finish rolling shall start longitudinally at the higher edge and proceed towards the lower edge.

27.5.13 Compaction (Cont'd)

Rolling (Cont'd)

(b) Vibratory Rolling

For all HMA being compacted on bridge decks, vibratory rollers shall be operated in static mode.

Compaction of Irregular Sections and Inaccessible Areas

At all places not accessible to rollers, the mix shall be properly compacted by mechanical, self-powered gas, electric, or air powered equipment, to meet the density requirements of this Specification.

Table 27.13: Maximum Production Rates Per Paver for Combinations of Rollers

Maximum Production (t/h)	Minimum Roller Combinations
120	S2 + R1 + S1
	V1 + R1
135	V2 + R1
	V1 + R2
150	S2 + 2 x R1 + S1
	S2 + R2 + S1
	V2 + R2
200	V3 + R2
220	V3 + R3

27.5.14 Tolerances

After final compaction, each course shall be smooth and true to the established crown and grade. HMA lower and upper courses shall be free from deviations exceeding 6 mm and 3 mm, respectively, as measured in any direction with a 3 m straight edge. These tolerances shall also apply to all frames and appurtenances (street hardware). All frames and appurtenances shall be adjusted to final grade so that, when tested with a 3 m straight edge placed anywhere and in any direction on the surface, there shall not be a vertical gap between the bottom of the straight edge and the surface of the asphalt concrete pavement, frame or appurtenance exceeding 3 mm.

27.5.15 Surface Appearance

Each course after final compaction shall be of uniform texture and shall be free of defects such as segregation, fat spots, oil spills, and roller marks, etc. Defective areas shall be removed and replaced with HMA of the same type and compacted to the satisfaction of the Engineer, at the Contractor's cost.

27.5.16 Placing Asphalt Concrete Curb

Asphalt concrete curb(s) shall be as shown in the Contract Documents, unless otherwise directed by the Engineer.

The hot-mix asphalt for asphalt concrete curb(s) shall be Superpave 9.5, unless otherwise specified in the Contract Documents.

The curbing machine used for placing the asphalt concrete curb shall be an automatic curber capable of producing a smooth, well-compacted finished curb by extrusion under the pressure method through a worm or screw gear into the curb mold. The curber shall have a sufficiently large hopper to ensure a steady flow of HMA to the extrusion screw. The curber shall have a uniform weight distribution to ensure sufficient compaction to produce maximum density. Side forms should be used where the pavement grade is not smooth in order that the finished asphalt concrete curb will have a smooth and true line and grade. The density of the placed asphalt concrete curb shall not be less than 90% of the maximum theoretical density of the HMA. On grades greater than 3% the asphalt concrete curb shall be laid uphill. No expansion joints are required for the asphalt concrete curb.

The surface on which the asphalt concrete curb is to be placed should be thoroughly cleaned and dried before placing the asphalt concrete curb. Tack coat shall be applied at 0.55 l/m² to 0.82 l/m², and allowed to properly cure (set), before placing the asphalt concrete curb. For proper support on pavement edges, the back of the curb should be at least 0.4 m from the pavement edge, unless otherwise instructed by the Engineer. Asphalt concrete curb shall not be placed on a surface cooler than 5°C or during inclement (wet) weather.

All costs associated with placing asphalt concrete curb will be deemed to be included in the unit prices for asphalt concrete curb in the Schedule of Quantities and Unit Prices, Division 4 of the Contract Specifications.

27.5.17 Placing Asphalt Concrete Sidewalk

Asphalt concrete sidewalk(s) shall be as shown in the Contract Documents, unless otherwise directed by the Engineer.

The hot-mix asphalt for asphalt concrete sidewalk(s) shall be Superpave 9.5, unless otherwise specified in the Contract Documents.

The granular base for the asphalt concrete sidewalk shall be prepared in accordance with the Sections on granular materials in Divisions 13 and 24. The minimum thickness of the granular base shall be 150 mm. The sidewalk shall be sloped at a 2% grade, and the direction of this slope will depend on local conditions, but in general shall be towards the street.

The asphalt concrete sidewalk shall have a compacted thickness of 50 mm, and shall be laid with a small asphalt paver (finishing machine) capable of producing an asphalt concrete sidewalk meeting the requirements of this Specification. Where the asphalt concrete sidewalk is abutted by an asphalt concrete curb, all contact surfaces of the curb shall be painted with a thin, uniform coat of tack coat.

27.5.17 Placing Asphalt Concrete Sidewalk (Cont'd)

If no suitable small asphalt paver is available in the City, the Contractor may, upon approval of the Engineer, lay the asphalt concrete sidewalk by hand. In this case, and when there is no curb for support, forms shall be employed. These sidewalk forms shall be staked so that the forms are held firmly in line and grade. The upper edge of the forms shall be level with the finished grade of the asphalt concrete sidewalk.

All costs associated with placing asphalt concrete sidewalk will be deemed to be included in the unit prices for asphalt concrete sidewalk in the Schedule of Quantities and Unit Prices, Division 4 of the Contract Specifications.

27.5.18 Shoulders

Upon completion of upper (surface) course asphalt concrete pavement, the Contractor shall place shoulder material to blend the new asphalt concrete pavement surface to the existing adjacent grade in accordance with Division 24. All driveways shall be made accessible within twenty-four (24) hours of placing the upper course asphalt concrete pavement. All shouldering shall be completed in five (5) working days of placing the upper course asphalt concrete pavement. If shouldering and/or driveway access are not provided within these specified time periods, the City reserves the right to have this work completed by others at the Contractor's cost.

The granular materials for shoulder construction shall be placed by means of a shoulder spreader. Where obstacles on the shoulder prevent the efficient use of the spreader, the shoulder material may be placed adjacent to the obstacle(s) by end dumping and hand spreading. Before commencing any shoulder construction, all debris and deleterious material shall be removed. Regardless of the method of placing, and the width of shoulder, all shoulder construction material shall be placed directly on to the shoulder without segregation and compacted to meet the requirements of Division 24. Any spillage and materials dragged on to the pavement surface shall be removed and the area thoroughly cleaned, without damage to the asphalt pavement surface.

All costs associated with shouldering will be deemed to be included in the unit prices for shouldering in the Schedule of Quantities and Unit Prices, Division 4 of the Contract Specifications.

27.5.19 Milling of Existing Asphalt Concrete

When and where indicated in the Contract Documents, existing asphalt concrete shall be milled off for the area(s) and depth(s) indicated.

The Contractor shall notify the Engineer a minimum of three (3) working days in advance of beginning the milling operations.

The Contractor shall take care in full depth removal to not contaminate the reclaimed asphalt pavement (RAP) with underlying aggregate material. The Contractor shall provide, in partial depth removal, equipment with automatic controls for longitudinal grade and transverse slope. The milled surface shall be uniform and free of ridges.

27.5.19 Milling of Existing Asphalt Concrete (Cont'd)

All loose materials remaining after cold milling shall be swept by the Contractor to a granular shoulder, or picked up from paved shoulders or gutters, before reopening to traffic. This shall be considered incidental to the work.

If a transverse vertical joint is milled in the existing pavement to allow for transition between new and old pavement, the Contractor shall promptly construct a temporary smooth ramp with HMA to a slope of 25:1. This shall be considered incidental to the work.

The reclaimed asphalt pavement (RAP) shall become the property of the Contractor.

The Contractor shall remove all asphalt concrete from the faces of curbs and/or gutters, around street hardware, catch basins, and any other structures abutting the work in such a manner that the curbs, gutters, street hardware, catch basins, and other structures are not damaged and the area, after removal, matches the grade of the adjacent milled area. This shall be considered incidental to the work.

Unless otherwise specified, a transverse key joint shall be cold milled at each end of an overlaid section or where new asphalt concrete pavement terminates against an existing pavement.

The HMA resurfacing shall be completed within ten (10) working days of completing the cold milling. The Contractor shall maintain the site free of potholes, and in a condition providing for the safe flow of traffic from the time of cold milling until the time of HMA resurfacing.

Should the Contractor not complete the HMA resurfacing within the required time after completion of the cold milling, the City may have the work completed by others at the Contractor's cost.

All costs associated with milling existing asphalt concrete will be deemed to be included in the unit prices for milling existing asphalt concrete in the Schedule of Quantities and Unit Prices, Division 4 of the Contract Specifications.

27.5.20 Quality Assurance

General

The Engineer is responsible for conducting QA testing and inspection procedures for all HMA aggregates, asphalt cement, and compaction to monitor compliance with the requirements of this Specification. QA HMA testing shall be conducted at a frequency specified in Table 27.12. All QA testing will be completed by a qualified Quality Assurance Laboratory reporting to the Engineer.

The HMA samples shall be randomly taken in the field by the Contractor using sample plates, or other methods approved by the Engineer, as given in Section 27.5.06.

The QA HMA samples and, if required, pavement cores, shall be delivered to the location designated by the Engineer within 4 hours of the sampling time.

27.5.20 Quality Assurance (Cont'd)

General (Cont'd)

All samples require identification of the location, date, and time of sampling; HMA type; and HMA lift, as given in Section 27.05.06.

Acceptance of hot mix aggregates and asphalt cement shall be according to Sections 27.4.02, 27.4.03 and 27.4.05, and subject to verification by the Engineer.

The Engineer may reject visually defective HMA areas based on, but not limited to, a condition survey of the following defects: flushing, bleeding, segregation, fat spots, ravelling, surface damage (roller marks, tire marks, checking, cracking and tearing), open and/or improperly matched joints, improperly reinstated sampling locations, and surface contamination. Such defective HMA and/or defective areas shall be removed from the work and replaced with acceptable HMA.

For surface quality assurance purposes, the Engineer may complete a visual evaluation of the surface of each finished paving course to check that it is homogeneous, free from segregation, and uniform with respect to surface texture. Segregation is defined as an area of the asphalt concrete pavement surface where the texture differs visually from the texture of the surrounding pavement. The severity of segregation, based on a field visual evaluation, will be categorized as follows (Asphalt Institute MS 22):

- Slight: Area where the mastic is in place between aggregate particles; however, there is slightly more coarse aggregate than in the surrounding acceptable mix;
- Medium: Area has significantly more coarse aggregate than the surrounding acceptable mat and usually exhibits some lack of surface mastic;
- Severe: Area appears very coarse in comparison to the surrounding acceptable mat, with stone against stone, and little or no mastic.

The following remedial actions will be considered to be acceptable for the severity of segregation involved:

- Slight: Accepted into the Work;
- Medium: Left in place for lower courses or shoulder, and subject to full lane width removal and replacement at the contractor's cost for upper (surface) course; and
- Severe: Subject to full lane or shoulder width removal and replacement at the contractor's cost for all courses.

The removal and replacement of any Superpave HMA asphalt concrete shall meet the overall quality requirements of this Specification.

Where the Contractor fails to consistently provide HMA that meets this Specification, the Engineer may refuse further material from the Contractor

27.5.20 Quality Assurance (Cont'd)

General (Cont'd)

until the mix properties are verified for quality by taking samples to determine and establish compliance to asphalt cement content, aggregate gradation, and Superpave mix properties in accordance with the requirements of this Specification.

Where the Contractor fails to consistently place hot-mix asphalt pavement that meets this Specification, the Engineer may stop the paving operations until such time that the Contractor demonstrates the ability, through for instance placing HMA off-site, to consistently meet this Specification.

Any asphalt pavement work that does not meet the requirements of this Specification and is rejected by the Engineer, shall be repaired by the Contractor at the Contractor's cost. Such repairs required in accordance with the Specification shall be carried out for the full width of the asphalt pavement lane. The full thickness of the rejected asphalt pavement course shall be removed by cold milling, or by other means acceptable to the Engineer. All milled surfaces and joints shall be tack coated.

Aggregate Gradation Requirements

Aggregate gradation test results for HMA samples shall meet the JMF tolerance requirements specified in Table 27.14.

Asphalt Cement Content Requirements

Asphalt cement content test results for HMA samples shall meet the JMF tolerance requirements specified in Table 27.14.

Table 27.14: Tolerances for the Job-Mix Formula Aggregate Gradation and Asphalt Cement Content

Mix	Attribute (Note 1)	Tolerances on the Job-Mix Formula (Note 2) %		
		Acceptable	Borderline	Rejectable
Upper Course	DLS, 4.75 mm sieve size	< 5.0	5.0 to 7.5	> 7.5
	600 µm sieve size	< 3.5	3.5 to 5.0	> 5.0
	75 µm sieve size	< 0.5	0.5 to 1.0	> 1.0 ³
Lower and Levelling Course	DLS, 4.75 mm sieve size	< 7.0	7.0 to 10.0	> 10.0
	600 µm sieve size	< 4.5	4.5 to 6.0	> 6.0
	75 µm sieve size	< 0.5	0.5 to 1.0	> 1.0 ³
All Mixes	Asphalt Cement Concrete	< 0.30	0.30 to 0.50	> 0.5

Table 27.14: Tolerances for the Job-Mix Formula Aggregate Gradation and Asphalt Cement Content (Cont'd)

- Notes:
1. DLS for Superpave 19.0 is 12.5 mm; DLS for Superpave 12.5 is 9.5 mm; DLS for Superpave 9.5 is 4.75 mm; and DLS for Superpave 4.75 is 2.36 mm.
 2. Tolerances on the Job-Mix Formula apply as both plus and minus from the Job-Mix Formula percent.
 3. More than 7.0 percent passing the 75 μ m sieve size shall be considered to be rejectable for all HMA mixes except the 4.75 mm mix. More than 9.0 percent passing the 75 μ m sieve size shall be considered to be rejectable for the 4.75 mm HMA mix.

27.5.21 Aggregate Gradation and Asphalt Cement Content Acceptance

If the HMA is borderline for aggregate gradation or asphalt cement content as specified in Table 27.14, the Contractor shall be notified in writing by the Engineer and shall take immediate corrective action through process control at the asphalt plant. A total of three borderline test results for the same attribute representing up to 3,000 tonnes of HMA production shall result in the work being deemed rejectable.

Rejected HMA due to aggregate gradation, such as non-compliance on the DLS 4.75 mm, 600 μ m, or 75 μ m sieve sizes, or non-compliance due to the asphalt cement content specified in Table 27.14, shall be removed and replaced with acceptable HMA.

27.5.22 Hot-Mix Asphalt Properties

General

The production air voids for all Superpave HMA shall be in the range of 3% to 5%.

Acceptance Criteria

If the Superpave HMA mix does not meet AASHTO M 323 and the air voids are within $\pm 1.0\%$ of the production range, the Contractor will be notified in writing by the Engineer and shall take immediate corrective action.

If the air voids are outside $\pm 1.0\%$ of the production range, the HMA represented by the test shall be removed and replaced by the Contractor with acceptable HMA of the same type and compacted to the satisfaction of the Engineer, all at the Contractor's cost.

27.5.23 Compaction Requirements

General

Acceptance for compaction based upon core testing, or calibrated nuclear density gauge testing, shall be conducted by the Engineer.

Compaction testing of the placed HMA shall meet the requirements given in Table 27.15.

27.5.23 Compaction Requirements (Cont'd)

Compaction Determined by Core Density Testing

Density testing of the cores will be in accordance with AASHTO T 166. If the percent water absorbed by the specimen is found to exceed 2% by volume as described in AASHTO T 166, then the bulk specific gravity will be according to AASHTO T 275, LS-306, or ASTM D 6752. Per cent compaction will be determined by comparing the core BRD to the average MRD, both according to AASHTO T 209, of the plant produced HMA.

Compaction Determined by Calibrated Nuclear Density Gauge

Compaction testing will be conducted randomly at a minimum frequency of every 100 m per lane or 150 m² area. Percent compaction will be determined by comparing the nuclear density in situ BRD to the average plant produced HMA MRD, both according to AASHTO T 209.

Acceptance

If the average percent compaction for the completed course of HMA pavement does not meet the acceptable minimum percent compaction, the Contractor will be notified in writing by the Engineer and shall take immediate corrective action. If the average percent compaction is rejectable, then the HMA pavement shall be removed and replaced to the satisfaction of the Engineer, all at the Contractor's cost.

Table 27.15: Pavement Compaction Requirements Based on Maximum Relative Density

Mix	Acceptable %	Borderline %	Rejectable %
Superpave 19.0	91.0 to 96.5	96.6 to 97.5	< 91.0 or > 97.5
All other Superpave Mixes	92.0 to 96.5	96.6 to 97.5	< 92.0 or > 97.5

27.5.24 Frames and Appurtenances

The Contractor shall be responsible for breaking out and resetting such frames and covers, reconstructing asphalt pavement around them and repaving with hot mix, all at the Contractor's cost, if the variances from grade are rejectable, as given in Table 27.16. If the variances from grade are borderline, the Contractor will be warned by the Engineer in writing and shall take immediate corrective action with the adjustment procedure.

27.5.24 Frames and Appurtenances (Cont'd)

**Table 27.16: Frames and Appurtenances Adjustment Requirements
Variances from Grade**

Variance from Grade (Gap), mm	Action
Up to 3.0	Acceptable
3.0 to 5.0	Borderline
Greater than 5.0	Rejectable

27.5.25 Dispute Resolution

In the case of dispute, the Contractor may request, in writing stating the technical reasons, the Engineer to undertake a coring and testing program to verify the mix using a mutually agreed upon third party Referee Testing Laboratory. If the mix is confirmed to be rejectable, the Contractor shall be responsible for all associated costs of the coring and testing program, otherwise the Engineer will be responsible for the costs. Referee cores may be used to verify compliance, if cores were previously extracted. Results of the Referee testing shall be used to assess the degree of remedial action required, if applicable. Referee testing of samples shall be under the same requirements as the Quality Assurance Laboratory.

Both the Contractor and the Engineer may have representatives present during Referee testing. During the Referee testing, each representative shall immediately comment on any aspect of the testing which the representative does not consider valid, and the Referee laboratory representative will respond to the comments. Prior to leaving the laboratory, any unresolved comments regarding testing procedures are to be given to the Referee laboratory's representative in writing.

27.5.26 Rejectable Work

The finished surface of any asphalt pavement shall have a uniform texture and be free of visible signs of poor workmanship and bumps and/or dips exceeding 3mm as measured with a 3 m straight edge. Any obvious defects, as determined by the Engineer, shall be cause for rejection of the work.

Such defects shall include but not necessarily be limited to the following:

1. Segregated areas;
2. Ravelling;
3. Roller marks;
4. Cracking or tearing;
5. Improper matching of longitudinal and transverse joints;
6. Tire marks;
7. Sampling locations not properly reinstated;
8. Improperly constructed patches;
9. Contaminant spills on the mat;
10. Flushed areas; and
11. Pneumatic-tired roller pickup.

Any asphalt pavement work that does not meet the requirements of this Specification and is rejected by the Engineer, shall be repaired by the Contractor at the Contractor's cost. Such repairs required in accordance with the

27.5.26 Rejectable Work (Cont'd)

Specification shall be carried out for the full width of the asphalt pavement lane. The full thickness of the rejected asphalt pavement course shall be removed by cold milling, or by other means acceptable to the Engineer. All milled surfaces and joints shall be tack coated.

All rejectable work shall be repaired by the Contractor within ten (10) working days of notification in writing by the Engineer, but in no case later than October 15th. If the ten (10) working day period extends beyond the October 15th deadline, the Contractor shall complete the repairs between June 1st and June 15th of the following year. Repaired areas will be tested for acceptance in accordance with this Specification, and those not meeting the requirements of this Specification will be rejected and require further repair by the Contractor, all at the Contractor's cost.

Where line and grade permits, rejectable asphalt concrete pavement may be overlaid, with written approval from the Engineer. Overlays shall extend the full width of the underlying asphalt concrete pavement surface and have a finished compacted thickness of not less than 50 mm for lower course(s) and 40 mm for upper (surface) course. If such an overlay requires adjustment or repair of curbs, appurtenances or other works, these repairs or adjustments shall be carried out by the Contractor to the satisfaction of the Engineer, all at the Contractor's cost. These overlaid areas will be tested for acceptance in accordance with this Specification, and those areas not meeting the requirements of this Specification will be rejected and require further repair by the Contractor, all at the Contractor's cost. Regardless, a second overlay will not be permitted.

27.6 METHOD OF PAYMENT

27.6.01 Measurement for Payment

The unit of measurement for payment for hot-mix, hot-laid asphalt concrete shall be the number of tonnes (t) of HMA, scale weighed, acceptably incorporated into the Work at the specified thickness, including all preparatory work. Any HMA quantity placed in excess of 110% of the theoretical quantity in tonnes (t) shall not be included for payment unless otherwise authorized in writing by the Engineer. The theoretical HMA quantity shall be determined by the following formula: (specified thickness in mm x final measured asphalt concrete pavement area in m² x in place density in kg/m³) / 1,000,000.

All HMA that is delivered to the Site shall be accompanied by an electronic truck weigh ticket showing the truck number, type of HMA, Contract number, truck loading time at the hot-mix plant, tare mass to the nearest 50 kg, gross mass to the nearest 50 kg, net mass in kg and driver's signature. The tare mass for the truck shall include the vehicle, operator, fuel, spare tire, etc.

The Contractor shall be responsible for ensuring that the truck weigh ticket for each load is handed to the Engineer's Representative inspecting the asphalt paving operation at the time the delivery truck unloads at the paving Site. The Engineer will not accept any responsibility for delivery tickets that are not submitted at the proper time, or are submitted in groups after the delivery trucks have left the Site. Asphalt weigh tickets are to be signed on-site by the Engineer's Representative during placement, with one (1) copy being retained by the Engineer's Representative and the other copy to be submitted with the Contractor's monthly invoice.

27.6.01 Measurement for Payment (Cont'd)

The following items shall not be measured for payment and shall be considered as incidental to the work:

- (a) Hauling of HMA to the site, sweeping and cleaning, and site restorations;
- (b) Sampling and testing of aggregates, calibration of asphalt plants, and trial batches;
- (c) Removal of surplus granular material as a result of fine grading, including disposal off-site;
- (d) Cutting existing asphalt concrete edges prior to resurfacing;
- (e) Handwork to complete HMA paving around catch basins, street hardware, valves, etc., to complete swales or any other place where handwork is carried out concurrently with the spreader operation;
- (f) Removal and replacement of any part of the Work not meeting the requirements of the Specifications; and
- (g) The use of tack coat at joints, curb lines, aprons, around street hardware and catch basin frames or any other vertical faces.

Measurement for payment of HMA padding shall be the number of tonnes (t) scale weighed and acceptably incorporated into the work.

Measurement for payment of HMA patching shall be the number of tonnes (t) scale weighed and acceptably incorporated into the work.

Measurement for payment of asphalt concrete curb and asphalt concrete sidewalk shall be per metre (m) of curb or sidewalk, including all labour, materials and equipment necessary to complete the work.

Measurement for payment of miscellaneous HMA work shall be the number of tonnes (t) scale weighed miscellaneous HMA acceptably incorporated into the work.

Measurement for payment for cold milling shall be per square metre (m²) of asphalt concrete pavement acceptably removed and hauled from the site to an approved location.

Tack coat that is specified to treat the entire cold milled, aged asphalt concrete or any other surfaces, shall be measured for payment per square metre (m²) of acceptably tack-coated surface.

27.6.02 Basis of Payment

Payment shall be made at the Contract Unit Prices as contained in the Schedule of Quantities and Unit Prices, Division 4 of the Contract Specifications.

Performance graded asphalt binder will be adjusted based on the New Brunswick Department of Transportation and Infrastructure (NB DTI) Asphalt Binder Price Index. The price index is published monthly and is available on the NB DTI website.

27.6.02 Basis of Payment (Cont'd)

A payment adjustment for the change in price of asphalt binder between the month preceding the month in which tenders were opened for the Contract and the time of the placement of the HMA will apply to the quantity of asphalt binder (cement) accepted into the Work and will be calculated as follows if the price index between the two (2) months differs by more than 5 %:

PA = Payment adjustment for asphalt binder in dollars

T = PG asphalt binder price index for the month prior to tender opening

P = PG asphalt binder price index for the month of paving

Q = Quantity of asphalt binder in tonnes

When $P > 1.05 T$, the Contractor receives additional payment as follows:

$$PA = (P - 1.05T) \times Q$$

When $P < 0.95 T$, the Owner receives a credit as follows:

$$PA = (0.95T - P) \times Q$$

This payment adjustment for the change in the price of asphalt binder during the Work is not considered to be extra work.