



Aviation Division

Addendum #1

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TO: Plan Holders *** 34 total pages including attachments ***

PROJECT: Extend Runway 14/32 (1,100' x 75') – Phase II
AIP Project No. 3-23-0041-18-2018
Stephen A. Bean Municipal Airfield, Rangeley, Maine

DATE: April 13, 2018

On which General Bids are to be received until Wednesday, April 25, 2018 at 1:00 PM at the Rangeley Municipal Building, 15 School Street, Rangeley, Maine. This Addendum forms part of the Contract Documents and modifies the original specifications and drawings dated March 2018.

***** Note Well: Bidders MUST acknowledge receipt of this Addendum on the space provided in the Proposal Form. Failure to do so may subject the bidder to disqualification.*****

The following revisions, additions, deletions, and/or clarifications are to be made to the Bid Documents:

GENERAL

1. **Invitation to Bid.** The advertisement stated bids “shall be receive...Friday, April 25th, 2018”... and should read “...Wednesday, April 25th, 2018.”
2. **Chick Hill Borrow Site:** The borrow pit limits shall be no closer than 100 feet to abutting property lines and rights-of-way as required by the MaineDEP quarry permit.
3. **Performance Period:** Sheet S2.1 identifies the performance period for Phase 1A-Construct Loon Lake Road Realignment as 14 calendar days. It is the intent of the project to construct the new section without disrupting traffic flow on this road. It is also the intent of this time to minimize the road/lane closures to as little as possible. The performance period for this phase will be increased to 21 calendar days, however the time for lane/road closures will be limited to 2 calendar days.

- 4. Pre-Bid Meeting Minutes.** Answers to questions from the pre-bid can be found in the meeting minutes and shall be incorporated into the contract documents.

CONTRACT DOCUMENTS AND SPECIFICATIONS

Schedule of Prices

- 1. P-152-4.5 Common Borrow (Inner Core).** This item shall be stricken from the bid schedule.
- 2. M-401 & M-304:** Replace Page P-10 with Page P-10A.

Technical Specifications

- 1. Item M-401 and M-304:** Add these items to the contract documents. M-401 Hot Mix Asphalt (LLR) & M-304 Aggregate Base will be used to for Loon Lake Road realignment and side road construction only. P-154 Subbase Course will continue to be used in the construction of Loon Lake Road and side roads.
- 2. Item P-152 – Excavation, Subgrade, and Embankment.** Rock Excavation shall be measured and paid for the activities that require ledge to be blasted, excavated and stockpiled only, including incidentals to these tasks such as survey, etc.

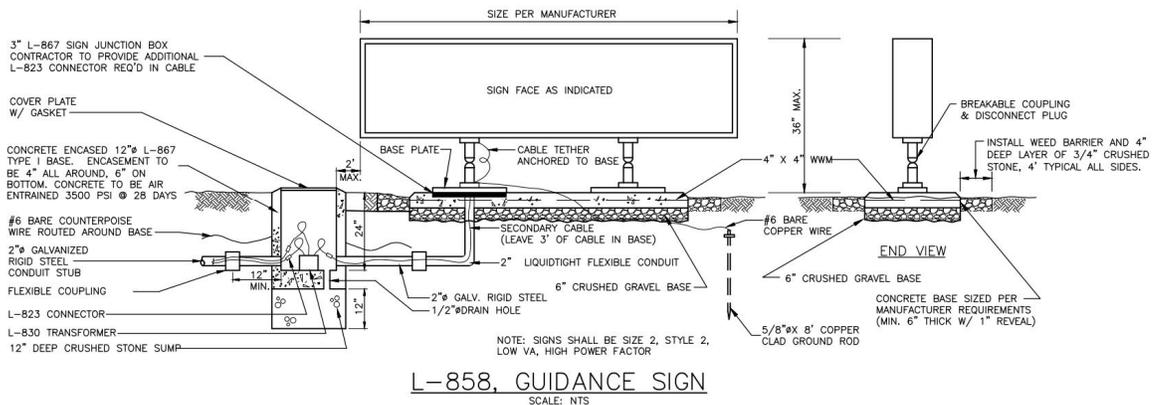
Rock Borrow shall be measured and paid for by processing these stockpiles as required to meet specification requirements, hauled, placed, compacted and accepted.

- 3. Item P-154 – Subbase Course.** Subbase course shall be measured and paid for from the Rock Excavated stockpiled material to include processing, crushing, screening, addition of any aggregate to meet the gradation requirements specified, hauled, placed, compacted, tested and accepted.
- 4. Item P-208A – Reclaimed Base Course.** Supplemental Aggregate, Item P-208A-5.3 shall be measured and paid for from the Rock Excavated stockpiled material, processed, crushed, screened, hauled and placed, compacted, tested and accepted. Excess P-208A shall be stockpiled on-site and maintain ownership of the Town of Rangeley.
- 5. Item D-705 – Pipe Underdrains and Soil Filter Swales.** Porous Backfill shall be obtained from the Rock Excavated stockpiled material. Porous Backfill shall not

be measured or paid for separately but is considered incidental to the installation of Pipe Underdrains and Soil Filter Swales.

DRAWINGS

1. **Drawing C4.1, Underdrained Vegetated Filter:** The detail titled “Typical Vegetated Filter Section” shows a dimension width of “varies.” This should read “6 feet” as it does in the “Typical Underdrained Vegetated Filter Basin” detail.
2. **Drawing C4.1, Underdrained Vegetated Filter:** The detail titled “Typical Underdrained Vegetated Filter Basin” should read elevation 1782’ for the top of soil filter media (or bottom of pond), 1788’ for top of embankment. The top of the Outlet structure is 3 feet above the bottom of the pond.
3. **Airport Guidance Sign.** Replace the “Taxiway Guidance Sign Detail” on sheet L4.3 with the following:



Attachments:

1. Pre-Bid Meeting Minutes - 10 Pages
2. Bid Schedule Page P-10A - 1 Page
3. Specification M-304 Aggregate Base and Subbase Course - 2 Pages
4. Specification M-401 Hot Mix Asphalt (LLR) – 18 Pages

END OF ADDENDUM NO. 1

Meeting Minutes



Pre-Bid Meeting, Stephen A. Bean Municipal Airfield, Rangeley, Maine
Extend Runway 14/32
AIP Project No. 3-23-0041-018-2018

Aviation Division

Date/Time: April 5, 2018 / 1:00 PM
Place: Rangeley Municipal Office
Attendees: Shane McDougall – DuBois & King
Guy Rouelle – DuBois & King
Rebekah Charmichael – Town of Rangeley, Airport Manager
Tim Pellerin – Town of Rangeley, Town Manager
Keith Savage – Town of Rangeley, Interim Public Works Director
Cyndy Egan – Town of Rangeley, Selectboard Chair
Tim LeSiege – MDOT (Via Phone)
Contractors – See Attendance List

Absentees: None
Distribution: Planholders

Proposed Project Description

Mr. McDougall began the meeting with a summary of the project description. The extension and reconstruction of Runway 14/32 will include clearing, embankment construction, pavement and gravel reclamation, subbase and base gravel placement, asphalt surface application, underdrain system installation, drilling and blasting, pavement markings, runway lighting, relocating of NAVIDS, as well as other ancillary items.

Mr. McDougall explained that a MaineDEP Site Law permit amendment along with a NRPA Tier II permit has been applied for as wetlands are being impacted due to the RW 14 extension as well as the overall increase in development. He went on to explain that Erosion and Sedimentation Control (ESC), noise and blasting were the submissions that received the most attention. With regards to ESC, MaineDEP will require a maximum amount of open construction to a 2 acre size until stabilization methods are complete.

Mr. McDougall discussed Chick Hill and its use as a borrow site for the project. He explained that the majority of fill material will come from Chick Hill as well as material to be manufactured for subbase gravels, underdrain stone, etc. A figure was shown that depicts the permitted borrow/quarry area and the proposed excavation limits.

Schedule of Work

Mr. McDougall then turned the meeting to the Safety & Phasing plans to discuss work schedule, timeline, and project phasing. The intent of the phasing is to construct as much as possible without closing the runway as when that takes place, aviation activity will not resume again until the new, extended runway is in place. The first phase is to relocate the road as this needs to be completed prior to embankment construction on the Runway 32 end. Then embankment construction can begin and continue until construction activities and equipment are outside the existing Runway Safety Areas, and more importantly, the imaginary approach surfaces. Prior to this, it is anticipated that the contractor will be processing material from Chick Hill. Once construction activities are set to impact aircraft operations, the airport will be closed and the contractor will have 70 calendar days to be substantially complete. The last phase will be working the areas outside of the RSAs, site cleanup, additional pavement markings, etc. with a total performance period of 300 calendar days.

Mr. McDougall noted that phasing may be rearranged depending on timing of grant award. Based on past experience and that this is one of the largest projects in the New England region and the largest in Maine, he is estimating a grant application no earlier than August or September. He mentioned that the contractor was required to hold their bids for 180 days for that reason. He mentioned the Rangeley Air Show & Fly-in on July 21, however this likely will not be affected due to the aforementioned, however, next years Fly-in may be.

The Construction Safety and Phasing Plan narrative is located at the back of the contract specifications, also see Contract Special Provisions of the bid documents. Mr. McDougall mentioned safety is top priority throughout the construction contract and that the contractor will be required to submit a Construction Safety Compliance Document.

Lastly, he mentioned that DuBois & King on-site daily and that the Town, FAA, MDOT, or MDEP may be on site at any time.

Quality Control Requirements

Mr. McDougall then went through the Quality Control requirements for the project. The Contractor will be required to provide a Quality Control plan as a submittal for review and approval by DuBois & King. The Contractor will be responsible for Quality Control, DuBois & King will be responsible for Quality Assurance. Testing requirements for individual items are outlined in the applicable technical specifications. All materials and methods will require a submittal, material cut sheet, tags or labels to be provided to the Engineer for record. Mr. McDougall noted these could be provided in electronic format.

Finally, the project will require a QC/QA meeting to discuss primarily paving operations. This meeting will require the attendance of the contractor and their subs, FAA, MaineDOT, and the town to ensure methods and means for pavement placement are understood by all parties.

Contract Items

Mr. McDougall then went through the individual contract items to describe each one in more detail, discuss measurement and payment methods, as well as note incidental requirements.

M-659-2.1 Mobilization (LS)

Paid in quarters. 10% retained until final inspection and punch list items are completed.

E-100-5.1 Engineers' Field Office

Incidental to mobilization.

P-125-5.1 Closed Runway Markers (LS)

Consists of furnishing all materials, necessary labor, equipment, and incidentals required to procure, install and remove closed runway markers (CRM's) as necessary to meet airport construction safety and work phasing requirements, as indicated on the construction drawings, and as required by the Owner or Engineer. Temporary unlighted CRM's shall be supplied by the contractor for use on this project and turned over to the Owner at the conclusion of the project.

P-151-4.1 Vegetation Clearing, Grubbing or Grinding, and Grading (Acre)

Consists of area clearing, topping, grubbing or grinding, and grading, including the disposal of materials. Clearing shall provide a mowable surface where fill is not being placed. No grubbing in wetlands, only clearing.

P-152-4.1 Unclassified Excavation (CY)

Includes removing unsuitable runway subbase gravels, box cutting deeper for new profile and new grades to accommodate surrounding safety areas. This item includes excavating, transporting, stockpiling or placing, and compacting in final location. Unit price to include excavation and placing and stabilizing at final location.

The contractor will have to provide erosion control measures for stockpiles, incidental.

Over excavation without Engineer's approval will not be paid for and replacement and compaction will not be paid for.

Subgrade compaction requirements and associated QC are incidental to this item.

P-152-4.2 Rock Excavation (CY)

Geotechnical report in Appendix A of contract specifications. The Ledge Quantity is based on material need from the Chick Hill Location. We don't anticipate ledge in the Runway construction but have a quantity built in for unanticipated rock.

Blasting will only commence once a Blasting Plan has been approved by the Town of Rangeley and the Engineer. Quantities will be based on pre and post surveys. The Contractor will be responsible for performing the surveys in the presence of the Engineer.

P-152-4.3 Pavement Removal (SY)

Pavement removal shall consist of existing bituminous pavement to be removed using excavation or milling techniques. Existing pavement areas shall be cut back to the limits shown on the drawings to provide a clean vertical face. Removed pavement shall be broken into pieces 24" or less and used for embankment fill material.

P-152-4.4 Rock Borrow (Keyway, Outer & Inner Core) (CY)

Shall consist of hard, durable rock pieces of variable sizes from 1" to 24" in size. The material shall be hauled and placed in such a way as to avoid segregation. The material shall be placed in lifts no thicker than 24", and compacted with the use of heavy equipment. Rock Borrow for the Base Layer and Keyway, and Outer Core shall be installed per the drawing notes. QC testing is required. Choking layer is incidental to the Rock Borrow quantity.

P-152-4.5 Common Borrow (Inner Core) (CY)

Strike this from the bid schedule. Unclassified Excavation provides payment for embankment material, i.e. common borrow.

P-152-4.6 Stone Fill (Shell) (CY)

Shall consist of hard, sound, durable rock that will not disintegrate by exposure to water and weather. Stone Fill shall be angular and rough. Rounded, subrounded, or long thin stone shall not be allowed. Stone Fill will be a screened product, the minimum size will be 5", the maximum size to be 36". Stone fill will be hauled and placed to avoid segregation. End dumping from slope crests and placement with a bulldozer will not be allowed.

P-154-5.1 Subbase Course (CY)

53" placed in 8 inch lifts and compacted to 100% of standard for the Runway construction and 18" in 9" lifts for the Loon Lake Road Relocation. P-154 to be manufactured from Chick Hill Borrow source. QC testing required

P-156-5.1 Erosion & Siltation Control (LF)

Shall consist of temporary control measures as shown on the construction drawings and as ordered by the Engineer during the duration of the contract to control water pollution, soil erosion, and siltation through the use of approved management practices.

P-208A-5.1 Base Course, Reclaiming (SY)

This item is for blending, mixing, reclaiming, crushing, existing pavement section to make a recycled base course that meets the project specifications.

P-208A-5.2 Reclaimed Base Course (CY)

This item is to pay for moving recycled base course after reclaiming activities, placing it in its final position or stockpiling, grading and compacting. If stockpiled, moving this material again is not paid for but considered incidental to this item.

P-208A-5.3 Base Course Supplemental Aggregate (CY)

This item consists of a clean aggregate (Assume a 2" minus) to be used in Subbase Course Reclaiming. This item is paid for per cubic yard in place prior to reclaiming. Geotech report indicates 4" of Supp. Agg. will produce P-208A. A test strip will be required for QC testing.

P-401-8.1 Hot Mix Asphalt Pavement (TON)

Pay factors for mix and density, but no escalator.

QC = 2000 Tons or Days production. 12.5 mm mix, PG64-28, tested at 50 gyros.

Electrically generated infrared joint heater for all joints less than 160 F.

P-603-5.1 Bituminous Tack Coat (GAL)

Tack paid by the gallon, does not include tack used for joints or pavement keys.

P-605-5.1 Pavement Joint Sawing and Sealing (LF)

Paid by linear foot and includes saw cutting, cleaning, and sealing, and all incidentals.

P-620-5.1 Airport Pavement Markings (SF)

Paid by the square foot and includes both applications. Striations not included. 2nd application after 30 days for new pavement. Runway markings are white, taxiway markings are yellow.

G-152-5.1 Geotextile (for Keyway) (SY)

Paid by square yard, does not pay for overlap, for installation under the keyway per the notes and details for embankment construction.

D-701-5.1-5.3 Pipe, Culvert, HDPE (15, 18, and 24-inch) (LF)

Item includes all excavation, backfill, trench box, etc to complete the item.

D-705-5.1 Underdrain System, 6-inch, HDPE, perforated (LF)

Underdrain placed in corner of bottom of box cut, no separate trench. Underdrain shown beyond edge of pavement on grading plans for clarity. Minimum 2' wide x 2' high porous backfill to be obtained from Chick Hill resource. All caps, T's, fittings are incidental.

D-705-5.2 Underdrain Vegetated Filters

This item will consist of the construction and materials associated with the underdrain vegetated filter including but not limited to the fabric, coarse gravel, soil filter media, underdrain pipe, anti-weep collar. Excavation and formation of embankments paid for by P-152 Items.

D-751-5.1 Drainage Outlet Control Structure (EA)

Paid by each. Foundations, gravels, subgrade, backfill, and compaction incidental.

T-901-5.1 Seeding (MSF)

Seeding is paid per thousand square feet.

T-905-5.1 Topsoil, On Site (CY)

Pay item to place topsoil stripped and screened. Stripped topsoil paid for under P-152. Can all be produced onsite using stripped topsoil. 3" over entire site. Excess topsoil stripped to be stockpiled at an on-site location determined by the owner. It is anticipated based on geotechnical investigation and quantity analysis that at least 2 times the amount required will be generated.

T-906-5.1 Vegetation Snow Barrier (EA)

The acquiring and installation and maintenance of 40, Min 8' White Spruce at location indicated on the construction drawings. Approved equal will be considered.

T-908-5.1 Mulching (MSF)

Mulching paid per thousand square feet

L-108-5.1-5.2 Cable & Counterpoise Trenching (LF)

Lighting and counterpoise trenching. Lighting 10 feet from edge of pavement when parallel to runway. Counterpoise 5 feet from edge of pavement when parallel. When not parallel, such as home runs, lighting and counterpoise in same trench, only paid lighting trench. Excavation, sand, tape are incidental.

L-108-5.3 No. 8 AWG, L-824C Cable, Installed in Trench, Ductbank or Conduit (LF)

Splices, Slack, markers, etc. are incidental

L-108-5.4 No. 6 AWG, L-824C Cable, Installed in Trench, Ductbank or Conduit (LF)

Splices, Slack, markers, etc. are incidental

L-108-5.5 Bare Counterpoise Wire, Installed in Trench (LF)

Slack and grounding rods incidental

L-108-5.6 Wire, Bare Stranded Equipment Ground, #6 (LF)

Slack and splicing incidental

L-109-5.1 Airport Transformer Vault Equipment, In Place (LS)

Connection of new PAPI power in existing electrical vault.

L-109-5.2 Utility Coordination \$2000.00 Allowance

Moving guy poles for road realignment, provide actual costs for reimbursement.

L-110-5.1 4x4 Inch Concrete Encased Ductbank (LF)

Chairs, connections, concrete, conduit, backfill incidental. Existing Ductbank removal incidental to this item.

L-110-5.2 Electrical Conduit, Unencased 4" SCH 40 PVC (LF)

Connections, backfill, restoration incidental

L-110-5.3 Casing, Unencased, 18" SCH 40 Steel (LF)

Steel casing to be installed 2 runs for future use, this includes excavation, grading, installation, backfill, and compaction.

L-115-5.1 Concrete Electrical Manhole Risers (EA)

Existing electrical CMP & FairPoint manholes to allow for access when the embankments are completed. Risers to adhere to CMP and Fairpoint standards as required.

L-115-5.2 Electrical Handholes (EA)

Per drawings and details

L-125-5.1 Medium Intensity L-861 R/W Edge Light, Stake Mounted (EA)

Per drawings and details, includes new fixtures, stakes, transformers, connections, etc.

L-125-5.2 Medium Intensity L-861 R/W Edge Light, Base Mounted (EA)

Per drawings and details, includes new fixtures, bases, transformers, connections, etc.

L-125-5.3 Medium Intensity L-861E R/W Threshold Light, Stake Mounted (EA)

Per drawings and details, includes new fixtures, stakes, transformers, connections, etc.

L-125-5.4 Medium Intensity L-861E R/W Threshold Light, Base Mounted (EA)

Per drawings and details, includes new fixtures, bases, transformers, connections, etc.

L-125-5.5 Medium Intensity L-861T T/W Edge Light, Stake Mounted (EA)

Per drawings and details, includes new fixtures, stakes, transformers, connections, etc.

L-125-5.6 Airport Guidance Sign, Lighted (EA)

Replacing 3 guidance signs on TW B, includes new bases, transformers, assemblies, handholes, etc.

L-125-5.7 Removal of Existing Light Fixture (EA)

Per drawings and details including stake and base mounted lights and airport guidance signs. All fixtures to become property of Contractor and disposed of off-airport property.

L-126-5.1 Relocated Runway End Identifier Light System (EA)

Both RW 14 & RW 32 REILs to be relocated and tied to new RW circuit, reuse existing foundations and cans.

L-127-5.1 Relocated PAPI System (RW 32) (LS)

Relocate existing system, reuse existing concrete bases, LHAs, controls, etc. New conduit, cable, connections, etc.

L-127-5.1 New PAPI System (RW 14) 4-Box, L-880 (LS)

Non FAA system, similar design as existing system.

Comments by the Engineer

Mr. McDougall noted that there will be an addenda issue to clarify the following:

- Bid opening date and time: Wednesday, April 25, 2018 at 1:00 PM
- No Borrow Excavation

Mr. McDougall discussed a few miscellaneous items for bidder consideration:

- Work hours 7am – 7pm - Noise
- All granular materials for embankment, runway, and Loon Lake Road, and other construction to come from Chick Hill or Runway
- Topographical survey to be verified by Contractor prior to beginning earth work. Contractor to verify clearing limits for Chick Hill with regards to property lines.
- Project Photographs to be taken by Contractor and submitted to Engineer electronically prior to construction. These are for
- Liquidated damages = \$1,000/day for each day work remains uncompleted after the specified completion date But, also \$2,000/day for each day beyond the 70 day runway closure period.
- Davis Bacon Wages apply to this project
- FAA grant application May 1. Largest discretionary project in Maine this year. Contractor needs to hold bids for 180 days. Grant award will dictate construction start.

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- Bid Payment & Performance Bonding and Insurance requirements
- DBE Goal is 5.1%
- Contractor to submit pages P-1 through P-27 in Bid proposal
- Incidentals include, but not limited to, safety barricades, restoration of haul routes, radios, FOD maintenance
- Coordination with Airport at different phases.

Comments by Owner

The Town Manager, Tim Pellerin, noted that construction would be required to adhere to the noise ordinance.

Questions from Bidders

1. Can the QC person for the contractor work for the contractor or does it have to be a subconsultant? A. Can be either or.
2. Is the overburden on Chick Hill included as unclassified excavation? A. Yes, this quantity is included in the Unclassified Excavation item, P-152-4.1.
3. Is the slab foundation to be removed near the apron included in a quantity? A. Yes, this is considered unclassified excavation and will be required to be broken into pieces smaller than 2' in diameter and used as embankment construction. Steel reinforcing shall become the responsibility of the contractor and disposed of off-site.
4. Does pavement removal only include Loon Lake Road? A. No, it includes all pavement removal other than the runway reclamation efforts.
5. Dimensions and specifications for the Vegetated Underdrained Filter don't appear to be correct. A. This will be reviewed and addendum issued accordingly.
6. There does not appear to be a detail for the airfield sign bases. A. An addendum will be issued to rectify this.
7. Do stumps need to be removed in the fill conditions, the P-152 specifies any area that has a fill greater than 4 feet does not need to have stumps removed? A. The majority of the clearing efforts are for the Runway 14 embankment and most of this is small, scrub-shrub growth. It is anticipated that clearing activities for this type of growth won't leave much of a stump. The intent of the project is to keep large, mature growth stumps out of the keyway for both embankments.
8. There appears to be an inconsistency with materials being used in the construction of Loon Lake Road and side roads with regards to phasing and material manufacture. A. This will be reviewed and addendum issue accordingly.
9. The typical detail for the Loon Lake Road is narrower than the cross-sections, what should be used. A. The typical section should be used, the subbase and base gravels extend to the edge of the shoulders.

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10. Is the stripping for Loon Lake Road conducted at the same time as the Runway pavement markings or will a second mobilization be required?
 - A. The pavement marking for the road will need to be in place as soon as the pavement is ready for vehicle traffic.

The meeting adjourned at approximately 3:00 PM.

The foregoing is considered to be a true and accurate record of all items discussed. If any discrepancies or inconsistencies are noted, please contact the writer immediately.

DuBois & King, Inc.



Shane McDougall, PE

Project Manager

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<u>ITEM</u>	<u>DESCRIPTION</u>	<u>EST. QTY.</u>	<u>UNIT PRICE</u>	<u>AMOUNT</u>
L-126-5.1	Relocated Runway End Identifier Light Systems Spell Out Unit Price _____ _____ _____	2 EA	\$ _____	\$ _____
L-127-5.1	Relocated PAPI System (RW 32) 4-Box, L-880 Spell Out Unit Price _____ _____ _____	1 LS	\$ _____	\$ _____
L-127-5.2	New PAPI System (RW 14) 4-Box, L-880 Spell Out Unit Price _____ _____ _____	1 LS	\$ _____	\$ _____
M-304-5.1	Aggregate Base Course, Crushed Spell Out Unit Price _____ _____ _____	1,050 CY	\$ _____	\$ _____
M-401-5.1	Hot Mix Asphalt (LLR) Spell Out Unit Price _____ _____ _____	1,700 Ton	\$ _____	\$ _____

GRAND TOTAL : \$ _____

NOTE: In the event of a bidder's mathematical error in tabulating any bid prices, the written unit price shall govern. Selection of the lowest bidder will be based on the calculated total of all items as written in words.

ITEM M-304 AGGREGATE BASE COURSE

(Supplement to MDOT Section 304)

DESCRIPTION

304-1.1 GENERAL. This item shall consist of furnishing and installing aggregate base courses for the construction of Loon Lake Road, Airport Road, Winter Road, and Frenchies Way as shown on the construction plans, details, and typical sections. Work relating to the subgrade and subbase course shall follow P-154 Subbase Course specification

All work shall be accomplished in accordance with the requirements of Section 304 of the Maine Department of Transportation Standard Specifications, revision of December 2002 including supplemental specifications dated 31 October 2005 except as supplemented or modified herein, as indicated on the construction drawings, or as directed by the Engineer or Owner.

304-1.2 REFERENCE STANDARDS

a. State of Maine, Department of Transportation, Standard Specifications, December 2002, including the latest revisions of adopted Supplemental Specifications dated 31 October 2005.

MATERIALS

304-2.1 MATERIALS

a. Aggregates shall be in accordance with MDOT Section 703.06:

Aggregate Base	703.06a
Aggregate Subbase	703.06b

b. Aggregate Base shall be Type A, crushed (not screened), as shown on the drawings.

c. Aggregate Subbase shall be Type D.

CONSTRUCTION METHODS

304-3.1 GENERAL

a. The placement of base and subbase courses shall be in accordance with MDOT Standard Specifications, Section 304.03. The number and thickness of each course shall conform to the drawings.

304-3.2 COMPACTION TESTING

a. Compaction testing for base and subbase courses shall be performed in accordance with MDOT Standard Specification Section 403.3 for base course and 304.4 for subbase course.

b. The field density of the compacted material shall be at least 100% of the maximum density of laboratory specimens prepared from samples of the base and subbase materials delivered to the job site. Laboratory specimens shall be tested in accordance with ASTM D 698. In-place field densities shall be determined in accordance with ASTM D 1556 or ASTM D 2167.

304-3.3 SUBGRADE TOLERANCE. Subgrade tolerances shall meet the requirements of Item P-152.

304-3.4 SURFACE TOLERANCE. The completed surface of the subbase course shall be shaped and maintained to a tolerance, above and below the indicated cross sectional grades of 1/2 inch. The completed surface of the base course shall be shaped and maintained to a tolerance, above and below the indicated cross sectional grades of 3/8 inch.

METHOD OF MEASUREMENT

304-4.1 The Engineer will measure aggregate base and subbase by the cubic yard in its final position in accordance with MDOT Standard Specification Section 304.06. Measurement for payment purposes will be made for roadway construction.

BASIS OF PAYMENT

304-5.1 The accepted quantities of aggregate base course and aggregate subbase course of the type specified will be paid for at the contract unit price for the respective aggregate base or subbase course item used in accordance with MDOT Standard Specification Section 304.07. Payment shall be considered full compensation for furnishing all materials along with the placement, grading, compaction, and testing along with all labor, materials, equipment that are necessary to complete all specified and implied requirements to produce fully functional products as intended and as approved by the Engineer.

Payment will be made under:

Item M-304-5.1 Aggregate Base Course, Crushed - per Cubic Yard

END OF SECTION

ITEM M-401 HOT MIX ASPHALT (LLR)

DESCRIPTION

401-1.1 GENERAL. The Contractor shall furnish a uniformly blended, homogenous mixture placed as one or more courses of Hot Mix Asphalt Pavement (HMA) on an approved base in accordance with the contract documents and in reasonably close conformity with the lines, grades, thickness, and typical cross sections shown on the plans or established by the Engineer. This specification is specifically for the construction and realignment of Loon Lake Road and the side roads as detailed on the drawings. The Engineer will accept this work under Quality Assurance provisions, in accordance with these specifications and the requirements of Section 106 – Quality (Maine Department of Transportation (MDOT) Standard Specifications, November 2014), the provisions of AASHTO M-323 except where otherwise noted in Sections 401 and 703 of the MDOT Standard Specifications, and the MDOT Policies and Procedures for HMA Sampling and Testing.

MATERIALS

401-2.1 COMPOSITION OF MIXTURES. The Contractor shall compose the Hot Mix Asphalt Pavement with aggregate, Performance Graded Asphalt Binder (PGAB), and mineral filler if required. HMA shall be designed and tested according to AASHTO R-35 and the volumetric criteria in Table 1. The Contractor shall size, uniformly grade, and combine the aggregate fractions in proportions that provide a mixture meeting the grading requirements of the Job Mix Formula (JMF). The Contractor may be allowed to use 15% reclaimed asphalt pavement (RAP) in mixtures used on this project.

The Contractor shall submit a Maine Department of Transportation approved JMF to the Engineer for approval for each mixture to be supplied. Should the Contractor elect to change the JMF during construction, the Contractor shall submit the new JMF to the Engineer for approval a minimum of 14 calendar days prior to scheduled placement. The JMF shall establish a single percentage of aggregate passing each required sieve size within the limits shown in Table 2. The general composition limits given in Table 2 indicate the control points of mixtures permissible under this specification. The JMF shall state the source, gradation, and percentage to be used of each portion of the aggregate, including RAP when utilized, and mineral filler if required. It shall also state the proposed PGAB content, the name and location of the refiner and the supplier for the source of PGAB submitted for approval, and the type of PGAB modification if applicable.

TABLE 1: VOLUMETRIC DESIGN CRITERIA

Required Density (Percent of G_{mm})			Voids in the Mineral Aggregate (VMA) (Minimum Percent)					Voids Filled with Binder (VFB)	Fines/Eff Binder Ratio
$N_{initial}$	N_{design}	N_{max}	Nominal Maximum Aggregate Size						
			37.5 mm	25.0 mm	19.0 mm	12.5 mm	9.5 mm		
≤ 90.5	96.0	≤ 98.0	12.0	13.0	14.0	15.0	16.0	65-78	0.6-1.2

In addition, the Contractor shall provide the following information with the proposed JMF:

- Stockpile Gradation Summary
- Design Aggregate Structure Consensus Property Summary
- Design Aggregate Structure Trial Blend Gradation Plots
- Design Aggregate Structure (for a minimum of 3 trial blends)
- Trial Blend Results (for a minimum of 3 asphalt contents)
- PGAB specific gravity and temperature/viscosity charts and recommended mixing and compaction temperatures from supplier
- Material Safety Data Sheets (MSDS) for PGAB.
- Asphalt Content vs. Air Voids Trial Blend Curve
- Summary of RAP test results
- Test report for Contractors Verification sample

TABLE 2: COMPOSITION OF MIXTURES - CONTROL POINTS

SIEVE SIZE	GRADING			
	TYPE 25.0 mm	TYPE 19.0 mm	TYPE 12.5 mm	TYPE 9.5 mm
	PERCENT BY WEIGHT PASSING - COMBINED AGGREGATE			
1 ½ inch	100			
1 inch	90-100	100		
¾ inch	-90	90-100	100	
½ inch	-	-90	90-100	100
⅜ inch	-	-	-90	90-100
No. 4	-	-	-	-90
No. 8	19-45	23-49	28-58	32-67
No. 16	-	-	-	-
No. 30	-	-	-	-
No. 50	-	-	-	-
No. 200	2-6	2-6	2-6	2-7

At the time of JMF submittal, the Contractor shall identify and make available the stockpiles of all proposed aggregates at the plant site. The Engineer may obtain samples for laboratory testing. The Contractor shall also make available to the Engineer the PGAB proposed for use in the mix in sufficient quantity to test the properties of the asphalt and to produce samples for testing of the mixture. Prior to the start of paving, the Contractor and the Engineer shall split a production sample for evaluation. The Contractor shall test its split of the sample and determine if the results are consistent with the JMF. If the results are found to be acceptable, the Contractor will forward their results to the Engineer's Lab, which will test the Engineer's split of the sample. The results of the two split samples will be compared and shared between the Engineer and the Contractor. If the Engineer finds the mixture acceptable, an approved JMF will be forwarded to the Contractor and paving may commence once the Engineer has accepted a test strip.

The Contractor shall submit a new JMF for approval each time a change in aggregate source or a change in PGAB is proposed. The same approval process shall be followed. The cold feed percentage of any aggregate may be changed up to 10 percent of the amount listed on the JMF, however no aggregate listed on the JMF shall be eliminated.

401-2.2 AGGREGATES. Fine aggregate, that material passing the No. 8 sieve, shall not exceed an absorption of 2.3 percent by weight as determined by AASHTO T-84. The composite blend (minus any RAP) shall have a Micro-Deval value of 18.0 or less as determined by AASHTO T-327. In the event of a failure, the Washington State Degradation test of 1967 shall be run prior to rejection of the material. Material with a value of 30 or more may be accepted. Aggregates shall also meet the following consensus properties. The Engineer reserves the right to sample and test the composite aggregate for any of the following properties at any time.

TABLE 3: AGGREGATE CONSENSUS PROPERTIES CRITERIA
(.3 to <3.0 Million ESAL'S)

ASTM D 5821 Coarse Aggregate Angularity (Minimum)	AASHTO T-304 Method A Uncompacted Void Content of Fine Aggregate (Minimum)	ASTM D 4791 (8.4) Flat and Elongated Particles (Maximum)	AASHTO T-176 Clay Content/Sand Equivalent (Minimum)
75/60	40	10	45

ASTM D 5821 - "75/60" denotes that 75% of the coarse aggregate has one fractured face and 60% has two fractured faces.

AASHTO T304 - Criteria are presented as percent air voids in loosely compacted fine aggregate, (U).

ASTM 4791 - Criteria are presented as maximum percent by weight of flat and elongated particles. (5:1 ratio).

401-2.3 VACANT

401-2.4 TEMPERATURE REQUIREMENTS. After the JMF is established, the temperatures of the mixture shall conform to the following tolerances:

In the truck at the mixing plant	275 - 325 degrees F
At the Paver	275 – 325 degrees F

The JMF and the mix subsequently produced shall meet the requirements of Tables 1 and 3.

401-2.5 PERFORMANCE GRADED ASPHALT BINDER. The PGAB shall be PG 64-28. The PGAB shall meet the applicable requirements of AASHTO M-320 - Standard Specifications for PGAB, in accordance with Section 702.01 Asphalt Cement (MDOT Standard Specifications, November 2014). The Contractor shall provide the Engineer with an approved copy of the Quality Control Plan for PGAB in accordance with AASHTO R 26 Certifying Suppliers of PGAB.

CONSTRUCTION METHODS

401-3.1 Weather and Seasonal Limitations. The bituminous mixture shall not be placed upon a wet surface or when the surface temperature of the underlying course is less than specified in Table 4. The temperature requirements may be waived by the Engineer, if requested; however, all other requirements including compaction shall be met.

TABLE 4. BASE TEMPERATURE LIMITATIONS

Mat Thickness	Base Temperature (Minimum)	
	Deg. F	Deg. C
3 in. (7.5 cm) or greater	40	4
Greater than 1 in. (2.5 cm) but less than 3 in. (7.5 cm)	45	7
1 in. (2.5 cm) or less	50	10

401-3.2 HOT MIX ASPHALT PLANT.

401-3.2.1 GENERAL REQUIREMENTS. Mixing plants shall conform to AASHTO M-156. The mixing plant shall include an efficient dust collecting system to prevent loss of fine material. The material collected may be returned to the mixture at a uniform rate and/or be discarded.

(a) **Truck Scales.** When the bituminous mixture is to be weighed on scales meeting the requirements of Section 108-Payment (MDOT Standard Specifications, November 2014), the scales shall be inspected and sealed by the State Sealer as often as the Engineer deems necessary to verify their accuracy.

(b) **Performance Graded Asphalt Binder.** The Contractor shall provide a valve for sampling the bituminous material, located in a circulating feed line connecting the storage tank with the mixing plant or in a line of the storage circulation system. The valve shall be in a readily accessible location offering protection from damage. The Contractor shall maintain this valve in a workable condition and provide a drainage receptacle.

401-3.2.2 AUTOMATION OF BATCHING. Batch plants shall be automated for weighing, recycling, and monitoring the system. In the case of a malfunction of the printing system, the requirements of Subsection 401-3.2.4(c) of this specification will apply.

The batch plant shall accurately proportion the various materials in the proper order by weight. The entire batching and mixing cycle shall be continuous and shall not require any manual operations. The batch plant shall use auxiliary interlock circuits to trigger an audible alarm whenever an error exceeding the acceptable tolerance occurs. Along with the alarm, the printer shall print an asterisk on the delivery slip in the same row containing the out-of-tolerance weight. The automatic proportioning system shall be capable of consistently delivering material within the full range of batch sizes. When RAP is being used the plant must be capable of automatically compensating for the moisture content of the RAP.

All plants shall be equipped with an approved digital recording device. The delivery slip load ticket shall contain information required under Section 108.1.3 Provision Relating to Certain Measurements, Mass (MDOT Standard Specifications, November 2014), and paragraphs (a) and (b) of Subsection 401.3.2.3 of this Specification.

401-3.2.3 AUTOMATIC TICKET PRINTER SYSTEM ON AUTOMATIC BITUMINOUS MIXING PLANT. An approved automatic ticket printer system shall be used with all approved automatic bituminous mixing plants. The automatic printed ticket will be considered as the Weight Certificate.

The requirements of Section 108.1.3(f) (MDOT Standard Specifications, November 2014) shall be met by the weigh slip or ticket, printed by the automatic system, which accompanies each truckload, except for the following changes:

- (a) The quantity information required shall be individual weights of each batch or total net weight of each truckload.
- (b) Signatures (legible initials acceptable) of Weighmaster (required only in the event of a malfunction below).

Automatic bituminous mixing plants shall have the scales sealed by the State Sealer of Weights and Measures within a period of 12 months preceding the date of any weighing and after each change of location. The Contractor shall make checks on the accuracy and sensitivity of the aggregate and asphalt plant scales in the presence of a representative of the State, at intervals not exceeding 60 days.

401-3.2.4 WEIGHT CHECKS ON AUTOMATIC BITUMINOUS MIXING PLANT. At least twice during each 5 days of production either of the following checks will be performed:

- (a) A loaded truck may be intercepted and weighed on a platform scale that has been sealed by the State Sealer of Weights and Measures within the past 12 months. Whenever the discrepancy in net weights is greater than 1.0 percent, but does not exceed 1.5 percent, the plant inspector will notify the producer to take corrective action; payment will still be governed by the printed ticket. The producer will be allowed a period of two days to make any needed repairs to the plant and/or platform scales so that the discrepancy in net weights between the two is less than 1.0 percent. If the discrepancy exceeds 1.5 percent, the plant will be allowed to operate as long as payment is determined by truck platform scale net weight. Effective corrective action shall be taken within two working days.
- (b) Where platform scales are not readily available, a check will be made to verify the accuracy and sensitivity of each scale within the normal weighing range and to assure that the interlocking devices and automatic printer system are functioning properly.
- (c) In the event of a malfunction of the automatic printer system, production may be continued without the use of platform truck scales for a period not to exceed the next two working days, providing total weights of each batch are recorded on weight tickets and certified by a Licensed Public Weighmaster.

401-3.2.5 TESTING FACILITIES. The Contractor shall provide laboratory facilities at the plant for the use of the Engineer's acceptance testing and the Contractor's Quality Control testing. The Engineer will always have priority in the use of the laboratory. The lab shall have sufficient space and equipment so that both testing representatives (Engineer's and Contractor's) can operate efficiently. The lab shall also meet the requirements of ASTM D 3666.

The plant testing laboratory shall have a floor space area of not less than 150 square feet, with a ceiling height of not less than 7-½ feet. The laboratory shall be weather tight, sufficiently heated in cold weather, air-conditioned in hot weather to maintain temperatures for testing purposes of 70 degrees F +/- 5 degrees F. The plant testing laboratory shall be located on the plant site to provide an unobstructed view, from one of its windows, of the trucks being loaded with the plant mix materials.

Laboratory facilities shall be kept clean, and all equipment shall be maintained in proper working condition. The Engineer shall be permitted unrestricted access to inspect the Contractor's laboratory facility and witness quality control activities. The Engineer will advise the Contractor in writing of any noted deficiencies concerning the laboratory facility, equipment, supplies, or testing personnel and procedures. When the deficiencies are serious enough to adversely affect the test results, the incorporation of the materials into the work shall be suspended immediately and will not be permitted to resume until the deficiencies are satisfactorily corrected.

As a minimum, the plant testing laboratory shall have:

- (a) Adequate artificial lighting
- (b) Electrical outlets sufficient in number and capacity for operating the required testing equipment and drying samples.
- (c) Fire extinguishers (2), Underwriter's Laboratories approved
- (d) Work benches for testing, minimum 2-½ feet by 10 feet.
- (e) Desk with 2 chairs
- (f) Sanitary facilities convenient to testing laboratory
- (g) Exhaust fan to outside air, minimum 12 inch blade diameter
- (h) A direct telephone line and telephone including a FAX machine operating 24 hours per day, seven days per week
- (i) File cabinet with lock for Engineer
- (j) Sink with running water, attached drain board and drain capable of handling separate material
- (k) Metal stand for holding washing sieves
- (l) Two element hot plate or other comparable heating device, with dial type thermostatic controls for drying aggregates
- (m) Mechanical shaker and appropriate sieves (listed in JMF, Table 3) meeting the requirements of ASTM E 11 for determining the gradation of coarse and fine aggregates in accordance with ASTM C 136
- (n) Superpave Gyrotory Compactor
- (o) Oven, thermostatically controlled, inside minimum 1 cubic foot
- (p) Two volumetric specific gravity flasks, 500 cc
- (q) Other necessary hand tools required for sampling and testing
- (r) Library containing contract specifications, latest ASTM volumes 4.01, 4.02, 4.03 and 4.09, AASHTO standard specification parts I and II, and Asphalt Institute Publication MS-2.
- (s) Equipment for Theoretical Specific Gravity testing including a 4,000 cc pycnometer, vacuum pump capable of maintaining 30 ml mercury pressure and a balance, 16-20 kilograms with accuracy of 0.5 grams
- (t) Extraction equipment, centrifuge or binder ignition oven
- (u) A masonry saw with diamond blade for trimming pavement cores and samples
- (v) Telephone

Approval of the plant and testing laboratory by the Engineer requires all facilities and equipment to be in good working order during production, sampling and testing. Failure to provide the specified facilities shall be sufficient cause for disapproving bituminous plant operations.

The Owner shall have access to the lab and the plant whenever Contractor is in production.

401-3.3 HAULING EQUIPMENT. Trucks for hauling Hot Mix Asphalt Pavement shall have tight, clean, smooth metal dump bodies which have been thinly coated with a small amount of lime solution or an approved soap solution or detergent to prevent the mixture from adhering to the bodies.

All truck dump bodies shall have a cover of canvas or other water repellent material capable of heat retention which completely covers the mixture. The cover shall be securely fastened on the loaded truck except when unloading.

All truck bodies shall have an opening on both sides which will accommodate a thermometer stem. The opening shall be located near the midpoint of the body, at least 12 inches above the bed.

401-3.4 PAVERS. Pavers shall be self-contained, self-propelled units with an activated screed (heated if necessary).

The Contractor shall place Hot Mix Asphalt Pavement with a paver using an automatic grade and slope controlled screed, unless otherwise authorized by the Engineer. The controls shall automatically adjust the screed and increase or decrease the layer thickness to compensate for irregularities in the preceding course. The controls shall maintain the proper transverse slope and be readily adjustable so that transitions and superelevated curves can be properly paved. The controls shall operate from a fixed or moving reference such as a grade wire or ski type device (floating beam) with a minimum length of 30 foot.

The Contractor shall operate the paver in such a manner as to produce a visually uniform surface texture and a thickness within the requirements of Subsection 401-3.6 Surface Tolerances. The paver shall have a receiving hopper with sufficient capacity for a uniform spreading operation and a distribution system to place the mixture uniformly, without segregation in front of the screed. The screed assembly shall produce a finished surface of the required evenness and texture without tearing, shoving, or gouging the mixture. Pavers with extendible screeds shall have auger extensions and tunnel extenders as necessary.

The Contractor shall have the paver at the project site sufficiently before the start of paving operations to be inspected and approved by the Engineer. The Contractor shall repair or replace any paver found worn or defective, either before or during placement, to the satisfaction of the Engineer.

401-3.5 ROLLERS. Rollers shall be static steel, pneumatic tire, or approved vibrator type. Rollers shall be in good mechanical condition, capable of starting and stopping smoothly, and be free from backlash when reversing direction. Rollers shall be equipped and operated in such a way as to prevent the picking up of hot mixed material by the roller surface. Use of rollers which result in crushing of the aggregate or displacement of the mixture will not be permitted. Any Hot Mix Asphalt Pavement that becomes loose, broken, contaminated, shows an excess or deficiency of Performance Graded Asphalt Binder, or is in any other way defective shall be removed and replaced with fresh Hot Mix Asphalt Pavement which shall be immediately compacted to conform with the adjacent area at no additional cost.

The type of rollers to be used and their relative position in the compaction sequence shall generally be the Contractor's option, provided specification densities are attained and with the following requirements:

- 1) At least one roller shall be pneumatic-tired on all lifts of pavement.
- 2) Compaction with a vibratory or steel wheel roller shall precede pneumatic-tired rolling, unless otherwise authorized by the Engineer.
- 3) Vibratory rollers shall not be operated in the vibratory mode when checking or cracking of the mat occurs.
- 4) Any method which results in cracking or checking of the mat will be discontinued and corrective action taken.

The maximum operating speed for a steel wheel roller shall not exceed the manufacturer's recommendations.

401-3.6 SURFACE TOLERANCES. The Engineer will check surface tolerance with a 16 foot straightedge or string line placed parallel to the centerline of pavement and with a 10 foot straightedge or string line placed transverse to the centerline of pavement. The Contractor shall correct variations exceeding 1/4 inch by removing defective work and replacing it with new material as directed by the Engineer. The Contractor shall furnish a 10 foot straightedge for the Engineer's use.

401-3.7 CONDITIONING OF EXISTING SURFACE. The Contractor shall thoroughly clean the surface upon which Hot Mix Asphalt Pavement is to be placed of all objectionable material. When the surface of the existing base or pavement is irregular, the Contractor shall bring it to uniform grade and cross section.

401-3.8 HOT MIX ASPHALT MATERIAL DOCUMENTATION. The Contractor and the Engineer shall agree on the amount of Hot Mix Asphalt Pavement that has been placed each day.

401-3.9 PREPARATION OF AGGREGATES. The Contractor shall dry and heat the aggregates for the mixture to the required temperature. The Contractor shall properly adjust flames to avoid physical damage to the aggregate and to avoid depositing soot on the aggregate.

401-3.10 MIXING. The Contractor shall combine the dried aggregate in the mixer in the amount of each fraction of aggregate required to meet the JMF. The Contractor shall measure the amount of PGAB and introduce it into the mixer in the amount specified by the JMF. The Contractor shall produce the mixture at the temperature established by the JMF.

The Contractor shall dry the aggregate sufficiently so that the mixture will not flush, foam excessively, or displace excessively under the action of the rollers. The Contractor shall introduce the aggregate into the mixer at a temperature of not more than 25 degrees F above the temperature at which the viscosity of the bituminous material being used is 0.1008 Lbm/sec*ft.

The Contractor shall store and introduce into the mixer the Performance Graded Asphalt Binder at a uniformly maintained temperature at which the viscosity of the material is between 0.1008 Lbm/sec*ft and 0.2016 Lbm/sec*ft. The aggregate shall be completely and uniformly coated with a thorough distribution of the PGAB. The Contractor shall determine the wet mixing time for each plant and for each type of aggregate used.

401-3.11 SPREADING AND FINISHING. On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impracticable, the Contractor shall spread, rake, and lute the mixture with hand tools to provide the required compacted thickness.

401-3.12 COMPACTION. Immediately after the Hot Mix Asphalt Pavement has been spread, struck off, and any surface irregularities adjusted, the Contractor shall thoroughly and uniformly compact the mixture by rolling.

The Contractor shall roll the surface when the mixture is in the proper condition and when the rolling does not cause undue displacement, cracking, or shoving. The Contractor shall prevent adhesion of the mixture to the rollers or vibrating compactors without the use of oil.

The Contractor shall immediately correct any displacement occurring as a result of the reversing of the direction of a roller or from other causes to the satisfaction of the Engineer. Any operation other than placement of variable depth shim course that results in breakdown of the aggregate shall be discontinued. Any new pavement that shows obvious cracking, checking, or displacement may be removed and replaced for the full lane width as directed by the Resident at no cost to the Owner.

Along forms, curbs, headers, walls, and other places not accessible to the rollers, the Contractor shall thoroughly compact the mixture with mechanical vibrating compactors. The Contractor shall only use hand tamping in areas inaccessible to all other compaction equipment. On depressed areas, the Contractor may use a trench roller or cleated compression strips under a roller to transmit compression to the depressed area.

401-3.13 JOINTS. The Contractor shall construct wearing course transverse joints in such a manner that minimum tolerances, shown in Section 401-3.6 Surface Tolerances, are met when measured with a straightedge.

The paver shall always maintain a uniform head of material during the joint construction. The bituminous mix shall be free of segregation and meet temperature requirements. Transverse joints of the wearing course shall be straight and neatly trimmed. The Contractor may form a vertical face exposing the full depth of the course by inserting a header, by breaking the bond with the underlying course, or by cutting back with hand tools. Feathered or "lap" joints will not be allowed.

The Contractor shall apply a coating of emulsified asphalt immediately prior to paving all joints, except those formed by pavers operating in echelon. The Contractor shall use an approved spray apparatus designed for covering a narrow surface. The Engineer may approve application by a brush for small surfaces, or in the event of a malfunction of the spray apparatus, but for a period of not more than one working day.

Where pavement under this Contract joins an existing pavement or when the Engineer directs, the Contractor shall cut the existing pavement along a smooth line, producing a neat, even, vertical joint. The Engineer will not permit broken or raveled edges. The cost of all work necessary for the preparation of joints is incidental to related contract pay items.

Longitudinal joints which are irregular, damaged, uncompacted or otherwise defective shall be cut back 3 to 6 inches to expose a clean, sound, uniform vertical surface for the full depth of the course. All cutback material shall be removed from the project. Asphalt tack coat or other product approved by the Engineer shall be applied to the clean, dry joint, prior to placing any additional fresh bituminous pavement against the joint. Any laitance produced from cutting joints shall be removed by vacuuming and washing. The cost of this work shall be considered incidental to the cost of the bituminous pavement.

If damage is identified, the contractor will be required to remove damaged sections and replace at no additional cost to the Owner. All contact surfaces shall be given a tack coat of bituminous material prior to placing any fresh bituminous pavement against the joint.

401-3.14 QUALITY CONTROL. The Contractor shall operate in accordance with the approved Quality Control Plan (QCP) to assure a product meeting the contract requirements. The QCP shall meet the requirements of Section 106.4.2 (MDOT Standard Specifications, November 2014) and these Specifications. The Contractor shall not begin paving operations until the QCP is approved in writing by the Engineer.

Prior to placing any mix, the Engineer and the Contractor shall hold a QC Workshop (Formal pre-paving conference) to discuss the paving schedule, source of mix, type and amount of equipment to be used, sequence of paving pattern, rate of mix supply, random sampling, project lots and sublots and air traffic control. All field and plant supervisors including the responsible onsite paving supervisor shall attend this meeting.

The QCP shall address all elements which affect the quality of the Hot Mix Asphalt Pavement including, but not limited to, the following:

- (a) JMF(s)
- (b) Hot asphalt mix plant details
- (c) Stockpile Management (to include provisions for a minimum 2-day stockpile)
- (d) Make & type of paver(s)
- (e) Make & type of rollers including weight, weight per inch of steel wheels, and average contact pressure for pneumatic tired rollers
- (f) Name of QCP Administrator, and certification number
- (g) Name of Process Control Technician(s), and certification number(s)
- (h) Name of Quality Control Technicians(s), and certification number(s)
- (i) Mixing & transportation including process for ensuring that truck bodies are clean and free of debris or contamination that could adversely affect the finished pavement.
- (j) Testing Plan
- (k) Laydown operations including longitudinal joint construction, procedures for avoiding paving in inclement weather, tacking of all joints, methods to ensure that segregation is minimized, procedures to determine the maximum rolling and paving speeds based on best engineering practices as well as past experience in achieving the best possible rideability of the pavement
- (l) Examples of Quality Control forms including a daily plant report and a daily paving report
- (m) Silo management and details (can show storage for use on project of up to 36 hours)
- (n) Provisions for varying mix temperature due to extraordinary conditions.
- (o) Name and responsibilities of the Responsible onsite Paving Supervisor
- (p) Method for calibration/verification of Density Gauge
- (q) A note that all testing will be done in accordance with AASHTO procedures
- (r) A detailed procedure outlining when production will be halted due to QC or QA testing results.

The QCP shall include the following technicians together with these minimum requirements:

(a) QCP Administrator - A qualified individual shall administer the QCP. The QCP Administrator must be a full-time employee of or a consultant engaged by the Contractor or paving subcontractor. The QCP Administrator shall have full authority to institute any and all actions necessary for the successful operation of the QCP. The QCP Administrator (or its designee in the QCP Administrator's absence) shall be available to communicate with the Engineer at all times. The QCP Administrator shall be certified as a Quality Assurance Technologist by the North East Transportation Training and Certification Program.

(b) Process Control Technician(s) (PCT) shall utilize test results and other quality control practices to assure the quality of aggregates and other mix components and control proportioning to meet the JMF(s). The PCT shall inspect all equipment used in mixing to assure it is operating properly and that mixing conforms to the mix design(s) and other Contract requirements. The QCP shall detail how these duties and responsibilities are to be accomplished and documented and whether more than one PCT is required. The Plan shall include the criteria to be utilized by the PCT to correct or reject unsatisfactory materials. The PCT shall be certified as a Plant Technician by the North East Transportation Training and Certification Program.

(c) Quality Control Technician(s) (QCT) shall perform and utilize quality control tests at the job site to assure that delivered materials meet the requirements of the JMF(s). The QCT shall inspect all equipment utilized in transporting, laydown, and compacting to assure it is operating properly and that all laydown and compaction conform to the Contract requirements. The QCP shall detail how these duties and responsibilities are to be accomplished and documented, and whether more than one QCT is required. The QCP shall include the criteria utilized by the QCT to correct or reject unsatisfactory materials. The QCT shall be certified as a Paving Inspector by the North East Transportation Training and Certification Program.

The QCP shall detail the coordination of the activities of the Plan Administrator, the PCT and the QCT. The project Superintendent shall be named in the QCP, and his responsibilities for successful implementation of the QCP shall be outlined.

The Contractor shall sample, test, and evaluate Hot Mix Asphalt Pavement in accordance with the minimum frequencies presented in Table 5.

The Contractor may utilize innovative equipment or techniques not addressed by the Contract documents to produce or monitor the production of the mix, subject to approval by the Engineer.

The Contractor shall submit all Hot Mix Asphalt Pavement plant test results in writing, signed by the appropriate technician and present them to the Engineer by 1:00 p.m. on the next working day, except when otherwise noted in the QCP due to local restrictions. The Contractor shall make density test results, including randomly sampled densities, available to the Engineer onsite. Summaries of each day’s results, including a daily paving report, shall be recorded and signed by the QCT and presented to the Engineer by 1:00 p.m. the next working day.

The Contractor shall have a testing lab at the plant site, equipped with all testing equipment necessary to complete the tests in Table 4. The Contractor shall locate an approved SHRP Gyrotory Compactor at the plant testing lab or within 30 minutes of the plant site.

The Contractor shall fill all holes in the pavement resulting from cutting cores by the Contractor or the Engineer with an acceptable mixture no later than the following working day. Before filling, the Contractor shall carefully clean and dry the holes and apply a coating of emulsified asphalt. On surface courses, cores shall not be cut except for Verification of the Nuclear Density Gauge, at a rate not to exceed 3 per day or 2 per 1100 tons placed. On a daily basis, the Contractor shall perform nuclear density testing across the uncompacted mat being placed, at 12 inch intervals. If the values vary by more than 2.0% from the mean, the Contractor shall make adjustments until the inconsistencies are remedied.

TABLE 5: MINIMUM QUALITY CONTROL FREQUENCIES

Test or Action	Frequency	Test Method
Temperature of mix	6 per day at street and plant	-
% TMD (Surface)	1 per 125 tons (As noted in QC Plan)	ASTM D 2950

Test or Action	Frequency	Test Method
% TMD (Base)	1 per 250 tons (As noted in QC Plans)	AASHTO T-269
Fines/Effective Binder	1 per 500 tons	AASHTO T-312
Gradation	1 per 500 tons	AASHTO T-30
PGAB content	1 per 500 tons	AASHTO T-164 or T-308
Voids at N_{design}	1 per 500 tons	AASHTO T-312
Voids in Mineral Aggregate at N_{design}	1 per 500 tons	AASHTO T-312
Rice Specific Gravity	1 per 500 tons	AASHTO T-209
Coarse Aggregate Angularity	1 per 5000 tons	ASTM D 5821
Flat and Elongated Particles	1 per 5000 tons	ASTM D 4791
Fine Aggregate Angularity	1 per 5000 tons	AASHTO T-304

The Contractor shall monitor plant production using control charts as specified in Section 106 – Acceptance (MDOT Standard Specifications, November 2014). Action limits shall be as noted in Table 6 below.

TABLE 6: CONTROL LIMITS

Property	UCL and LCL
Passing No. 4 and larger sieves	Target ± 4.0
Passing No. 8 sieve	Target ± 2.5
Passing No. 200 sieve	Target ± 1.2
PGAB Content*	Target ± 0.3
Voids in the Mineral Aggregate	LCL = LSL + 0.2
% Voids at N_{design}	JMF Target ± 1.3

*Based on AASHTO T-308

The Contractor shall construct a pavement test strip on the first project constructed with each individual Job Mix Formula (JMF). The test strip quantity shall be excluded from the lot for QA analysis. Prior to placement of the test strip a passing verification test is required. The quantity of Hot Mix Asphalt produced for the test strip shall not exceed 330 tons, or 10 percent of the total quantity for the project, as determined by the Engineer. The Contractor shall notify the Engineer 48 hours in advance of placing the test strip in order to allow for Engineering personnel to assist with the sampling.

The test strip is intended to:

- 1) Allow the Contractor to establish rolling patterns to achieve optimum density for the mat being laid.

- 2) Allow the Contractor to adjust targets in new JMF's prior to approval.

The Engineer will not sample from the first third of the mat, allowing the Contractor to establish a roller pattern. The Engineer will obtain two random mix samples from the middle third of the test strip and these shall be split with the contractor and the results compared. Five cores shall be randomly sampled from the mat, (excluding the first third) and tested for density verification. Should the resulting values average lower than the LSL for percent TMD, the test strip shall be rejected. Provided that the average of the results is 90 percent or greater the Engineer will pay for the first test strip at 100 percent of the bid price, but the Contractor shall remove and replace subsequent rejected test strips at their expense, as well as the first test strip if it fails to meet a minimum average of 90.0 percent. Production shall not commence until a test strip has met these criteria.

The Contractor shall cease paving operations whenever one of the following occurs on a lot in progress:

- 1) The Pay Factor for VMA, Voids @ N_d , Percent PGAB, composite gradation, VFB, fines to effective binder or density using all Acceptance or all Quality Control tests for the current lot is less than 0.85.
- 2) The Coarse Aggregate Angularity or Fine Aggregate Angularity value falls below the requirements of Table 3.
- 3) The first 2 control tests for the lot fall outside the upper or lower limits for VMA, Voids @ N_d , or PGAB. This includes any case where both tests are out on the same, or different, properties.
- 4) The Flat and Elongated Particles value exceeds 10 percent by ASTM D 4791
- 5) There is any visible damage to the aggregate due to over-densification other than on variable depth shim courses.
- 6) The Contractor fails to follow the approved QCP.
- 7) The Contractors control chart shows the process to be out of control on any property listed in Table 6.

Paving operations shall not resume until the Contractor and the Engineer determine that material meeting the Contract requirements will be produced. The Engineer will consider corrective action acceptable if the pay factor for the failing property increases. If the Engineer determines that the resumption of production involves a significant change to the production process, the current lot will be terminated and a new lot will begin.

401-3.15 ACCEPTANCE.

This method utilizes Quality Level Analysis and pay factor specifications.

The Acceptance Testing Method will be determined by the total quantity of material represented by a JMF. Method A will be used if the total quantity represented by a JMF is expected to be 1500 tons or greater. Method B will be used if the total quantity represented by a JMF is expected to be less than 1500 tons.

For Hot Mix Asphalt Pavement designated for acceptance under Quality Assurance (QA) provisions, the Engineer will sample once per subplot on a statistically random basis, test, and evaluate in accordance with the following Acceptance Criteria:

TABLE 7: ACCEPTANCE CRITERIA

PROPERTIES	POINT OF SAMPLING	TEST METHOD
Gradation	Truck	AASHTO T-30
PGAB Content	Truck	AASHTO T-308
%TMD (Surface)	Mat behind all Rollers	AASHTO T-269
%TMD (Base or Binder)	Mat behind all Rollers	AASHTO T-269
Air Voids at N_d	Truck	AASHTO T-312
Voids in Mineral Aggregate at N_d	Truck	AASHTO T-312
Fines to Effective Binder	Truck	AASHTO T-312
Voids Filled with Binder	Truck	AASHTO T-312

On the first day of production of a new JMF the Engineer will take three random samples which will be used to calculate the quality level of the in-place material in the event the lot is terminated prematurely. Only one of the three will be tested, the other two will be held onsite until at least three random samples have been taken, at which time the other two will be discarded.

(a) Acceptance Method A

Lot Size will be the entire production per JMF for the project, or if so agreed at the Pre-paving Conference, equal lots of up to 4500 tons, with unanticipated over-runs of up to 1500 ton rolled into the last lot. Sublot sizes shall be 750 ton for mixture properties, 500 ton for base or binder densities and 250 ton for surface densities. The minimum number of sublots for mixture properties shall be four, and the minimum number of sublots for density shall be five. If there is less than one-half of a sublot remaining at the end, then it shall be combined with the previous sublot. If there is more than one-half sublot remaining at the end, then it shall constitute the last sublot and shall be represented by test results.

TABLE 8: METHOD A ACCEPTANCE LIMITS

Property	USL and LSL
Passing 4.75 mm and larger sieves	Target +/-7%
Passing 2.36 mm to 1.18 mm sieves	Target +/-4%
Passing 0.60 mm	Target +/-3%
Passing 0.30 mm to 0.075 mm sieve	Target +/-2%
PGAB Content	Target +/-0.4%
Air Voids	4.0% +/-1.5%
Fines to Effective Binder	0.6 to 1.2
Voids in the Mineral Aggregate	LSL Only from Table 1
Voids Filled with Binder	Table 1 values plus a 4% production tolerance for USL only
% TMD (In place density)	95.0% +/- 2.5%

(b) Acceptance Method B

Lot Size will be the entire production per JMF for the project and shall be divided into 3 equal sublots for Mixture

Properties and 3 equal sublots for density.

TABLE 9: METHOD B ACCEPTANCE LIMITS

Property	USL and LSL
Percent Passing 4.75 mm and larger sieves	Target +/-7
Percent Passing 2.36 mm to 1.18 mm sieves	Target +/-5
Percent Passing 0.60 mm	Target +/-4
Percent Passing 0.30 mm to 0.075 mm sieve	Target +/-3
PGAB Content	Target +/-0.5
Air Voids	4.0% +/-2.0
Fines to Effective Binder	0.6 to 1.2
Voids in the Mineral Aggregate	LSL from Table 1
Voids Filled with Binder	Table1 plus a 4% production tolerance for USL.
% TMD (In-place Density)	95.0% +/- 2.5%

(c) For acceptance testing, the Engineer will obtain samples of Hot Mix Asphalt Pavement in conformance with AASHTO T-168 - Sampling Bituminous Paving Mixtures. The Engineer will take the sample randomly within each subplot. Target values shall be as specified in the JMF. The Engineer will use the appropriate Table 8 or 9 depending on the acceptance method, for calculating pay factors for gradation, PGAB Content, Air Voids at N_d , VMA, Fines to Effective Binder and VFB. Upon conclusion of each lot, where there is a minimum of four sublots, results shall be examined for statistical outliers, as stated in Section 106.7.2 – Statistical Outliers (MDOT Standard Specifications, November 2014).

(d) During the course of inspection, should it appear that there is an isolated area that is not representative of the lot based on a lack of observed compactive effort, excessive segregation or any other questionable practice, that area may be isolated and tested separately. An area so isolated that has a calculated pay factor below 0.80 for Method A or below 0.86 for Method B, based on three random tests shall be removed and replaced at the expense of the Contractor for the full lane width and a length not to be less than 150 ft.

(e) The Engineer will measure pavement density using core samples tested according to AASHTO T-166. The Engineer will randomly determine core locations. The Contractor shall cut 6 inch diameter cores at no additional cost to the Owner within 24 hours of placement of the pavement, and immediately give them to the Engineer. At the time of sampling, the Contractor and the Engineer shall mutually determine if a core is damaged. If it is determined that the core(s) is damaged, the Contractor shall cut new core(s) at the same offset and within 3 feet of the initial sample. At the time the core is cut, the Contractor and the Engineer will mutually determine if saw cutting of the core is needed, and will mark the core at the point where sawing is needed. The core may be saw cut by the Contractor in the Engineer’s presence onsite, or in the laboratory by the Engineer, without disturbing the layer being tested to remove lower layers of Hot Mix Asphalt Pavement, gravel, or RAP. No recuts are allowed at a test location after the core has been tested. Upon conclusion of each lot, density results shall be examined for statistical outliers as stated in Section 106.7.2 – Statistical Outliers (MDOT Standard Specifications, November 2014).

METHOD OF MEASUREMENT

401-4.1 MEASUREMENT. The Engineer will measure Hot Mix Asphalt Pavement by the ton in accordance with Section 108.1 - Measurement of Quantities for Payment (MDOT Standard Specifications, November 2014).

BASIS OF PAYMENT

401-5.1 PAYMENT. The Engineer will pay for the work, in place and accepted, in accordance with the applicable sections of this Specification, for each type of material specified.

The Engineer will pay for the work as specified above for the material used, except that cleaning objectionable material from the pavement and furnishing and applying bituminous material to joints and contact surfaces is incidental.

Payment for this work will be made under Item M-401-5.1 (LLR) and shall be full compensation for all labor, equipment, materials, and incidentals necessary to meet all related Contract requirements, including design of the JMF, implementation of the QCP, obtaining core samples, transporting cores, filling core holes, applying emulsified asphalt to joints, and providing testing facilities and equipment.

The Engineer will make a pay adjustment for quality below the minimum acceptable level, as specified below.

The total project payment for plant mix bituminous concrete pavement shall not exceed 100 percent of the product of the contract unit price and the total number of tons of bituminous mixture used in the accepted work.

401-5.2 PRICE ADJUSTMENT FOR THE QUALITY OF HOT BITUMINOUS PAVEMENT. The Engineer will sample, test, and evaluate Hot Mix Asphalt Pavement in accordance with Section 106 - Quality (MDOT Standard Specifications, November 2014) and Section 401-3.15 - Acceptance of this specification.

For each lot accepted, the adjusted contract unit price shall be the product of the lot composite pay factor for the lot and the contract unit price. Payment shall be subject to the total project payment limitation specified in Section 401-5.1. Payment in excess of 100 percent for accepted lots of bituminous concrete pavement shall be used to offset payment for accepted lots of bituminous concrete pavement that achieve a lot pay factor less than 100 percent, with the exception of if the lot's factor is less than 0.75. If the lot's pay factor is less than 0.75, then that lot's pay factor cannot be offset by any pay factors greater than 1.00.

401-5.3 PAY FACTOR (PF). The Engineer will use density, Performance Graded Asphalt Binder content, voids @Nd, VMA, VFB, F/B^e, and the screen sizes listed in Table 10 for the type of material represented in the JMF. The Engineer will evaluate materials using the following price adjustment factors under Section 106.7 - Quality Level Analysis (MDOT Standard Specifications, November 2014).

The Engineer will apply price adjustments to the appropriate Hot Mix Asphalt Pavement pay items. Price adjustments shall be applied based on test results for each lot. If any pay factor for any single property (or composite gradation) falls below 0.85, the Contractor shall shut down the HMA plant. If any single pay factor for PGAB Content, VMA, or Air Voids falls below 0.80 for Method A or 0.86 for Method B, the volumetric composite pay factor for PGAB Content, VMA, and Air Voids shall be 0.55 for Method A or 0.70 for Method B.

If the pay factor for Density falls below 0.80 for Method A or 0.86 for Method B, all of the cores will be randomly recut by Sublot. A new pay factor will be calculated that combines all initial and retest results. If the resulting pay factor is below 0.80 for Method A or 0.86 for Method B, the entire Lot shall be removed and replaced with material meeting the specifications at no additional cost to the Owner¹. Pay factors equal to or greater than the reject level will be paid accordingly.

¹ However, the Engineer may decide to allow the rejected lot to remain. In that case, if the Engineer and Contractor agree in writing that the lot shall not be removed, it shall be paid for at 50 percent of the contract unit price AND THE TOTAL PROJECT PAYMENT LIMITATION SHALL BE REDUCED BY THE

AMOUNT WITHHELD FOR THE REJECTED LOT.

TABLE 10: TABLE OF GRADATION COMPOSITE “F” FACTORS
Method A & B

Constituent		“F” Factor			
		¾ inch	½ inch	3/8 inch	3/16 inch
Gradation	1 inch		-	-	-
	¾ inch	4	-	-	-
	½ inch		4	4	-
	3/8 inch				4
	No. 8	6	6	6	8
	No. 16				
	No. 30	2	2	2	2
	No. 50	2	2	2	2
	No. 200	6	6	6	8

For each lot of material, the Engineer will determine a price adjustment as follows:

Gradation. The Engineer will determine a composite pay factor (CPF) using applicable price adjustment factors “F” from Table 10 and acceptance limits from Table 8 or Table 9. The Engineer will not make price adjustments for gradations, but will monitor them as shutdown criteria.

VFB and Fines to Effective Binder. The Engineer will determine a pay factor (PF) using acceptance limits from Table 8 for Method A or Table 9 for Method B. The Engineer will not make price adjustments for VFB or Fines to Effective Binder, but will monitor them as shutdown criteria.

PGAB Content, VMA and Air Voids. The Engineer will determine a pay factor using acceptance limits from Table 8 for Method A or Table 9 for Method B. The Engineer will calculate the volumetric composite pay factor as follows:

$$VCPF = [(air\ voids\ PF \times 0.20) + (vma\ PF \times 0.20) + (PGAB\ content\ PF \times 0.10)] / (0.50)$$

Where

VCPF = Volumetric composite pay factor

PF = Pay Factor

The maximum VCPF shall be 1.025.

If any single pay factor for PGAB Content, VMA, or Air Voids falls below 0.80 for Method A or 0.86 for Method B, the volumetric composite pay factor for PGAB Content, VMA, and Air Voids shall be 0.55 for Method A or 0.70 for Method B.

Density. The Engineer will determine a pay factor using acceptance limits from Table 8 for Method A or Table 9 for Method B.

The maximum Pay Factor for Density shall be. 1.025.

Lot Composite Pay Factor. The Engineer will calculate the lot composite pay factor as follows:

$$\text{LCPF} = (\text{VCPF} \times 0.5) + (\text{Density PF} \times 0.5)$$

Adjusted Price. The Engineer shall calculate the adjusted price as follows:

$$\text{AP} = \text{LCPF} \times \text{price per ton} \times \text{quantity}$$

END OF ITEM M-401