

## EXHIBIT A

### DESCRIPTION OF GOODS & SERVICES AND ADDITIONAL TERMS & CONDITIONS

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#### **1. Description of Goods and Services:**

The Contractor shall provide equipment or services or both for the milling of and placement of bituminous concrete pavement on bridges and highways statewide using generally accepted pavement preservation techniques that includes patching and crack filling prior to bituminous concrete placement. Other ancillary work performed includes, but is not limited to, furnishing and replacing catch basin tops, installing temporary line striping, placing processed aggregate for backfilling, employing uniform placement and compaction procedures, and applying pavement smoothness pay adjustments to enhance quality and increase pavement longevity. Contractor shall supply all materials, equipment, including fuel for such equipment, equipment maintenance and equipment repair, operators and labor to put the materials in place using these techniques. The Contractor shall also furnish all labor, equipment, tools, materials, maintenance and protection of traffic and pedestrian detours, including traffic control services, all signs, barricades and devices erected, re-erected, maintained and removed to perform the work.

#### **(a) FORM 817, Standard Specifications for Roads, Bridges, Facilities and Incidental Construction (Standards):**

Reference is made in this Contract to ConnDOT's FORM 817, "**Standard Specifications for Roads, Bridges, Facilities and Incidental Construction**", as amended (the "**Standards**"). Contractor's Performance under this Contract shall be in accordance with the Standards including all supplements and other applicable standards. The applicable portions of the Standards are incorporated herein and any terms capitalized but not defined in this Exhibit A have the meanings ascribed to them in the Standards.

The Standards are located at the below website address, as it may be modified from time to time:  
<http://www.ct.gov/dot/cwp/view.asp?a=3609&q=430362>

#### **(b) Definitions:**

- "Engineer" is defined in the most recent version of the Standards: The Commissioner or Deputy Transportation Commissioner acting directly or through a duly-authorized representative.
- "Inspector or District Construction Personnel" is defined in the most recent version of the Standards: A duly authorized representative of the Engineer, assigned to make inspections of the work performed and materials furnished by the Contractor.
- "Laboratory" is defined in the most recent version of the Standards: The official testing laboratory of the Department, unless the Department designates another laboratory to provide services in connection to the Project.
- "Complete-In-Place" is defined as the Contractor price, including all materials needed, equipment, tools, labor and work incidental thereto.
- "Change Order" is defined as any change made to a purchase order.

#### **(c) Contractor Notification:**

The Client Agency shall attempt to contact the Contractor for a period of two (2) consecutive days or forty-eight (48) hours (whichever is longer). Saturdays and Sundays will be excluded from the notice timeframe. If the Contractor cannot be reached or does not respond within the notice timeframe, the next lowest Contractor will be contacted to perform the task. The availability of a Contractor to commence work within five (5) business days will be considered when selecting the "lowest available

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qualified Contractor". The availability of required equipment to perform a particular project is another factor that may be considered.

**(d) Client Agency Notification:**

Contractor shall notify Client Agency's Engineer personnel in charge and Client Agency's central Laboratory of its proposed work schedules. Notifications must be made on or before 3:00 p.m. on the day prior to the commencement of work and must include the following: actual time the work is to commence, plant location material is to be drawn from, and whether or not storage bins shall be used for overnight storage.

**(e) Start of Work:**

The Contractor shall start each project within ten (10) days after the start date that is ordered by the Client Agency at the preconstruction meeting. If Contractor cannot meet the start date ordered at the preconstruction meeting, Client Agency may, at its discretion, award the work to the next lowest available Contractor in accordance with Section 13 of the Contract.

The ten (10) day limit may be extended in writing at the discretion of Client Agency's Engineer. After commencing work, Contractor shall complete all machine-spread work and shall not be allowed to leave the job site without prior approval from the Client Agency's Engineer.

**(f) Minimum Wage Rates:**

The wages paid to any mechanic, laborer or worker employed in the work contracted to be done must be at a rate equal to the rate of wages customary or prevailing for the same work in the same trade or occupation and in the area in which the work is to be performed. Payment must be made to each employee engaged in work under this Contract in the trade or occupation listed, not less than the wage rate set by category in accordance with the wage schedule attached to this Contract. In the event it becomes necessary for Contractor or any subcontractor to employ any mechanic, laborer or worker in a trade or occupation for which no minimum wage is set forth, Contractor shall immediately notify the Connecticut State Commissioner of Labor, who shall ascertain the minimum applicable wage rate from the time of the initial employment of the person affected and during continuance of such employment. Every Contractor or subcontractor performing work for the State is subject to the provisions described herein, as determined by the Connecticut State Commissioner of Labor, and shall post the prevailing wages in prominent and easily accessible places at each work site. Questions regarding wage regulations must be directed to the State of Connecticut Department of Labor ("DOL"), Division of Wage and Workplace Standards at: 860-263-6790.

**(g) Wage Regulations:**

Contractor shall contain wage scales as provided by DOL. Contractor shall abide by all provisions outlined in the applicable State regulations throughout the term of this Contract, including any extensions. During the term of this Contract the State shall verify that wages meeting the wage scales are being paid in accordance with Connecticut General Statutes ("CGS") as outlined in Title 31.

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Contractor shall comply with the provisions of CGS Section 31-55a, which states the following: "Each Contractor that is awarded a Contract on or after October 1, 2002, for (1) construction of a state highway or bridge that falls under the provisions of section 31-54, or (2) the construction, remodeling, refinishing, refurbishing, rehabilitation, alteration or repair of any public works project that falls under the provisions of section 31-53 shall contact the Labor Commissioner on or before July first of each year, for the duration of such Contract, to ascertain the prevailing rate of wages on an hourly basis and the amount of payment or contributions paid or payable on behalf of each mechanic, laborer or worker employed upon the work contracted to be done, and shall make any necessary adjustments to such prevailing rate of wages and such payment or contributions paid or payable on behalf of each such employee effective each July 1<sup>st</sup>."

**(h) Work Periods, Restricted Time and Payments:**

In accordance with the normal work schedule in use by the Client Agency, the Contractor shall cover regular work hours and premium additional hours for night work, Saturday work, and Sunday work. The Contractor will be required to provide traffic control on all roadways including multi-lane highways and expressways. All prices include haulage costs. All work performed will be paid for at the price bid unless otherwise ordered by the Client Agency's Engineer. Payment examples are described below.

Definition of such work periods are as follows:

**1. Regular Work Hours: Material's Bid Price ("MBP")**

The hours between 7:00 a.m. and 6:00 p.m. are considered regular work hours.

Regular work hours are defined as the time the Contractor starts construction operations for the day to the time these operations are completed. Regular work hours will consist of seven and one-half (7 ½) hours worked between the hours of 7:00 a.m. and 6:00 p.m.

The actual work hours will be determined during each project's pre-construction meeting. Any changes to the predetermined regular work hours must be in writing and preapproved by the Client Agency Office of Maintenance.

When less than seven and one-half (7 ½) hours are worked, payments to Contractor will be made under the "Restricted Time Period" provision described below.

**2. Night Work Hours:**

The hours after 6:00 p.m. and before 7:00 a.m. are considered night work hours.

The price bid for "Night" will be added to the price bid for all tonnage that leaves the plant after 6:00 p.m. and before 7:00 a.m.

The Contractor shall provide all of the necessary lighting to illuminate the work area and the illumination of traffic control, testing and signing operations.

**3. Saturday Work Hours:**

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The hours between 7:00 a.m. and 6:00 p.m. are considered Saturday's regular work hours and the price bid for "Saturday" will be added to the price bid for all tonnage that leaves the plant between these hours.

The price awarded for "Saturday" and the price awarded for "Night" will not be combined.

4. **Sunday Work Hours:**

The hours between 7:00 a.m. and 6:00 p.m. are considered Sunday's regular work hours and the price bid for "Sunday" will be added to the price bid for all tonnage that leaves the plant between such hours.

The price awarded for "Sunday" and the price awarded for "Night" will not be combined.

5. **Restricted Time Period:**

Paving

Client Agency may limit the hours a Contractor works when extreme traffic disruptions occur. Work delays or work stopped by the Client Agency for a specific period that results in less than seven and one-half (7 ½) hours worked during regular work hours in any one (1) day will be considered a restricted time period. Restricted time periods do not apply to shutdowns caused by adverse weather, Contractor breakdowns or completion of work covered by the purchase order. Restricted time period payments will be made at the rate of one thousand dollars (\$1,000.00) per hour per crew with paver and five hundred dollars (\$500.00) per hour per each hand-working crew. The minimum restricted time period payment will be one-half (1/2) hour. Client Agency shall round off all restricted time periods to the nearest one-half (1/2) hour increment.

Fine Milling

The Client Agency may limit the hours a Contractor works when extreme traffic disruptions occur. Work delays or work stopped by the Client Agency for a specific period which results in less than seven and one-half (7 ½) hours worked during regular work hours in any one (1) day will be considered a restricted time period. Restricted time periods do not apply to shutdowns caused by adverse weather, Contractor equipment breakdowns or completion of work covered by the purchase order. Restricted time period payments will be made at the rate of five hundred dollars (\$500.00) per hour, per work crew. The minimum restricted time period payment will be one-half (½) hour. Client Agency shall round off all restricted time periods to the nearest one-half (½) hour increment.

Payment Example

Contractor work commences on Friday at 5:00 p.m. and ends Saturday at 9:00 p.m. The total number of hours is twenty-eight (28).

**Total payment breakdown for this work period is as follows:**

***Friday*** - One (1) hour of MBP (5:00 p.m. to 6:00 p.m.)

***Friday*** -Thirteen (13) hours of MBP ***plus additional per ton*** Night Bid Price (6:00 p.m. to 7:00 a.m.)

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**Saturday** - Eleven (11) hours MBP *plus additional per ton* Saturday Bid Price (7:00 a.m. to 6:00 p.m.)

**Saturday** - Three (3) hours MBP *plus additional per ton* Night Bid Price (6:00 p.m. to 9:00 p.m.)

**(i) Equipment Regulations:**

Contractors shall equip all rented and supplied equipment or vehicles with all required safety or other operational devices. Contractor shall maintain equipment to remain in compliance with all of the applicable Federal, State and municipal laws, ordinances and regulations.

**(j) Equipment Inspections:**

All equipment must be in good operating condition and available for inspection by the Client Agency's Inspectors prior to the start of each project. Inspections will be conducted within the State and must be passed prior to the issuance of a purchase order. If the Contractor's equipment is not available for inspection or determined by the Client Agency to be unfit to perform the work specified, the Client Agency shall inform the Contractor and the Client Agency may contact the next lowest available qualified Contractor in accordance with Section 13 of the Contract.

**(k) Transportation:**

The Contractor shall be responsible for all costs of transporting equipment and materials to and from job sites. No transportation charges, setup or breakdown fees or charges will be accepted.

**(l) Tolls:**

The Contractor shall be responsible for payment of all applicable tolls.

**(m) Connecticut Registration Requirements:**

Under State law, a commercial vehicle used by the Contractor in connection with work under this Contract may be subject to State registration requirements. CGS§ 14-12a requires such registration for any vehicle which is most frequently garaged in this State, or most frequently leaves from and returns to one (1) or more points within this State in the normal course of operations. In addition, Contractor shall obtain State registration for any vehicle which continuously receives and discharges cargo within the State. The Contractor shall comply with all applicable provisions and regulations of Title 14 of the CGS.

**(n) Safety Equipment:**

The Contractor shall be responsible for all personal protective equipment required for the Contractor's employees while Performing under this Contract, at no cost to the Client Agency.

**(o) Material Specifications:**

The Contractor shall haul and place material in accordance with the Standards and Section 4.06 and M.04 of Attachment 1- Bituminous Concrete Standards and all other provision specification requirements contained herein, which for the purposes of this Contract replaces and supersedes the Standards.

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Tack coat must be utilized and paid for as specified in Section 4.06 of Attachment 1- Bituminous Concrete Standards. In the event the tack coat fails the Client Agency's testing, the Contractor shall not receive any payment for the application of the tack coat.

**(p) Material Orders:**

The Contractor shall receive purchase orders on the basis of the lowest net cost. The Client Agency shall determine the types of materials best suited for the work, at its sole discretion.

The Client Agency shall issue purchase orders for Complete-In-Place on the basis of total quantities used on each purchase order regardless of the quantity and types of material used. The quantity range representing the total quantity being placed must be used to determine the applicable Contract price for each type of material regardless of the quantity of each individual type of material.

Contracts are termini specific and may cross town lines. Each termini section is bid separately. For each separate termini section, the Contractor with the lowest net cost will be considered the lowest bidder for that section.

**(q) Quantities and/or Usages:**

Any quantities set forth in this Contract are estimated quantities and/or usages only and in no way represent a commitment and/or intent to purchase any particular amount. Actual quantities may vary and will be identified on individual purchase orders issued by the Client Agency.

The Client Agency does not guarantee that any particular amount of bituminous concrete material will be required during the Contract term. Contractor shall provide quantities of material on purchase orders issued in accordance with Exhibit B, Price Schedule. Contractor shall be responsible for and capable of installing in place tonnage in accordance with the Contract price and from plants on Contractor's list of suppliers in Exhibit B, Price Schedule. Prices will not be accepted that provide less than one thousand five hundred (1,500) tons per seven and one-half (7.5) hour continuous paving operation within the travel way of a limited access highway, and one thousand (1,000) tons per seven and one-half (7.5) hour continuous paving operation on all other projects. These minimum tonnage requirements apply only to surface course pavements of two (2) inches or more. Ramps, shoulders and adjustments to the paving operation that are directed by the Client Agency's Engineer or an authorized representative are excluded.

Calculations for payments will be based on legal loads only. The Client Agency shall not provide payment for any overweight material or for associated traffic control.

If the Contractor cannot provide the required tonnage per day in accordance with Exhibit B, Price Schedule, the Client Agency may, at its sole discretion, award the work to the next lowest available Contractor in accordance with Section 13 of this Contract.

When the Contractor fails to provide the required quantity per day in accordance with Exhibit B, Price Schedule, the Client Agency shall adjust the payment based on the bituminous material

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actually provided Complete-In-Place for the day. The adjustment will be assessed in accordance with the chart below:

<b><u>Percent of Required Daily Tonnage</u></b>	<b><u>Percent of Payment</u></b>
96% - 100%	100%
75% – 95%	95%
Less than 75%	90%

The adjustment will not apply during conditions beyond the control of the Contractor, shutdowns due to adverse weather, equipment malfunctions or when discontinuance of the work is ordered by the Client Agency.

**(r) Proprietary Devices, Materials and Processes:**

The Client Agency shall not accept any material from any plant until the mix design data has been submitted by the Contractor and approved by the Client Agency Division Chief from the Office of Construction. Mix design data and trial mixes must be furnished upon request of the Client Agency.

If the Contractor is required or desires to use any design, device, material or process covered by another party’s license, patent, copyright or trademark, the Contractor shall provide, prior to such use, a legal agreement executed between the Contractor and the holder of the license, patent, copyright or trademark holder. The Contractor shall provide a copy of any and all such agreements to the Client Agency’s Engineer prior to use of such design, device, material or process. If the Contractor is allowed by the Client Agency, but not specifically required by the Client Agency’s Engineer, to use any proprietor’s design, device, material or process covered by license, patent, copyright or trademark, the Contractor and its surety shall indemnify and hold harmless the State from any and all claims that may be brought against the State, and any and all costs, expenses, and damages that the State may be obligated to pay by reason of any infringement or alleged infringement relating to the use of such licensed, patented, copyright or trademark design, device, material or process at any time during the prosecution or after the completion of the project.

**(s) Handwork and Curbing:**

When bituminous concrete curbing is placed across driveways in a continuous run and cut down to form the lip of the driveway, it must be paid for under the item, machine placed curb mix four (4) to (6) inches. All machine laid curbing must be paid for under the appropriate item(s), Bituminous Concrete Lip Curbing or Bituminous Concrete Park Curbing. In small areas where a curbing machine won’t fit (<10 feet), curbing must be spread and formed by hand. All hand spread curb mix, including the cut down curb mix at driveways must be paid for as “Hand Work” under the Hot-Mix Asphalt (“HMA”) item S0.375 of Exhibit B1- Price Schedule. The Client Agency shall handwrite adjustments on the “curb mix” delivery ticket for record purposes.

Work outside of paver placed machine laid areas, as ordered by the Engineer, shall be paid for under “Hand Work” and shall include, but not be limited to, placement of material in fillets and driveway

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aprons. The Contractor shall not calculate its invoice for use of tack coat in conjunction with hand work and curbing and instead, shall include such work in the cost of the appropriate items.

**(t) Adjustments:**

If the Contractor fails to complete the hand work and curbing work within ten (10) consecutive working days of the completion of the paver placed machine laid work, an adjustment of one-half (0.5%) percent of the job total may be charged to Contractor for each day in excess of the allowable time period it takes to complete the curbing work. Any adjustment to the allowable time period for the completion of the hand spread and curbing work shall be at the discretion of the Client Agency and shall be determined prior to any payments made to the Contractor.

**(u) Milling Machine:**

Contractor shall provide a milling machine in accordance with the "Fine Milling of Bituminous Concrete (0 to 4 inches)" specification as described in this Exhibit A below. The milling machine must be provided with an operator.

**(v) Material Transfer Vehicle:**

A material transfer vehicle ("MTV") must be used with all types of HMA, Polymer Modified Asphalt ("PMA"), and all other bituminous concrete mixes unless otherwise specified in this Contract or waived by the Client Agency. MTV must meet the all Technical Requirements and Standard Specifications contained in this Contract. MTV must be paid for separately in accordance with Exhibit B1, Price Schedule.

**(w) Permits, Licenses, and Fees:**

Contractor shall pay all fees for permits, licenses and certifications, and provide all notices to the Client Agency and comply with all laws, ordinances, rules and regulations of the city, town and Client Agency in which the installation is to be made. Contractor shall immediately notify the Client Agency by written notice in the event any of such permits, licenses or certifications expire or are revoked. The Client Agency, at any time during the term of this Contract, may request the Contractor and subcontractor, if any, to provide proof of any required permits, licenses and certifications.

**(x) Geographical Limits:**

The geographical limits of each district are outlined on the State map contained herein as Attachment 2- Maintenance District Map.

**(y) Environmental Compliance:**

The Contractor shall remain in compliance with the environmental regulations promulgated by the State of Connecticut Department of Energy and Environmental Protection. If Contractor fails to comply with any environmental regulations, the Client Agency may not issue any new purchase orders to Contractor until such noncompliance has been cured.

The Contractor shall comply with Sections 1.07.16 and 1.10.03 and the Department Best Management Practices of the Standards, as well as any other applicable addenda or provisions of the Standards.



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**(z) Traffic Control:**

The Contractor shall supply, erect, maintain, move and remove all signs, sign supports, barricades, traffic cones, traffic delineators and any, but not limited to, other material that may be necessary to set up the various Traffic Control Patterns as set forth in the Standards and any revisions to such provisions contained herein as Attachment 3- Maintenance and Protection of Traffic. In addition, the Contractor shall furnish the required number of Traffic Control Personnel throughout the term of this Contract. The term "Traffic Control Personnel" is defined as Uniformed Flagger(s) or Uniformed Police Officer(s). The Contractor shall request the minimum number of Traffic Control Personnel, specifically:

1. With respect to limited access highways "Expressways", a minimum of one (1) Connecticut State Police Officers or as authorized by the Engineer.
2. With respect to two-lane (non-divided) highways, a total of three (3) Traffic Control Personnel (in any combined number of Uniformed Police Officer(s) and/or Uniformed Flaggers).
3. With respect to handwork/curbing, a total of two (2) Traffic Control Personnel (in any combined number of Uniformed Police Officer(s) and/or Uniformed Flaggers) on Two-Lane (non-divided) highways and a minimum of two (2) Connecticut State Police Officers on Expressways.

Subcontracted traffic services shall not preform any detouring of traffic without prior approval of the Client Agency. If State/ local police or traffic controllers detour traffic, the paving Contractor shall be responsible for any adverse conditions that may arise from the detour. Only planned detours with appropriate notification to the appropriate parties and approved by the Engineer will be allowed.

Contractor shall supply, erect, maintain, move and remove any necessary lighting which may be required to illuminate the work area including the illumination of any signing operations. If night work is performed utilizing traffic control, the Contractor shall provide bright wide angle retro-reflective sheeting signage in accordance with the Standards section M.18.09.02.

In situations where the scheduled police officers don't show or cancel, and cannot be replaced, the Contractor may still set up the required traffic control. In such cases, the Contractor, with approval from the Engineer, may utilize additional crash trucks and attenuation vehicles to safely secure the roadway in order to erect the traffic control and establish a proper roadway work zone.

**(aa) Pricing for Contractor Furnished Traffic Control:**

Prices for traffic control are set forth in Exhibit B2, Price Schedule Traffic Control by District for both Limited Access Highways and Non-limited Access Highways. Limited Access Highways are defined as those that the ConnDOT Commissioner, with the advice and consent of the State Governor and the Attorney General, designates as limited access highways to allow access only at highway intersections or designated points.

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Pricing of Traffic Control Items A through E are on an hourly basis as indicated in Exhibit B2, Price Schedule Traffic Control. The Client Agency shall pay the rate offered for one-half (1/2) hour increments. The hourly rate will include setup and removal where traffic control is required. Traffic Control Items F through K, as indicated in Exhibit B2, Price Schedule Traffic Control, will be paid for actual hours used. The Contractor will comply with Attachment 3- Maintenance and Protection of Traffic which will determine whether a Truck Mounted Attenuator ("TMA") is required and the quantity needed.

Crash units without operators, will be paid for between the set-up/removal time in the best suitable category listed in Exhibit B2, Price Schedule Traffic Control during the time crash units are idling with flashing lights.

The cost of providing traffic control is a factor in determining the lowest priced Contractor for each purchase order. The pricing set must be adhered to throughout the term of this Contract.

If State police officers are utilized as traffic personnel, the Client Agency shall reimburse the State of Connecticut, Department of Emergency Services and Public Protection ("DESPP") directly for all approved work performed by State police officers.

If Uniformed Flaggers are required, the Contractor shall pay the rate listed in Exhibit B2- Price Schedule Traffic Control for line item G.

If uniformed police officers are utilized as traffic personnel, the Contractor shall pay the rate listed in Exhibit B2- Price Schedule Traffic Control for line item K.

The Contractor's price in Exhibit B2, Price Schedule Traffic Control, for traffic control including the Minimum Number of Traffic Control Personnel is a factor in determining the lowest available qualified Contractor for a project. The Contractor shall adhere to the pricing listed in Exhibit B2, Price Schedule Traffic Control throughout the term of this Contract, notwithstanding the number and type of Traffic Control Personnel used by the Contractor, which is at the sole discretion of the Client Agency.

On projects utilizing uniformed police officers, Client Agency's Engineer shall determine the type and of traffic personnel required at the pre-construction or work zone safety meetings. The cost for additional Traffic Control Personnel will not be a factor used in determining the lowest available qualified Contractor for the project. The number, and type, of any additional Traffic Control Personnel needed will be determined at the pre-construction or work zone safety meetings by the Engineer.

Traffic Control Personnel must be trained in the proper performance of their duties and must be provided in addition to paving crewmembers. Traffic Control Personnel are responsible for providing traffic control at areas where any representatives from the Client Agency, including Inspectors and laboratory personnel, are present at or near the work area.

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- **Uniformed Flaggers:**

All Uniformed Flaggers shall be persons who have successfully completed flagger training by the American Traffic Safety Services Association, National Safety Council or other approved programs. A valid copy of the Uniformed Flagger's training certificate must be provided to the Client Agency's representative before the Uniformed Flagger performs any work on the project. Uniformed Flaggers shall wear garments, including high visibility headgear, so as to be readily distinguishable as a Uniformed Flagger, in accordance with Standard 6E-3 of the Manual on Uniform Traffic Control Devices ("MUTCD") published by the Federal Highway Administration. Each Uniformed Flagger shall also be equipped with a STOP/SLOW paddle that is at least eighteen (18) inches in width with letters at least six (6) inches high and conforms to Standard 6E-4 of the MUTCD.

Traffic control must be performed in accordance with "Traffic Control During Construction Operations (Rev. Date 12/16/2015)" including the general notes for Traffic Control and Traffic Control Plan as stated in the Standards.

The Client Agency reserves the right to change the traffic control requirements set forth herein.

- **Uniformed Police Officers:**

Uniformed Police Officers shall be sworn Municipal Police Officers or Uniformed Constables. Their services shall include an official municipal police vehicle when requested by the Client Agency. Uniformed Police Officers shall wear a high visibility safety garment that complies with OSHA, MUTCD, and American Society for Testing and Materials ("ASTM") Standards provided by their law enforcement agency. If no high visibility safety garment is provided, the Contractor shall provide the law enforcement personnel with a garment meeting such requirements.

The Contractor shall be responsible for the scheduling and payments of Uniformed Police Officers used for traffic control.

- **State Police Officers:**

State Police Officers shall be uniformed off-duty sworn State Police Officers. Their services include the use of official State police vehicles and associated equipment. State Police Officers with official State police vehicles must be used at locations and for periods of time as the Engineer deems necessary.

State Police Officers shall assist in implementing the traffic control specified in the Maintenance and Protection of Traffic included in the Standards, or as directed by the Engineer. Any situation requiring a State Police Officer to operate in a manner contrary to the Maintenance and Protection of Traffic specification must be authorized in writing by the Engineer. The Contractor shall not direct State Police Officers assigned to a work site.

The Contractor shall be responsible for the hiring and scheduling of State Police if the Client Agency determines State Police Officers are required to be utilized as traffic personnel. The Contractor shall submit the Attachment 4- Request Form and Cancellation Form State Police Traffic Control Services, DPS-0691-C-3 in the event the Client Agency determines such State Police

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Officers are required. The Client Agency shall reimburse DESPP directly for all approved work performed by State Police Officers. Payments for State Police Officers utilized by the Contractor for its convenience, and not approved by the Engineer, is the responsibility of the Contractor. In such an event, the Contractor shall not issue a separate payment item for State Police Officers.

Contractor shall be responsible for any applicable sales and use taxes associated with traffic control required for it to fulfill its contractual obligations and for determining its liability with respect thereto.

**(bb) Construction Staking:**

The Contractor shall fulfill the requirements of the Construction Staking provision below in this Exhibit A prior to commencing any work. This includes laying out the stationing and recording the locations of all existing line striping before it is eradicated by the milling operation.

**(cc) Liquidated Damages:**

1. The Contractor shall pay liquidated damages in the amounts listed in Attachment 5 – Liquidated Damages for not meeting the “Limitation of Operations” requirements as described in Attachment 6 – Prosecution Progress of Work.
2. In addition, the Contractor shall pay as liquidated damages the following:
  - a. For every day or working shift that any milled surface greater than one thousand (1000) SY is left open to traffic past the specification requirements to cover up that milled surface, the Contractor shall pay the Client Agency three thousand dollars (\$3000.00) per day or working shift until such time that new pavement is applied to the milled surface; and
  - b. If the Contractor fails to install either temporary or permanent line striping in its entirety by the end of any day or working shift, the Contractor shall pay the Client Agency three thousand dollars (\$3000.00) per day or working shift until such time that the line striping is placed in its entirety.
3. Any liquidated damages assessed will be deducted and paid from a major pavement item quantity.
4. The liquidated damages described above shall only apply to the above listed circumstances without limiting the Client Agency’s contractual rights and remedies, including any damages or indemnity rights due to the Contractor’s default as provided in this Contract.
5. The Client Agency and the Contractor hereby agree that such liquidated damages are intended to represent estimated actual damages and are not intended as a penalty.

**(dd) Bathroom Facilities:**

The Contractor shall provide at least one (1) portable bathroom facility at each work location. A “work location” is defined as each individual roadway section where work is performed. The portable bathroom facility must have a urinal, a toilet, and a hand sanitizer unit. It must be cleaned and maintained at least once a week. If work is performed at night, the portable bathroom facility must be located in a safe and well-lit location. The Contractor shall provide portable lighting at no cost. If a handicapped person will be working on the job site from either the Contractor or the Client Agency, a handicapped equipped portable bathroom facility will be required at that work location. No work will commence at any work location until the portable bathroom facility is installed.

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**(ee) Project Continuation:**

In the event the Contract expires and the Contractor has projects that are underway, the Client Agency may, at its discretion, allow the Contractor to complete these projects if the following conditions are met:

1. The Contractor requests to complete the projects that are underway.
2. Prices in the original Contract remain in effect until all work is completed.
3. All other contractual obligations and conditions remain the same, including insurance requirements and, if applicable, prevailing wage scales.

**2. Technical Requirements**

**(a) Processed Aggregate for Roadside Drop-offs**

Processed Aggregate must be used to backfill all pavement edge drop-offs. The locations will be determined by the Engineer. All work under this item must conform to the Standards.

**(b) Hot Applied Painted Pavement Markings**

All temporary pavement markings must use the following items: Hot Applied Painted Pavement Markings, four (4) inch yellow, Hot Applied Painted Pavement Markings, four (4) inch white, Hot Applied Painted Pavement Markings six (6) inch white, Hot Applied Painted Pavement Markings eight (8) inch white and Hot Applied Painted Legend, Arrows and Markings. All work under these items must conform to the Standards.

**(c) Catch Basin Tops – Removal, Replacement, Required Masonry Block Work, and Related Sidewalk Concrete Work**

All catch basin tops must be removed using Reset Type “C” Catch Basin. The Contractor shall pay for the work and materials required to install new basin tops. New basin tops including but not limited to, the following items: Type “C” Catch Basin Top, Type “CM” Catch Basin Top, Type “C-L” Type Catch Basin Top, Type “C” Catch Basin Double Grate Type 1 Top or Type “C-L” Catch Basin Double Grate Type 2 Top. Any masonry block work required will be paid for per row of masonry block installed under the new basin tops. A row of block is defined as a row of solid masonry block at least eight (8) inches deep. If a layer of masonry brick, two (2) inches thick, is needed to top off a row of block, it must be included in that row's cost. As many rows of block as needed can be used to aid in the replacement of any catch basin top. Any masonry work performed that is less than eight (8) inches will not be paid for separately but will be included in the cost of the “Reset” item. The cost per row of block includes all labor and materials needed to complete each row. All Sidewalk Concrete Work and materials must comply with the Standards. Such work includes all sawcutting, removal and disposal of existing sidewalk including any concrete curbing affected. All required installation, protection and curing of all new sidewalk installed including any concrete curbing affected must be included. Any sealants needed to replicate and match the surrounding existing sidewalk must also be included. All Sidewalk Concrete Work will be paid for by the square foot regardless of the depth of the concrete removed, formed, placed, and cured. All work and materials under the above items must conform to the appropriate items of work for concrete sidewalk and concrete curbing work and

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Section 5.07, "Catch Basins, Manholes, and Drop Inlets" within the Standards.

**(d) Removal, Replacement, and Backfilling of Bituminous Concrete Lip Curbing**

All bituminous concrete curbing must be removed using earth excavation. Replacement of bituminous concrete curbing must be done using bituminous concrete lip curbing or bituminous concrete park curbing. Backfilling with top soil and seeding behind the new curbing must be included in the bituminous concrete Park Curbing or Bituminous Concrete Lip Curbing. The Engineer shall approve the type of seed to be used prior to backfilling and seeding. All work under these items shall conform to the Standards.

**(e) Construction Staking**

**Description:** The work under this item consists of construction layout and reference staking necessary for the proper control and satisfactory completion of all work on the project, except property lines, highway lines, or non-access lines.

**Materials:** All stakes used for control staking must be of the same quality as those used by the Client Agency for such purposes. Lesser quality stakes may be acceptable, with prior approval of the Client Agency, provided the stakes are suitable for the intended purpose. Such lesser quality stakes may be used for, but not limited to, slope limits, pavement edges, and gutter lines, where so called "green" or "working" stakes are commonly used.

**Construction Methods:** The Client Agency will furnish the Contractor such control points, bench marks and other data as may be necessary for the construction staking and layout by qualified engineering or surveying personnel as noted elsewhere herein. The Contractor shall be responsible for the placement and preservation of adequate ties to all control points, necessary for the accurate re-establishment of all base lines, center lines, and all critical grades as shown on the preconstruction plans. All stakes, references, and batter boards which may be required for construction operations, signing and traffic control shall be furnished, set and properly referenced by the Contractor. The Contractor shall be responsible for the accuracy of the line and grade of all features of the work. Any errors or apparent discrepancies found in previous surveys, preconstruction plans, specifications or special provisions must be called to the Engineer's attention immediately for correction or interpretation prior to proceeding with the work. During roadway construction or site work, the Contractor shall provide and maintain reference stakes at one hundred (100) foot intervals outside the slope limits as determined by the Engineer. Further, the Contractor shall provide and maintain reference stakes at fifty (50) foot intervals immediately, prior to and during the formation of subgrade and the construction of all subsequent pavement layers. These stakes shall be properly marked as to station, offset and referenced to the proposed grade, even if laser or Global Positioning System ("GPS") machine controls are used. The Contractor shall provide and maintain reference stakes at drainage structures, including reference stakes for the determination of the structure alignments as may be needed for the proper construction of the drainage structure. The reference stakes shall be placed immediately prior to and maintained during the installation of the drainage structure. These stakes shall be properly marked as to station, offset and shall be referenced to the proposed grade. The Contractor shall furnish copies of data used in setting and referencing stakes and other layout markings used by the Contractor after completion of each operation. The

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Contractor shall provide safe facilities for convenient access by the Client Agency personnel to control points, batter boards, and references. All staking shall be performed by qualified engineering or surveying personnel who are trained, experienced and skilled in construction layout and staking of the type required under this Contract. Prior to commencement of work, the Contractor shall submit to the Client Agency for review and comment on the qualifications of personnel responsible for construction staking on the project. The submission shall include, but not be limited to, a description of the experience and training which the proposed staff possesses and a list of state projects the personnel have worked on previously. All field layout and staking required for the project must be performed under the direct supervision of a person, or persons, of engineering background experienced in the direction of such work and acceptable to the Engineer. If the personnel responsible for construction staking changes during the course of the project, then a revised submittal will be required. The Client Agency may check the control of the work, as established by the Contractor, at any time as the work progresses. The Client Agency shall inform the Contractor of the results of such checks. By doing so, the Client Agency in no way relieves the Contractor of responsibility for the accuracy of the layout work. The Contractor shall correct or replace, at their own expense, any deficient layout and construction work which may be the result of the inaccuracies in the Contractor's staking operations or the failure to report such inaccuracies to the Client Agency. If, as a result of these inaccuracies, the Client Agency is required to make further studies, redesign, or both, and all expenses incurred by the Client Agency due to such inaccuracies will be deducted from any payment due the Contractor. The Contractor shall furnish all necessary personnel, engineering equipment and supplies, materials, transportation, and work incidental to the accurate and satisfactory completion of this work.

**For roadways where the existing pavement markings need to be reestablished:** Prior to any resurfacing or obliteration of existing pavement markings, the Contractor and Engineer shall establish and document pavement marking control points from the existing markings. These control points will be used to reestablish the positions of the lanes, the beginning and end of tapers, channelization lines for on and off ramps, lane use arrows, stop bars, and any lane transitions in the project area. The Contractor shall use these control points to provide appropriate pre-marking prior to the installation of the final markings.

The Contractor shall provide and maintain reference stakes or markings at one hundred (100) foot intervals immediately off the edge of pavement or both to be used to reestablish the existing pavement markings. The Contractor shall also provide and maintain reference stakes or markings at any point where there is a change in pavement markings or both to reestablish the existing pavement markings.

**For non-limited access roadways:** On non-limited access roadways, all marking locations must be replaced identically. Due to an increased focus on pedestrian and bicyclists, it may be necessary to adjust the final locations of some pavement markings to accommodate pedestrians and bicyclists where feasible. Anticipated adjustments may need to be made prior to any resurfacing or obliteration of existing pavement markings. The Contractor, a Engineer, and a representative of the Division of Traffic Engineering shall establish and document pavement marking control points from the existing markings as described above. The control points at that time may be adjusted to provide

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minimum shoulder widths of four (4) to five (5) feet wherever possible while maintaining travel lane widths of no less than eleven (11) feet and no more than twelve (12) feet.

**Method of Measurement:** Construction staking will be at the Contract lump sum for Construction Staking. When no price for Construction Staking is requested during the preconstruction meeting, the cost of the work described above shall be included in the general cost of the work and no direct payment for Construction Staking will be made.

**Basis of Payment:** The price for Construction Staking must include all materials, tools, equipment, labor and work incidental thereto. A schedule of values for payment must be submitted to the Client Agency for review and comment prior to payment.

Pay Item	Pay Unit
Construction Staking	L.s.

**(f) Pothole Patch**

**Description:** Pothole patch consists of cleaning areas of deteriorated pavement of all loose and delaminated pavement materials, disposing of deteriorated pavement materials, application of tack coat, and placement of HMA or an equivalent PMA to match the elevation of the surrounding pavement.

For road sections being milled and paved, all pothole patching operations must be completed after milling is complete and before paving begins. In order to insure the pavement surface is suitable for traffic, all pothole patching operations must be completed within the same working shift following milling and completed before traffic is permitted to resume on the exposed roadway. This item must be used as needed to continuously patch and maintain a suitable pavement surface prior to placing an overlay. The Engineer shall determine if pothole patches will be replaced or re-patched with a more durable patch item. In addition, the Engineer shall determine if the pothole patches will be left in place as permanent patches.

**Materials:** Materials for this work must consist of the following:

- HMA S0.25, HMA S0.375 or an equivalent PMA.
- All HMA, or PMA, shall be Traffic Level 2 unless indicated otherwise on the preconstruction plans.
- Tack coat.

**Construction Methods:** Contractor shall provide all equipment required for pothole patch, including but not limited to: an air compressor capable of producing one hundred (100) pounds per square inch (“psi”) oil free compressed air for cleaning the area to be patched, tools for the placement of bituminous concrete, and pavement compaction equipment to perform patching operations, such as a plate compactor.

The Engineer shall mark out areas for patching that are broken, damaged, distorted or delaminated in order to provide a suitable surface for placement of a layer of bituminous concrete or other



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surfacing material. Examples of such areas to be patched include potholes, open longitudinal joints, ruts and depressions. The Contractor shall sweep and clean the areas to be patched in order to remove all loose and delaminated material to the satisfaction of the Engineer. Any residual dust or small debris must be removed using compressed air to the satisfaction of the Engineer and the area allowed to fully dry.

A thin uniform tack coat, meeting the requirements of Attachment 1-Bituminous Concrete Standards must be applied prior to patching. It must cover one hundred percent (100%) of the surface area of the patch, and be allowed to sufficiently cure or break. The Contractor shall place and compact HMA S0.25, HMA S0.375, or an equivalent PMA, by means acceptable to the Engineer, and to the elevation meeting the surrounding pavement.

**Method of Measurement:** This work must be measured by the number of square feet of patched roadway completed and accepted.

**Basis of Payment:** This work will be paid for at the Contract unit price per square foot of "Pothole Patch." The price includes all tools, materials, labor, equipment, disposing of deteriorated materials, sweeping and cleaning, tack coat application, and placement and compaction of HMA or PMA.

<u>Pay Item</u>	<u>Pay Unit</u>
Pothole Patch	S.F.

**(g) Bituminous Concrete Patching – Partial Depth**

**Description:** Bituminous Concrete Patching- Partial Depth consists of sawcutting, removing and properly disposing of deteriorated bituminous concrete pavement, regrading and recompacting the existing granular base, cleaning and application of tack coat on the vertical faces of the sawcut, and placement of HMA or an equivalent PMA at the same thickness as surrounding pavement (minimum six (6) inches) and as shown on the preconstruction plans.

**Materials:** Materials for this work must meet the requirements of the Standards, Section M.04 and consist of the following:

- HMA S0.5, HMA S0.375 (when requested by the Contractor and approved by the Engineer at least five (5) days in advance), or an equivalent PMA. All HMA or PMA shall be Traffic Level 2 unless indicated otherwise on the preconstruction plans.
- Tack coat.

**Construction Methods:** The Contractor shall provide all equipment required for Bituminous Concrete Patching- Partial Depth including but not limited to equipment required for pavement cutting, removal, material handling, and compaction to perform all patching operations. The Contractor shall provide a tack coat distributor with a minimum one hundred fifty (150) gallon capacity tank that is trailer mounted or self-propelled and capable of applying tack coat meeting the requirements of Attachment 1- Bituminous Concrete Standards. The Contractor shall also provide a ten (10) foot straightedge. If the work is performed at night, a portable truck towed light

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tower and driver shall be provided for use by the Engineer for all marking, installation, and inspection of the patches. All equipment used to place and compact the HMA or PMA must meet the requirements of Attachment 1-Bituminous Concrete Standards. Due to the nature of this work, the equipment must be small to medium size to fit the excavated areas to be patched. It is also expected that placement of HMA or PMA will require hand work or a combination of equipment and hand work methods and tools to achieve the required results.

1. The Engineer shall mark out areas for patching. The minimum dimension of areas to be patched shall be twenty-four (24) inches. Any area to be patched must completely encompass the entire distressed pavement area and extend at least six (6) inches beyond into the surrounding pavement wherever possible.
2. The Contractor shall sawcut at the marked areas through the full depth of the bituminous concrete pavement.
3. The Contractor shall remove existing pavement from within the sawcut minimizing disturbance of the existing granular base.
4. The Contractor shall regrade the existing granular base and re-compact it using jumping jack or vibratory plate compactors. A minimum of four (4) passes or coverages must be made by the compaction device. If existing granular base material is lost during the excavation of the deteriorated pavement, the Contractor shall add material meeting the requirements of the Standards, Section 3.04. Compaction of the granular base material must meet the density requirements of the Standards, Section 3.04.
5. If it is determined that poor or inadequate granular base is contributing to the distress in the asphalt layers, the Engineer may direct that it be removed and processed aggregate base be placed and compacted.
6. The Contractor shall wipe or sweep clean the cut sides/ walls of the excavated area. Tack coat must be applied covering the entire area of the vertical bituminous concrete faces and allowed to cure or break.
7. HMA S0.5 or PMA S0.5 must be placed in lifts between two (2) inches and three (3) inches, and must have a final lift thickness placed at two (2) inches and be placed as indicated by the Client Agency. The Contractor shall place HMA S0.375 or PMA S0.375 in lifts between one and one half (1.5) inches and two and one half (2.5) inches, and have a final lift thickness placed at one and one half (1.5) inches, and be placed as indicated by the Client Agency. Pavement placement must also be in accordance with the Standards, Section 4.06.03-6. The Contractor shall confirm that the surface elevation of the finished patch matches the elevation of the surrounding pavement surface to within one-quarter (1/4) inch using the ten (10) foot straightedge. The Contractor shall confirm that all patch material placed is uniform in appearance without segregation.
8. The Contractor shall properly dispose of all excavated materials at the end of the work shift.

**Method of Measurement:** Bituminous Concrete Patching – Partial Depth will be measured by the number of square yards of patched bituminous concrete completed and accepted.

**Basis of Payment:** Bituminous Concrete Patching - Partial Depth must be paid for at the unit price per square yard completed and accepted. The price must include all tools, materials, labor and

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equipment, including sawcutting, pavement removal, material disposal, grading and compaction of existing granular base, cleaning, tack coat application, and HMA or PMA placement and compaction. There will be no separate pay item for replacing granular base material lost during the excavation of the deteriorated pavement. Inadequate or poor granular base foundations that cannot be re-compacted shall be identified by the Engineer. "Processed Aggregate Base" must be paid for per cubic yard as listed in Exhibit B1, Price Schedule.

<u>Pay Item</u>	<u>Pay Unit</u>
Bituminous Concrete Patching - Partial Depth	s.y.

**(h) Bituminous Concrete Surface Patch**

**Description:** Bituminous Concrete Surface Patch consists of milling out deteriorated bituminous concrete pavement to a depth between one and one half (1.5) to two and one half (2.5) inches, disposing of pavement millings, sweeping and cleaning, application of tack coat on all surfaces within the milled area, and placement of HMA or an equivalent PMA to match the elevation of the surrounding pavement.

For road sections being milled and paved, all patching operations must be performed after milling is complete and before paving begins. The Contractor shall complete all patching operations within one (1) working day following milling and before traffic is permitted to resume on the exposed roadway.

**Materials:** Materials for this work must meet the requirements of the Standards, Section M.04 and consist of the following:

- HMA S0.375 or an equivalent PMA. All HMA or PMA shall be Traffic Level 2 unless indicated otherwise by the Client Agency.
- Tack coat.

**Construction Methods:** The Contractor shall provide all equipment required for Bituminous Concrete Surface Patch including, but not limited to, the following:

1. Milling machine: A milling machine designed and built for milling flexible pavements. It must be self-propelled with sufficient power, traction, and stability to maintain depth and slope and be capable of removing the existing bituminous concrete pavement.

The rotary drum of the machine must use carbide tip tools spaced not more than five-eighths (5/8) inches apart. The forward speed of the milling machine shall be a maximum of forty-five (45) feet per minute. The Contractor shall continually maintain the tools on the revolving cutting drum and replace as warranted.

The machine must be equipped with an integral pickup and conveying device to immediately remove milled material from the surface of the roadway and discharge the millings into a truck in a single operation. The machine must also be equipped with a means of effectively limiting the amount of dust escaping from the milling and removal operation. When milling smaller areas or areas where it is impractical to use the above described

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equipment, the Contractor may be permitted to use a lesser equipped milling machine, as approved by the Engineer.

The minimum milling width shall be twenty (20) inches, making the minimum achievable patch size twenty (20) inches by twenty (20) inches, or 0.30 square yards.

2. Ten (10) foot straight edge.
3. Sweeper: A sweeper, equipped with a water tank, capable of remove millings and loose debris.
4. Air compressor: An air compressor capable of producing one hundred (100) psi oil free compressed air for cleaning the milled pavement surface.
5. Hot air lance: A hot air lance that can deliver one hundred (100) psi oil free heated air to clean and dry the pavement surface. The compressed air emitted from the tip of the lance shall achieve a temperature of at least one thousand five hundred (1500) degrees Fahrenheit.
6. Paving and compaction equipment: Paving and compaction equipment must meet the requirements of Attachment 1- Bituminous Concrete Standards. It is expected that much of the placement will require hand work or a mixture of equipment and hand tools to achieve the required results. Smaller compaction equipment, including vibratory plate compactors, may be allowed by the Engineer to achieve the required results. The Contractor is required to meet the density and compaction and all other requirements specified in the Standards, Sections 4.06 and M.04.
7. Portable lighting equipment: If the work is performed at night, the Contractor shall provide a truck towed light tower and driver for use by the Engineer for all marking, installation, and inspection of the patches.
8. Tack Coat Distributor: A minimum one hundred fifty (150) gallon capacity tank that is trailer mounted or self-propelled and capable of applying tack coat and compliant with Attachment 1- Bituminous Concrete Standards.

The work shall include, but is not limited to, the following:

9. Demarcating: The Engineer shall mark out areas for patching and determine the appropriate milling depth between 1.5 inches and 2.5 inches. The minimum length and width dimensions of the patch must be twenty (20) inches. Any area to be patched must completely encompass the entire distressed pavement area and extend at least six (6) inches beyond into the surrounding pavement wherever possible.
10. Milling: Mill marked out areas to the specified depths.
11. Sweeping, Cleaning, and Drying: Sweep the milled surface clean, and allow milled areas to dry. Any moisture in or on the milled areas must be allowed to evaporate or be removed with the assistance of the hot air lance. When the milled area is dry to the satisfaction of the Engineer, it shall be blown clean of any residual dust or debris using compressed air.
12. Applying Tack Coat: Apply tack coat to the entire clean and dry milled area, including the sides/walls of the area to be patched, in accordance with the requirements of Attachment 1- Bituminous Concrete Standards.

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13. Placing Patch Material: After the tack coat has had sufficient time to cure or break, HMA S0.375 or equivalent PMA shall be placed and compacted to the requirements above and in Attachment 1- Bituminous Concrete Standards. The Contractor shall confirm that the surface elevation of the finished patch matches the elevation of the surrounding pavement surface to within 1/4 inch using the 10-foot straightedge. The Contractor shall confirm that all patch material placed is uniform in appearance without segregation.

**Method of Measurement:**

This work will be measured by the number of square yards of patched bituminous concrete completed and accepted by the Client Agency.

**Basis of Payment:**

<u>Pay Item</u>	<u>Pay Unit</u>
Bituminous Concrete Surface Patch	s.y.

**(i) Hot-Mix Asphalt Smoothness Adjustment**

**Description:** The Engineer shall evaluate the final pavement surface for smoothness and rideability to either pay a bonus or assess a penalty based on the determination of smoothness of the surface lift. The amount of the bonus or penalty, as applicable shall be determined solely by the Client Agency. This item will apply to pavement construction included in the project requiring a minimum of two (2) lifts of bituminous concrete in which the combined total compacted depth of bituminous concrete placed is two and one half (2.5) inches or greater. All provisions and requirements of Attachment 1- Bituminous Concrete Standards apply, unless specifically stated otherwise.

**Hot-Mix Asphalt Smoothness Adjustment Definitions:**

Surface lift: The uppermost lift of bituminous-concrete paving.

Roadway segment: A segment of highway designated to receive pavement rehabilitation that includes paving at least two (2) lifts, the combined thickness of which is two and one half (2.5) inches or greater. A roadway segment contains one (1) or two (2) directions of travel, through lanes in each direction, and any additional shoulder area, paved median area, ramp(s), and/or auxiliary lanes designated to receive paving.

Lane: An area of pavement designated to carry traffic in a given direction.

Measured lane: A lane subject to a hot-mix asphalt pavement smoothness adjustment. Ramps, shoulders, and certain other features are excluded from the adjustment as described below.

Tenth mile segment: The subset of a measured lane that will be evaluated for smoothness and used as the basis for payment adjustments. Each measured lane shall be divided into tenth (0.1) mile segments. Some tenth mile segments may be less than a full tenth (0.1) mile because of a boundary such as the end of the lane or a bridge without an asphaltic plug joint. Payment adjustments will be based on the smoothness and tonnage of the surface lift of each tenth (0.1) mile segment.

Lift pay thickness (inches): The thickness shown on the preconstruction plans for the surface lift of the measured lane.

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Tenth mile segment pay area (square yards): The area of the travelway of a tenth (0.1) mile segment as determined from the preconstruction plans. If striping exists, measurement shall be the area bounded by the lane striping and beginning and ending termini of the tenth (0.1) mile segment. Where a segment's travelway width varies (for example, a low speed lane which narrows as it begins or terminates within the 0.1 mile), the Pay Area shall reflect the actual travelway area.

Automatic Road Analyzer (ARAN): A vehicle operated by the State that collects roadway profile data. It provides IRI data every 16.4 feet for both the right and left wheel paths.

International Roughness Index IRI (inches/mile): Index developed by the World Bank to quantify roughness.

ProVAL: FHWA sponsored software that is used to analyze road roughness.

Average IRI (MRI) (inches/mile): The average of the right and left wheel path IRIs for a tenth mile (528 foot) segment as computed by analyzing ARAN data with ProVAL software.

Hot-Mix Asphalt: Whenever reference is made to HMA, the reference shall apply to PMA, and WMA.

This item must be applied separately to each roadway segment that is included in this Contract and designated to be measured for a hot-mix asphalt smoothness adjustment. The Engineer will calculate smoothness, as represented by ProVAL MRI, and cost adjustments separately for each tenth (10<sup>th</sup>) mile segment in each measured lane.

#### **Evaluation Methods**

The Client Agency shall conduct final evaluations for payment or penalty by measuring all lanes of interest in each direction of travel.

Data Collection and IRI Computation – The final pavement surface will be evaluated for smoothness using a State ARAN vehicle. The ARAN measures the IRI in each wheelpath (right and left) for each lane of travel over the project. If a State ARAN vehicle is unavailable, the Engineer may substitute another suitable method of obtaining IRI values with a World Bank Class II profiler that allows calculation of smoothness adjustments as indicated in this item. ProVAL will be used to calculate an MRI value for each tenth (0.1) mile segment.

The evaluation will be subject to the following:

1. Only mainline travel lanes must be evaluated. This includes climbing lanes, operational lanes, and turning roadways that are 0.4 miles (2,112 feet) or greater in length. For smoothness purposes, the length of a climbing lane includes where the lane is at least half of its full normal width. Likewise, the length of an acceleration lane is from the tip of the painted gore of the on ramp to where the lane width diminishes to half of its normal width. These climbing and acceleration lengths determine both whether a lane should be measured for smoothness and the section of the lane that will be measured for smoothness.
2. Data collection will start approximately one hundred (100) feet prior to, and end approximately one hundred (100) feet after the transverse construction joints at the project limits. The pay area will be limited to the limits of the paving as defined by the transverse construction joints at the start and end of the project.

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3. Construction joints inside the Project will not be excluded from the area measured for smoothness.
4. Smoothness data and payment adjustments will not be computed for the following project sections:
  - Ramps
  - Climbing lanes, operational lanes, acceleration lanes, deceleration lanes, and turning roadways less than 0.4 miles (2,112 feet) in length
  - Shoulders and gore areas
  - Pavement on horizontal curves which have a nine hundred (900) foot or less centerline radius of curvature, and pavement within the super-elevation transition of these curves
5. Bridge decks will be included if they are paved as part of the project, have two (2) lifts totaling two and one half (2.5) inches of bituminous concrete, and have an asphaltic plug or similar product for bridge joints. Structures with exposed concrete, elastomeric concrete or steel joint systems will be excluded.
6. Transition sections of varying pavement thicknesses, created by milling or paving, leading into or away from pavement changes such as bridge decks or underpasses or project end points will be excluded if the deck or underpass is excluded. A length of fifty (50) feet on either end of a transition will be excluded from measurement of IRI, but not from payment of an adjustment. The fifty (50) foot length will have the same payment adjustment as the immediately adjacent tenth (0.1) mile section.
7. If a deck or underpass is excluded and there is no transition section adjoining it, then a length of fifty (50) feet before and after the deck or underpass will be excluded for measurement, but included for payment similar to #6 above.
8. The Client Agency shall collect data within thirty (30) days of the completion of the entire surface lift of pavement, or within thirty (30) days of the completion of any corrective work on the pavement. The Contractor, at its own expense, shall be allowed to correct any areas prior to the collection of data. The Contractor shall notify the Engineer in writing of its intent to do so along with a proposed schedule for corrective work that includes an anticipated date that data collection can be performed. The completion of the entire final lift of pavement or any corrective work includes, but is not limited to, all associated work such as pavement markings, sawing and sealing of joints, and installation of bridge asphaltic plug joints.

To minimize the number of times the ARAN van is required, all final surface lift paving in both directions of travel must be completed before calling on the ARAN van to measure the smoothness. However, if final surface lift paving extends beyond a single paving season, then the ARAN van shall be used to measure the final surface lifts completed each paving season.

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9. No testing will be conducted during rain or under other conditions deemed unacceptable by the Engineer. During testing, the roadway must be free of moisture and other deleterious materials which might affect the evaluation. Any work associated with preparing the roadway for the evaluation (ex. sweeping) will not be measured for payment.
10. The option on the State ARANs to apply the ten (10) inch filter, which represents the footprint length of a typical tire, will be not be selected, because a similar twelve (12) inch filter is already pre-applied by the ARAN van when the data is collected.
11. Measurements and locations are understood to have an accuracy limited to what can be attained by reviewing data and photos collected by the ARAN van. The Client Agency will not be required to conduct surveys in addition to the ARAN van measurements.

**Method of Measurement:** Rideability Adjustments (“RA”) for pavement smoothness will be applied to all bituminous concrete in the surface lift of all measured lanes in both directions, as specified herein. It will be computed and paid or a penalty will be assessed for each tenth (0.1) mile segment.

Tonnages for payment must be calculated based on the theoretical volume of bituminous concrete as determined by the typical sections and distances measured by the ARAN van and assuming a density of 0.0575 tons per SY per inch of bituminous concrete thickness. The quantity of bituminous concrete used to determine the RA for each tenth (0.1) mile segment will be calculated by using the equation below:

<u>Segment Tons =</u>	<u>HMA Lift Thickness x</u>	<u>Tenth Mile Segment Pay Area x</u>	<u>0.0575</u>
(tons)	(inches)	(s.y.)	(tons/s.y.·inch)

Rideability Adjustment Percent (%) - The RA bonus or penalty and applicable pay factor percentage for each tenth (0.1) mile segment will be determined based on its MRI. Each tenth (0.1) mile segment MRI will be classified into one of the following MRI ranges shown in Table 1 and the applicable pay factor percentage for the segment derived.

**Table 1: Rideability Pay Factor Schedule**

<b>MRI (inches per mile)</b>	<b>Pay Factor (%)</b>	<b>RA</b>
Less than 50	+10	Bonus
50 to 60	+(60 – MRI)	Bonus
60 to 80	0	0
80 to 120	1.25 x (80 – MRI)	Penalty
over 120	- 50	Penalty

**Basis of Payment:** Bonuses or penalties must be computed for each tenth (0.1) mile segment. For each segment, the HMA pay factor and tonnage of the surface lift will be determined as described above. The adjustment to the estimated cost will be determined by the following formula:



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$$\text{Smoothness Adjustment} = \text{Segment Tons} \times \text{Pay Factor} / 100 \times \text{HMA Unit Cost}$$

For example, a 1.06 mile measured lane with surface lift thickness of two (2) inches has eleven (11) segments with lengths, average travelway widths, and MRI values as shown in Table 2 below. Assuming a unit cost bid price for HMA of \$85.00 per ton, the smoothness adjustments for each segment would be as shown in Table 2 below. The unit cost used must be the Contract bid price for the material used in the surface lift without Asphalt Adjustment Cost applied to it.

**Table 2: HMA Smoothness Adjustment Example Calculations**

Segment	Length (miles)	Average Width (ft)	Area (SY)	HMA Lift Thickness (inch)	HMA Computed Tons (Area x thickness x 0.0575)	MRI (in/mile)	Pay Factor (%)	Adjust (\$) (Tons x Pay Factor /100 x Unit cost)
1	0.1	4	235	2	26.99	72	0	0
2	0.1	9	528	2	60.72	50	10	516
3	0.1	12	704	2	80.96	40	10	688
4	0.1	12	704	2	80.96	90	-12.5	-860
5	0.1	12	704	2	80.96	100	-25	-1720
6	0.1	12	704	2	80.96	50	10	688
7	0.1	12	704	2	80.96	77	0	0
8	0.1	12	704	2	80.96	55	5	344
9	0.1	12	704	2	80.96	55	5	344
10	0.1	8	469	2	53.97	51	9	413
11	0.06	4	141	2	16.19	62	0	0
							Total:	413

For the surface lift in this measured lane, the maximum amount of the bonus will be \$413.00 as indicated in the above Table 2.

Adjustments for smoothness will not be made for areas the Engineer determines to be defective and require removal and replacement of the HMA.

Pay Item	Pay Unit
Hot Mix Asphalt Smoothness Adjustment	Estimated Cost

**(j) Filling Joints and Cracks in Bituminous Concrete Pavement**

**Description:** The filling of joints and cracks in bituminous concrete pavement consists of furnishing and applying a hot-applied mixture of performance graded (“PG”) asphalt binder and polyester fibers into bituminous concrete pavement joints and cracks. It must be constructed in close conformity with the lines, grades, thicknesses, and typical cross sections shown on the preconstruction plans or

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established by the Engineer. Filling joints and cracks in bituminous concrete pavement may be used in conjunction with other repair treatments including, but not limited to, joint and crack sealing or patching, in which case the sequence of treatments will be provided in this Contract or directed by the Engineer.

For the purposes of this Exhibit A, the word “crack” includes all longitudinal, along the direction of travel, and transverse, perpendicular to the direction of travel, cracks and joints. All work specified for “crack(s)” herein must apply to all types of cracks and joints unless otherwise specified.

**Materials:** The hot-applied crack filling material must be composed of a mixture of PG asphalt binder and polyester fibers blended to provide 3% ± 0.5% fibers by weight. No field mixing of the fibers is allowed. The crack filling material, with fibers, shall be prepackaged and arrive on site ready to be placed in the melter applicator. The component materials shall meet the following requirements:

1. Polyester Fibers: A materials certificate must be provided by the manufacturer for this material. The polyester fibers must meet the following requirements:

Property	Test Method	Requirement
Length	N/A	0.25 inch ± 2 mils (6.4mm ± 0.05mm)
Crimps	ASTM D3937	None
Tensile Strength*	ASTM D2256	69,600 psi (480 MPa), minimum
Denier*	ASTM D1577	3.0 – 6.0
Specific Gravity	N/A	1.32 – 1.40
Melting Temperature	N/A	473°F (245°C), minimum
Ignition Temperature	N/A	1000°F (540°C), minimum

\* The Contractor shall obtain this data prior to cutting the fibers and document such on the materials certificate.

2. Performance Graded Asphalt Binder: The performance graded asphalt binder must be PG 64E-22 (PG 76-22) and meet the requirements of AASHTO M 320(M) and AASHTO R 29(M). The Contractor shall submit a certified test report and bill of lading representing each delivery in accordance with AASHTO R 26(M). The certified test report must also indicate the asphalt binder specific gravity at seventy-seven degrees Fahrenheit (77°F), rotational viscosity at two hundred seventy-five degrees Fahrenheit (275°F) and three hundred twenty-nine degrees Fahrenheit (329°F), and a mixing and compaction viscosity-temperature chart as if the asphalt binder were to be used as binder for the construction of hot mix asphalt. The blending of PG asphalt binder from different suppliers is strictly prohibited. Contractors who blend PG asphalt binders will be classified as a "Supplier" and must certify the asphalt binder in accordance with AASHTO R 26(M).
3. Optional Barrier Material - Clean, Dry Sand: Sand must conform to the requirements of the Standards, Specification Article M.01.03, Fine Aggregates, except that the gradation requirements shall be replaced with the following:

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<b>Square Mesh Sieve</b>	<b>Percent Passing by Weight</b>
No. 8	100
No. 50	10 – 40
No. 100	0 – 10
No. 200	0 – 3

The Contractor shall submit to the Engineer all material safety data sheet and certified test report documents from the material manufacturer(s) prior to the commencement of work. During work progress, the Contractor shall submit to the Engineer the manufacturer’s material certificate for compliance to applicable specifications for each batch or lot of material used on the Contract.

**Construction Methods:** The crack filling operation must proceed in accordance with the requirements of Attachment 3- Maintenance and Protection of Traffic and Attachment 6- Prosecution and Progress specifications.

**Equipment:** The equipment used by the Contractor shall include, but not be limited to, the following:

- **Melter Applicator:** This equipment consists of a boiler kettle equipped with pressure pump, hose, and applicator wand; the boiler kettle may be a combination melter and pressurized applicator of a double-boiler type with space between the inner and outer shells filled with heat transfer oil. Heat transfer oil must have a flash point of not less than six hundred degrees Fahrenheit (600°F). The kettle must include a temperature control indicator and be capable of maintaining the crack fill material at the manufacturer’s specified application temperature range. The kettle must include an insulated applicator hose and application wand. The hose must be equipped with a shutoff control. The kettle must include a mechanical fullsweep agitator to provide continuous blending. The kettle must be equipped with thermometers to monitor the material temperature and the heating oil temperature. The unit must be equipped with thermostatic controls that allow the operator to regulate material temperature up to at least four hundred twenty-five degrees Fahrenheit (425°F).
- **Application Wand and Squeegee Applicator:** The material must be applied with a wand followed by a squeegee applicator. The squeegee applicator must be of commercial/industrial quality designed with a “U” shaped configuration. It must be able to strike off, flush with the surrounding pavement surface and without overflow around the sides, all crack fill material placed. This tool must be either attached to the applicator wand or used separately as its own long handled tool.
- **Hot Air Lance:** The hot air lance must be designed for cleaning and drying the pavement surface cracks. Minimum compressed air capacity shall be one hundred (100) psi. The compressed air emitted from the tip of the lance must be capable of achieving a temperature of at least one thousand five hundred degrees Fahrenheit (1500°F).

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- **Vertically Mounted Power Driven Wire Brush:** The vertically mounted power driven wire brush will be used to remove any dirt, debris, or vegetation to the depths specified that cannot be removed by the hot air lance. It must be of adequate size and power to remove all material from cracks as specified.

**Weather Requirements:** Work must not be performed unless the pavement is dry. No frost, snow, ice, or standing water may be present on the roadway surface or within the cracks. The ambient temperature must be forty degrees Fahrenheit (40°F) and rising during field application operations for work to proceed.

**Material Mixing Procedure:** The prepackaged material must be added to the melter applicator in the presence of the Engineer. It must then be mixed and heated to the recommended application temperature. The crack fill material cannot exceed four hundred degrees Fahrenheit (400°F).

**Determination of Cracks to be Filled:** The width and depth requirements for cracks to be filled are as follows:

- All crack width determinations must be made by measuring the crack width flush at the surface of the pavement prior to being filled. A straightedge will be used whenever necessary to establish the location or limits of the flush surface of the pavement.
- All cracks from one quarter ( $\frac{1}{4}$ ) inch up to one and one half ( $1\frac{1}{2}$ ) inches wide must be prepared and filled as stated below. Cracks that are between one quarter ( $\frac{1}{4}$ ) inch and one and one half ( $1\frac{1}{2}$ ) inches wide, but eventually taper in width below the minimum one quarter ( $\frac{1}{4}$ ) inch, shall also be prepared and filled as stated below. Cracks that are less than one quarter ( $\frac{1}{4}$ ) inch wide throughout their entire length will be excluded.
- Transverse cracks, where a portion of the crack, fifty percent (50%) or less, exceeds a width of one and one half ( $1\frac{1}{2}$ ) inches, up to two (2) inches, must also be prepared and filled as stated below.
- All joints to be filled that are raveled (loss of the pavement surface material) must be at least one half ( $\frac{1}{2}$ ) inch in depth at the joint's deepest point. The minimum width of a raveled joint must be one half ( $\frac{1}{2}$ ) inch. The maximum width of a raveled joint to be filled is three (3) inches.
- Any cracks exceeding the width and depth requirements specified above must be repaired using separate items.

**Crack Preparation:** Cracks to be filled must be treated with a hot air lance prior to application of the crack fill material. A minimum of two (2) passes must be made with the hot air lance. The hot air lance operation must proceed at a rate no greater than one hundred twenty (120) feet per minute. There shall be no more than ten (10) minutes between the second hot air lance treatment and the material application. Additional passes must be made with the hot air lance should this time be exceeded.

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The hot air lance is not intended to heat the crack. It is used to blow all debris from the crack to the specified depths and to remove any latent moisture from the crack until the inside of the crack is completely dry as determined by the Engineer. Moisture does not include standing water. The hot air lance is not to be used to boil off or blow standing water from the bottom of a crack. If standing water is present in the bottom of any crack, the filling operation must be postponed until such time that the standing water evaporates naturally. The Contractor may use compressed, unheated, oil-free air to blow standing water from a crack to help accelerate the natural evaporation process. If standing water remains after using compressed air, the crack must be allowed to dry naturally until remaining standing water evaporates. The hot air lance may be used after visible water has evaporated. If a crack is already completely dry as determined by the Engineer, the hot air lance must be operated at its lowest temperature possible.

The hot air lance must be used to blow all debris from cracks, excluding raveled joints, to a depth of at least three quarter ( $\frac{3}{4}$ ) inch for cracks between one quarter ( $\frac{1}{4}$ ) inch and three quarter ( $\frac{3}{4}$ ) inch wide, and to a depth of one and one quarter ( $1\frac{1}{4}$ ) inches for cracks between three quarter ( $\frac{3}{4}$ ) inch and two (2) inches wide. The hot air lance must be used to blow all debris from raveled joints to a depth of one (1) inch or the full depth of the joint, whichever is smaller.

In the event that cracks are packed tightly with debris, dirt, vegetation, or other material, except previously placed sealant or filler, the Contractor shall use a vertically mounted power driven wire brush to remove all material and burnish the sides of the crack to the depths specified above. Cracks treated with the power driven wire brush must subsequently be treated with a hot air lance as described in this section. The use of both the power driven wire brush and the hot air lance must completely remove all material in the crack, with the exception of previously placed sealant or filler, to the depths specified above such that the sides of the crack are completely free and clean of any debris and moisture.

In the event that cracks have depths greater than two (2) inches below the pavement surface, the Contractor may place a barrier composed of clean, dry sand as specified herein. The barrier material shall be placed in a manner leaving one and one quarter ( $1\frac{1}{4}$ ) inches below the elevation of the pavement surface for crack filling material. A barrier will not be allowed for cracks wider than one and one half ( $1\frac{1}{2}$ ) inches or less than one half ( $\frac{1}{2}$ ) inch wide.

**Crack Filling:** As soon as cracks have been prepared, they must be filled to refusal along their entire length. The treatment material must be maintained at the manufacturer's specified/recommended application temperature range at all times. The filling operation must be suspended if the temperature of the crack filling material falls outside the specified temperature range and must remain suspended until the crack filling material is brought within the specified temperature range. Filled cracks must be squeegeed immediately following application of the crack filling material, striking excess filler flat to the adjacent pavement surface. There must not be any build-up of treatment material above or adjacent to the crack at any time. If the initial application of crack fill material fails to fill the crack or shrinks upon cooling such that there is a depression formed of at

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least one quarter (¼) inch or greater, a second application of filler must be placed over the first application.

**Protection of Filled Cracks:** Traffic must not be permitted on the pavement until the crack fill material is set so that the material does not track and is not deformed or pulled out by tires. If the work under this item is being performed prior to placing a hot mix overlay or other surface treatment, a detackifier or blotting agent will not be allowed. If work under this item is not followed by placement of an overlay of any kind, a detackifier or blotting agent may be used. If a detackifier or blotting agent is used, it must be one recommended by the supplier of the crack filling material and used as recommended by the supplier, except that no paper, cotton, or other organic materials will be allowed. Information on the type and usage of a detackifier or blotting agent shall be presented to the Engineer for their written acceptance prior to use.

**Removal and Disposal of Material:** The Contractor shall remove all debris generated from the operations described above.

Treatment material remaining in the Contractor's kettle at the close of the daily work session shall be discarded. At no time will treatment material be re-heated for use in subsequent crack filling applications unless permitted by the Engineer.

All debris and surplus treatment material must be properly disposed in accordance with the Standards, Article 1.10.03 and State law.

**Acceptance of Work:** The Contractor shall schedule an inspection with the Engineer when the work is complete. The Engineer shall note all deficiencies including, but not limited to: areas exhibiting adhesion failure, cohesion failure, tracking of filler material, and missed cracks. Work identified by the Client Agency Engineer as not acceptable must be repaired at the Contractor's expense. The Contractor shall notify the Engineer upon completion of any corrective work performed.

**Method of Measurement:** This work will be measured by the total number of linear feet (l.f.) of cracks filled as indicated in the preconstruction plans and as measured, verified, and accepted by the Engineer.

**Basis of Payment:** This work will be paid for at the Contract unit price per linear foot for "Filling Joints and Cracks in Bituminous Concrete Pavement" complete and accepted in place. The price must include all submittals, materials, equipment, tools, and labor incidental thereto. No payment will be made to the Contractor prior to submittal of required documents.

<b><u>Pay Item</u></b>	<b><u>Pay Unit</u></b>
Filling Joints and Cracks in Bituminous Concrete Pavement	l.f.

**(k) Fine Milling of Bituminous Concrete (0 to 4 Inches)**

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**Description:** The fine milling of bituminous concrete (0 to 4 inches) consists of the milling, removal, and disposal of existing bituminous concrete pavement.

**Construction Methods:** The Contractor shall remove the bituminous concrete material using means acceptable to the Engineer. The pavement surface must be removed to the line, grade, and existing or typical cross-section shown on the preconstruction plans or as directed by the Engineer.

The Contractor shall dispose of the bituminous concrete material offsite at an approved disposal facility unless otherwise stated in this Contract.

Any milled surface, or portion thereof, that is exposed to traffic must be paved within fourteen (14) calendar days unless otherwise stated in the construction plans or this Contract. If any milled section is not covered up within fourteen (14) days, all other work must be stopped except that related to placing the first lift of pavement on the milled surface. In addition, failure to place pavement on milled surfaces within fourteen days (14) days will be subject to liquidated damages as stated in Article 1 Section (cc) of this Exhibit A.

The milling equipment must be designed and built for milling bituminous concrete pavements. The milling machine must be self-propelled with sufficient power, traction, and stability to maintain depth and slope and capable of removing the existing bituminous concrete pavement.

The milling machine must be equipped with a built-in automatic grade averaging control system that can control the longitudinal profile and the transverse cross-slope to produce the specified results. The longitudinal controls must be capable of operating from any longitudinal grade reference, including string line, contact ski (thirty (30) feet minimum), non-contact ski (twenty (20) feet minimum), or mobile string line (thirty (30) feet minimum). The transverse controls must have an automatic system for controlling cross-slope at a given rate. The Engineer may waive the requirement for automatic grade or slope controls where the situation warrants such action.

The milling machine must be able to provide a zero (0) to four (4) inch deep cut in one pass. The rotary drum of the milling machine must use carbide or diamond tipped tools spaced not more than five-sixteenths ( $\frac{5}{16}$ ) inch apart. The forward speed of the milling machine must be limited to no more than forty-five (45) feet per minute. The Contractor shall continually maintain the tools on the revolving cutting drum and replace as warranted to provide a uniform pavement texture.

The milling machine must be equipped with an integral pickup and conveying device to immediately remove material being milled from the surface of the roadway and discharge the millings into a truck in a single operation. The milling machine must also be equipped with a means of effectively limiting the amount of dust escaping from the milling and removal operation.

When milling smaller areas or areas where it is impractical to use the above described equipment, the Client Agency may approve the use of a lesser equipped milling machine. The Client Agency shall approve such request in writing at the preconstruction meeting.

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Contractor shall provide protection around existing catch basin inlets, manholes, utility valve boxes, and any similar structures. Any damage to such structures as a result of the milling operation is the Contractor's responsibility and must be repaired at the Contractor's expense.

To prevent the infiltration of milled material into the storm drainage system, the Contractor shall take special care to prevent the milled material from falling into the inlet openings or inlet grates. Any milled material that has fallen into inlet openings or inlet grates shall be removed immediately at the Contractor's expense.

**Surface Tolerance:** The milled surface must provide a satisfactory riding surface with a uniform textured appearance. The milled surface must be free from gouges, longitudinal grooves and ridges, oil film, and other imperfections that are a result of defective equipment, improper use of equipment, or poor workmanship. The Contractor shall perform random spot-checks with a Contractor supplied ten foot (10') straightedge to verify surface tolerances at a minimum of five (5) locations per day under the direction of the Inspector. The variation of the top of two (2) ridges from the testing edge of the straightedge, between any two (2) ridge contact points, must not exceed one quarter ( $\frac{1}{4}$ ) inch. The variation of the top of any ridge to the bottom of the groove adjacent to that ridge shall not exceed one quarter ( $\frac{1}{4}$ ) inch. The Contractor shall be responsible for any unsatisfactory surfaces produced and shall be corrected at the Contractor's expense and to the satisfaction of the Engineer.

The Contractor shall verify the depth of the removed bituminous concrete pavement by taking measurements every two hundred fifty feet (250') per each pass of the milling machine, or as directed by the Engineer. The Contractor shall use these depth measurements to monitor the average depth of the removed bituminous concrete pavement.

Where a surface delamination between bituminous concrete layers or a surface delamination of bituminous concrete on Portland cement concrete causes a non-uniform texture to occur, the milling depth must be adjusted in small increments to a maximum of +/- one half ( $\frac{1}{2}$ ) inch to eliminate the condition.

When removing bituminous concrete pavement entirely from an underlying Portland cement concrete pavement, all of the bituminous concrete pavement must be removed leaving a uniform surface of Portland cement concrete, unless otherwise directed by the Engineer.

The Contractor shall be responsible for any unsatisfactory surfaces produced by the milling operation and shall be corrected at the Contractor's expense and to the satisfaction of the Engineer.

The Contractor shall leave no vertical faces, transverse or longitudinal, or roadway structures including but not limited to catch basins, manholes and utility valve boxes exposed to traffic unless the requirements listed below are met. If any vertical face is formed in an area exposed to traffic, a temporary paved transition must be established according to the requirements shown in the construction plans. If the milling machine is used to form a temporary transition, the length of the temporary transition must conform to the provisions included in Attachment 1-Bituminous Concrete



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Standards, "Transitions for Roadway Surface," the requirements shown on the construction plans, or as directed by the Engineer. At all permanent limits of removal, a clean vertical face must be established by saw cutting, prior to paving.

Roadway structures shall not have a vertical face of greater than one (1) inch exposed to traffic as a result of milling. All structures within the roadway that are exposed to traffic and greater than one (1) inch above the milled surface must receive a transition meeting the following requirements:

**For roadways with a posted speed limit of 35 mph or less\*:**

- Round structures with a vertical face of greater than one (1) inch to two and one half (2.5) inches must be transitioned with a hard rubber tapered protection ring of the appropriate inside diameter designed specifically to protect roadway structures.
- Round structures with a vertical face greater than two and one half (2.5) inches must receive a transition of bituminous concrete formed at a minimum twenty-four to one (24:1) taper in all directions.
- All rectangular structures with a vertical face greater than one (1) inch must receive a transition of bituminous concrete formed at a minimum twenty-four to one (24:1) taper in all directions.
- \*Bituminous concrete tapers at a minimum twenty-four to one (24:1) taper in all directions may be substituted for the protection rings if approved by the Engineer.

**For roadways with a posted speed limit of 40, 45 or 50 mph:**

- All structures must receive a transition of bituminous concrete formed at a minimum thirty-six to one (36:1) taper in the direction of travel. Direction of travel includes both the leading and trailing side of a structure. The minimum taper must be twenty-four to one (24:1) in all other directions.

**For roadways with a posted speed limit of greater than 50 mph:**

- All structures must receive a transition of bituminous concrete formed at a minimum sixty to one (60:1) taper in the direction of travel. Direction of travel includes both the leading and trailing side of a structure. The minimum taper shall be twenty-four to one (24:1) in all other directions.

All roadway structure edges and bituminous concrete tapers must be clearly marked with fluorescent paint. The paint must be maintained throughout the exposure to traffic.

The milling operation must proceed in accordance with the requirements of Attachment 3-Maintenance and Protection of Traffic and Attachment 6-Prosecution Progress of Work, or other Contract requirements. In the event of a conflict, the more stringent specification shall apply.

The Contractor shall thoroughly sweep any milled surface using a sweeper truck prior to opening an area to traffic. The sweeper truck must be equipped with a water tank and be capable of removing the millings and loose debris from the surface. The sweeper truck must operate at a forward speed

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that allows for the maximum pickup of millings from the roadway surface. Other sweeping equipment may be provided in lieu of the sweeper truck where approved by the Engineer.

Any milled area that will not be exposed to live traffic for a minimum of forty-eight (48) hours prior to paving shall require a vacuum sweeper truck in addition to, or in lieu of, mechanical sweeping. The vacuum sweeper truck must have sufficient power and capacity to completely remove all millings from the roadway surface including any fine particles within the texture of the milled surface. Vacuum sweeper truck hose attachments may be used to clean around pavement structures or areas that cannot be reached effectively by the main vacuum. Compressed air may be used in lieu of vacuum attachments if approved by the Engineer.

**Method of Measurement:** Payment for the above described work will be measured by the number of square yards of area from which the milling of asphalt has been completed and the work accepted by the Client Agency. The Client Agency shall not allow any area deductions for minor unmilled areas such as catch basin inlets, manholes, utility boxes and any similar structures.

**Basis of Payment:** Payment for the above described work will be paid for at the Contract unit price per square yard for "Fine Milling of Bituminous Concrete (0 to 4 Inches)." The price must include all equipment, tools, labor, and materials incidental thereto.

The Client Agency shall not provide additional payments for multiple passes with the milling machine to remove the bituminous surface.

No separate payments will be made for cleaning the pavement prior to paving; providing protection and preforming handwork removal of bituminous concrete around catch basin inlets, manholes, utility valve boxes and any similar structures; repairing surface defects as a result of the Contractor's negligence; providing protection to underground utilities from the vibration of the milling operation; placement of temporary paved transitions at all exposed vertical faces including transverse and longitudinal joints and all raised structures; removal of any temporary milled or paved transition; removal and disposal of millings; and furnishing a sweeper truck and sweeping after milling. The costs for these items must be included in the Contract unit price.

<b><u>Pay Item</u></b>	<b><u>Pay Unit</u></b>
Fine Milling of Bituminous Concrete (0 to 4 inches)	s.y.

**(I) Documentation of Uniform Placement of Bituminous Concrete (Paver)**  
**Documentation of Uniform Compaction of Bituminous Concrete (Roller)**

**Description:** This item consists of the continuous real-time tracking and recording the location of all placement (pavers) and compaction (rollers) equipment using GPS technology during the placement of bituminous mixtures within the limits of the work as described in the construction plans. In addition, the continuous real-time temperature of the pavement under the rollers and immediately behind the paver(s) must also be measured and recorded.

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**GPS-Related Definitions:** The definitions in AASHTO PP 81 are applicable to this standard.

- **GPS:** A space-based satellite navigation system that provides location and time information in all weather, anywhere on or near the Earth to determine the location in geodetic coordinates. In this specification, GPS refers to all GPS-related signals including US GPS and other Global Navigation Satellite Systems (GNSS).
- **Hand-Held GPS Rover:** A portable GPS radio/receiver for in-situ point measurements.
- **GPS Base Station:** A single ground-based system consisting of a GPS receiver, GPS antenna, radio and radio antenna to provide L1/L2 differential GPS correction signals to other GPS receivers within a range limited by radio, typically three (3) miles in radius without repeaters.
- **Network RTK:** Network RTK is a system that uses multiple bases in real-time to provide high-accuracy GPS positioning within the coverage area that is generally larger than that covered by a ground-based GPS base station; e.g., VRSTM.
- **GPS Correction Service Subscription:** A paid service that can receive VRS signals in order to achieve higher accuracy GPS positioning, normally via cellular wireless data services without the need for a ground-based base station. Examples of GPS Correction Service Subscriptions are as follows: Trimble VRSTM, Trimble VRS NOWTM, and OmniSTAR.
- **ECEF XYZ:** Earth-Centered, Earth-Fixed Cartesian X, Y, Z coordinates.
- **Grid:** Referred to as ECEF XYZ in this specification.
- **GUI Display:** Graphical User Interface Display.

**Construction Methods:**

**Equipment**

1. **Rollers/Pavers:** All rollers used for breakdown, intermediate, and finish rolling, and pavers used to place bituminous concrete within the project limits must be equipped as follows:
  - a. GPS radio and receiver units must be mounted on each roller and paver to monitor the speed and location of such equipment during the entire paving operation.
  - b. The rolling and paving equipment must include an integrated on-board documentation system that is capable of displaying real-time color-coded maps of the location, number of passes, pavement surface temperatures and speeds.
  - c. The display unit shall be capable of transferring the data by means of a USB port.
  - d. An on-board printer capable of printing the identity of the equipment, the date of measurements, construction area being mapped and percentage of the construction area mapped.

Table 1 below is provided to assist the Contractor in investigating the equipment that may provide the means to meet this specification.

**Table 1 – Suggested Equipment List**

Vendor	Bomag	Sakai	Wirtgen/Hamm
Model	Asphalt Manager	CIS	HCQ
Model No.	BW190AD-4AM	SW880/SW890	HD+ 90 / HD+ 110 HD+ 120 / HD+ 140

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<b>Documentation</b>	BCM 05 Office	AithonMT-A	HMV
<b>Company Address</b>	Bomag Americas, Inc. 200 Kentville Road Kewanee, Il. 61443	Sakai America, Inc. 90 International Parkway Adairsville, Ga. 30103	Wirtgen America, Inc. 6030 Dana Way Antioch, TN 37013
<b>Contact Information</b>	Chris Connolly (301) 262-5447 Chris.Connolly@bomag.com	Brandon Crockett (800) 323-0535 B-crockett@sakaiamerica.com	Tim Kowalski (615) 501-0600 tkowalski@Wirtgenamerica.com

2. Global Positioning System (GPS): The Contractor shall provide GPS technology to achieve accurate and consistent GPS measurements among all GPS equipped devices on the project.

All GPS devices for this project must be set to the same consistent coordinate datum/system no matter whether GPS or Grid data are originally recorded. The Connecticut State Plane Coordinate must be used. The records shall be in meters. Ad-hoc local coordinate systems will not be allowed.

3. GPS System and Reference System Combination: Contractor shall provide the GPS system (including GPS receivers on equipment and hand-held GPS receivers (rovers)) that makes use of the same reference system that can be a ground-based base station or network-RTK, to achieve RTK-GPS accuracy. Examples of combinations are as follows:
- a. GPS receivers on equipment and hand-held GPS rovers referenced to the same on-ground base station.
  - b. GPS receiver on equipment and hand-held GPS receivers referenced to the same network RTK.

4. GPS Data Records and Formats: The recorded GPS data, whether from the equipment or hand-held GPS rovers, must be in accordance to AASHTO PP 81 Table 1.

Coordinates must be in meters with at least three (3) digits of significance (0.001 m or 1 mm).

When importing data into the data analysis software, the GPS data and associated measurements must be stored with minimum data conversions and minimum loss of precisions. Users can then select unit of preference to allow real time unit conversion for the GUI display.

5. Data Analysis Software: Standardized data analysis software (Veta) to be used for this project is available on the following website, as it may be modified from time to time: <http://www.intelligentcompaction.com>. As a minimum, the following Essential Data Information and Data Elements must be included in each data file or section:

**Table 2 – Essential Data Information**

Item	Description	Item	Description
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1	Section Title	6	Drum Diameter (m) (roller only)
2	Machine Manufacturer	7	Machine Weight (metric ton)
3	Machine Type	8	CSPC Zone
4	Machine Model	9	Offset to UTC (hrs)
5	Drum/Screed Width (m)	10	Number of data points

**Table 3 – Essential Data Elements for each Data Point**

Item	Data Field Name	Example of Data
1	Date Stamp (YYYYMMDD)	20080701
2	Time Stamp (HHMMSS.SS – military format)	090504.00 (9 hr. 5 min. 4.00 sec.)
3	Longitude (decimal degrees)	94.85920403
4	Latitude (decimal degrees)	45.22777335
5	Easting (m)	354048.300
6	Northing (m)	5009934.900
7	Height (m)	339.9450
8	Pass number (rollers only)	2
9	Direction index	1 forward, 2 reverse
10	Speed (kph) (rollers and pavers)	4.0
11	Vibration on	1 for yes, 2 for no
12	Frequency (vpm)	3500.0
13	Amplitude (mm)	0.6
14	Surface temperature (°C)	120

In Table 3, Items 3 and 4 can be exchanged with Items 5 and 6, and vice versa.

The size of data mesh after post-processing must be less than eighteen (18) inches (450 mm) by eighteen (18) inches (450 mm) in the X and Y directions.

6. Trained Equipment Operators: The Contractor shall provide equipment operator(s) trained to accomplish the above described work. Sufficient training for the operator(s) must be supplied by a representative of the equipment manufacturer prior to commencement of the work, at no cost to the Client Agency.
7. Equipment Information: Prior to commencement of the work, the Contractor shall supply the Engineer with equipment information, to include at a minimum the supplier, make, model, unique identifier, and GPS system supplier to be utilized.

**Quality Control during Rolling:** In addition to any other quality control responsibilities, the Contractor shall be responsible for the following:

1. Daily GPS check testing for the equipment and rover(s).
2. Establishing target number of passes using data from standard testing devices (such as nondestructive density gauges and pavement cores).

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3. Monitoring the equipment location during paving operations and the operation of the entire GPS system on the project site.
4. Daily check of the temperature accuracy following AASHTO PP81 Section X3.4.
5. Quality control testing to monitor the pavement temperature.
6. Daily download and analysis of the data from the roller(s).
7. Daily set-up, take down, and secure storage of GPS and equipment components.

**Materials Sampling and Testing Requirements:** The minimum frequency of obtaining the data from the equipment shall be two (2) times per day of asphalt compaction operations. The data is date and time stamped which allows for external evaluation at a later time. The Contractor shall provide data from the on-board printer if requested by the Engineer.

The Contractor shall make available all raw data and results from the analysis software to the Engineer within twenty-four (24) hours of obtaining the data.

**Post-Process GPS Check:** The Contractor shall follow the vendor-specific instructions to export data from the equipment to Veta-compatible formats. For each data export, the Contractor shall import the equipment data into Veta and enter GPS point measurements from the rover and visually inspect the map and point measurements on the Veta display screen for consistency.

**GPS Setup:** Prior to the start of production, the Contractor and representatives of the GPS and equipment manufacturer shall conduct a check of the setup of the GPS, equipment and the rover(s) using the same datum, as follows:

1. On a location nearby or within the project limits, the GPS base station (if required by the GPS) must be established and the equipment and the GPS rover tied into the same base station.
2. Verification that the equipment and rover are working properly and that there is a connection with the base station.
3. There are two options for comparing the equipment and rover coordinates. Production will not begin until proper GPS verification has been obtained. The manufacturer's recommended verification process can be used to augment either of the following options:
  - a. GPS verification measurements must be conducted while the equipment is stationary. The GPS coordinates from the equipment on-board display must be recorded ensuring that the distance offsets are applied correctly to the center of the front drum (e.g., the measurement is at the equipment GPS receiver position). Place the hand-held GPS receiver on top of the GPS receiver mounted on the equipment and record the coordinates from the hand-held receiver display. The differences of the coordinates between the equipment GPS receiver and hand-held GPS receiver shall be within twelve (12) inches and three hundred (300 mm) in both the horizontal axes (X and Y). A vertical axis check is not required.
  - b. The Contractor shall select and mark a reference location on the project site. The equipment must be placed so that the center of the roller's front drum or paver hopper is on top of the reference location and location measurement must be recorded. After moving the equipment from the marked location, a hand-held rover must be used to

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locate the reference location. The differences of the coordinates in grid shall be within twelve (12) inches and three hundred (300 mm) in both the horizontal axes (X and Y). The GPS location measurements from the equipment must be used to determine any offsets that are required so that the GPS coordinate of the equipment is at the center of the front drum or hopper. On some systems, distance offsets are applied to the roller/paver GPS measurements from the on-board display and the coordinates may be on the left or right side of the drum or hopper. In those cases, the equipment must be moved so that the left or right side of the front drum axle or hopper is flush with the reference location. The hand-held rover shall be placed on the marked location and the difference of both coordinate records checked. The final GPS coordinate for each data point recorded in data files must be at the center of the front drum or hopper.

4. The project plan file provided by the Client Agency must be uploaded into the data analysis software and depending on the equipment manufacture, the on-board system.
5. GPS setup must be conducted daily during production operations to ensure consistency and accuracy of GPS measurements for all GPS devices prior to the paving and compaction operations.

**Documentation:** In addition to any data documentation requirements listed elsewhere in this Contract, the following minimum documentation regarding all phases of data collection, processing, and reporting must be provided to the Engineer:

1. **Equipment:** Documentation of the manufacturer, model, type of paver, and rollers used each day of paving. The relative positioning of the equipment in the paving operations shall be noted.
2. **Initial Data:** At a minimum, the electronic data from equipment and the data analysis software shall be provided to the Engineer upon the completion of the first day of paving.
3. **Production Roller/Paver Data:** The Contractor shall export from the manufacturer's software all data on a daily basis.

The Contractor shall analyze the equipment data for coverage area and uniformity and shall submit the results to the Engineer within twenty-four (24) hours of completion of each day of paving operations.

A summary of all equipment data shall be submitted to the Client Agency at the expiration or termination of this Contract.

**Assistance and Training:**

1. **Technical Assistance:** The Contractor shall coordinate on-site technical assistance of the equipment representative(s) during the initial seven (7) days of production and as needed during the remaining operations. The equipment representative shall be present during the initial setup and verification testing of the equipment. The equipment representative shall assist the Contractor with data management using the data analysis software including data input and processing.
2. **On-Site Training.** The Contractor shall coordinate on-site training for Contractor and Client Agency project personnel related to operation of the technology, at no cost to the Client

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Agency. Contractor’s personnel shall include the paving superintendent, QC technician(s) and equipment operator(s). Minimum training topics must include the following:

- a. Background information for the specific system(s) to be used.
- b. Setup and checks for system(s), GPS receiver, base-station and hand held rovers.
- c. Operation of the system(s) on the equipment, including but not limited to, setup data collection, start/stop of data recording, and on-board display options.
- d. Transferring raw data from the equipment including but not limited to, via USB connections.
- e. Operation of manufacturer’s software to open and view raw data files and exporting all-passes and proofing data files in Veta-compatible format.
- f. Operation of Veta software to import the above exported all-passes and proofing data files, inspection of maps, input point test data, perform statistics analysis and produce reports for project requirements.
- g. Coverage and uniformity requirements.

**Method of Measurement:** Payment for the above described work will be measured by the number of tons of PMA S0.5 and PMA S0.375 for the project placed by a paver and compacted by the roller(s), in accordance with these specifications. The number of tons eligible for payment will be equal to the number of tons of PMA S0.5 and PMA S0.375 delivered to the project during the period of acceptable documentation for the equipment.

For these Contract items, acceptable documentation is considered a continuous period(s) of data collection of one hundred percent (100%) of the essential data information and data elements for no less than ninety percent (90%) of the time period material is being placed by the paver or compacted by the roller(s) as appropriate for the item.

The Client Agency shall not pro-rate measurements of material under this item.

**Basis of Payment:** Payment for the above described work will be paid at the Contract unit price per ton for “Documentation of Uniform Placement of Bituminous Concrete (Paver)” and at the Contract unit price per ton per roller for “Documentation of Uniform Compaction of Bituminous Concrete (Roller)” as specified below The price must include all submittals, technical assistance, materials, equipment, tools and labor incidental thereto.

<b><u>Pay Item</u></b>	<b><u>Pay Unit</u></b>
Documentation of Uniform Placement of Bituminous Concrete (Paver)	Ton
Documentation of Uniform Placement of Bituminous Concrete (Roller)	Ton

**(m) Asphalt Adjustment Cost**

**Description:** The Asphalt Adjustment Cost will be based on the variance in price for the performance-graded binder component of HMA, PMA, and ultra-thin bonded hot-mix asphalt mixtures completed and accepted during this Contract.



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**The Asphalt Price is available on the State of Connecticut Department of Transportation website, as it may be modified from time to time, at:**

<http://www.ct.gov/dot/asphaltadjustment>

**Construction Methods:**

An asphalt adjustment will be applied only if all of the following conditions are met:

For HMA and PMA mixtures:

- a. The HMA or PMA mixture for which the adjustment would be applied is listed as a Contract item with a pay unit of tons.
- b. The total quantity for all HMA and PMA mixtures in this Contract or individual purchase order exceeds one thousand (1000) tons or the project duration is greater than six (6) months.
- c. The difference between the posted *Asphalt Base Price* and *Asphalt Period Price* varies by more than five dollars (\$5.00) per ton.

For Ultra-Thin Bonded HMA mixtures:

- a. The Ultra-Thin Bonded HMA mixture for which the adjustment would be applied is listed as a Contract item.
- b. The total quantity for Ultra-Thin Bonded HMA mixture in this Contract exceeds:
  - Eight hundred (800) tons if the Ultra-Thin Bonded HMA item has a pay unit of tons.
  - Thirty thousand (30,000) square yards if the Ultra-Thin Bonded HMA item has a pay unit of square yards.

Note: The quantity of Ultra-Thin Bonded HMA measured in tons shall be determined from the material documentation requirements set forth in the Ultra-Thin Bonded HMA item Special Provision.

- c. The difference between the posted *Asphalt Base Price* and *Asphalt Period Price* varies by more than five dollars (\$5.00) per ton.
- d. No Asphalt Adjustment Cost will be applied to the liquid emulsion that is specified as part of the Ultra-Thin Bonded HMA mixture system.
- e. Regardless of the binder used in all HMA or PMA mixtures, the Asphalt Adjustment Cost will be based on PG 64-22.

The CTDOT shall post on its website, the average per ton selling price (asphalt price) of the performance-graded binder. The average is based on the high and low selling price published in the most recent available issue of the Asphalt Weekly Monitor<sup>®</sup> furnished by Poten & Partners, Inc. under the "East Coast Market – New England, New Haven, Connecticut area," F.O.B. manufacturer's terminal.

The selling price furnished from the Asphalt Weekly Monitor<sup>®</sup> is based on United States dollars per standard ton (US\$/ST).

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**Method of Measurement:**

Formula: $HMA \times [PG\%/100] \times [(Period\ Price - Base\ Price)] = \$ \underline{\hspace{2cm}}$
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**HMA:**

- a. For HMA, PMA, and Ultra-Thin Bonded HMA mixtures with pay units of tons: The quantity in tons of accepted HMA, PMA, or Ultra-Thin Bonded HMA mixture measured and accepted by the Client Agency for payment.
- b. For Ultra-Thin Bonded HMA mixtures with pay units of square yards:  
 The quantity of Ultra-Thin Bonded HMA mixture delivered, placed, and accepted by the Client Agency for payment, calculated in tons as documented according to the Material Documentation provision (Construction Methods, paragraph G above) of the Ultra-Thin Bonded HMA Special Provision.

**Asphalt Base Price:** The asphalt price posted on the CTDOT website twenty-eight (28) days before the actual bid opening posted.

**Asphalt Period Price:** The asphalt price posted on the CTDOT website during the period the HMA or PMA mixture was placed.

**PG%:** Performance-Graded Binder percentage

- a. For HMA or PMA mixes:
  - PG% = 4.5 for HMA S1 and PMA S1
  - PG% = 5.0 for HMA S0.5 and PMA S0.5
  - PG% = 6.0 for HMA S0.375, PMA S0.375, HMA S0.25 and PMA S0.25
- b. For Ultra-Thin Bonded HMA mixes:
  - PG% = Design % PGB (Performance Graded Binder) in the approved job mix formula, expressed as a percentage to the tenth place (e.g. 5.1%)
  - The asphalt adjustment cost must not be considered as a changed condition in this Contract as result of this provision since all bidders are notified before submission of bids.

**Basis of Payment:** The "Asphalt Adjustment Cost" must be calculated using the formula indicated above. A payment will be made for an increase in costs. The Client Agency shall deduct monies due the Contractor for a decrease in costs.

The sum of money shown on the estimate and in the itemized proposal as "Estimated Cost" for this item will be considered the bid price although the adjustment will be made as described above. The estimated cost figure is not to be altered in any manner by the Contractor. If the Contractor alters the amount shown on the estimate, the altered figure will be disregarded and the original cost figure will be used to determine the amount of the bid for this Contract.

<u>Pay Item</u>	<u>Pay Unit</u>
Asphalt Adjustment Cost	est.

**(n) Ultra-Thin Bonded PMA Pavement (Type B)**

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**PMA Emulsion (Type 1)**

**Material Transfer Vehicle for Ultra-Thin Bonded PMA**

**Description:** The Work performed under these items includes the production and placement of an ultra-thin PMA mixture consisting of a warm polymer-modified asphalt emulsion tack coat followed immediately by an ultra-thin (0.625 inch) lift of PMA. Gradation “Type B” must be used. “Polymer Modified Asphalt Emulsion (Type 1)” will be referred to herein as “polymer modified emulsion.” “Ultra-Thin Bonded PMA Pavement (Type B)” will be referred to herein as “ultra-thin PMA” or “ultra-thin PMA, material/mixture.” The PMA applies to the PMA mixture that specifies a polymer-modified binder with warm-mix technology incorporated. These items must be constructed in conformance with the lines, grades, thicknesses, and typical cross sections shown on the construction plans or established by the Engineer.

**Materials:**

- a. **Polymer Modified Emulsion:** This material must meet the requirements of CRS-1P as shown below in Table 1 - Polymer Modified Emulsion Material Properties, must be tested by the supplier and must be submitted to the Engineer with a Certified Test Report. The polymer modifier must be milled or blended into the asphalt emulsion base or the emulsifying agent prior to the emulsification process.

**Table 1 – Polymer Modified Emulsion Material Properties**

Emulsion Properties	Method	Minimum	Maximum
Polymer Content, % by Weight of Total Residue	AASHTO T 59	3.0	--
Viscosity, Saybolt Furol, 77°F (25°C), second	AASHTO T 59	20	100
Sieve Test, %	AASHTO T 59	--	0.10
Demulsibility, %	AASHTO T 59	40	--
Storage Stability Test, 1 Day (Difference in % Residue)	AASHTO T 59	--	1.0
Classification Test	AASHTO T 59	Passes	--
Particle Charge Test	AASHTO T 59	Positive <sup>(1)</sup>	--
Residue by Distillation, % <sup>(2)</sup>	AASHTO T 59	63	--
Oil Distillate, Volume of Total Emulsion, %	AASHTO T 59	--	3

**Table 1 – Polymer Modified Emulsion Material Properties (continued)**

Residue from Distillation Properties	Method	Minimum	Maximum
Penetration at 77°F (25°C), 100 g, 5 second	AASHTO T 49	60	150
Ductility at 77°F (25°C), 5 cm/minute (2 in./min), cm	AASHTO T 51	40	--
Solubility in Organic Solvent, % <sup>(3)</sup>	AASHTO T 44	97.0	--

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Elastic Recovery at 50°F (10°C), % <sup>(4)</sup>	ASTM D6084	58	--
Ash Content, %	AASHTO T 111	--	1 max

**Notes:**

- If the Particle Charge Test result is inconclusive, material having a minimum pH value of 6.7 will be acceptable.
  - Perform according to AASHTO T 59 except as follows:
    - i. When the lower temperature reaches approximately 275°F (135°C) move the ring burner approximately level with the bottom of the still.
    - ii. Increase the temperature to a maximum 350°F±11°F (177°C ± 5.5°C), maintaining this temperature for fifteen (15) minutes.
    - iii. Use an ASTM 16c thermometer to monitor the temperature of the emulsion. Distillation on field samples must show no more than trace amounts of oil.
  - Any organic solvent used must be demonstrated and proven to work under the above testing protocols. The type and brand of solvent used must be recorded and submitted as part of the required testing information.
  - Use ASTM D6084 Testing Procedure “A.” Samples shall be tested at 50°F (10°C).
- b. **Ultra-Thin PMA:** The materials for the ultra-thin PMA mixture, source(s) of supply, Job Mix Formula (“JMF”), mix tolerances, approval of JMF and the control of the mixture must meet the requirements of the Standards, Section M.04. The JMF must also meet the requirements in Table 2- Ultra-Thin PMA Mixture Requirements (Type B) below, and must be submitted to the Engineer for approval at least thirty (30) days before production. Any JMF change must be submitted to the Engineer for approval at least twenty-four (24) hours in advance of manufacturing any ultra-thin PMA mixture using the new JMF.

**Table 2 – Ultra-Thin PMA Mixture Requirements (Type B)**

Sieve Sizes	Design Limits % Passing <sup>(1)</sup>	Production Tolerance % <sup>(1)</sup>
1/2 inch	100	
3/8 inch	85-100	+/- 5
No. 4	24-40	+/- 4
No. 8	21-32	+/- 4
No. 16	16-26	+/- 4
No. 30	12-20	+/- 3
No. 50	8-16	+/- 3
No. 100	5-10	+/- 2
No. 200	4.0-7.0	+/- 1.5
% PGB	4.8 – 5.4	
Moisture Sensitivity, AASHTO T 283 <sup>(2)</sup>	80% minimum	

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Film Thickness <sup>(3)</sup>	0.35 mils (9.0 $\mu$ m (microns)) minimum
Draindown, AASHTO T 305	0.1% maximum

**Notes:**

- All aggregate percentages are based on total mass of aggregate.
  - Specimens for AASHTO T 283 testing are to be compacted using the Superpave gyratory compactor. The mixtures shall be compacted using one hundred (100) gyrations to produce specimens approximately 3.7 inches in height. Use mixture and compaction temperatures recommended by the binder supplier. When necessary, an anti-stripping agent shall be added to provide resistance to stripping.
  - Film thickness to be obtained using effective binder content. Surface area to be calculated according to Asphalt Institute MS-2 methodology.
- c. **Asphalt Binder:** A PG 64E-22 binder must be used meeting the requirements of the Standards, Section M.04, with the following additional requirement: The binder must incorporate warm-mix technology listed on the Northeast Asphalt User-Producer Group Qualified WMA technologies list at the time of bidding, under headings (A) (Organic (Waxes) Additives) or (B) (Chemical Additives) only, available online at [http://www.neaupg.uconn.edu/?attachment\\_id=345, as it may be amended from time to time](http://www.neaupg.uconn.edu/?attachment_id=345, as_it_may_be_amended_from_time_to_time). The PG 64E-22 binder with warm-mix technology must be selected to meet the recommended mix application temperature of 300 - 350°F and the compaction cessation temperature of 200°F, as specified in Construction Methods, (C) Application and (E) Compaction. The dosage of warm-mix additive must be as recommended by the binder supplier and must be submitted to the Engineer for approval at least seven (7) days prior to commencing any ultra-thin PMA paving under this Contract.
- d. **Coarse Aggregate:** Coarse aggregates that are from more than one source or of more than one type of material must have all constituents proportioned and blended to provide a uniform mixture. Crushed stone from an approved source meeting the requirements of subsection (a) or (b) and Table 3 – Coarse Aggregate Properties located below must be applied:
- (a) Sandstone, granite, chert, traprock, or other similar non-carbonate material.
  - (b) Gravel, or a natural or manufactured blend of the following types of material: limestone, dolomite, gravel, sandstone, granite, chert, traprock or other similar materials meeting the following requirements:
    - 0.5 inch Nominal Maximum Size Aggregate Mixes: A minimum of 20% of plus 0.375 inch particles must be non-carbonate.
    - 0.375 inch Nominal Maximum Size Aggregate Mixes: A minimum of 20% of plus 0.1875 inch particles must be non-carbonate.

**Note:** Non-carbonate particles are defined as having a minimum acid insoluble residue content of 80%.

**Table 3 – Coarse Aggregate Properties**

Property	Method	Requirement
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LA Abrasion Coefficient, maximum % loss	AASHTO T 96	30
Maximum percent passing #200 sieve, %	AASHTO T 11, T 27	2
Soundness, maximum % loss	AASHTO T 104	10
Fractured particles, %	AASHTO T 335	100

**Table 4 – Recommended Coarse Aggregate Gradation**

Sieve Size	Type B (% Passing)
3/4 inch	100
1/2 inch	100
3/8 inch	85-100
1/4 inch	0-15
No. 4	0-3
No. 8	0

- e. **Fine Aggregate:** Fine aggregate shall be one hundred percent (100%) crushed stone having a minimum sand equivalent of sixty percent (60%), as determined by AASHTO T 176, “Plastic fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test.” Table 5 – Fine Aggregate Gradation, located below, shows the recommended fine aggregate gradation.

**Table 5 – Fine Aggregate Gradation**

Sieve Size	Percent Passing
No. 4	100
No. 8	90-100
No. 16	60-80
No. 30	45-60
No. 50	30-40
No. 100	20-30
No. 200	15-25

- f. **Mineral Filler:** Mineral Filler must meet the requirements of the Standards, Section M.04.01.

**Construction Methods:**

**Equipment**

1. **Paver:** The self-priming spray paver must be capable of spraying the polymer modified emulsion, applying the PMA overlay and smoothing the surface of the mat in one pass at a rate of at least thirty (30) feet per minute. The self-priming spray paver must be equipped with a receiving hopper, feed conveyor, emulsion storage tank, metered high-pressure emulsion spray bar(s) and a variable width, heated, extendable ironing-type screed. The spray bar system must be capable of applying the polymer modified emulsion across the entire

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width of the screed, including the full width of the variable width screed extensions.

The paver must be equipped with a microprocessor and controls which controls the flow of the polymer modified emulsion and adjust the application rate of the emulsion to ensure a uniform application rate of the polymer modified emulsion at the desired application rate, plus or minus 0.02 gallons per square yard based on speed and paving width. The paver must be able to apply the specified polymer modified emulsion rate at all speeds, including all start and stops of the paver, uniformly across the full width of the mat being placed. The screed must have the ability to produce a crown at the center both positively and negatively and be vertically adjustable and have horizontal extensions to accommodate the desired pavement profile.

2. Rollers: All rollers must be self-propelled, ten (10) ton double drum rollers designed for compaction of PMA. The Contractor shall furnish a minimum of two (2) rollers for each paving machine to properly seat the ultra-thin PMA. The rollers must only operate in the static mode. The Client Agency may request the Contractor provide additional rollers to meet production needs.
3. Infrared Thermometers: The Contractor shall supply a minimum of two (2) new, unused handheld digital infrared laser sighted thermometers for use by the Engineer for the duration of each project. The infrared thermometers supplied must meet the certification requirements of EN61326-1, EN61010, and EN60825-1 maintained by the European Committee for Electrotechnical Standardization (CENELEC). The thermometers must have a minimum distance-to-spot ratio of fifty to one (50:1) and must have adjustable emissivity control. The thermometers must have a minimum accuracy value of  $\pm 1\%$  of reading or  $\pm 2^{\circ}\text{F}$ , whichever is greater. The thermometers must be used in accordance with the manufacturer's written directions. All thermometers supplied must be in agreement within  $5^{\circ}\text{F}$  of each other at all times at any temperature between  $0^{\circ}\text{F}$  and  $500^{\circ}\text{F}$ . If any of the thermometers supplied are found to be in noncompliance with any of the above criteria, the Contractor shall dispose of them and provide the Engineer with a minimum of two (2) new unused thermometers meeting the above requirements. Immediately at the completion of the ultra-thin PMA work, the thermometers supplied by the Contractor shall become the property of the State and shall be delivered to the Engineer, with a signed letter of transmission acknowledging the formal transfer of ownership of the infrared thermometers to the Engineer.
4. Material Transfer Vehicle ("MTV"): An MTV must be used when placing ultra-thin PMA material. The MTV must be a self-propelled vehicle, specifically designed for the purpose of delivering the bituminous concrete mixture from the delivery truck to the paver. The MTV must continuously remix the bituminous concrete mixture throughout the placement process. The use of a MTV will be subject to the requirements stated in the Standards, Article 1.07.05 - Load Restrictions. The Engineer may limit the use of the MTV if it is determined that the use of the MTV may damage highway components, utilities, or bridges. The Contractor shall submit the following information to the Engineer at the pre-construction meeting:
  - a. The make and model of the MTV to be used.

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- b. The individual axle weights and axle spacing for each separate piece of paving equipment (haul vehicle, MTV and paver).
  - c. A working drawing showing the axle spacing in combination with all three (3) pieces of equipment that will comprise the paving echelon.
5. Power Broom/ Sweeper: A motorized broom or sweeper must be provided that is capable of cleaning the road surface prior to application of polymer modified emulsion.

**Surface Preparation:** The removal of pavement markings, seal cracks and patch areas of distress must have been completed (under other items) prior to application of polymer modified emulsion and ultra-thin PMA. Immediately prior to the application of polymer modified emulsion and ultra-thin PMA, the roadway surface must be cleaned by the Contractor using a motorized sweeper and any other equipment or means necessary to remove all foreign debris and material, including but not limited to, leaves, branches, dirt, sand, and garbage from the pavement surface. The Contractor shall be responsible for all foreign debris and material removed and its disposal, at no cost to the Client Agency.

The pavement surface must be dry immediately prior to the application of the emulsion.

The Contractor shall protect all manhole covers, water boxes, catch basins and other utility structures with plastic or building felt. The Contractor shall remove all material used to protect such structures upon completion of the paving operation.

**Temperature Determinations and Requirements:** The infrared thermometers provided by the Contractor shall be used to determine all specified temperature requirements. Only one (1) thermometer will be used to determine and record a temperature. If there is any question about the accuracy of any recorded temperature, an additional Contractor supplied infrared thermometer must be used to confirm the temperature. As long as two (2) or more thermometers are in agreement within 5°F, the first temperature will be officially recorded by the Engineer. This temperature will be used, as necessary, to enforce any and all specified temperature requirements, including rejection of materials and halting or shutdown of the work as stated herein.

**Note:** A probe type thermometer may be used only at the asphalt plant manufacturing facility to test the PMA during production and plant testing. If a probe type thermometer is used at an asphalt plant, it must comply with the probe type thermometer requirements contained in Attachment 1- Bituminous Concrete Standards of the Contract. Probe type thermometers must not be used in the field once the mix is delivered to the site.

**Application:** The pavement surface temperature for application of the polymer modified emulsion and placement of the ultra-thin PMA shall be at least 50°F. The ambient temperature must be at least 50°F and rising. Artificial heating of the pavement surface will not be allowed. The finished in-place ultra-thin PMA must be a minimum thickness of 0.625 inches and a



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maximum thickness of 0.875 inches. If the ultra-thin PMA is placed creating a “drop-off” or “vertical deviation” exceeding 0.750 inches between pavement surfaces that are exposed to traffic, the transition requirements defined in Section 4.06.03-5 of Attachment 1- Bituminous Concrete Standards must apply.

The application temperature of the polymer modified emulsion must be 130°F – 190°F and a uniform application across the entire width to be overlaid must be at a rate of 0.15 to 0.25 gallon per square yard. The Contractor shall submit in writing the project-specific rate(s) of application to the Engineer for approval prior to commencement of the work under this item. The submittal must include backup details for the proposed polymer modified emulsion rates for each distinct surface type such as, but not limited to, milled vs. unmilled surfaces and new vs. aged or raveling pavement. A “distinct area” must have a minimum length of one hundred (100) feet and minimum width of eight (8) feet. The Engineer may direct the Contractor to pre-apply additional emulsion to any area that requires a higher emulsion application rate within a paver pass so that the proper emulsion application rate for each surface texture type can be achieved in a single paving pass. The Contractor shall continuously monitor the spray rate.

The ultra-thin PMA material must be placed on the polymer modified emulsion as soon as possible to ensure that the ultra-thin PMA is placed on the polymer modified emulsion before it breaks or migrates along the pavement surface. Prolonged paver stop periods are not allowed. If a prolonged stop results in improper application or breaking of the polymer modified emulsion, or the inability to meet the compaction requirements stated herein, the Engineer shall stop the operation until the Contractor can demonstrate that all emulsion application and mix compaction requirements are being met.

**Note:** The emulsion target application rate will depend on the macro texture of the surface on which the emulsion will be placed. Projects where the emulsion will be placed on milled or high (open) texture existing pavements will require emulsion application rates toward the high end of the 0.15 to 0.25 gallon per square yard range, while applications over pavements with a particularly tight texture (small-aggregate leveling courses and/or polished, flushed, or bled pavement surfaces) will require application rates at the lower end of the specification range.

No equipment must come in contact with the polymer modified emulsion before the ultra-thin PMA wearing course is applied.

The ultra-thin PMA wearing course must be applied across the full width of the emulsion at a temperature of 300°F – 350°F. The mix delivery temperature will be verified for conformance using the infrared thermometers provided. The Engineer will check the mix delivery temperature at the back of the haul truck. The Engineer may also check the mix delivery temperature in the hopper of the paver or in the hopper of the material transfer vehicle machine if warranted. When checking the mix in the back of the haul truck, at least the top six (6) inches of the surface of the load will be removed prior to checking the mix temperature. This will be accomplished by either using a shovel to remove at least

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the top six (6) inches of the load or the load shall be allowed to “break” when beginning the dumping process, exposing PMA material that is at least six (6) inches below the surface of the load. When checking mix in the hopper of the paver or the material transfer vehicle, the Engineer will use the infrared thermometer to record the temperature of the mix in several areas of the hopper and use a shovel, if necessary, to remove any mix from the surface to expose mix in the hopper that is representative of the overall temperature of the truck load. The Engineer will record the highest temperature found when multiple infrared temperature readings are taken in the hopper. Truckloads of PMA material not meeting the minimum temperature requirement shall be rejected by the Engineer.

**Testing of Materials:** The Engineer shall conduct acceptance sampling and testing of the ultra-thin PMA mixture at the PMA facility, in accordance with the Standards, Section M.04, for gradation and binder content. The Engineer may allow the Contractor to conduct acceptance testing, following the sampling and testing procedures herein and shall retain a two thousand five hundred (2500) gram split sample for verification testing. Verification testing will be performed by the Engineer on the retained samples in accordance with the Client Agency’s current Quality Assurance (QA) Program for Materials, Acceptance and Assurance Testing. Should gradation or binder content exceed the specified tolerances, the Client Agency shall investigate to determine an assignable cause. The Contractor test results for a subject sub-lot may be replaced with the Client Agency’s results. The split sample must be stored in an appropriate container, sealed, and labeled with the project number, PMA plant name, date, time obtained, sequential truckload number, sub-lot, and name of the person obtaining the sample. The sample shall be stored and disposed of at the discretion of the Engineer following the completion of the project.

**Passing Test:** Ultra-thin PMA material meeting all tolerances for gradation and binder content shown in Table 2 as determined by sampling and testing in accordance with the requirements is defined as a Passing Test.

**Failing Test:** A Failing Test is defined as ultra-thin PMA material exceeding one or more of the tolerances in gradation and binder content shown above in Table 2- Ultra-Thin PMA Mixture Requirements (Type B) as determined by sampling and testing in accordance with the requirements.

**Lot:** For ultra-thin PMA mixture sampling and testing purposes, a lot is defined as one planned production run or twenty-four (24) hour period, whichever is shorter. An additional lot will be created every twenty-four (24) hours of a multiple-day production run.

Each lot must be subdivided into equal sub-lots based on planned quantity of PMA mixture for the production run as outlined in Table 6 – Minimum Sampling and Testing Schedule at PMA Facility, located below, so that each lot is represented by a minimum of two or three sub-lots.

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**Table 6 – Minimum Sampling and Testing Schedule at PMA Facility**

<b>Planned Production Run Quantity (tons)</b>	<b>Number of Sub-lots</b>
1-400	1
401-800	2
801-1200	3
1201+	4

The Contractor shall submit to the Engineer the planned production quantity for a lot at least four (4) hours prior to commencement of production of the ultra-thin PMA mixture. The planned quantity of production for each sub-lot must be converted to a sequential, ordinal number of truckloads (i.e. 1, 2, 3, etc.). For each lot, the first sub-lot may be randomly selected from the first five (5) truckloads. A random-selection procedure must be used to sample the truckload of material representing each remaining sub-lot.

The Contractor may obtain additional samples for Quality Control (“QC”) purposes at any time. The Contractor shall designate a sample as a QC sample prior to conducting its sampling. No QC samples will be included in the acceptance of the produced material.

**Compaction:** The compaction process used must seat the PMA mixture into the sprayed polymer modified emulsion rather than to obtain density. Compaction must start immediately after application of the wearing course and be completed before the mix falls below the compaction cessation temperature of 200°F. Compaction must be obtained by use of the paver screed and by the use of two (2) double drum rollers in static mode. A minimum of two (2) static passes from each roller is required to adequately seat the material. Therefore, a minimum of four (4) roller passes must be made over any given area prior to cooling of the ultra-thin PMA material below 200°F.

The ultra-thin PMA mixture must be placed and rolled to provide a continuous and smooth surface with uniform texture. The roller(s) must not stop on the freshly placed wearing course. The wearing course must be protected from traffic until the rolling operation is complete and the material has cooled sufficiently to resist damage.

The Contractor shall provide a ten (10) foot straightedge for use by the Engineer during all paving operations, inspection, and testing. If milling is specified as part of the work, or in any other areas where the ultra-thin PMA is required to be placed flush with adjacent pavement surfaces, structures, or other surrounding appurtenances, the pavement surface must be tested with the straightedge to ensure that the pavement surface does not deviate by more than one quarter (¼) inch in any direction. When matching irregular surfaces or structures, the Engineer shall use their discretion when enforcing this rule.

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**Corrective Work Procedures:** Any portion of the completed pavement that the Engineer determines does not meet the specifications, or is determined to be defective or non-homogeneous in surface texture, shall be corrected at the Contractor's expense.

If at any time the Engineer determines that the polymer modified emulsion supplied does not meet any of the specifications, the Engineer shall stop the entire paving operation until the Contractor demonstrates "re-conformance" with these specifications.

If the Engineer determines that the specified application rate of the polymer modified emulsion falls outside the allowable tolerances, the Engineer shall stop the paving operation until such time the Contractor can demonstrate compliance with these specifications. In all cases, if the Contractor continues to place material unacceptable to the C Engineer, the Engineer reserves the right to withhold payment for, or call for the removal and replacement of all material placed that is in non-conformance with the specifications.

If any of the individual specified ultra-thin PMA material production tolerances are not met more than once in four tests, the production of the ultra-thin PMA material must be stopped until the Contractor runs a trial test demonstrating compliance within the production tolerances listed herein. In such a case, the Engineer shall reserve the right to withhold payment for, or call for the removal and replacement of, all ultra-thin PMA material placed between the rendering of the first out of tolerance test, at no cost to the Client Agency, and ceasing mix production operations due to the second out of tolerance test.

Any ultra-thin PMA material placed at less than 0.625 inches thick, or greater than one (1) inch thick, shall be subject to removal as determined by the Engineer. In no case will the permanent edge or limit of the ultra-thin PMA placed be allowed to form a "drop-off" greater than one (1) inch. The Contractor shall immediately remove any edge or "drop-off" formed showing a thickness of greater than one (1) inch.

Any flushing of the polymer modified emulsion to the surface of the ultra-thin PMA material must be considered and treated as a deviation in texture and analyzed and treated according to the texture requirements herein.

If the Engineer determines that any full width travel lane area or full width shoulder area, that is at least one hundred (100) feet long, contains any change or deviation in texture occurring in one and one half percent (1.5%), or greater, of the surface, the Contractor shall replace such area at no cost to the Client Agency.

Unless otherwise determined by the Engineer, all corrective work shall be done with the ultra-thin PMA material. Any corrective ultra-thin PMA placed must be placed by the spray paver as specified herein and must be placed at a minimum width equal to the width of the main screed of the paver for no less than one hundred (100) feet in length. The Contractor shall not perform corrective work exclusively by hand with the ultra-thin PMA material. Small isolated areas or

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defects, may be repaired with material other than the ultra-thin PMA material if approved by the Engineer and shall be placed with the spray paver specified herein.

**Note:** "Small isolated areas or defects" are defined as: One area of twenty- five (25) square feet or less per full width lane or full width shoulder for any given continuous two-hundred (200) foot lane or shoulder section that was placed by the spray paver.

If pavement placed by the Contractor is deemed unacceptable, and the Engineer requires its replacement or correction, the Contractor shall:

1. Propose a corrective procedure to the Engineer for review and approval prior to any corrective work commencing. The proposal shall include:
  - a. Limits of pavement to be replaced or corrected, indicating stationing or other landmarks.
  - b. Anticipated schedule.
  - c. Construction method and sequence of operations.
  - d. Methods of maintenance and protection of traffic.
  - e. Material sources.
  - f. Names and telephone numbers of supervising personnel.
2. Perform all corrective work in accordance with this Contract and the approved corrective procedure.

**Material Documentation:** All manufacturer's producing ultra-thin PMA must have their truck-weighing scales, storage scales and mixing plant automated to provide a detailed ticket. Delivery tickets must include the following information:

1. State printed on ticket.
2. Name of producer, identification of plant, and specific storage bin (silo) if used.
3. Date and time of day.
4. Net weight (tons) of material loaded into truck.
5. Gross weight or tare weight of truck.
6. Project number, purchase order number, name of contractor (if Contractor other than manufacturer).
7. Sequential truck number for specific identification of truck. Sequential number shall use natural numbers and be ordered beginning with the first truck for a production lot on the basis of time truck is loaded (i.e. 1, 2, 3, etc.)
8. Individual aggregate and asphalt high/target/low weights must be printed on batch plant tickets. (For drum plants and silo loadings, the plant printouts shall be maintained by the Contractor for a period of three (3) years after the completion of the project).

The Contractor shall immediately notify the Engineer if, during the production day, there is a malfunction of the recording system in the automated plant or truck-weighing scales. Manually written tickets containing all required information will be allowed for one (1) hour, provided that each load is weighed on State-approved scales. At the Engineer's sole discretion, trucks may be approved to leave the plant if a State inspector is present to monitor weighing. If such a malfunction is not repaired within forty-eight (48) hours, material will not be approved to leave

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the plant until the system is repaired to the Engineer's satisfaction. No damages will be considered should the State be unable to provide an inspector at the plant.

The State reserves the right to have an inspector present to monitor batching or weighing operations.

**Cessation of Supply:** The production plant providing ultra-thin PMA shall cease supplying materials to this project under any of the following conditions:

1. If the supplied ultra-thin PMA material exceeds one or more of the tolerances shown in Table 2- Ultra-Thin PMA Mixture Requirements (Type B), located above, on two (2) samples out of the latest three (3) consecutive samples tested for gradation or binder content, the Client Agency shall cease delivery of material to the site until a passing test is performed.
2. If the supplied polymer modified emulsion fails to meet any of the specified requirements. Supply of material to the site may resume once the Contractor demonstrates, in writing to the Engineer, that the requirements herein are met.
3. If the resulting surface texture fails to meet any of the specified requirements. The Client Agency shall cease supply of material to the site until the Contractor determines the cause of the deficient or non-homogeneous surface texture, proposes corrective measures in a submittal to the Engineer for acceptance or approval.
4. If the final compacted thickness requirements and tolerances stated herein are not met, the Client Agency shall cease supply of the material until the Contractor determines why the final compacted thickness placed specified herein was not met, proposes/demonstrates a change in the placement operations, and institutes said change to assure conformance with this specification.
5. If the compaction requirements stated herein are not met, the Client Agency shall cease supply of the material until the Contractor submits, in writing to the Engineer, the cause of the inability to meet the compaction requirements stated within this specification. In addition, the Contractor shall submit, in writing to the Engineer, proposed changes to address the identified cause of the problem and propose revisions to the compaction plan to comply with this specification.

Cessation of supply of the material will occur as many times as necessary until the Contractor completes the work properly according to all the requirements within this specification.

The Client Agency shall consider all ultra-thin PMA material in non-conformance with this specification, as described above, which is not subject to non-payment or removal and replacement by the Engineer, to be deficient material ("DM").

**Method of Measurement:**

1. **Polymer Modified Asphalt Emulsion (Type 1):** The quantity of Polymer Modified Asphalt Emulsion (Type 1) will be measured for payment by the number of gallons furnished and applied on the project and accepted by the Engineer.

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2. **Ultra-Thin Bonded PMA Pavement (Type B):** The quantity of Ultra-Thin Bonded PMA Pavement (Type B) will be measured for payment by the documented area covered, measured in square yards, at the thickness shown on the preconstruction plans and will be subject to the following adjustment:

Material Deficiency Adjustment (MDA): Ten percent (10%) of the total quantity of material determined by the Engineer that exceeds one or more of the tolerances shown in Table 2- Ultra-Thin PMA Mixture Requirements (Type B), located above, for Ultra-Thin PMA, Type B will be used for purposes of determining MDA.

For deficient material due to failing tests of the PMA mixture at the plant, the entire quantity of produced PMA in each of the two (2) failing sub-lots leading to each instance of Cessation of Supply delivered to the site will be included in the DW term of the MDA calculation located in Table 2- Ultra-Thin PMA Mixture Requirements (Type B) above.

The adjustment in square yards will be calculated as follows:

$$\text{MDA in square yards (s.y.)} = \text{DM} \times 0.10$$

Where:

DM = square yards (s.y.) of deficient ultra-thin PMA, Type B material, calculated as follows:

$$\text{DM} = \text{TA} \times [ \text{DW} / \text{TW} ]$$

Where:

TA = Total documented area covered and measured in square yards (s.y.)

DW = Total weight of deficient ultra-thin PMA, Type B material exceeding one or more of the tolerances shown in Table 2 for ultra-thin PMA, Type B, as determined by the Engineer from delivery tickets

TW = Total weight of ultra-thin PMA, Type B material determined by the Engineer from the delivery tickets

**Material Transfer Vehicle:** The furnishing and use of a MTV must be measured for payment based on the actual number of tons of ultra-thin PMA Pavement (Type B) delivered to a paver using the MTV. The number of tons will be obtained from delivery tickets.

**Basis of Payment:**

**Polymer Modified Asphalt Emulsion (Type 1):** Material for asphalt emulsion will be paid at the Contract unit price per gallon for "Polymer Modified Asphalt Emulsion (Type 1)."

**Ultra-Thin Bonded PMA Pavement (Type B):** The furnishing and placing of the PMA mixture will be paid at the Contract unit price per square yard for "Ultra-Thin Bonded PMA Pavement (Type B)."

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The cost for all equipment, tools, and work required to place and compact the polymer modified emulsion and the ultra-thin PMA must be included in the respective unit prices. Contractor pricing shall also include cleaning the existing pavement surface prior to placement of the ultra-thin PMA material with rotary power sweeping and vacuuming equipment, if required, and the cost for providing lighting for the purpose of illuminating the work area and equipment during placement operations.

The work to remove pavement markings, seal cracks and patch areas of distress will be paid under other items.

**Material Transfer Vehicle:** The Material Transfer Vehicle (MTV) will be paid at the Contract unit price per ton for a "Material Transfer Vehicle."

**Adjustments:** Any adjustments shall be incorporated by construction order for material deficiencies documented by the Engineer.

**Material Deficiency Adjustment (MDA):** The quantity of MDA in square yards will be used to determine the adjustment value which must be deducted from the total Contract amount.

**MDA Adjustment = MDA (s.y.) X Contract price per square yard (\$/s.y.)**

No separate or additional payment will be made for any work related to the replacement or correction of defective pavement as determined by the Engineer. Related work includes, but is not limited to, items such as the removal and replacement of ultra-thin PMA, maintenance and protection of traffic, pavement repairs, replacement of bridge joints, pavement markings and any other work that is deemed necessary by the Engineer to provide and produce acceptable corrective or replacement work to the pavement.

Payment shall be for the items completed and accepted by the Engineer, the price of which shall include all labor, materials and equipment incidentals thereto.

<u>Pay Item</u>	<u>Pay Unit</u>
Polymer Modified Asphalt Emulsion (Type 1)	Gal.
Ultra-Thin Bonded PMA Pavement (Type B)	s.y.
Material Transfer Vehicle for Ultra-Thin Bonded PMA	ton

### **3. ADDITIONAL TERMS AND CONDITIONS:**

#### **a. Bonds**

Payment Bond: Contractor may either provide a payment bond in the amount of one hundred percent (100%) of each purchase order or a payment bond in the minimum amount of three million dollars (\$3,000,000.00). If the total value of the awarded work meets or exceeds the three million dollars (\$3,000,000.00) payment bond value, the payment bond requirement must



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be increased in minimum increments of seven hundred fifty thousand dollars (\$750,000.00) beyond the value listed on the current payment bond. Client Agency will notify the Contractor when a new payment bond is required. The required payment bond must be received prior to the purchase order being issued. Failure to submit a payment in a form satisfactory to the Client Agency prior to the purchase order being issued will result in the Client Agency issuing the purchase order to the next lowest Contractor responsive to Client Agency's payment bond request.

Payment bonds must meet the following requirements:

1. Corporation: The payment bond must be signed by an official of the corporation above his official title and the corporate seal must be affixed over his signature.
2. Firm or Partnership: The payment bond must be signed by all the partners and indicate they are "Doing Business As (name of firm)".
3. Individual: The payment bond must be signed by the individual owning the business and indicated "Owner".
4. The surety company executing the payment bond must be licensed to do business in the State, or the payment bond must be countersigned by a company so licensed.
5. The payment bond must be signed by an official of the surety company and the corporate seal must be affixed over his or her signature.
6. Signature of two (2) witnesses for both principal and the surety must appear on the payment bond.
7. A power of attorney for the official signing of the payment bond for the surety company must be submitted with the payment bond, unless such power of attorney has previously been filed with the Client Agency.

The payment bond requirement may be waived for companies that manufacture and supply their own material and do not purchase materials required under the performance of the Contract from any third party source. Appropriate documentation must be supplied with the bid to establish the basis upon which to request a waiver of the payment bond. This waiver does not apply to the performance payment bond requirements.

Re-insurance arrangements are not be acceptable as substitutes for performance or payment bonds. A maximum of one (1) co-surety will be acceptable for a payment and/or performance bond. Client Agency, as obligee, shall hold all surety companies which execute payment and performance bonds as co-sureties, jointly and severally liable for the entire obligation set forth by such payment bonds. Sureties will not be allowed to limit their interest in such payment bonds.

Other offers of surety will be reviewed on a case by case basis and approved or disapproved at the sole discretion of the Client Agency.

Notice address for ConnDOT as the Client Agency:

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State of Connecticut  
Department of Transportation  
Division of Purchasing & Materials Management  
2800 Berlin Turnpike  
Newington CT 06111

**b. Contract Separately/Additional Savings Opportunities**

DAS reserves the right to either seek additional discounts from the Contractor or to contract separately for a single purchase, if in the judgment of DAS, the quantity required is sufficiently large, to enable the State to realize a cost savings, over and above the prices set forth in Exhibit B, whether or not such a savings actually occurs.

**c. P-Card (Purchasing MasterCard Credit Card)**

Notwithstanding the provisions of Section 4(b)(2) of the Contract, purchases may be made using the State of Connecticut Purchasing Card (MasterCard) in accordance with Memorandum No. 2011-11 issued by the Office of the State Comptroller.

Contractor shall be equipped to receive orders issued by the Client Agency using the MasterCard. The Contractor shall be responsible for the credit card user-handling fee associated with MasterCard purchases. The Contractor shall charge to the MasterCard only upon acceptance of Goods delivered to the Client Agency or the rendering of Services.

The Contractor shall capture and provide to its merchant bank, Level 3 reporting at the line item level for all orders placed by MasterCard.

Questions regarding the state of Connecticut MasterCard Program may be directed to Ms. Kerry DiMatteo, Procurement Card Program Administrator at 860-713-5072.

**d. Subcontractors**

DAS must approve any and all subcontractors utilized by the Contractor in writing prior to any such subcontractor commencing any work. Contractor acknowledges that any work provided under the Contract to any state entity is work conducted on behalf of the State and that the Commissioner of DAS or his/her designee may communicate directly with any subcontractor as the State deems to be necessary or appropriate. Contractor shall be responsible for all payment or fees charged by the subcontractor(s). A performance evaluation of any subcontractor shall be provided promptly by the Contractor to DAS upon request.

Contractor must provide the majority of services described in the specifications.

**e. Prevailing Wages**

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Some or all of the Performance may be subject to prevailing wages. Accordingly, the following provision is included in this Contract in accordance with the requirements of Conn. Gen. Stat. Sec. 31-53(a):

The wages paid on an hourly basis to any person performing the work of any mechanic, laborer or worker on the work herein contracted to be done and the amount of payment or contribution paid or payable on behalf of each such person to any employee welfare fund, as defined in subsection (i) of Conn. Gen. Stat. Sec. 31-53(a), shall be at a rate equal to the rate customary or prevailing for the same work in the same trade or occupation in the town in which such public works project is being constructed. Any Contractor who is not obligated by agreement to make payment or contribution on behalf of such persons to any such employee welfare fund shall pay to each mechanic, laborer or worker as part of such person's wages the amount of payment or contribution for such person's classification on each pay day.

**f. Standard Wages**

Contractors shall comply with all provisions of Connecticut General Statutes 31-57f, Standard Wage Rates for Certain Service Workers and shall pay wages in accordance with the current wage rates provided by the Department of Labor. Information regarding this Statute and how and when it applies can be obtained from DOL's web site at <http://www.ctdol.state.ct.us/wgwkstnd/standardwage.htm>. Questions concerning the provisions and implementation of this act should be referred to the Connecticut Department of Labor, Wage and Workplace Standards Division, 200 Folly Brook Blvd., Wethersfield, CT 06109-1114 (860) 263-6790 or his designated representative. A link to the Standard Wages is provided below.

Standard Wages

<http://www.ctdol.state.ct.us/wgwkstnd/prevailing-rates/service/rates-service.htm>

**g. Security and/or Property Entrance Policies and Procedures**

Contractor shall adhere to established security or property entrance policies and procedures or both for each requesting Client Agency. It is the responsibility of each Contractor to understand and adhere to those policies and procedures prior to any attempt to enter any Client Agency premises for the purpose of carrying out the scope of work described in this Contract.

**h. Department of Correction Requirements for Contractors who Perform at a Correctional Facility**

(1) Facility Admittance

(A) Contractors shall not allow any of their employees to enter the grounds of or any structures in any Department of Correction ("DOC") facility ("Facility") or undertake any part of the

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Performance unless the employees have first been issued an individual, valid, security identification badge which they shall display properly at all times while at the Facility.

(B) Contractor employees who seek admittance to a DOC Facility must first undergo a background check to confirm their eligibility to be admitted into the DOC Facility. Contractors shall obtain from the DOC a form for each employee and complete and submit that form to DOC at least 10 business days prior to the date that the employee is scheduled to arrive at the DOC Facility for the Performance. Information on the form includes the following:

1. Name
2. Date of Birth
3. Social Security Number
4. Driver's License Number
5. Physical Characteristics (such as age, height, weight, etc.)

(2) Official Working Rules

Contractors shall adhere to the following Official Working Rules of the DOC:

(A) All Contractors shall report to the Facility's security front desk for sign-in, regardless of work location, immediately upon arrival at the Facility.

(B) All Contractor personnel shall work under the observation of an assigned correctional officer or supervisor, who will provide escort for the duration of the work.

(C) Contractor personnel shall not have any verbal or personal contact with any inmates.

(D) Equipment must be checked daily and, when not in use, locked in a secure place as the Facility officials may direct.

(E) Hacksaws, blades and files will remain in the custody of the officer assigned, except when being used.

(F) The correctional officials may refuse admittance to any Contractor personnel for any cause or reason the correctional officials deem to be sufficient.

(G) In the event of any emergency, all Contractor personnel will be escorted outside the Facility by correctional officials.

(H) Contractors shall address all questions pertaining to interruptions of service or to safety of the Facility to the appropriate correctional official.

(I) Work at the Facility must be Performed between 8:00 a.m. and 12:00 Noon and between 12:30 p.m. and 4:30 p.m., the maximum allowable working day being 8 hours. The Contractor shall not Perform any work at any Facility on any Saturday, Sunday or Holiday, unless DOC determines, in its sole discretion, that there is an emergency.

(J) The Contractor shall ensure that all equipment not in use, is secure to prevent use by inmates.

(K) The Contractor shall supply to DOC a copy of all material safety data sheets for all products used in the process of construction, construction materials, and products brought onto the Facility.

(L) All Contractors shall sign out at the Facility's security front desk prior to departure following completion of Performance.

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(3) Rules Concerning Department of Correction Facilities

Contractors shall adhere to the Facilities rules ("Facilities Rules") described in this section. At the time that Contractors and Contractor Parties seek to enter a Facility, DOC staff will present to them a document setting forth the following Facilities Rules and extracts of the laws governing the introduction and control of contraband. Contractors and Contractors Parties shall read, understand and sign that document as a condition precedent to entering the Facility and as evidence that they understand the consequences imposed for violating these Facilities Rules:

(A) Restricted Areas

All persons except DOC personnel, upon entering the grounds are restricted to the immediate area of their work assignment. In order to go to other areas, Contractor personnel shall first obtain written permission from the supervisory correctional official in charge. Only persons having official business will be admitted to construction sites.

(B) Inmates

There may be times when inmates may be working adjacent to or in the same area as Contractor or Contractor Parties. All persons are prohibited from accepting or giving anything from and to an inmate. Inmates are accountable to DOC personnel only, no other person will have any conversation or dealings with inmates without the approval of the DOC supervisory official in charge.

(C) Vehicle Control

Any Contractor personnel entering upon the Facility shall remove the ignition keys of their vehicle and lock the vehicle when they leave it for any reason. Contractors shall ensure that all equipment in, on or around the vehicles is secured and inaccessible to anyone else while in the Facility.

(D) Contraband

Contractors shall not bring clothing or contraband into or onto the Facility's grounds or leave clothing or contraband in a vehicle located on the grounds of the Facility outside of an area designated by DOC personnel. Contraband is defined below and all persons are subject to these DOC Facilities Rules concerning contraband when on the Facility's grounds.

Contractor shall not introduce into or upon, take or send to or from, or attempt the same to or from, the grounds of the Facility anything whatsoever without the knowledge of the Facility supervisor.

"Contraband" means any tangible or intangible article whatsoever which DOC has not previously authorized and may include letters, stamps, tools, weapons, papers, floor implements, writing materials, messages (written and verbal), instruments and the like. Contractors shall discuss any questions regarding such matters with the Facility supervisor immediately upon those questions arising.

Cigarettes and Cell Phones are "contraband." Accordingly, Contractors shall leave them secured inside their locked vehicles in an area designated by DOC personnel.

Failure to comply with these Facilities Rules, in the sole determination of DOC, will result in the Contractor being removed from the Facility.

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(4) State Laws Governing Unauthorized Conveyance, Possession or Use of Items, Weapons and Certain Devices

(A) Unauthorized conveyance of certain items brought into the Facility is governed by Conn. Gen. Stat. Sec. 53a-174, which provides as follows:

1. Any person not authorized by law who conveys or passes or causes to be conveyed or passed, into any correctional or humane institution or the grounds or buildings thereof, or to any inmate of such an institution who is outside the premises thereof and known to the person so conveying or passing or causing such convey or passing to be such an inmate, any controlled drug, as defined in section 21a-240, any intoxicating liquors, any firearm, weapon, dangerous instruments or explosives of any kind, any United States currency, or any rope, ladder or other instrument or device for use in making, attempting or aiding an escape, shall be guilty of a class D felony. [Penalty for a Class "D" felony per Sec. 53a-35 subsection a, b, c, d is a term not to exceed five (5) years.]The unauthorized conveying, passing, or possessing of any rope or ladder or other instrument or device, adapted for use in making or aiding an escape, into any such institution or the grounds or building thereof, shall be presumptive evidence that it was so conveyed, passed or possessed for such use.

2. Any person not authorized by law who conveys into any such institution any letter or other missive which is intended for any person confined therein, or who conveys from within the enclosure to the outside of such institution any letter or other missive written or given by any person confined therein, shall be guilty of a class A misdemeanor. [Penalty for a Class "A" misdemeanor per Sec. 53a-36 subsection 1, the term is not to exceed one (1) year.]

3. Any person or visitor who enters or attempts to enter a correctional institution or Facility by using a misleading or false name or title shall be guilty of a class A misdemeanor.

(B) Possession of weapons or dangerous instruments in the Facility is governed by Conn. Gen. Stat. Sec.53a-174a, which provides as follows:

1. A person is guilty of possession of a weapon or dangerous instrument in a correctional institution when, being an inmate of such institution, he knowingly makes, conveys from place to place or has in his possession or under his control any firearm, weapon dangerous instrument, explosive, or any other substance or thing designed to kill, injure or disable.

2. Possession of a weapon or dangerous instrument in a correctional institution is a class B felony. [Penalty for a Class "B" felony per Sec. 53a-35 subsection a, b, c, d is a term not to exceed twenty (20) years.]

(C) Conveyance or use of electronic or wireless communication devices in the Facility is governed by Conn. Gen. Stat. Sec. 53a-174b, which provides as follows:

1. A person is guilty of conveyance or use of an electronic wireless communication device in a correctional institution when such person, without authorization by the Commissioner of Correction or the commissioner's designee, (1) conveys or possesses with intent to convey an electronic wireless communication device to any inmate of a correctional institution while such

**EXHIBIT A**

**DESCRIPTION OF GOODS & SERVICES AND ADDITIONAL TERMS & CONDITIONS**

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inmate is in such institution, or (2) uses an electronic wireless communication device to take a photographic or digital image in a correctional institution.

2. Conveyance or use of an electronic wireless communication device in a correctional institution is a Class A misdemeanor.