City of Torrington

ENGINEERING DEPARTMENT
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ADDENDUM No. 1

DATE ISSUED: March 27, 2019

RE: RECONSTRUCTION OF VARIOUS ROADS

BID # RVR-027-040519

All bidders are hereby advised of the following amendments to the Contract Bid Documents, which are hereby made an integral part of the specifications for the subject project, prepared by The City of Torrington, to the same extent as all other documents. All work shall conform to the standards and provisions of same.

Bids submitted shall be deemed to include the Contract Document information as shown in Addendum No. 1. General bidders shall notify sub-bidders that may be affected by this addendum as applicable. Bidders shall be required to acknowledge receipt of this Addendum in the space provided on the Bid Proposal Form, Page BP-1. Failure to acknowledge this Addendum by the Bidder may result in the rejection of their bid. Bidders are directed to review changes to all portions of the work as changes to one portion may affect the work of another.

1. **Replace pages IFB-9 and IFB-10 of Information to Bidders with attached revised pages IFB-9 and IFB-10 "Information to Bidders" noted as "REVISED for Addendum #1 3/27/19".**

2. **Replace Entire Section 1.08 "PROSECUTION AND PROGRESS" with attached revised Section 1.08 "PROSECUTION AND PROGRESS" noted as "REVISED for Addendum #1 - 3/27/19".**

3. **Replace Entire Section 4.06 "BITUMINOUS CONCRETE" with attached revised Section 4.06 "BITUMINOUS CONCRETE" noted as "REVISED for Addendum #1 3/27/19"**

4. **Add Special Provision Section 4.07 FIELD DENSITY TESTING pages 4.07.1 thru 4.07.5.**

5. **Replace "BID FORM" pages BF-1 of 5 thru BF- 5 of 5 with "BID FORM" noted as "REVISED for Addendum #1 - 3/27/19".**

END OF ADDENDUM No. 1

workers compensation insurance in the State of Connecticut.

Prior to the award of the contract, the bidder is required to submit a current Statement from the State of Connecticut Treasurer that states to the best of his/her knowledge and belief, as of the date of the statement; the particular bidder was not liable to the State of Connecticut for any workers' compensation payments made pursuant to C.G.S section 31-355. It is recommended that a current statement be included with the bid submittal.

~~**AFFIRMATIVE ACTION REQUIREMENTS:**~~

~~This contract is subject to all Federal and State Affirmative Action regulations. The contractor will be required to comply with those regulations. This includes the documentation attached and included within the contract.~~

RIGHT OF THE CITY TO TERMINATE THE CONTRACT:

The schedule for this project is very inflexible and therefore it is critical that the Contractor starts the project in a timely manner. In the event that any of the provisions of this Contract are violated by the Contractor, or by any of his subcontractors, the City may serve written notice upon the Contractor and his Surety of its intention to terminate the Contract, such notices to contain the reasons for such intention, and unless within five (5) days after the serving of such notice upon the Contractor, such violations or delay shall cease and satisfactory arrangements or correction be made, the Contract shall, upon expiration of said five (5) days, cease and terminate. In the event of any such termination, the City shall immediately serve notice upon the Surety and the Contractor. The Surety shall have the right to take over and perform the Contract; provided however, that if the Surety does not commence performance thereof within five (5) days from the date of mailing of notice of termination, the City may take over the work and prosecute the same to completion by contract or by force account for the amount and at the expense of the Contractor, and the Contractor and his Surety shall be liable to the City for any excess cost to the City for any excess cost occasioned by the City. In such event, the City may take possession of and utilize in completing the work, any materials, appliances, and plant as may be on the site of the work and necessary therefore.

Contractor to also note the requirements under the section titled TIME OF COMPLETION AND LIQUIDATED DAMAGES herein the Information to Bidders.

STATE WAGE RATES:

Attention to bidders is directed to certain requirements of this contract which require payment and compliance with certain local and state requirements. **This project is fully City funded.** The Contractor shall pay the State prevailing wage rate according to the following requirements:

a) Wage rates, establishing the minimum rates, issued by the State of Connecticut Labor Department and Contractor's Wage Certification Form, a copy of which is attached, is made a part of this contract. The Contractor shall submit with his/her bid a completed, notarized Contractor's Wage Certification form. This form is found in the Section "C", with the other contract forms.

b) Pursuant to the State of Connecticut Public Act 93-392, the bidder shall submit a certified payroll record, utilizing the form furnished with the prevailing wage rates included in these specifications. The certified payroll shall be submitted on a weekly basis with a "Statement of Compliance" to the contracting agency included on the reverse side of the payroll form.

c) Apprentices may be employed at less than predetermined rates if they are in an apprenticeship program registered with the Department of Labor or with a state apprenticeship agency recognized by the Department. Trainees may be employed at less than predetermined rates if they are in a training program certified by the Department.

d) Contractors and subcontractors on prime contracts in excess of $100,000 are required, pursuant to the Contract Work Hours and Safety Standards Act, to pay employees one and one-half times their basic rates of pay for all hours over 40 worked on covered contract work in a workweek. Covered contractors and subcontractors are also required to pay employees weekly and to submit weekly-certified payroll records to the contracting agency.

e) Prevailing Wages for Work on State Highways; Annual Adjustments. With respect to contracts for work on state highways and bridges on state highways, the Contractor shall comply with the provisions of Section 31-54 and 31-55a of the Connecticut General Statutes, as revised.

f) As required by section 1.05.12 (Payrolls) of the State of Connecticut, Department of Transportation's Standard Specification for Roads, Bridges and Incidental Construction (FORM 817), as may be revised, every Contractor or subcontractor performing project work on a federal aid project is required to post the relevant prevailing wage rates as determined by the United States Secretary of Labor. The wage rate determinations shall be posted in prominent and easily accessible places at the work site.

~~g) The contractor who is selected to perform this State project must comply with CONN. GEN. STAT. §§4a-60, 4a-60a, 4a-60g, and 46a-68b through 46a-68f, inclusive, as amended by June 2015 Special Session Public Act 15-5.~~
~~State law requires a minimum of twenty-five (25%) percent of the state-funded portion of the contract for award to subcontractors holding current certification from the Connecticut Department of Administrative Services ("DAS") under the provisions of CONN. GEN. STAT. § 4a-60g. (25% of the work with DAS certified Small and Minority owned businesses and 25% of that work with DAS certified Minority, Women and/or Disabled owned businesses.) The contractor must demonstrate good faith effort to meet the 25% set-aside goals.~~

LAWS AND REGULATIONS:

The bidders' attention is directed to the fact that all applicable State laws, municipal ordinances, and the rules and regulations of all authorities having jurisdiction over the construction of the project shall apply to the contract throughout, and they are considered in the contract the same as though they were written in full.

~~The contractor selected to perform this State project must comply with CONN. GEN. STAT. §§ 4a-60,04a-60a, 4a-60g, and 46a-68b through 46a-68f, inclusive, as amended by June 2015 special Session Public Act 15-5. An Affirmative Action Plan must be filed with and approved by the Commission on Human Rights and Opportunities prior to the commencement of construction.~~

~~State law requires a minimum of twenty five (25%) percent of the state funded portion of the contract for award to subcontractors holding current certification from the Connecticut Department of Administrative Services ("DAS") under the provisions of CONN. GEN STAT. §§ 4a-60g, as amended. (25% of the work with DAS certified Small and Minority owned businesses and 25% of that work with DAS certified Minority, Women and/or Disabled owned businesses.) The contractor must demonstrate good faith effort to meet the 25% set-aside goals.~~

~~For the purpose of calculating the 25% set aside amount, the state-funded portion of this contract is 100%.~~

~~For municipal public works contracts and quasi public agency reports, the contractor must file a written or electronic non-discrimination certification with the Commission on Human Rights and Opportunities. Forms can be found at http://www.ct.gov/opm/cwp/view.asp?a=2982&q=390928&opmNav_GID=1806.~~

~~The contractors must file the OPM completed non-discrimination certification/affidavit with CHRO. It can be emailed to spencer.hill@ct.gov (Forms included)~~

~~The Notification to Bidders/Contract Compliance Monitoring Report also must be included in the bid document for contractors to complete and return with their bid. (Forms Included)~~

END OF SECTION

SECTION 1.08
PROSECUTION AND PROGRESS

1.08.01 – TRANSFER OF WORK OR CONTRACT

1.08.04.01 WORKING HOURS, NIGHT WORK, SATURDAYS, SUNDAYS AND HOLIDAYS

1.08.04.02 CITY INSPECTIONS

1.08.11—CLEANING UP

ARTICLE 1.08.01 – TRANSFER OF WORK OR CONTRACT:

Add the following after the last paragraph:

The Contractor shall pay the subcontractor for work performed within thirty (30) days after the Contractor receives payment for the work performed by the subcontractor. Also, any retained monies on a subcontractor's work shall be paid to the subcontractor within thirty (30) days after satisfactory completion of all the subcontractor's work.

For the purpose of this Item, satisfactory completion shall have been accomplished when:

(1) The subcontractor has fulfilled the contract requirements of both the Department and the subcontract for the subcontracted work, including the completion of any specified material and equipment testing requirement or plant establishment period and the submission of all submittals (i.e.: certified payrolls, material samples and certifications, required state and federal submissions, etc.) required by the specifications and the Department, and

(2) The work done by the subcontractor has been inspected and approved by the Department and the final quantities of the subcontractor's work have been determined and agreed upon.

If the Contractor determines that a subcontractor's work is not complete, the Contractor shall notify the subcontractor and the Engineer, in writing, of the reasons why the subcontractor's work is not complete. This written notification shall be provided to the subcontractor and the Engineer within twenty-one (21) days of the subcontractor's request for release of retainage.

The Engineer will institute administrative procedures to expedite the determination of final quantities for the subcontractor’s satisfactorily completed work.

The inspection and approval of a subcontractor's work does not eliminate the Contractor's responsibilities for all the work as defined in Article 1.07.12, "Contractor's Responsibility for Work."

The inspection and approval of the subcontractor’s work does not release the subcontractor from its responsibility for maintenance and other periods of subcontractor responsibility specified for the subcontractor’s items of work. Failure of a subcontractor to meet its maintenance, warranty and/or defective work responsibilities may result in a finding that the subcontractor is non-responsible on future subcontract assignments.

For any dispute regarding prompt payment or release of retainage, the alternate dispute resolution provisions of this article shall apply.

The above requirements are also applicable to all sub-tier subcontractors and the above provisions shall be made a part of all subcontract agreements.

Failure of the Contractor to comply with the provisions of this section may result in a finding that the Contractor is non-responsible on future projects.

Article 1.08.04 - Limitation of Operations - Add the following:

1.08.04.01 WORKING HOURS, NIGHT WORK, SATURDAYS, SUNDAYS AND HOLIDAYS:

In order to provide for traffic operations as outlined in the Special Provision "Maintenance and Protection of Traffic," the Contractor will not be allowed to perform any work that will interfere with existing traffic operations on all project roadways as follows:

The roadway may be closed to local traffic only during the workday provided all required signage are in place. The roadway shall remain open to one lane traffic at all time through the work zone for local and emergency traffic to pass through.

The roadway shall be open to two-way traffic at the end of each workday.

The Contractor will not be permitted to do any work which will interfere with normal traffic operations on any project roadways when any other Contractor is restricting normal traffic operations on the same roadway within one-half mile of a lane closure on this project unless the Contractors have coordinated the lane closure and this coordination is acceptable to the Engineer.

Night work or work on Saturdays, Sundays or legal holidays will not be permitted except for emergencies or as specified elsewhere.

1.08.11—CLEANING UP

1.01 CONTRACT DOCUMENT

The general provisions of the CONTRACT, including General and Supplementary Conditions and General Requirements, apply to the work specified in this subsection.

1.02 DESCRIPTION

A. During its progress the Work and the adjacent areas affected thereby shall be kept cleaned up and all rubbish, surplus materials and unneeded construction equipment shall be removed and all damage repaired so that the public and property owners will be inconvenienced as little as possible.

B. Where material or debris has washed or flowed into or been placed in water-courses, ditches, gutters, drains, catch basins or elsewhere as a result of the CONTRACTOR's operations, such material or debris shall be entirely removed and satisfactorily disposed of during the progress of the Work and the ditches, channels, drains, etc., kept in a neat, clean and functioning condition.

C. On or before the completion of the Work, the CONTRACTOR shall, unless otherwise especially directed or permitted in writing, tear down and remove all temporary structures built by him; shall remove all rubbish from any grounds which he has occupied; and shall leave the roads and all parts of the premises and adjacent property affected by his operations in a neat clean and functioning condition.

D. The CONTRACTOR shall restore or replace, when and as directed, any public or private property damaged by his work, equipment or employees, to a condition at least equal to that existing immediately prior to the beginning of operations. The CONTRACTOR shall do, as required, all necessary highway or driveway, walk and landscaping Work. Suitable materials, equipment and methods shall be used for such restoration, or as required in other divisions of this specification.

E. In case the CONTRACTOR shall fail or neglect, after backfilling, to promptly remove all surplus materials, tools and other incidentals, or promptly do the required repaving when ordered, the CITY may, after 24 hours notice, cause the work to be done and the cost thereof shall be deducted from any monies then or thereafter due the CONTRACTOR.

F. All excavated materials not approved for backfill and fill, all surplus material and all rock and boulders resulting from the excavations; shall be removed and satisfactorily disposed of, off the site, by the CONTRACTOR at no additional expense to the CITY.

1.03 MEASUREMENT AND PAYMENT

This item will not be measured for payment. All costs in connection with this work shall be included in the Contract Unit prices bid for the various items of work in the Bid Proposal.

SECTION 4.06
BITUMINOUS CONCRETE

ITEM 0406442A- BITUMINOUS CONCRETE
ITEM 0406236A - MATERIAL FOR TACK COAT

4.06.01—Description
4.06.02—Materials
4.06.03—Construction Methods
4.06.04—Method of Measurement
4.06.05—Basis of Payment

4.06.01—DESCRIPTION: Work under this section shall include the production, delivery and placement of a non-segregated, smooth and dense bituminous concrete mixture brought to proper grade and cross section. This section shall also include the method and construction of longitudinal joints. The terms listed below as used in this specification are defined as:

Bituminous Concrete: A concrete material that uses a bituminous material (typically asphalt) as the binding agent and stone and sand as the principal aggregate components. Bituminous concrete may also contain any of a number of additives engineered to modify specific properties and/or behavior of the concrete material. For the purposes of this Specification, references to bituminous concrete apply to all of its sub-categories, for instance those defined on the basis of production and placement temperatures, such as hot-mix asphalt (HMA) or warm-mix asphalt (WMA), or those defined on the basis of composition, such as those containing polymer-modified asphalt (PMA).

Course: A lift or multiple lifts comprised of the same bituminous concrete mixture placed as part of the pavement structure.

Density Lot: All material placed in a single lift and as defined in Article 4.06.03.

Disintegration: Wearing away or fragmentation of the pavement. Disintegration will be evident in the following forms: Polishing, weathering-oxidizing, scaling, spalling, raveling, potholes or loss of material.

Dispute Resolution: A procedure used to resolve conflicts resulting from discrepancies between the Engineer and the Contractor's density results that may affect payment.

Hot Mix Asphalt (HMA): A bituminous concrete mixture typically produced at 325°F.

Lift: An application of a bituminous concrete mixture placed and compacted to a specified thickness in a single paver pass.

Polymer Modified Asphalt (PMA): A bituminous concrete mixture containing a polymer modified asphalt binder in accordance with contract specifications. All PMA mixtures shall incorporate a qualified warm mix technology.

Production Lot: All material placed during a continuous daily paving operation.

Quality Assurance (QA): All those planned and systematic actions necessary to provide confidence that a product or facility will perform as designed.

Quality Control (QC): The sum total of activities performed by the vendor (Producer, Manufacturer, and Contractor) to ensure that a product meets contract specification requirements.

Reference Specifications: Connecticut Department of Transportation Form 817, latest edition.

Superpave: A bituminous concrete mix design used in mixtures designated as "S*" Where "S" indicates Superpave and * indicates the sieve related to the nominal maximum aggregate size of the mix.

Segregation: A non-uniform distribution of a bituminous concrete mixture in terms of gradation, temperature, or volumetric properties.

Warm Mix Asphalt (WMA): A bituminous concrete mixture that can be produced and placed at reduced temperatures than HMA using a qualified additive or technology.

4.06.02--MATERIALS: All materials shall conform to the requirements of Section M.04 of the Reference Specifications.

1. Materials Supply: The bituminous concrete mixture must be from one source of supply and originate from one Plant unless authorized by the Engineer. Bituminous Concrete plant QCP requirements are defined in Section M.04.

2. Recycled Materials: Reclaimed Asphalt Pavement (RAP), Crushed Recycled Container Glass (CRCG), Recycled Asphalt Shingles (RAS), or crumb rubber (CR) from recycled tires may be incorporated in bituminous concrete mixtures in accordance with Section M.04 and Project Specifications. CRCG and RAS shall not be used in the surface course.

3. Bituminous Tack Coat shall conform to Section M.04.01of the Reference Specifications and shall be applied between bituminous concrete layers in case of delayed construction or overlays of existing pavements.

4.06.03—CONSTRUCTION METHODS:

1. Material Documentation: All vendors producing bituminous concrete must have their truck-weighing scales, storage scales, and mixing plant automated to provide a detailed ticket.

Delivery tickets shall include the following information:

a. State of Connecticut printed on ticket.
b. Name of producer, identification of plant, and specific storage bin (silo) if used.
c. Date and time of day.
d. Mixture Designation; Mix type and level Curb mixtures for machine-placed curbing must state "curb mix only".
e. If RAP is used, the plant printouts shall include the RAP dry weight, percentage and daily moisture content.
f. If RAS is used, the plant printouts shall include the RAS dry weight and percentage daily moisture content.
g. The delivery ticket for all mixes produced with Warm Mix Technology must indicate the additive name, and the injection rate (water or additive) incorporated at the HMA plant. The delivery ticket for all mixes produced with pre-blended WMA additive must indicate the name of the WMA Technology.
h. Net weight of mixture loaded into truck (When RAP and/or RAS is used the moisture content shall be excluded from mixture net weight).
i. Gross weight (Either equal to the net weight plus the tare weight or the loaded scale weight).
j. Tare weight of truck – Daily scale weight.
k. Project number, purchase order number, name of Contractor (if Contractor other than Producer).
l. Truck number for specific identification of truck.
m. Individual aggregate, Recycled Materials, and virgin asphalt high/target/low weights. For drum plants and silo loadings, the plant printouts shall be produced at 5 minute intervals maintained by the vendor for a period of three years after the completion of the project.
n. For every mixture designation the running daily total delivered and sequential load number.

The net weight of mixture loaded into the truck must be equal to the cumulative measured weight of its components.

The Contractor must notify the Engineer immediately if, during the production day, there is a malfunction of the weighing or recording system in the automated plant or truck-weighing scales. Manually written tickets containing all required information will be allowed for one hour, but for no longer, provided that each load is weighed on city-approved scales. At the Engineer's sole discretion, trucks may be approved to leave the plant if a city inspector is present to monitor weighing. If such a malfunction is not fixed within forty-eight hours, mixture will not be approved to leave the plant until the system is fixed to the Engineer's satisfaction. No damages will be considered should the city be unable to provide an inspector at the plant.

The city reserves the right to have an inspector present to monitor batching and /or weighing operations.

2. Transportation of Mixture: Trucks with loads of bituminous concrete being delivered to city projects must not exceed the statutory or permitted load limits referred to as gross vehicle weight (GVW). The Contractor shall furnish a list of all vehicles and allowable weights transporting mixture.

The city reserves the right to check the gross and tare weight of any delivery truck. A variation of 0.4 percent or less in the gross or tare weight shown on the delivery ticket and the certified scale weight shall be considered evidence that the weight shown on the delivery ticket is correct. If the gross or tare weight varies from that shown on the delivery ticket by more than 0.4 percent, the Engineer will recalculate the net weight. The Contractor shall take action to correct discrepancy to the satisfaction of the Engineer.

If a truck delivers mixture to the project and the ticket indicates that the truck is overweight, the load will not be rejected but a "Measured Weight Adjustment" will be taken in accordance with Article 4.06.04.

The mixture shall be transported from the mixing plant in trucks that have previously been cleaned of all foreign material and that have no gaps through which mixture might inadvertently escape. The Contractor shall take care in loading trucks uniformly so that segregation is minimized. Loaded trucks shall be tightly covered with waterproof covers acceptable to the Engineer. Mesh covers are prohibited. The front and rear of the cover must be fastened to minimize air infiltration. The Contractor shall assure that all trucks are in conformance with this specification. Trucks found not to be in conformance shall not be allowed to be loaded until re-inspected to the satisfaction of the Engineer.

Truck body coating and cleaning agents must not have a deleterious effect on the transported mixture. The use of solvents or fuel oil, in any concentration, is strictly prohibited for the coating of the inside of truck bodies. When acceptable coating or agents are applied, truck bodies shall be raised immediately prior to loading to remove any excess agent in an environmentally acceptable manner.

3. Paving Equipment: The Contractor shall have the necessary paving and compaction equipment at the project site to perform the work. All equipment shall be in good working order and any equipment that is worn, defective or inadequate for performance of the work shall be repaired or replaced by the Contractor to the satisfaction of the Engineer. During the paving operation, the use of solvents or fuel oil, in any concentration, is strictly prohibited as a release agent or cleaner on any paving equipment (i.e., rollers, pavers, transfer devices, etc.).

Refueling of equipment is prohibited in any location on the paving project where fuel might come in contact with bituminous concrete mixtures already placed or to be placed. Solvents for use in cleaning mechanical equipment or hand tools shall be stored clear of areas paved or to be paved. Before any such equipment and tools are cleaned, they shall be moved off the paved or to be paved area; and they shall not be returned for use until after they have been allowed to dry.

Pavers: Each paver shall have a receiving hopper with sufficient capacity to provide for a uniform spreading operation and a distribution system that places the mix uniformly, without segregation. The paver shall be equipped with and use a vibratory screed system with heaters or burners. The screed system shall be capable of producing a finished surface of the required evenness and texture without tearing, shoving, or gouging the mixture. Pavers with extendible screed units as part of the system shall have auger extensions and tunnel extenders as necessary. Automatic screed controls for grade and slope shall be used at all times unless otherwise authorized by the Engineer. The controls shall automatically adjust the screed to compensate for irregularities in the preceding course or existing base. The controls shall maintain the proper transverse slope and be readily adjustable, and shall operate from a fixed or moving reference such as a grade wire or floating beam.

Rollers: All rollers shall be self-propelled and designed for compaction of bituminous concrete. Rollers types shall include steel-wheeled, pneumatic or a combination thereof and may be capable of operating in a static or dynamic mode. Rollers that operate in a dynamic mode shall have drums that use a vibratory or oscillatory system or combination of. The vibratory system achieves compaction through vertical amplitude forces. Rollers with this system shall be equipped with indicators that provide the operator with amplitude, frequency and speed settings/readouts to measure the impacts per foot during the compaction process. The oscillatory system achieves compaction through horizontal shear forces. Rollers with this system shall be equipped with frequency indicators. Rollers can operate in the dynamic mode using the oscillatory system on concrete structures such as bridges and catch basins if at the lowest frequency setting.

Pneumatic tire rollers shall be self-propelled and equipped with wide-tread compaction tires capable of exerting an average contact pressure from 60 to 90 pounds per square inch uniformly over the surface, adjusting ballast and tire inflation pressure as required. The Contractor shall furnish evidence regarding tire size; pressure and loading to confirm that the proper contact pressure is being developed and that the loading and contact pressure is uniform for all wheels.

The contractor shall use as many rollers as needed to achieve the required compaction specifications. The minimum number of fully functional operating rollers required for each paver shall be three (3) rollers; One (1) breakdown roller, one (1) compaction roller and one (1) finish roller.

4. Test Section: The Engineer may require the Contractor to place a test section whenever the requirements of this specification or Section M.04 are not met.

The Contractor shall submit the quantity of mixture to be placed and the location of the test section for review and acceptance by the Engineer. The equipment used in the construction of a passing test section shall be used throughout production.

If a test section fails to meet specifications, the Contractor shall stop production, make necessary adjustments to the job mix formula, plant operations, or procedures for placement and compaction. The Contractor shall construct test sections, as allowed by the Engineer, until all the required specifications are met. All test sections shall also be subject to removal as set forth in Article 1.06.04.

5. Transitions for Roadway Surface: Transitions shall be formed at any point on the roadway where the pavement surface deviates, vertically, from the uniform longitudinal profile as specified on the plans. Whether formed by milling or by bituminous concrete mixture, all transition lengths shall conform to the criteria below unless otherwise specified.

Permanent Transitions: A permanent transition is defined as any transition that remains as a permanent part of the work. All permanent transitions, leading and trailing ends shall meet the following length requirements:

a) Posted speed limit is greater than 35 MPH: 30 feet per inch of vertical change (thickness)
b) Posted speed limit is 35 MPH or less: 15 feet per inch of vertical change (thickness).
c) Bridge Overpass and underpass transition length will be 75 feet either
    (1) Before and after the bridge expansion joint, or
    (2) Before or after the parapet face of the overpass.

In areas where it is impractical to use the above described permanent transition lengths the use of a shorter permanent transition length may be permitted when approved by the Engineer.

Temporary Transitions: A temporary transition is defined as a transition that does not remain a permanent part of the work. All temporary transitions shall meet the following length requirements:

a) Posted speed limit is greater than 50 MPH
    (1) Leading Transitions = 15 feet per inch of vertical change (thickness)
    (2) Trailing Transitions = 6 feet per inch of vertical change (thickness)
b) Posted speed limit is 40, 45, or 50 MPH
    (1) Leading and Trailing = 4 feet per inch of vertical change (thickness)
c) Posted speed limit is 35 MPH or less
    (1) Leading and Trailing = 3 feet per inch of vertical change (thickness)

Note: Any temporary transition to be in-place over the winter shutdown period or during extended periods of inactivity (more than 14 calendar days) shall conform to the greater than 50 MPH requirements shown above.

6. Spreading and Finishing of Mixture: Prior to the placement of the bituminous concrete, the underlying base course shall be brought to the plan grade and cross section within the allowable tolerance. Immediately before placing the mixture, the area to be surfaced shall be cleaned by sweeping or by other means acceptable to the Engineer. The bituminous concrete mixture shall not be placed whenever the surface is wet or frozen. The Engineer will verify the mix temperature by means of a probe or infrared type of thermometer. A probe type thermometer, must be used in order to reject a load of mixture based on temperatures outside the range stated.

Placement: The bituminous concrete mixture shall be placed and compacted to provide a smooth, dense surface with a uniform texture and no segregation at the specified thickness and dimensions indicated in the plans and specifications.

When unforeseen weather conditions prevent further placement of the mix, the Engineer is not obligated to accept or place the bituminous concrete mixture that is in transit from the plant.

In advance of paving, traffic control requirements shall be set up daily, maintained throughout placement, and shall not be removed until all associated work including density testing is completed.

The Contractor shall inspect the newly placed pavement for defects in the mixture or placement before rolling is started. Any deviation from standard crown or section shall be immediately remedied by placing additional mixture or removing surplus mixture. Such defects shall be corrected to the satisfaction of the Engineer.

Where it is impractical due to physical limitations to operate the paving equipment, the Engineer may permit the use of other methods or equipment. Where hand spreading is permitted, the mixture shall be placed by means of suitable shovels and other tools, and in a uniformly loose layer at a thickness that will result in a completed pavement meeting the designed grade and elevation.

Placement Tolerances: Each lift of bituminous concrete placed at a uniform specified thickness shall meet the following requirements for thickness and area. Any pavement exceeding these limits shall be subject to an adjustment or removal. Lift tolerances will not relieve the Contractor from meeting the final designed grade. Lifts of specified non-uniform thickness, i.e. wedge or shim course, shall not be subject to thickness and area adjustments.

a) Thickness- Where the total thickness of the lift of mixture exceeds that shown on the plans beyond the tolerances shown in Table 4.06-3, the longitudinal limits of such variation including locations and intervals of the measurements will be documented by the Engineer for use in calculating an adjustment in accordance with Article 4.06.04.

TABLE 4.06-3: Thickness Tolerances

Mixture Designation	Lift Tolerance
S1	+/- ⅜ inch
S0.25, S0.375, S0.5	+/- ¼ inch

Where the thickness of the lift of mixture is less than that shown on the plans beyond the tolerances shown in Table 4.06-3, the Contractor, with the approval of the Engineer, shall take corrective action in accordance with this specification.

b) Area- Where the width of the lift exceeds that shown on the plans by more than the specified thickness of each lift, the longitudinal limits of such variation including locations and intervals of the measurements will be documented by the Engineer for use in calculating the adjustment in Article 4.06.04.

c) Delivered Weight of Mixture - When the delivery ticket shows that the truck exceeds the allowable gross weight for the vehicle type the quantity of tons representing the overweight amount will be documented by the Engineer for use in calculating an adjustment in accordance with Article 4.06.04.

Transverse Joints: All transverse joints shall be formed by saw-cutting a sufficient distance back from the previous run, existing bituminous concrete pavement or bituminous concrete driveways to expose the full thickness of the lift. A brush of tack coat shall be used on any cold joint immediately prior to additional bituminous concrete mixture being placed.

Tack Coat Application: Immediately before application, the area to be tacked shall be cleaned by sweeping or by other means acceptable to the Engineer. A thin uniform coating of tack coat shall be applied to the pavement immediately before overlaying and be allowed sufficient time to break (set) prior to any paving equipment or haul vehicles driving on it. All surfaces in contact with the bituminous concrete that have been in place longer than 3 calendar days shall have an application of tack coat. The tack coat shall be applied by a non-gravity pressurized spray system that results in uniform overlapping coverage at an application rate of 0.03 to 0.05 gallons per square yard for a non-milled surface and an application rate of 0.05 to 0.07 gallons per square yard for a milled surface. For areas where both milled and un-milled surfaces occur, the tack coat shall be an application rate of 0.03 to 0.05 gallons per square yard. The Engineer must approve the equipment and the method of measurement prior to use. The material for tack coat shall not be heated in excess of 160°F and shall not be further diluted.

Compaction: The Contractor shall compact the mixture to meet the density requirements as stated in Article 4.06.03 and eliminate all roller marks without displacement, shoving, cracking, or aggregate breakage.

When placing a lift with a specified thickness less than one and one-half (1 ½) inches, or a wedge course, the Contractor shall provide a minimum rolling pattern as determined by the development of a compaction curve

The use of the vibratory system on concrete structures is prohibited. When approved by the Engineer, the Contractor may operate a roller using an oscillatory system at the lowest frequency setting.

If the Engineer determines that the use of compaction equipment in the dynamic mode may damage highway components, utilities, or adjacent property, the Contractor shall provide alternate compaction equipment. The Engineer may allow the Contractor to operate rollers in the dynamic mode using the oscillatory system at the lowest frequency setting.

Rollers operating in the dynamic mode shall be shut off when changing directions.

These allowances will not relieve the Contractor from meeting pavement compaction requirements.

Surface Requirements: The pavement surface of any lift shall meet the following requirements for smoothness and uniformity. Any irregularity of the surface exceeding these requirements shall be corrected by the Contractor.

a) Smoothness- Each lift of the surface course shall not vary more than ¼ inch from a Contractor-supplied 10 foot straightedge. For all other lifts of bituminous concrete, the tolerance shall be ⅜ inch. Such tolerance will apply to all paved areas.

b) Uniformity- The paved surface of the mat and joints shall not exhibit segregation, rutting, cracking, disintegration, flushing or vary in composition as determined by the Engineer.

7. Longitudinal Joint Construction Methods: The Contractor shall use **Method II- Butt Joint (see Figure 4.06-2)** when constructing longitudinal joints where lift thicknesses are between 1½ and 3 inches or where directed by the Engineer. S1.0 mixtures shall be excluded from using Method I. ~~Method II Butt Joint (see Figure 4.06-2) shall be used for lifts less than 1½ inches or greater than or equal to 3 inches~~. During placement of multiple lifts, the longitudinal joint shall be constructed in such a manner that it is located at least 6 inches from the joint in the lift immediately below. The joint in the final lift shall be at the centerline or at lane lines. Each longitudinal joint shall maintain a consistent offset from the centerline of the roadway along its entire length. The difference in elevation between the two faces of any completed longitudinal joint shall not exceed ¼ inch in any location.

Method I - Notched Wedge Joint:

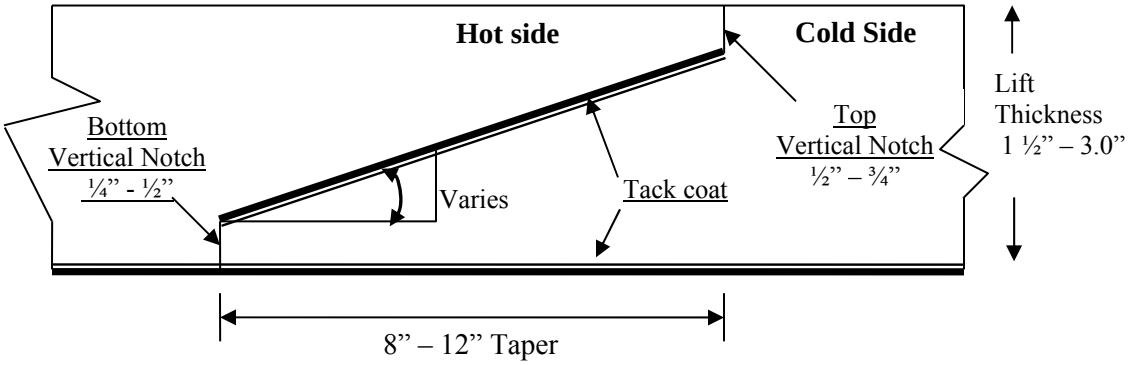

FIGURE 4.06-1: Notched Wedge Joint

A notched wedge joint shall be constructed as shown in Figure 4.06-1 using a device that is attached to the paver screed and is capable of independently adjusting the top and bottom vertical notches. The device shall have an integrated vibratory system.

The taper portion of the wedge joint must be placed over the longitudinal joint in the lift immediately below. The top vertical notch must be located at the centerline or lane line in the final lift. The requirement for paving full width "curb to curb" as described in Method II may be waived if addressed in the QC plan and approved by the Engineer.

The taper portion of the wedge joint shall be evenly compacted using equipment other than the paver or notch wedge joint device.

The taper portion of the wedge joint shall not be exposed to traffic for more than 5 calendar days.

Any exposed wedge joint must be located to allow for the free draining of water from the road surface.

The Engineer reserves the right to define the paving limits when using a wedge joint that will be exposed to traffic.

If Method I, Notched Wedge Joint cannot be used on lifts between 1.5 and 3 inches, Method III Butt Joint may be substituted according to the requirements below for "Method III – Butt Joint with Hot Pour Rubberized Asphalt Treatment."

Method II - Butt Joint:

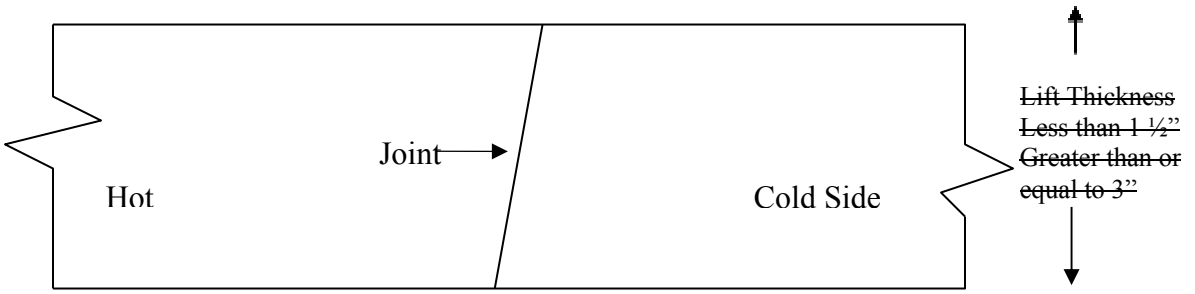

FIGURE 4.06-2: Butt Joint

When adjoining passes are placed, the Contractor shall utilize equipment that creates a near vertical edge (refer to Figure 4.06-2). The completing pass (hot side) shall have sufficient mixture so that the compacted thickness is not less than the previous pass (cold side). The end gate on the paver should be set so there is an overlap onto the cold side of the joint.

The Contractor shall not allow any butt joint to be incomplete at the end of a work shift unless otherwise allowed by the Engineer. When using this method, the Contractor is not allowed to leave a vertical edge exposed at the end of a work shift and must complete paving of the roadway full width "curb to curb."

Method III- Butt Joint with Hot Poured Rubberized Asphalt Treatment: If Method I Wedge Joint cannot be used due to physical constraints in certain limited locations; the contractor may submit a request in writing for approval by the Engineer, to utilize Method III Butt Joint as a substitution in those locations. There shall be no additional measurement or payment made when the Method III Butt Joint is substituted for the Method I Notched Wedge Joint. When required by the contract or approved by the Engineer, Method III (see Figure 4.06-3) shall be used.

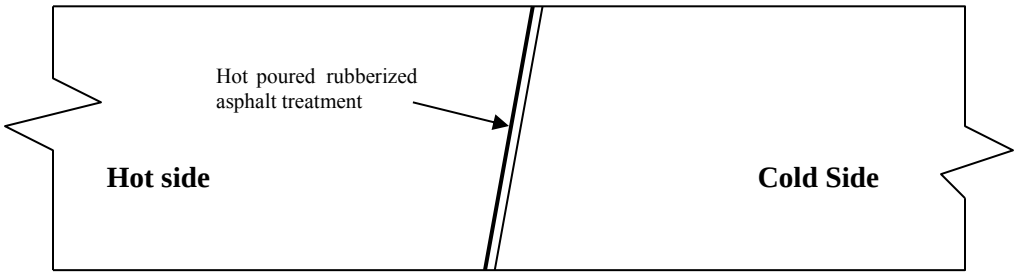

FIGURE 4.06-3: Butt Joint with Hot Poured Rubberized Asphalt Treatment

All of the requirements of Method II must be met with Method III. In addition, the longitudinal vertical edge must be treated with a rubberized joint seal material meeting the requirements of ASTM D 6690, Type 2. The joint sealant shall be placed on the face of the "cold side" of the butt joint as shown above prior to placing the "hot side" of the butt joint. The joint seal material shall be applied in accordance with the manufacturer's recommendation so as to provide a uniform coverage and avoid excess bleeding onto the newly placed pavement.

8. Contractor Quality Control (QC) Requirements:
The Contractor shall be responsible for maintaining adequate quality control procedures throughout the production and placement operations. Therefore, the Contractor must ensure that the materials, mixture and work provided by Subcontractors, Suppliers and Producers also meet contract specification requirements.

9. Temperature and Seasonal Requirements: Paving, including placement of temporary pavements, shall be divided into two seasons, "In-Season" and "Extended-Season". In-Season paving occurs from May 1 – October 14, and Extended Season paving occurs from October 15- April 30. The following requirements shall apply unless otherwise authorized or directed by the Engineer:

- Bituminous concrete mixes shall not be placed when the air or sub base temperature is below 40°F regardless of the season.
- Should paving operations be scheduled during the Extended Season, the Contractor must submit an Extended Season Paving Plan for the project that addresses minimum delivered mix temperature considering WMA, PMA or other additives, maximum paver speed, enhanced rolling patterns and the method to balance mixture delivery and placement operations. Paving during Extended Season shall not commence until the Engineer has approved the plan.

10. **Field Density Testing:** Field Density testing will be based on In-Place Nuclear Density Gauge results. Results may be corrected by correlating with cores cut from the compacted roadway according to Section 4.07- Field Density Testing Correction of these technical specifications, to improve and produce higher accuracy density results. Nuclear Density Gauge results shall form the basis of acceptance based on the density specifications listed herein. Sections of roadways identified with density results below the acceptable range as listed herein may require additional Nuclear Density or Core testing. Density results from Nuclear Density Gauge results or laboratory core density results not meeting the required specifications may be subject to corrective measures or replacement as required in this technical specification.

The contractor shall compact each lift of bituminous concrete to a target density of 94.5 %.
The contractor shall compact each lift of bituminous concrete to a minimum density of 93.0 % and no greater than a maximum density of 97.0%

11. **Obtaining Bituminous Concrete Cores:** Cores will be obtained at the beginning of the project to determine a correlation factor between the Nuclear Density Readings and the Core density as required in Section 4.07 Field Density Testing Correction of these technical specifications.
Additional cores may be taken during or after paving operations to determine other parameters as required by the Engineer as an additional quality control method. Cores may be taken after the second lift at the total depth that includes all lifts. The Engineer shall determine the location and number of cores as required to obtain the best representative sample.

Cores shall be obtained by the Contractor. Coring for Field Density Testing Correction shall be performed by the Contractor according to Section 4.07 Field Density Testing Correction. The Contractor shall extract cores from locations determined by the Engineer. The Engineer must witness the extraction, labeling of cores and filling of the core holes. After the lift has been compacted and cooled, the Contractor shall cut cores and remove them without damaging the lift(s) to be tested. Any core that is damaged or obviously defective while being obtained will be replaced with a new core from a location within 2 feet measured in a longitudinal direction.

The cores shall be labeled by the Contractor with the project number, date placed, lot number and sub-lot number. The core's label shall, include "M" for a mat core and "J" for a joint core. A mat core from the second lot and first sub-lot shall be labeled "M2 – 1" (Figure 4.06-4). The Engineer shall fill out a MAT-109 to accompany the cores. The Contractor shall deliver the cores and MAT-109 to the City's Testing Company. The Contractor shall use a container approved by the Engineer. The container shall have a lid capable of being locked shut and tamper proof. The Contractor shall use foam, bubble wrap, or another suitable material to prevent the cores from being damaged during handling and transportation. Once the cores and MAT-109 are in the container the Engineer will secure the lid using a security seal. The security seal's identification number must be documented on the MAT-109. City's Testing Company personnel will break the security seal and take possession of the cores.

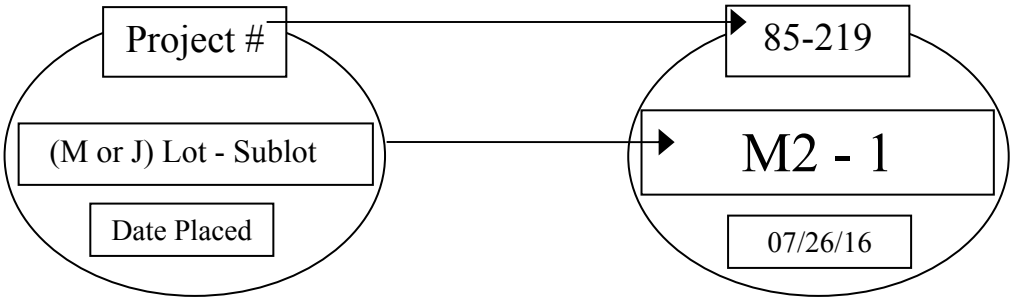

FIGURE 4.06-10: Labeling of Cores

Each core hole shall be filled within four hours upon core extraction. Prior to being filled, the hole shall be prepared by removing any free water and applying tack coat using a brush or other means to uniformly cover the cut surface. The core hole shall be filled using a bituminous concrete mixture at a minimum temperature of 240ºF containing the same or smaller nominal maximum aggregate size and compacted with a hand compactor or other mechanical means to the maximum compaction possible. The bituminous concrete shall be compacted to ⅛ inch above the finished pavement.

12. Acceptance Inspection, Sampling and Testing: Inspection, sampling, and testing to be used by the Engineer shall be performed at the minimum frequency specified in Section M.04 or as stated herein or as deemed necessary by the Engineer.

Sampling for acceptance shall be established using ASTM D 3665, or a statistically based procedure of random sampling approved by the Engineer.

The Engineer may at any time take production samples from the hauling vehicles or at the production plant facility as required and perform quality characteristic control testing of the mix. These test results may be used to calibrate Field Nuclear Density Testing equipment.

13. Density Dispute Resolution Process: The Contractor and Engineer will work in partnership to avoid potential conflicts and to resolve any differences that may arise during quality control or acceptance testing for density. Both parties will review their sampling and testing procedures and results and share their findings. If the Contractor disputes the Engineer's test results, the Contractor must submit in writing a request to initiate the Dispute Resolution Process within 7 calendar days of the notification of the test results. Should the dispute not be resolved through evaluation of existing testing data or procedures, the Engineer may authorize the Contractor to obtain core samples for the disputed area.

14. Corrective Work Procedures: Any portion of the completed pavement that does not meet the requirements of this specification shall be corrected at the expense of the Contractor. Any corrective courses placed as the final wearing surface shall match the specified lift thickness after compaction.

If pavement placed by the Contractor does not meet the specifications, and the Engineer requires its replacement or correction, the Contractor shall:

a) Propose a corrective procedure to the Engineer for review and approval prior to any corrective work commencing. The proposal shall include:
   - Limits of pavement to be replaced or corrected, indicating stationing or other landmarks that are readily distinguishable.
   - Proposed work schedule.
   - Construction method and sequence of operations.
   - Methods of maintenance and protection of traffic.
   - Material sources.
   - Names and telephone numbers of supervising personnel.

b) Perform all corrective work in accordance with the Contract and the approved corrective procedure.

15. Protection of the Work: The Contractor shall protect all sections of the newly finished pavement from damage that may occur as a result of the Contractor's operations for the duration of the Project. Prior to the Engineer's authorization to open the pavement to traffic, the Contractor is responsible to protect the pavement from damage.

16. Cut Bituminous Concrete Pavement: Work under this item shall consist of making a straight-line cut in the pavement to the lines delineated on the plans or as directed by the Engineer. The cut shall provide a straight, clean, vertical face with no cracking, tearing or breakage along the cut edge.

4.06.04—METHOD OF MEASUREMENT:

1. HMA S *: The quantity of bituminous concrete measured for payment will be determined by the documented net weight in tons accepted by the Engineer in accordance with this specification and Section M.04.

2. Adjustments: Adjustments may be applied to bituminous concrete quantities and will be measured for payment using the following formulas:

Yield Factor for Adjustment Calculation = 0.0575 Tons/SY/inch

Actual Area = [(Measured Length (ft)) x (Avg. of width measurements (ft))]

Actual Thickness (t) = Total tons delivered / [Actual Area (SY) x 0.0575 Tons/SY/inch]

a) Area: If the average width exceeds the allowable tolerance, an adjustment will be made using the following formula. The tolerance for width is equal to the specified thickness (in.) of the lift being placed.

Tons Adjusted for Area (T_A) = [(L x W_{adj})/9] x (t) x 0.0575 Tons/SY/inch = (-) Tons

Where: L = Length (ft)
(t) = Actual thickness (inches)
W_{adj} = (Designed width (ft) + tolerance /12) - Measured Width)

b) Thickness: If the actual average thickness is less than the allowable tolerance, the Contractor shall submit a repair procedure to the Engineer for approval. If the actual thickness exceeds the allowable tolerance, an adjustment will be made using the following formula:

Tons Adjusted for Thickness (T_T) = A x t_{adj} x 0.0575 = (-) Tons

Where: A = Area = {[L x (Designed width + tolerance (lift thickness)/12)] / 9}
t_{adj} = Adjusted thickness = [(Dt + tolerance) - Actual thickness]
Dt = Designed thickness (inches)

c) Weight: If the quantity of bituminous concrete representing the mixture delivered to the project is in excess of the allowable gross vehicle weight (GVW) for each vehicle, an adjustment will be made using the following formula:

Tons Adjusted for Weight (T_W) = GVW – DGW= (-) Tons

Where: DGW = Delivered gross weight as shown on the delivery ticket or measured on a certified scale.

3. Transitions for Roadway Surface: Temporary transitions shall not be measured for payment. The installation and removal of a bond breaker, and the removal and disposal of any temporary transition formed by milling or with bituminous concrete pavement is not measured for payment.

4. Material for Tack Coat: The quantity of tack coat will be measured for payment by the number of gallons furnished and applied on the Project and approved by the Engineer. No tack coat material shall be included that is placed in excess of the tolerance described in Article 4.06.03.

Method of Measurement:

a. Container Method- Material furnished in a container will be measured to the nearest ½ gallon. The volume will be determined by either measuring the volume in the original container by a method approved by the Engineer or using a separate graduated container capable of measuring the volume to the nearest ½ gallon. The container in which the material is furnished must include the description of material, including lot number or batch number and manufacturer or product source.

b. Truck Method- The Engineer will establish a weight per gallon of the tack coat based on the density at 60ºF for the material furnished. The number of gallons furnished will be determined by weighing the material on scales furnished by and at the expense of the Contractor, or from the automated metering system on the delivery vehicle.

4.06.05—BASIS OF PAYMENT:

1. HMA S* or PMA S*: The furnishing and placing of bituminous concrete will be paid for at the Contract unit price per ton for "HMA S*"

- All costs associated with cleaning the surface to be paved, including mechanical sweeping, are included in the general cost of the work. All costs associated with constructing longitudinal joints are included in the general cost of the work.
- All costs for dispute resolution are included in the general cost of the work.

2. Bituminous Concrete Adjustment Quantity: The adjustment will be calculated using the formulas shown below. A negative adjustment will be applied to the final quantity in Tons of ITEM 0406442A- BITUMINOUS CONCRETE.

Adjustment Quantity: $T_{adj} = [T_T + T_A + T_W] = (-)$ Tons

Where: T_T , T_A and T_W are calculated in Section 4.06.4-2.

3. Transitions for Roadway Surface: The installation of permanent transitions shall be paid under the quantity of asphalt place under item 0406442A - Bituminous Concrete, (HMA S 0.50) Super Pave.

The quantity of material used for the installation of temporary transitions is included in the general cost of the work. The installation and removal of a bond breaker, and the removal and disposal of any temporary transition formed by milling or with bituminous concrete pavement is included in the general cost of the work.

4. Supply and application of **tack coat** will be paid for under the bid item for "Material for Tack Coat".

PAY ITEM	**PAY UNIT**
BITUMINOUS CONCRETE, (HMA S 0.50) SUPER PAVE	**TON**
MATERIAL FOR TACK COAT	**GALLON**

END OF SECTION

SECTION 4.07
FIELD DENSITY TESTING CORRECTION

4.07.01 SCOPE
4.07.02 APPARATUS
4.07.03 CALIBRATION
4.07.04 STANDARDIZATION
4.07.05 FIELD TESTING TO ESTABLISH A NUCLEAR DENSITY CORRECTION FACTOR
4.07.06 CALCULATION OF THE CORRECTION FACTOR
4.07.07 DAILY VALIDATION
4.07.08 NUCLEAR DENSITY GAUGE REPLACEMENT
4.07.09 MAT NUCLEAR DENSITY MEARUREMENT AFTER DETERMINING CORRECTION FACTOR

Procedure for Determining a Correction Factor between Nuclear Density Readings and Cores

This procedure is intended to determine a correction factor that relates nuclear density readings to cores cut from compacted roadways. It is intended for nuclear density readings taken from the mat. Its applicability to joint density measurements is unknown.

Currently, this procedure is intended to produce a correction factor that is specific only to the project in question and the nuclear density gauge(s) to be used throughout the project. Further data collection will provide the information to determine if the correction factor is applicable for similar mixes produced with similar aggregates placed on different projects.

4.07.01 SCOPE

1.1 This method covers the determination of density of Hot Mix Asphalt (HMA) pavements in accordance with Section 4.06 of these technical specifications .

1.2 This method requires the correlation of Nuclear Density Gauge readings with core densities determined in accordance with AASHTO TP69.

1.2 All Nuclear Density Gauges to be used on a project must be correlated to the HMA and field conditions present at a project by the use of cores.

1.3 This correction procedure must be performed for all HMA mixes to be used as binder course and wearing surface. Leveling courses are exempt from this requirement.

1.4 The use of leveling sand is prohibited when testing in accordance with this procedure.

04.07.02 APPARATUS

2.1 Nuclear Density Gauge with the factory matched standard reference block including manufacturer's Operator's Manual for the specific gauge, factory calibration, Standard Count Log Book and proper transport case.

2.2 A rolling measuring device that will measure from 1 to 10,000 linear feet.

2.3 Coring machine capable of sawing cores with a minimum 6-inch (150 mm) diameter and with minimal distortion of the specimen.

2.4 Diamond blade wet saw.

2.5 Forced draft oven capable of maintaining 125 ± 5 degrees Fahrenheit.

2.6 Equipment conforming to AASHTO TP69 for determining the Bulk Specific Gravity of cores.

4.07.03 CALIBRATION

3.1 The Nuclear Density Gauge shall be calibrated in accordance with ASTM D2950 every 12 months or sooner if the readings from the gauge become suspect.

> 3.1.1 Calibration shall be performed by the gauge manufacturer or by other methods acceptable to the Engineer.

3.2 Copies of gauge calibration certificates will be submitted to the Engineer.

4.07.04 STANDARDIZATION

4.1 Standardization of the Nuclear Density Gauge shall be performed at the start of each day's work. The gauge shall be turned on and allowed to stabilize for 10-20 minutes or per manufacturer's recommendation prior to performing Standardization.

4.2 Follow the manufacturer's procedure for performing the Standardization.

4.3 Record the Standard Count in the Standard Count Log Book. If the Standard Count exceeds the reported accuracy established by the manufacturer, repeat the Standardization procedure. If the second Standard Count is within the manufacturer's tolerance, the gauge may then be used. If the second Standard Count remains outside of the manufacturer's tolerances, then the Nuclear Density Gauge must be adjusted or repaired as recommended by the manufacturer before use.

4.4 After completing Standardization, the Nuclear Density Gauge power should remain on for the rest of the day.

4.07.05 FIELD TESTING TO ESTABLISH A NUCLEAR DENSITY CORRECTION FACTOR

5.1 A correction factor between Nuclear Density Readings and cores tested in accordance with AASHTO TP69 shall be established for each HMA mixture used on a project. A new correlation factor will also be established when the job mix formula changes sufficiently to require a new mix design to be submitted. Also, a new correlation factor will be required when the target compacted thickness is changed more than 0.5 inch. A new correlation factor should be established whenever the test results from the Nuclear Density Gauge become suspect. If a different Nuclear Density Gauge is used than was during the determination of the correction factor for the project, then a new correction factor must be established for that Nuclear Density Gauge.

5.2 The correction factor will be established during the first day's production for the project. All locations used for establishing the correction factor shall occur in the travel lanes of the roadway.

5.3 10 test locations will be chosen by dividing the first days' paving occurring in the travel lanes into 10 subsections of equal length. One test location will occur within each of the subsections. Its location will be determined randomly in accordance with ASTM D3665 or other method acceptable to the Engineer.

> 5.3.1 For purposes of establishing the correction factor, no testing shall occur within 50 feet of the starting transverse joint and no testing will occur within 2 feet of either longitudinal edge. Any random transverse location falling within 2 feet of a longitudinal edge shall be eliminated and a new random transverse location determined. Unless otherwise noted, transverse offsets are referenced from the left edge when facing the direction of paving.
>
> 5.3.2 All measurements used for random locations shall be rounded to the nearest foot.

5.4 Locate points determined randomly as described in section 5.3.

5.5 At each test location, 4 nuclear density readings shall be taken. The bias in the gauge should be set to zero. For each reading, the operator must ensure the Nuclear Density Gauge is seated on a flat surface. This may be accomplished by ensuring the Nuclear Density Gauge does not rock when downward force is applied at each corner of the Gauge. It is critical to maintain maximum contact area between the Nuclear Density Gauge and the pavement

surface. At no time shall any gap exceed 0.25 inches or 6 mm as per ASTM D-2950. The Nuclear Density Gauge testing mode used for determining correlation factor must be recorded on Connecticut Department of Transportation testing report forms and used throughout the entire project.

5.5.1 Place the Nuclear Density Gauge parallel with the direction of paving such that the center of the Nuclear Density Gauge is over the random location. Mark the footprint of the Nuclear Density Gauge with a crayon. Take a reading using a minimum 60-second count. Record this value in lb/ft3.

5.5.2 Rotate the Nuclear Density Gauge 180 degrees placing the Nuclear Density Gauge back on the pavement within the crayon footprint outline previously made in 5.5.1. Take a reading using a minimum 60-second count. Record this value in lb/ft3.

5.5.3 Rotate the Nuclear Density Gauge 90 degrees placing the center of the Nuclear Density Gauge in the center of the crayon footprint established in 5.5.1. The Nuclear Density Gauge should now be perpendicular to the direction of paving. Mark the footprint of the Nuclear Density Gauge with a crayon. Take a reading using a minimum 60-second count. Record this value in lb/ft3.

5.5.4 Rotate the Nuclear Density Gauge 180 degrees placing the Nuclear Density Gauge back on the pavement within the crayon footprint outline previously made in 5.5.3. Take a reading using a minimum 60-second count. Record this value in lb/ft3.

5.5.5 The Nuclear Density Value in lb/ft3 for this location will be represented by the average of the 4 readings.

5.5.6 This process shall be repeated for all Nuclear Density Gauges to be used on the project.

5.6 A core shall be cut at the Contractor's expense from the center of the crayon footprint outlines created in section 5.5. The coring apparatus must be able to cut a core with minimal disturbance to the specimen.

5.6.1 The temperature of the mat shall be sufficiently cool to allow the core to be cut without distorting it. This may be aided by applying ice or dry ice to the surface prior to cutting. It is recommended that the maximum surface temperature of the pavement be 100-120°F prior to cutting the core.

5.6.2 The minimum diameter of the core shall be 6-inches.

5.6.3 The core bit must cut completely through the layer being tested. If the core delaminates after penetrating the full depth of the layer of interest, then coring may stop. If the core does not delaminate, then the coring must extend on until the core is free.

5.6.4 After removing the core, the core should be inspected to ensure it is not damaged or distorted.

5.6.5 Each core shall be labeled using a lumber crayon with: Project Number, Core Number matching subsection number and date.

5.6.6 Any core that appears to be damaged or distorted shall be rejected. A new test location will be established moving in the direction of paving at least 1 foot to the closest dry location, while maintaining the same transverse offset.

5.6.7 Each core location shall be patched by the Contractor at the contractor's expense.

5.6.7.1 Excess water shall be removed from core hole using a sponge.

5.6.7.2 The sides of the hole shall be tacked.

5.6.7.3 HMA from the project will be used to fill the hole. Compaction of the core hole shall be accomplished by using a circular tamper.

5.6.7.4 At the contractor's discretion, an alternate core may be cut to allow testing at the contractor's lab. This core should be located approximately one foot away from the original core in the longitudinal direction of paving.

5.7 This process will be repeated until all 10-test locations have been completed.

5.8 The cores will be collected by the City or its consultant and tested at an independent testing laboratory within 24 hours of cutting the cores. Care must be exercised in storing the cores for transport to the Materials Lab to avoid distorting and damaging the cores.

5.9 Cores extending beyond the layer of measurement shall be sawn using a wet-diamond blade saw to remove the extraneous material.

5.10 The cores shall be dried to a constant mass in accordance with AASHTO TP69, Note 2.

5.11 The density of the cores shall be determined in accordance with AASHTO TP69.

5.12 The core thicknesses shall also be measured and recorded.

4.07.06 CALCULATION OF THE CORRECTION FACTOR

6.1 Nuclear Density Computations

6.1.1 The average of the four nuclear densities obtained for each cored location shall be determined.

6.1.2 The percent compaction shall be computed for the average nuclear density obtained for each cored location. The average maximum theoretical density for the day's production shall be used in the computation of percent compaction.

% Comp nuclear = {(Average Nuclear Density)/ (Maximum Theoretical Density)}*100

6.2 Core Density Computations

6.2.1 The percent compaction for the core shall be computed. The average maximum theoretical density for the day's production shall be used in the computation of the percent compaction.

% Comp core = {(Core Density)/ (Average Maximum Theoretical Density)}*100

6.3 Compute the difference between the percent compaction of the nuclear density gauge and core for each cored location.

% Difference = % Comp nuclear - % Comp core

6.4 Discard any results where the % Difference, as calculated in section 6.3, is greater than +2%. (Values greater than +2% typically indicate the core is damaged and should not be used) Values less than -2% are acceptable and should be used.

6.5 Compute the correction factor for the nuclear density gauge by averaging the remaining % differences.

6.6 The correction factor shall be subtracted from all subsequent measurements of percent compaction made with the nuclear density gauge. This value is nuclear density gauge and project specific. (Subtraction of negative number is the same as adding the absolute value of the number.)

4.07.07 DAILY VALIDATION

7.1 A location shall be selected on the first day of paving where measurements shall be taken each day for each nuclear density gauge on the project. This location must be selected to allow safe access each paving day. This would typically be located on a shoulder or ramp. It should also be on material that is representative of the material being placed. Care should be taken to avoid areas exhibiting visible defects.

7.2 Each day of the project, the nuclear density gauges used shall make 4 one-minute measurements similar to the procedure outlined in section 5.5 on this location. The position of the nuclear density gauge should be marked out using temporary marking paint on the first day's measurements.

7.3 The average of the four density measurements should be computed for each day. This value shall be compared to the average obtained on the first day's testing. Average values obtained after the first day should not differ from the first day's average by more than 4 pcf.

4.07.08 NUCLEAR DENSITY GAUGE REPLACEMENT

8.1 In the event that a nuclear gauge used in the original determination of the correction factor must be replaced, the following procedure should be followed. This situation should be avoided whenever possible as the confidence in the accuracy of the correction factor is decreased.

8.2 The correction factor for the replacement gauge shall be determined using the location marked out for the Daily Validation. Note: the maximum theoretical specific gravity (G_{mm}) used in this section is the G_{mm} from the first days' paving when the Daily Validation location was placed.

8.2.1 The replacement gauge shall make a series of 4 one-minute readings in a similar fashion as was used in the Daily Validation measurements. The bias in the nuclear density gauge shall be set to zero for these measurements.

8.2.2 The average of these four density measurements shall be determined.

8.2.3 The corrected density shall be determined for this location using data collected by a nuclear density gauge utilized on the first day of paving. This will utilize the average density for the Daily Validation location obtained on the first day's paving and the correction factor for that gauge obtained in section 6.6.

Density $_{corrected}$ = (first day's Daily Validation average) + (correction factor/100)*G_{mm}*62.4.

8.2.4 The correction factor in pcf for the replacement gauge shall be computed by subtracting the average of the four density measurements obtained from the corrected density at Daily Validation location.

Replacement Correction Factor, pcf = Density $_{corrected}$ – average obtained in section 8.2.2.

8.2.5 To convert the replacement correction factor determined in section 8.2.4 To percent compaction, divide the replacement correction factor by the G_{mm} and 62.4.

Replacement Correction Factor, % = (Replacement Correction Factor, pcf)/(G_{mm}*62.4)*100

4.07.09 MAT NUCLEAR DENSITY MEASUREMENTS AFTER DETERMINING CORRECTION FACTOR

9.1 After determining the correction factor, all subsequent measurements on the project shall be adjusted by subtracting the correction factor from the percent compaction determined by the nuclear density gauge. (Subtraction of negative number is the same as adding the absolute value of the number.)

9.2 A measurement at a randomly determined location shall consist of the average for 4 one-minute readings. The nuclear density gauge shall be oriented in the same manner as is outlined in sections 5.5.1 through section 5.5.5 for the 4 one-minute readings.

9.3 When testing the mat density for a day's production where testing has occurred at least 10 different mat locations, the highest and lowest density values obtained from the nuclear density gauge shall be dropped from the computation of the day's average percent compaction. All nuclear gauge measurements of the percent compaction shall be corrected using the average G_{mm} for that day's production.

END OF SECTION

BID FORM - EXHIBIT "A"

REVISED FOR ADDENDUM#1 - 3/27/19

Reconstruction Various Roads Project Road Group 2019.1

ITEM NO#	ITEM DESCRIPTION	ESTIMATED QUANTITY	UNIT PRICE	TOTAL AMOUNT
0201001A	**Clearing and Grubbing** for the price per **Lump Sum** of _____Dollars _____Cents	**1**	_____	_____
0202000A	**Earth Excavation** for the price per **Cubic Yard** of _____Dollars _____Cents	**5,517**	_____	_____
0202529	**Cut Bituminous Concrete Pavement** for the price per **Linear Foot** of _____Dollars _____Cents	**1,199**	_____	_____
0212001A	**Subbase** for the price per **Cubic Yard** of _____Dollars _____Cents	**278**	_____	_____
0403873A	**Full-Depth Reclamation** for the price per **Square Yard** of _____Dollars _____Cents	**61,404**	_____	_____
0406236A	**Material for Tack Coat** for the price per **Gallon** of _____Dollars _____Cents	**3,070**	_____	_____

ITEM NO#	ITEM DESCRIPTION	ESTIMATED QUANTITY	UNIT PRICE	TOTAL AMOUNT
0406442A	**Bituminous Concrete, (HMA S 0.50) Super Pave** for the price per **TON** of _____Dollars _____Cents	**14,338**	_____	_____
0406999A	**Asphalt Adjustment Cost** for the price per **Estimated** of _____Dollars _____Cents	**1**	$10,000.00	$10,000.00
0507001A	**Replace Catch Basin Top** for the price per **Each** of _____Dollars _____Cents	**130**	_____	_____
0507502A	**Replace Type 1 or Type 2 Double Catch Basin Top** for the price per **Each** of _____Dollars _____Cents	**6**	_____	_____
0507505A	**Catch Basin Structure with Top** for the price per **Each** of _____Dollars _____Cents	**5**	_____	_____
0507560A	**Replace Manhole Frame & Cover (Storm or Sanitary)** for the price per **Each** of _____Dollars _____Cents	**76**	_____	_____
0507580A	**Convert Existing Catch Basin Top to Manhole Frame & Cover** for the price per **Each** of _____Dollars _____Cents	**3**	_____	_____

ITEM NO#	ITEM DESCRIPTION	ESTIMATED QUANTITY	UNIT PRICE	TOTAL AMOUNT
0507590A	**Remove Existing Catch Basin** for the price per **Each** of _____Dollars _____Cents	**2**	_____	_____
0651885A	**12" HDPE Storm Pipe** for the price per **Linear Foot** of _____Dollars _____Cents	**72**	_____	_____
0651913A	**6" Underdrain** for the price per **Linear Foot** of _____Dollars _____Cents	**710**	_____	_____
0815001A	**6" Bituminous Concrete Curbing** for the price per **Linear Foot** of _____Dollars _____Cents	**31,256**	_____	_____
0910170	**Metal Beam Guiderail (Type R-B 350)** for the price per **Linear Foot** of _____Dollars _____Cents	**100**	_____	_____
0911924	**Metal Beam Guiderail (Type R-B 350) - End Anchorage - Type II** for the price per **Each** of _____Dollars _____Cents	**4**	_____	_____
0921039A	**Detectable Warning Pad** for the price per **Each** of _____Dollars _____Cents	**10**	_____	_____

ITEM NO#	ITEM DESCRIPTION	ESTIMATED QUANTITY	UNIT PRICE	TOTAL AMOUNT
0922001A	**Bituminous Concrete Sidewalk** for the price per **Square Foot** of _____Dollars _____Cents	**8,131**	_____	_____
0922501A	**Bituminous Concrete Driveway** for the price per **Square Foot** of _____Dollars _____Cents	**15,653**	_____	_____
0950005A	**Turf Establishment** for the price per **Square Yard** of _____Dollars _____Cents	**8,766**	_____	_____
0970006A	**Uniformed Municipal Police Officer** for the price per **Hour** of _____Dollars _____Cents	**400**	$65.00	$26,000.00
0970007A	**Traffic Person (Uniformed Flagger)** for the price per **Hour** of _____Dollars _____Cents	**1,920**	_____	_____
0971001A	**Maintenance and Protection of Traffic** for the price per **Lump Sum** of _____Dollars _____Cents	**1**	_____	_____
0975001A	**Mobilization and Demobilization** for the price per **Lump Sum** of _____Dollars _____Cents	**1**	_____	_____

ITEM NO#	ITEM DESCRIPTION	ESTIMATED QUANTITY	UNIT PRICE	TOTAL AMOUNT
0980001A	**Construction Staking** for the price per **Lump Sum** of _____Dollars _____Cents	**1**	_____	_____
1206036A	**Existing traffic and parking signs reinstalled** for the price per **Each** of _____Dollars _____Cents	**7**	_____	_____
1208928A	**Sign Face - Sheet Aluminum (Type IV Reflective Sheeting)** for the price per **Square Foot** of _____Dollars _____Cents	**54**	_____	_____
1209114A	**4" White/Yellow Hot Applied Painted Pavement Markings** for the price per **Linear Foot** of _____Dollars _____Cents	**8,906**	_____	_____
1209131A	**Hot Applied Markings, Symbols & Legends** for the price per **Square Foot** of _____Dollars _____Cents	**995**	_____	_____

TOTAL BID AMOUNT $_____