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STATE OF DELAWARE

DEPARTMENT OF TRANSPORTATION

BID PROPOSAL

for

CONTRACT T201206304.01

PAVEMENT & REHABILITATION, SOUTH II-IV, 2012

SUSSEX COUNTY

ADVERTISEMENT DATE: December 8, 2011

Completion Date 145 Calendar Days

SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION
DELAWARE DEPARTMENT OF TRANSPORTATION
AUGUST 2001

Bids will be received in the Bidder's Room (B1.11.01), Transportation Administration Center, 800 Bay Road, Dover, Delaware until 2:00 P.M. local time January 10, 2012

Contract No.T201206304.01

PAVEMENT & REHABILITATION, SOUTH II-IV, 2012
SUSSEX COUNTY

LOCATION

These improvements are located in SUSSEX County more specifically shown on the Location Map(s) of the enclosed Plans.

DESCRIPTION

The improvements consist of furnishing all materials for PAVEMENT & REHABILITATION, SOUTH II-IV, 2012, and other incidental construction in accordance with the location, notes and details shown on the plans and as directed by the Engineer.

COMPLETION DATE

All work on this contract must be complete within 145 Calendar Days .

It is the Department's intent to issue a Notice to Proceed such that work starts on or about March 12, 2012.

ELECTRONIC BIDDING

This project incorporates the electronic bidding system Expedite 5.2b. Bidder wishing to use the electronic bidding option should request a bid file disk and installation CD.

PROSPECTIVE BIDDERS NOTE:

1. No retainage will be withheld on this contract.

2. Copy(ies) of the American Traffic Safety Services Association (ATSSA) Certification(s) when listed in the applicable plan notes.

3. Standard Specification Section 110.08 Site Reviewer requires that the name and DNREC certification number of each Site Reviewer if required shall be submitted to the Department at the time of bid. The level of certification and number required are listed in the applicable plan notes.

4. The Department has adopted an External Complaint Procedure. The procedure can be viewed on our website at; http://www.deldot.gov/information/business/, or you may request a copy by calling (302) 760-2555.

STATE OF DELAWARE
CONSTRUCTION ITEMS UNITS OF MEASURE

English Code	English Description	Multiply By	Metric Code	Metric Description	Suggested CEC Metric Code
ACRE	Acre	0.4047	ha	Hectare	HECTARE
BAG	Bag	N/A	Bag	Bag	BAG
C.F.	Cubic Foot	0.02832	m^3	Cubic Meter	M3
C.Y.	Cubic Yard	0.7646	m^3	Cubic Meter	M3
EA-DY	Each Day	N/A	EA-DY	Each Day	EA-DY
EA-MO	Each Month	N/A	EA-MO	Each Month	EA-MO
EA/NT	Each Night	N/A	EA-NT	Each Night	EA/NT
EACH	Each	N/A	EA	Each	EACH
GAL	Gallon	3.785	L	Liter	L
HOUR	Hour	N/A	h	Hour	HOUR
INCH	Inch	25.4	mm	Millimeter	MM
L.F.	Linear Foot	0.3048	m	Linear Meter	L.M.
L.S.	Lump Sum	N/A	L.S.	Lump Sum	L.S.
LA-MI	Lane Mile	1.609	LA-km	Lane-Kilometer	LA-KM
LB	Pound	0.4536	kg	Kilogram	KG
MFBM	Thousand Feet of Board Measure	2.3597	m^3	Cubic Meter	M3
MGAL	Thousand Gallons	3.785	kL	Kiloliter	KL
MILE	Mile	1.609	km	Kilometer	KM
S.F.	Square Foot	0.0929	m^2	Square Meter	M2
S.Y.	Square Yard	0.8361	m^2	Square Meter	M2
SY-IN	Square Yard-Inch	0.8495	m^2-25 mm	Square Meter-25 Millimeter	M2-25 MM
TON	Ton	.9072	t	Metric Ton (1000kg)	TON
N.A.*	Kip	4.448	kN	Kilonewton	N.A.*
N.A.*	Thousand Pounds per Square Inch	6.895	MPa	Megapascal	N.A.*

*Not used for units of measurement for payment.

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SPECIFICATIONS:

The specifications entitled "Delaware Standard Specifications, for Road and Bridge Construction, August, 2001", hereinafter referred to as the Standard Specifications, Supplemental Specifications, the Special Provisions, notes on the Plans, this Bid Proposal, and any addenda thereto shall govern the work to be performed under this contract.

CLARIFICATIONS:

Under any Section or Item included in the Contract, the Contractor shall be aware that when requirements, responsibilities, and furnishing of materials are outlined in the details and notes on the Plans and in the paragraphs preceding the " Basis of Payment" paragraph in the Standard Specifications or Special Provisions, no interpretation shall be made that such stipulations are excluded because reiteration is not made in the "Basis of Payment" paragraph.

ATTESTING TO NON-COLLUSION:

The Department requires as a condition precedent to acceptance of bids a sworn statement executed by, or on behalf of, the person, firm, association, or corporation to whom such contract is to be awarded, certifying that such person, firm, association, or corporation has not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in connection with such contract. The form for this sworn statement is included in the proposal and must be properly executed in order to have the bid considered.

QUANTITIES:

The quantities shown are for comparison of bids only. The Department may increase or decrease any quantity or quantities without penalty or change in the bid price.

REQUIREMENT BY DEPARTMENT OF LABOR FOR SWORN PAYROLL INFORMATION

Delaware Code, Title 29, Chapter 69, Section 6960, Paragraph (c)

> "(c) Every contract based upon these specifications shall contain a stipulation that certified sworn payroll reports be maintained by every contractor and subcontractor performing work upon the site of construction. The contractor and subcontractor shall keep and maintain the sworn payroll information for a period of two (2) years from the last day of the work week covered by the payroll. A certified copy of these payroll reports shall be made available:
>
> 1. For inspection or furnished upon request to a representative of the Department of Labor;
> 2. Upon request by the public or for copies thereof. However, a request by the public must be made through the Department of Labor. The requesting party shall, prior to being provided the records, reimburse the costs of preparation by the Department of Labor in accordance with the Department's copying fee policy. The public shall not be given access to the records at the principal office of the contractor or subcontractor; and
> 3. The certified payroll records shall be on a form provided by the Department of Labor or shall contain the same information as the form provided by the Department and shall be provided within ten (10) days from receipt of notice requesting the records from the Department of Labor."

Contractor may contact:

Department of Labor
Division of Industrial Affairs
4425 No. Market Street
Wilmington, DE 19802

Telephone (302) 761-8200

PREFERENCE FOR DELAWARE LABOR:

Delaware Code, Title 29, Chapter 69, Section 6962, Paragraph (d), Subsection (4)b

"In the construction of all public works for the State or any political subdivision thereof, or by firms contracting with the State or any political subdivision thereof, preference in employment of laborers, workmen or mechanics shall be given to bona fide legal citizens of the State who have established citizenship by residence of at least 90 days in the State. Each public works contract for the construction of public works for the State or any political subdivision thereof shall contain a stipulation that any person, company or corporation who violates this section shall pay a penalty to the Secretary of Finance equal to the amount of compensation paid to any person in violation of this section."

EQUALITY OF EMPLOYMENT OPPORTUNITY ON PUBLIC WORKS:

Delaware Code, Title 29, Chapter 69, Section 6962, Paragraph (d), Subsection (7)

"a. As a condition of the awarding of any contract for public works financed in whole or in part by State appropriation, such contracts shall include the following provisions:

`During the performance of this contract, the contractor agrees as follows:

1. The contractor will not discriminate against any employee or applicant for employment because of race, creed, color, sex or national origin. The contractor will take positive steps to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, creed, color, sex or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places available to employees and applicants for employment notices to be provided by the contracting agency setting forth this nondiscrimination clause.

2. The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, creed, color, sex or national origin.'

TAX CLEARANCE:

As payments to each vendor or contractor aggregate $2,000, the Division of Accounting will report such vendor or contractor to the Division of Revenue, who will then check the vendor or contractor's compliance with tax requirements and take such further action as may be necessary to insure compliance.

LICENSE:

A person desiring to engage in business in this State as a contractor shall obtain a license upon making application to the Division of Revenue. Proof of said license compliance to be made prior to, or in conjunction with, the execution of a contract to which he has been named.

DIFFERING SITE CONDITIONS,

SUSPENSIONS OF WORK and SIGNIFICANT CHANGES IN THE CHARACTER OF WORK:

Differing site conditions: During the progress of the work, if subsurface or latent physical conditions are encountered at the site differing materially from those indicated in the contract of if unknown physical conditions of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in the work provided for in the contract are encountered at the site, the party discovering such conditions shall promptly notify the other party in writing of the specific differing conditions before they are disturbed and before the affected work is performed.

Upon written notification, the engineer will investigate the conditions, and if he/she determines that the conditions materially differ and cause an increase or decrease in the cost or time required for the performance of any work under the contract, an adjustment, excluding loss of anticipated profits, will be made and the contract modified in writing accordingly. The engineer will notify the contractor of his/her determination whether or not an adjustment of the contract is warranted.

No contract adjustment which results in a benefit to the contractor will be allowed unless the contractor has provided the required written notice.

No contract adjustment will be allowed under their clause for any effects caused on unchanged work.

Suspensions of work ordered by the engineer: If the performance of all or any portion of the work is suspended or delayed by the engineer in writing for an unreasonable period of time (not originally anticipated, customary or inherent to the construction industry) and the contractor believes that additional compensation and/or contract time is due as a result of such suspension or delay, the contractor shall submit to the engineer in writing a request for adjustment within 7 calendar days of receipt of the notice to resume work. The request shall set fourth the reasons and support for such adjustment.

Upon receipt, the engineer will evaluate the contractor's request. If the engineer agrees that the cost and/or time required for the performance of the contract has increased as a result of such suspension and the suspension was caused by conditions beyond the control of and not the fault of the contractor, its suppliers, or subcontractors at any approved tier, and not caused by weather, the engineer will make an adjustment (excluding profit) and modify the contract in writing accordingly. The engineer will notify the contractor of his/her determination whether or not an adjustment of the contract is warranted.

No contract adjustment will be allowed unless the contractor has submitted the request for adjustment within the time prescribed.

No contract adjustment will be allowed under this clause to the extent that performance would have been suspended or delayed by any other cause, or for which an adjustment is provided for or excluded under any other term or condition of this contract.

Significant changes in the character of work: The engineer reserves the right to make, in writing, at any time during the work, such changes in quantities and such alterations in the work as are necessary to satisfactorily complete the project. Such changes in quantities and alterations shall not invalidate the contract nor release the surety, and the contractor agrees to perform the work as altered.

If the alterations or changes in quantities significantly change the character of the work under the contract, whether or not changed by any such different quantities or alterations, an adjustment, excluding loss of anticipated profits, will be made to the contract. The basis for the adjustment shall be agreed upon prior to the performance of the work. If a basis cannot be agreed upon, then an adjustment will be made either for or against the contractor in such amount as the engineer may determine to be fair and equitable.

The term "significant change" shall be construed to apply only to the following circumstances:

(A) When the character of the work as altered differs materially in kind or nature from that involved or included in the original proposed construction or

(B) When a major item of work, as defined elsewhere in the contract, is increased in excess of 125 percent or decreased below 75 percent of the original contract quantity. Any allowance for an increase in quantity shall apply only to that portion in excess of 125 percent of original contract item quantity, or in case of a decrease below 75 percent, to the actual amount of work performed.

PREVAILING WAGES

Included in this proposal are the minimum wages to be paid various classes of laborers and mechanics as determined by the Department of Labor of the State of Delaware in accordance with Title 29 Del.C. §6960, relating to wages and the regulations implementing that Section.

Title 29 Del.C. §6960 relating to wages further stipulates "that the employer shall pay all mechanics and laborers employed directly upon the site of the work, unconditionally and not less often than once a week and without subsequent deduction or rebate on any account, the full amounts accrued at time of payment, computed at wage rates not less than those stated in the specifications, regardless of any contractual relationship which may be alleged to exist between the employer and such laborers and mechanics", and ... "that the scale of wages to be paid shall be posted by the employer in a prominent and easily accessible place at the site of the work, and that there may be withheld from the employer so much of accrued payments as may be considered necessary by the Department of Labor to pay to laborers and mechanics employed by the employer the difference between the rates of wages required by the contract to be paid laborers and mechanics on the work and rates of wages received by such laborers and mechanics to be remitted to the Department of Labor for distribution upon resolution of any claims."

Bidders are specifically directed to note the Department of Labor's regulations implementing §6960 relating to the effective date of the wage rates, at Part VI., Section C., which in relevant part states:

> "Public agencies (covered by the provisions of 29 Del.C. §6960) are required to use the rates which are in effect on the date of the publication of specifications for a given project. In the event that a contract is not executed within one hundred twenty (120) days from the date the specifications were published, the rates in effect at the time of the execution of the contract shall be the applicable rates for the project."

STATE OF DELAWARE
DEPARTMENT OF LABOR
DIVISION OF INDUSTRIAL AFFAIRS
OFFICE OF LABOR LAW ENFORCEMENT
PHONE: (302) 451-3423

Mailing Address:
225 CORPORATE BOULEVARD
SUITE 104
NEWARK, DE 19702

Located at:
225 CORPORATE BOULEVARD
SUITE 104
NEWARK, DE 19702

PREVAILING WAGES FOR **HIGHWAY CONSTRUCTION** EFFECTIVE MARCH 15, 2011

CLASSIFICATION	NEW CASTLE	KENT	SUSSEX
BRICKLAYERS	44.98	44.98	14.51
CARPENTERS	40.86	48.31	38.62
CEMENT FINISHERS	28.11	24.68	23.29
ELECTRICAL LINE WORKERS	22.50	54.05	54.05
ELECTRICIANS	57.10	57.10	57.10
IRON WORKERS	42.20	22.98	25.35
LABORERS	25.44	23.33	24.00
MILLWRIGHTS	16.11	15.63	13.49
PAINTERS	41.42	41.42	41.42
PILEDRIVERS	59.23	23.75	26.95
POWER EQUIPMENT OPERATORS	31.46	26.00	26.31
SHEET METAL WORKERS	22.75	20.31	18.40
TRUCK DRIVERS	26.54	21.68	19.96

CERTIFIED: 10/6/11 BY: _____
ADMINISTRATOR, OFFICE OF LABOR LAW ENFORCEMENT

NOTE: THESE RATES ARE PROMULGATED AND ENFORCED PURSUANT TO THE PREVAILING WAGE REGULATIONS ADOPTED BY THE DEPARTMENT OF LABOR ON APRIL 3, 1992.

CLASSIFICATIONS OF WORKERS ARE DETERMINED BY THE DEPARTMENT OF LABOR. FOR ASSISTANCE IN CLASSIFYING WORKERS, OR FOR A COPY OF THE REGULATIONS OR CLASSIFICATIONS, PHONE (302) 451-3423.

NON-REGISTERED APPRENTICES MUST BE PAID THE MECHANIC'S RATE.

PROJECT: T201206304.01 Pavement and Rehabiliations, South II-IV, Sussex County

SUPPLEMENTAL SPECIFICATIONS TO THE AUGUST 2001 STANDARD SPECIFICATIONS

EFFECTIVE AS OF THE ADVERTISEMENT DATE OF THIS PROPOSAL AND INCLUDED BY REFERENCE

The Supplemental Specifications can be viewed and printed from the Department's Website.

To access the Website;
- in your internet browser, enter; http://www.deldot.gov
- on the left side of the page under 'INFORMATION', Click; 'Publications'
- scroll down under 'MANUALS' and Click; "Standard Specifications 2001"

The full Website Link is;
http://www.deldot.gov/information/pubs_forms/manuals/standard_specifications/index.shtml

Printed copies of the Supplemental Specifications are available upon request. A printed copy of the above referenced Supplemental Specifications will be included in the final contract documents upon award.

The Contractor shall make himself aware of these revisions and corrections (Supplemental Specifications), and apply them to the <u>applicable item(s)</u> of this contract.

SPECIAL PROVISIONS

CONSTRUCTION ITEM NUMBERS

All construction pay items are assigned a six (6) digit number, shown as Item Number on the Plans and/or in the Special Provisions, and shall be interpreted in accordance with the following:

Standard Item Number:

The first three digits of the construction item numbers indicates the Section number as described in the Standard Specifications, and all applicable requirements of the Section shall remain effective unless otherwise modified by the Special Provisions. The last three digits of the construction item identifies the item by sequential number under that Section. Sequential numbers for all items covered under Standard Specifications range from 000 to 499. A comprehensive list of construction item numbers begins on page 421 of the Standard Specifications. Additions to this list will be made as required.

Special Provisions Item Number:

The first three digits of the construction items, covered under Special Provisions, indicates the applicable Section number of the Standard Specifications, and shall be governed fully by the requirements of the Special Provisions. The last three digit of the items covered under Special Provisions identifies the item by sequential number. Sequential numbers for Special Provision items, range from 500 to 999.

Examples

Standard Item Number - 202000 Excavation and Embankment

202 Indicates Section Number

000 Indicates Sequential Number

Special Provision Item Number - 202500 Grading and Reshaping Roadway

202 Indicates Section Number

500 Indicates Sequential Number

401502 - ASPHALT CEMENT COST ADJUSTMENT

For Sections 304, 401, 402, 403, 404, and 405, payments to the Contractor shall be adjusted to reflect increases or decreases in the Delaware Posted Asphalt Cement Price when compared to the Project Asphalt Cement Base Price, as defined in these Special Provisions.

The Delaware Posted Asphalt Cement Price will be issued monthly by the Department and will be the industry posted price for Asphalt Cement, F.O.B. Philadelphia, Pennsylvania.

The Project Asphalt Cement Base Price will be the anticipated Delaware Posted Asphalt Cement Price expected to be in effect at the time of receipt of bids.

All deviations of the Delaware Posted Asphalt Cement Price from the Project Asphalt Cement Base Price are eligible for cost adjustment. No minimum increases or decreases or corresponding percentages are required to qualify for cost adjustment.

Actual quantity of asphalt cement qualifying for any Asphalt Cement Cost Adjustment will be computed on the basis of weight tickets and asphalt percentage from the approved job mix formula.

For Recycled Hot-Mix the asphalt percentage eligible for cost adjustment shall be only the new asphalt cement added to the mix.

There shall be no separate payment per ton (metric ton) cost of asphalt cement. That cost shall be included in the various unit prices bid per ton (metric ton) for those bid items that contain asphalt cement (mentioned above).

The Asphalt cement cost adjustment will be calculated on grade PG 64-22 asphalt regardless of the actual grade of asphalt used. The Project Asphalt Cement Base Price for the project will be $593.33 per ton ($654.04 per metric ton).

If the Contractor exceeds the authorized allotted completion time, the price of asphalt cement on the last authorized allotted work day, shall be the prices used for cost adjustment during the time liquidated damages are assessed. However, if the industry posted price for asphalt cement goes down, the asphalt-cement cost shall be adjusted downward accordingly.

NOTE

Application of Asphalt Cement Cost Adjustment requirements as indicated above shall apply only to those contracts involving items related to bituminous base and pavements, and with bitumen, having a total of 1,000 tons (1,000 metric tons) or more of hot-mix bid quantity in case of Sections 401, 402 and 403; and 15,000 gallons (60 000 liters) or more in case of Sections 304, 404 and 405.

304508 – BITUMINOUS STABILIZED FULL-DEPTH RECLAMATION

Description:

This work shall consist of stabilization of road pavements by in-place pulverizing and blending of the existing underlying granular material with an appropriate percentage of bituminous and/or chemical additives. To adjust the grade, Graded Aggregate Base Course (GABC), Recycled Concrete Aggregate (RCA), or Recycled Asphalt Pavement (RAP) may be added to meet the requirements. The process shall result in a uniformly mixed, fully compacted and cured mixture of sub-grade and roadway materials to produce a working platform for subsequent paving operations and a structural support for the pavement.

Unless otherwise referenced, the depth of full-depth reclamation shall be 6”.

Materials:

Reclaimed Material. Once this material is pulverized, the following gradations shall be met: 95% passing the 2" sieve. If more than 5% is retained on the 2" sieve the pavement pulverizing process shall be adjusted to reduce the amount to less than 5%.

Stabilizing Agents. Recycling agents, such as CSS 1h emulsion, will be accepted under certification from the Contractor. All recycling agents delivered shall be sampled in the presence of the Engineer. The Contractor shall place a representative sample in a clean plastic container, note the date of sample, load number, and gallons verified. The sample shall be provided to the Engineer for testing.

Additives. Additives to help in the mixing operation or curing process shall be approved by the Engineer prior to incorporation into the mix.

Aggregates. If imported aggregates are required, they shall meet the material requirements of Section 302 of the Standard Specifications for GABC or RCA. If RAP is required, it shall have 100% passing the 2" sieve.

Preconstruction:

Sampling and Pre-Testing Reclaimed Materials. The Contractor shall obtain samples of the granular base and sub-grade soils from test pits or cores to the depth to be reclaimed for laboratory evaluation. The Contractor shall provide to the Engineer the following information:

1. Test Pit and cores location, one sample for every 1500 lane-feet with a minimum of six samples for each mix design, with additional locations selected upon pavement conditions and variability.
2. Depth of the existing road structure to be reclaimed unless shown otherwise on plans.
3. Laboratory test results:

DESCRIPTION OF TEST METHOD	AASHTO TEST
Determination of water moisture content	T265
Liquid Limit, Plastic Limit, and Plasticity Index of Soil	T89, T90
Sand Equivalent Value of Soils and Fine Aggregate	T176
Sieve Analysis of Fine and Coarse Aggregate	T27
Classification of Soils	M145

Mix Design. The Contractor shall be responsible for determining what recycling agent, and additives are necessary to produce an acceptable mix. The design shall be performed by the Contractor in accordance with these specifications and submitted to the Engineer for approval a minimum of 10 working days prior to the planned start of the work. The mixture design shall determine: the suitability of the reclaimed material, optimum moisture content determine the optimum bitumen content, and confirmation of the mechanical properties of the stabilized mix. The Contractor shall submit, to the Engineer for approval, the mix design listing the name, source, and amount of each recycling agent.

Construction Methods:

Weather Limitations. This recycling operation shall be performed with asphalt emulsion when the atmospheric temperature, in the shade, is 55ºF and rising and it is not foggy. Recycling operations shall not be performed when rain is occurring or rain is imminent or night temperatures are forecast to fall below 35ºF.

Subsequent lifts shall not be placed on the cured recycled base course within forty eight hours of any rain event.

Equipment. The equipment shall be capable of reclaiming in-place bituminous overlays and road base materials to the depth called for in the plans and pulverizing them down to the gradation as defined above. Only a single lane shall be pulverized and mixed at a time to ensure the least practical obstruction to the traveling public. When the adjoining lane is pulverized, the lane already reclaimed shall be overlapped 6" unless otherwise directed by the Engineer. The adjoining lane shall be used as a reference for the finished grade at the centerline of the roadway unless otherwise shown on the Plans or as directed by the Engineer.

Mixing of all reclaimed materials, aggregates, and emulsified asphalt shall be conducted in-place. The GABC, RCA, and/or RAP, recycling agent, and additives shall be combined in the quantities required by the specifications or as directed by the Engineer. The mixing operation shall result in the GABC, RCA, and/or RAP being completely and uniformly coated with the recycling agent and additives, if used.

The mix in-place operation shall spread the required quantity of reclaimed material and aggregate, if required, on the prepared area in a uniform loose layer to obtain the specified compacted depth. Adjust the speed of the mixer to obtain a thorough and uniform mixture.

Ensure that positive displacement pumps accurately meter the planned amount of bituminous material and the pulverizing machine mixes it thoroughly with the GABC, RCA, and/or RAP materials. The pump shall be mechanically or electronically interlocked with the ground speed of the machine. The bituminous metering system and water metering system shall be capable of continuous monitoring (gallons per minute) flow, and totalizing the quantity of the bituminous material applied into the mixing chamber. The travel speed, in feet, shall be visible on the computer readout screen.

Self-propelled asphalt pavers shall conform to Subsection 401.05 of the Standard Specifications and shall be utilized to spread the recycled mixture to the established grade and cross slope. The paving operations shall be conducted to protect existing and finished pavement sections. The paver shall be equipped with a floating averaging beam or non-contact averaging beam.

Test Rolling. After the cure time has elapsed, test rolling shall be performed with a fully legally loaded ten-wheel dump truck or other equipment approved by the Engineer that will reveal any soft or yielding areas. The equipment shall be run longitudinally with less than 18” of unrolled area between the tire strips.

If the test rolling reveals any soft or yielding areas, the Contractor shall be required to stabilize, compact, and cure the designated areas to achieve the required stability.

Acceptance of the test roll by the Engineer will be required prior to placement of subsequent lifts.

Grading & Compaction. After the mixture has been spread, allowed to cure as necessary, and any surface irregularities corrected, the mat shall be uniformly compacted without displacement and cracking.

A minimum of one pneumatic tire roller (minimum 25 tons) operated at a maximum of 4 mph and one double drum vibratory steel-wheeled roller (minimum 12 tons), operated in a vibratory mode, shall be utilized at all times in the rolling operation. The sequence of rolling operations shall provide a minimum density of 88% of the theoretical maximum density (AASHTO T209), or a minimum density of 93% of laboratory specimens made of production materials obtained.

When the rolling operations are to be based on the control strip method of density control, the control strip shall be constructed of mixture produced with the reclamation equipment and within the pavement section. The Contractor shall construct at least two (2) control strips by varying the roller sequence to achieve

maximum density. Compact the remaining recycled mixture to a target density of at least 96% of the highest average control strip density. Whenever there is a change in the reclaimed materials or compaction method or equipment, or when unacceptable results occur, at least two (2) new test control strips shall be constructed by varying the roller sequence to achieve maximum density.

Excess material from the operation shall be removed and disposed of in an approved manner by the Contractor.

Surface Tolerance. When directed by the Engineer, the completed layer shall be tested for smoothness and accuracy of grade. Difference of level between any two points of the surface, controlled by the 10-foot straightedge, shall not exceed 0.5".

Depth Check. One drilled core for each 500' or less of completed recycled bituminous base shall be utilized to determine the depth of the recycled base. The Contractor shall remove and replace any section deficient by 1/2" or greater from the specified depth at no expense to the Department

Curing. Allow the recycled base course to cure for at least one week before placing subsequent lifts unless otherwise permitted by the Engineer.

Method of Measurement:

The quantity of stabilized pavement will be measured as the actual number of square yards of pavement stabilized and accepted.

The quantity of GABC, RAC, or RAP added will be measured by the ton in accordance with Subsection 302.05 of the Standard Specifications.

The quantity of emulsified asphalt will be measured in accordance with Subsection 109.01 of the Standard Specifications as the number of gallons of emulsified asphalt used in the completed and accepted stabilized pavement not to exceed, in the proportion of the mix for payment purposes, more than 10% of the theoretical design percentage.

There will be no measurement for water or any stabilizing agents, other than emulsified asphalt.

Basis of Payment:

The quantity of stabilized pavement will be paid for at the Contract unit price per square yard. Price and payment will constitute full compensation for sampling, designing the mix, furnishing water and stabilizing agents (other than emulsified asphalt), pulverizing the sub-grade, mixing, compacting, grading, and for all labor, equipment, tools and incidentals required to complete the work.

The quantity of GABC, RCA, or RAP will be paid for at the Contract unit price per ton. Price and payment will constitute full compensation for furnishing and spreading the material. GABC, RCA, or RAP will be paid for under it²s respective item.

The quantity of emulsified asphalt will be paid for at the Contract unity price per gallon. Price and payment will constitute full compensation for furnishing, mixing and applying the emulsified asphalt, and for all labor, equipment, tools and incidentals required to complete the work. Emulsified asphalt will be paid for under its respective item.

5/4/11

401580 – RIDE QUALITY OF HOT-MIX PAVEMENT

Description:

The purpose of this Special Provision is to modify Standard Specification Section 401.13 to change the method of determining an acceptable riding surface. This Special Provision replaces the entire existing wording in Section 401.13.

The Contractor shall be responsible for providing smoothness characteristics that will meet the requirements of the Contract. The Contractor shall be responsible for providing equipment, maintenance of traffic (MOT) as required by the Delaware MUTCD, and performing testing in accordance to the processes and procedures set forth in this Special Provision. All costs for testing and MOT shall be incidental to this item. Both the International Roughness Index (IRI) and deviations located within a 10' straightedge are used to characterize smoothness in this Special Provision.

Definitions:

Class 1 Project - a project that is full depth construction based on contract documents and document modifications.

Class 2 Project - a project in which a minimum of two smoothness opportunities are performed based on contract documents and document modifications.

Class 3 Project - a project that only one smoothness opportunity is performed based on contract documents and document modifications.

Deviation – a hump or depression found to exceed the tolerances defined in this Special Provision within a 10' straightedge.

ERD File – a file storing numbers in tabular form for plotting and processing purposes. The ERD file format was developed by the Engineering Research Division of the University of Michigan Transportation Institute (UMTRI).

Full Depth Construction – a project that consists of a hot mix asphalt wearing surface placed on a hot-mix asphalt base / binder course or Portland cement concrete, on an aggregate or asphalt / cement stabilized base structure on existing or prepared subgrade materials or borrow.

Inertial Profiler – a high speed or lightweight device used to measure the pavement profile with an accelerometer to form an inertial reference and a height sensor to measure pavement height relative to that reference.

International Roughness Index (IRI) – a statistic, based on computations from a measured longitudinal profile using a quarter-car simulation, calculated to represent the amount of roughness in a pavement surface.

Rolling Ten Foot Straightedge - a rigid 10' straightedge mounted to measurement wheels and used to indicate both high and low deviations.

Smoothness Opportunity – a smoothness opportunity is roadway milling, placement of a leveling course, in place recycling, or placement of a lift of Hot Mix Asphalt. Full depth reclamation is not considered in this Special Provision as a smoothness opportunity. The final wearing surface is considered one smoothness opportunity.

Equipment:

The Contractor shall have available, at all times during paving operations, an approved 10' straightedge. The Contractor shall also have available a high speed or lightweight inertial profiling system meeting the standards set forth in AASHTO MP-11 that is capable of collecting data in both wheelpaths simultaneously. Data collected using the inertial profiling system shall be used to calculate both IRI and deviation locations using on-board computer software. Deviations, as defined in this Special Provision, shall be calculated using a rolling 10' straight edge simulation program capable of isolating deviations greater than

or equal to 0.25" in 10'. If software is not available to calculate the parameters for a rolling 10' straight edge simulation, the Contractor may be permitted to use, at the Engineer's discretion, a rolling 10' straightedge capable of isolating deviations greater than or equal to 0.25" in 10'.

Documentation Required

Prior to the start of corrective actions (milling, overlaying, recycling, etc.), the Contractor shall provide to the Engineer:

1. Manufacturer, Make, and Model of the test system,
2. Equipment Owner,
3. Relevant Certifications,
4. Manufacturer Calibration Procedures, and
5. Relevant Operator Training information.

Testing cannot take place until the Engineer has received this information and provided approval of the proposed test equipment and MOT plan.

Calibration

Prior to testing, the Contractor shall verify that the inertial profiling equipment is calibrated by following the manufacturer's calibration procedure in the presence of the Engineer. Vertical and longitudinal calibrations shall be performed. The Engineer will provide calibration blocks for the Contractor's use at the time of calibration. If the equipment does not pass the calibration procedure, it will not be permitted for use.

Testing:

Testing of the pavement surface includes measurement and calculation of the IRI parameters and deviations in the longitudinal direction. The Contractor shall notify the Engineer at least three (3) working days prior to data collection for both initial and final testing.

Transverse Deviations / Cross Slope

After final rolling and at the Engineer's discretion, the Contractor shall test the surface of each lift and the final wearing surface for deviations in the transverse direction. The Contractor shall have available at all times, and use appropriately, an approved 10' straightedge to be placed perpendicular to the centerline for checking cross slope. Deviations in the transverse direction shall not equal or exceed 0.25". The discount charge for deviations in the transverse direction is described in Section 'Acceptance and Payment' of this Special Provision. Deviations in the transverse direction shall require corrective actions or will be assessed a deviation discount charge at the discretion of the Engineer.

General Testing Requirements for IRI Data Collection

Data used for calculation of the IRI shall be measured in each wheel path using an approved inertial profiling system. Data collected for IRI calculation shall have longitudinal spacing no greater than 6 inches. Wavelengths exceeding 300 feet shall be removed using long wavelength filters. The International Roughness Index shall be calculated using this data and reported in 0.1 mile (528 foot) segments. Three (3) passes shall be made in each lane and direction requiring testing. The filename given to the data set shall include the contract number, the location number, the lane tested and direction tested. For example, the Eastbound left lane of Contract XX-XXX-XX, Location 1, run 3 shall be named:

XXXXXXXLoc1LEBr3

Testing shall be performed within seven (7) days of the completion of project paving operations. Areas not subject to IRI testing for all Classes of projects include:

1. 50 feet before the first bridge deck expansion joint to 50 feet after the last expansion joint if the bridge deck is excluded from the HMA overlay.

2. 20 feet longitudinally from the center of an existing obstruction located and visible in the pavement surface such as a manhole or water main. Obstructions located within the test area shall be noted as an event on report printouts using an automated event marking system and should be removed from the calculations prior to report submission.
3. Shoulders, short acceleration and deceleration lanes, and turn lanes less than 1000 feet in length, and median crossovers.

Testing shall be performed in accordance to the following procedures.

1. Clean the roadway path to be measured of all debris and other loose material. Ensure that the roadway surface is dry and free of any standing water.
2. Locate the start of the project limits and mark them to enable automatic start sensors to be activated.
3. Locate the end of the project limits and mark them to enable automatic stop sensors to be activated.
4. Locate any obstructions in the wheelpath / test area and mark them with reflective tape to enable automatic event marking.
5. Establish a pre-test length (150' or the manufacturer's recommended pre-test length, whichever is greater) prior to the start of the project limits.
6. Position the left wheelpath sensor three feet (3') from the left edge marking of each lane tested.
7. Attain a test speed that is within the manufacturers recommendations for the equipment and maintain that test speed throughout the test.

Provide the Department the plot of one profile trace per tested lane and a summary report containing IRI values for each of the three test runs performed in each direction.

Initial Testing, IRI

The original surface for Class 3 projects shall be tested at no cost to the Department prior to performance of any smoothness opportunities in accordance to the methods and parameters in Section 'General Testing Requirements for IRI Data Collection'. Class 1 and Class 2 projects do not require initial testing. Results from initial testing for Class 3 projects shall be submitted to the Engineer within five (5) working days of test completion in the format specified by the Engineer. Results not received within the allotted time frame will be assessed a charge of $1,000.00 per day at the Engineer's discretion. Three (3) measurements shall be taken for each lane required to meet this Special Provision. No paving shall be permitted until the Contractor has performed initial testing to the satisfaction of the Engineer.

Final Testing

The final surface, after all smoothness operations have been completed, shall be tested in accordance to Section 'General Testing Requirements for IRI Data Collection'. Results of final testing for all projects shall be submitted to the Engineer within five (5) working days of test completion in the format specified by the Engineer. Results not received within the allotted time frame will be assessed a charge of $1,000.00 per day at the Engineer's discretion. Three measurements shall be taken for each lane to meet the requirements of this Special Provision.

Final Testing for Excessive Deviations

All paved areas, whether subject to IRI testing or not, must be tested to locate deviations in each wheelpath in the longitudinal direction and in the transverse direction. A deviation is considered to be a hump or depression greater than or equal to 0.25" within 10'. Longitudinal deviations shall be located using data collected by an inertial profiling system and processed through a rolling 10'-straightedge simulation, a rolling 10' straightedge, or a rigid 10' straightedge. Transverse deviations shall be located using a rigid 10' straightedge at the discretion of the Engineer. Testing shall be performed within seven (7) days of the completion of paving.

Quality Assurance Testing:

If the Engineer chooses to perform comparison testing, the Contractor shall provide a lane closure at no cost to the Engineer. The length of the lane closure shall be determined for each project location based on site conditions. The minimum closure shall be 0.25 mile and the maximum closure shall be 1 mile. The lane closure shall be at either end of the project limits and will be determined on a project basis at the Engineer's discretion.

If comparison testing indicates a difference greater than 6 in/mi in IRI measurements per 0.1-mile section, the Contractor and Engineer shall work to resolve the differences. If the differences cannot be resolved the equipment will be rejected for use on the project and all data collected to that point will be deemed invalid for that contract. At that point, the Contractor shall propose an alternative piece of testing equipment for use.

Data Reporting:

Test results shall be provided to the Department within five (5) working days of the completion of testing. Results not received within the allotted time frame will be assessed a charge of $1,000.00 per day at the discretion of the Engineer.

The Department recognizes that inertial profiler manufacturers use different formats for reporting capabilities. Printouts on 8 ½" by 11" paper or strip charts are acceptable.

Data collected using the inertial profiling system shall be provided to the Engineer with the following information clearly displayed on the printout:

1. Profiling Company Name
2. Date of Paving
3. Date of Test
4. Parameters used in the calculation
5. Data file name
6. Testing Personnel

A printout of the pavement profile is required for one (1) of the three (3) runs for each lane and direction tested. A summary chart may be submitted for the remaining test runs. If excessive deviations are calculated using inertial profiling data runs submitted for IRI analysis a summary chart shall be submitted as well. The summary chart shall include the station and wheelpath for deviation reporting. If excessive deviations are manually determined (using a rolling ten-foot straightedge or rigid 10' straightedge), the Engineer will be present during testing and will record the data on site.

Inertial profiling systems have the capability of producing ERD files. An ERD file is requested for each run performed and can be submitted electronically (via email) or on external media (CD). More information about the format of ERD files can be obtained through the Engineer.

Acceptance and Payment:

Acceptance of the final pavement will be based on the results of IRI values and the number of deviations. A section that has an IRI value greater than 100.0 in/mi will require corrective actions. Deviations equal to or in excess of 0.25" in 10' shall be corrected at no expense to the Engineer or have a discount charge of $200.00 per deviation assessed at the discretion of the Engineer.

An IRI number in inches per mile will be used for each 0.1-mile (528 foot) section as the basis for payment of the surface courses designated by each contract. The average value of the three test runs will be used as the IRI value for payment. Payments for each section will be based on estimated tonnage calculated from plan thickness and widths using the average maximum specific gravity ("Rice") value for all surface mix used at that location. If the plan does not indicate the travel lane width, a default value of 12' will be used. The formula used for tonnage estimation is:

$$Estimated\ Tonnage = [(L * W * T) * Rice * 62.4\ (lb/ft^3) * (0.0005\ tons/12\ in)]$$

where: L = Length Segment (ft.)
W = Width Lane (ft.)
T = Plan Thickness (in.)

The percentage of improvement for Class 3 projects will be calculated using the following equation:

$$\%\ Improvement = [(Initial\ IRI - Final\ IRI) / Initial\ IRI] * 100$$

The applicable pay adjustments for IRI will be taken from Table A (Class 1 and 2 Projects) and Table B (Class 3 Projects)

$$IRI\ Bonus / Penalty = Estimated\ Tonnage * UP * (PA - 100) / 100$$

where: UP = Contract Hot Mix Unit Price (Dollars)
PA = Pay Adjustment (Percent)

The total pay adjustment for paving work performed on each location will be:

$$(\sum IRI\ Adj\ for\ each\ section) - Total\ Deviations * 200$$

It will be possible to receive bonus for IRI measurements and a discount charge for excessive deviations on the same project. If a 528' section has an IRI value resulting in a deduction of at least 30% of the section pay (i.e. IRI >100 in/mi), the deviation discount charge for that section is disregarded and the IRI discount charge is the only action taken for that section.

Table A: Payment Adjustments for Class 1 and Class 2 Projects

	Payment Adjustments	
IRI per 0.1 mile Section (in./mi.)	**Class 1**	**Class 2**
40.0 and under	103	104
40.1 - 55.0	101	102
55.1 – 65.0	100	101
65.1 – 75.0	99	100
75.1 – 100.0	96	97
>100	70	70

Class 3 projects will be paid based on the percent improvement for each 528' section from the average of the three initial profile traces taken prior to any work action as shown in the Table B.

Table B: Payment Adjustments for Class 3 projects

Percent Improvement from Initial test	**Payment Adjustments for Class 3 Projects**
> 60.0%	103
45.1 – 60.0%	102
25.1 – 45.0%	101
0 – 25.0%	100
<0%	70

Corrections to the paving surface, such as diamond grinding with approved equipment, patching, or other measures may be taken at the Contractor's expense and at the Engineer's discretion to correct pavement surfaces assessed a discount charge. Areas corrected using these methods will not be eligible for bonus payment, but may be assessed a charge based on the resulting surface after correction. The Engineer reserves the right to require corrective actions such as remove & replace or diamond grinding if the must correct discount charge exceeds 50% of the cost of materials or the IRI exceeds 100 in/mi. The Engineer may also require corrective actions if the deviations are at a height or depth which will create a safety concern on the roadway.

401636 - COLD RECYCLED BITUMINOUS PAVEMENTS

Description:

This work shall consist of the processing and treatment with bituminous and/or chemical additives of existing asphalt pavement without heating to produce a restored pavement layer. Cold recycling consists of milling an existing asphalt pavement to a specified depth (2.5" minimum, 6" maximum), mixing an additive or additives with (RAP) reclaimed asphalt pavement (when specified), spreading, and compacting the recycled mixture to a specified depth and/or cross slope. This is followed by a placement of a new asphalt base and/or surface course.

Materials:

The cold recycled mixture shall be composed of reclaimed aggregate and/or reclaimed asphalt pavement, a recycling agent, and additives. The Contractor shall be responsible for determining what recycling agent and additives are necessary to produce an acceptable mix. The Contractor shall submit to the Engineer for approval, the mix design listing the name, source, and amount of each recycling agent and/or additive used.

Reclaimed Material. Reclaimed aggregate material (RAM) or reclaimed asphalt pavement (RAP) shall be removed from the existing pavement by a milling process that results in a minimum of 95% of the material passing through the 2" sieve. If more than 5% is retained on the 2" sieve the pavement removal process shall be adjusted to reduce the amount to less than 5%.

Recycling Agents. Recycling agents, such as CSS 1h emulsion, will be accepted under certification from the Contractor. All recycling agents delivered shall be sampled in the presence of the Engineer. The contractor shall place a representative sample in a clean plastic container, note the date of sample, load number, and gallons verified. The sample shall be provided to the Engineer for testing.

Additives. Additives to help the mixing operation shall be approved by the Engineer prior to incorporation into the mix.

Construction:

Weather Limitations. Cold recycling operations shall be performed with asphalt emulsion when the atmospheric temperature in the shade is 55ºF and rising and it is not foggy. Recycling operations shall not be performed when rain is occurring or night temperatures are forecast to fall below freezing.

Mixing and Placement. The equipment for this operation shall produce the completed bituminous concrete pavement in-place as follows:

A single processing unit capable of planing, sizing, and mixing all materials in-place and which is capable of placing the recycled bituminous material in a single pass. If applicable, a multi-unit train capable of planing, sizing, and mixing all materials in-place shall be utilized. Up-cutting machines shall not be permitted unless secondary crushing is conducted in-place prior to mixing and the introduction of the bituminous material. The cutting mandrel of the rotomill shall be a minimum of 10.5' and shall not exceed 12.5'.

Recycling along curb, guardrail, gutter line, and around utilities shall be accomplished by the use of a small rotomilling machine. The small rotomilling machine shall rotomill to a minimum depth of 4" longitudinally along all curbs and gutters, and around all manholes, inlets, and any other structure not accessible or practical to be rotomilled by either a single processing unit or a multi-unit train. The rotomilled product produced by the small rotomill machine will be the same as the large rotomill machine and of equal gradation to produce a uniform recycled bituminous pavement. The rotomilled material shall be removed and replaced with new recycled bituminous base course material or binder. Inlets/catch basins shall be covered during the rotomilling and recycling operation to prevent rotomilled material from entering the catch basin area where it could contaminate and/or block the storm water system.

Recycling adjacent to an existing asphalt shoulder shall be rotomilled to a depth of 4". The recycled base course material shall be compacted to the same elevation with the existing asphalt shoulders, leaving no depressions or higher areas.

Mixing of all reclaimed materials, aggregates, and emulsified asphalt shall be conducted in-place. The RAP, recycling agent, and additives shall be combined in the quantities required by the specifications or as directed by the Engineer. The mixing operation shall result in the RAP being completely and uniformly coated with recycling agent and additives, if used.

The mix in-place operation shall spread the required quantity of reclaimed material and aggregate, if required, on the prepared area in a uniform loose layer to obtain the specified compacted depth. Adjust the travel speed of the mixer to obtain a thorough and uniform mixture in a single pass.

Ensure that positive displacement pumps accurately meter the planned amount of bituminous material and the rotomilling machine mixes it thoroughly with the RAP materials. The pump shall be mechanically or electronically interlocked with the ground speed of the machine. The bituminous metering system and water metering system shall be capable of continuous monitoring (gallons per minute) flow, and totalizing the quantity of bituminous material applied into the mixing chamber. The travel speed in feet of the rotomill shall be visible on the computer readout screen.

Self-propelled asphalt pavers shall conform to Subsection 401.05 of the Standard Specifications and shall be utilized to spread the cold recycled mixture to the established grade and cross slope. The paving operations shall be conducted to protect existing and finished pavement sections. The paver shall be equipped with a floating averaging beam or non-contact averaging beam.

The bituminous concrete pavements shall be constructed in approximately equal depth layers. The compacted layer depth shall be not less than 3" nor greater than 5".

Compaction. After the cold recycled mixture has been spread, allowed to cure as necessary, and any surface irregularities corrected, the mat shall be uniformly compacted without displacement and cracking.

A minimum of one pneumatic tire roller (25 tons) operated at a maximum of 4 mph and one double drum vibratory steel-wheeled roller (12 tons), operated in a vibratory mode, shall be utilized at all times in the rolling operation. The sequence of rolling operations shall provide a minimum density of 88% of the theoretical maximum density (AASHTO T209), or a minimum density of 93% of laboratory specimens made of production materials obtained.

When the control strip method of density is specified, the control strip shall be constructed of mixture produced with the cold recycling equipment and within the pavement section. Whenever there is a change in the cold recycled material or compaction method or equipment, or unacceptable results occur, a new test control strip shall be constructed, tested, and analyzed. The target density for the control strip method shall be 96%.

Surface Tolerance. The surface shall be tested with a 10' straightedge at locations selected by the Engineer. The variation of the surface from the testing edge of the straightedge between any two contacts, longitudinal or transverse with the surface, shall not exceed ¼". Irregularities exceeding the specified tolerance shall be corrected by and at the expense of the Contractor.

Depth Check. One drilled core for each 500' or less of completed bituminous pavement shall be utilized to determine the depth of the recycled pavement. The Contractor shall remove and replace any section deficient by ½" or greater from the specified depth at no expense to the Department.

Curing. Allow the recycled base course to cure for at least one week before placing the final wearing surface.

Method of Measurement:

The quantity of cold recycled bituminous pavement will be measured as the number of square yards per inch of depth shown on the Plans, completed and accepted. The depth will be verified and corrected based on measurements of the cores.

Basis of Payment:

The quantity of cold recycled bituminous pavement will be paid for at the Contract unit price per square yard per inch of depth. Price and payment will constitute full compensation for preparing the sub grade, supplying, mixing, placing and compacting the cold recycled bituminous pavement material, removing any excess material from the site and properly disposing of it, and any other incidental items associated with this item.

The quantity of emulsified asphalt will be paid for at the Contract unit price per gallon. Price and payment will constitute full compensation for furnishing, mixing and applying the emulsified asphalt, and for all labor, equipment, tools and incidentals required to complete the work. Emulsified asphalt will be paid for under its respective item.

11/23/11

401696 – ENTRANCE, DRIVEWAY AND INTERSECTING STREET PAVING SURCHARGE

Description:

To compensate for work associated with paving the tie-ins at entrances, driveways and intersecting streets when such work cannot be completed as part of the mainline (roadway, auxiliary lanes, shoulder) paving operation. The surcharge limits will extend from the outermost roadway element to the point of tie-in as directed by the Engineer with the following exceptions.

No Surcharge will be paid:

1. When the tie-in does not exceed three feet (0.9 meters) from the outermost roadway element.

2. For paving any portion of a tie-in which exceeds 100 feet (30.48 meters) from the outermost roadway element. The entire tie-in section will be performed under normal paving operations.

3. When the intersecting street is to be paved under the same Contract.

4. For paving of auxiliary lanes and crossovers in the median of divided highways.

Method of Measurement:

The quantity of entrance, driveway and intersecting street paving surcharge will be meaured as the actual number of tons (metric tons) of hot-mix placed and accepted in entrances, driveways and intersecting streets as described in this item.

Basis of Payment:

The quantity of entrance, driveway and intersecting street paving surcharge will be paid for at the Contract unit price per ton (metric ton). Price and payment will constitute full compensation for the additional labor and equipment costs involved with the reduced production associated with such work.

5/25/11

401699 - QUALITY CONTROL/QUALITY ASSURANCE OF BITUMINOUS CONCRETE

.01 Description.

This item shall govern the Quality Control/Quality Assurance Testing for supplying hot-mix asphalt plant materials and constructing hot-mix asphalt pavements.

The Contractor shall be responsible for providing the quality level of materials and construction incorporated into the Contract that will meet the requirements of the Contract. The Contractor shall perform all necessary quality control inspection, sampling, and testing. The Engineer will evaluate all materials and construction for acceptance. The procedures for Quality Control and Acceptance are described in this Section.

.02 Definitions.

Acceptable Quality Level (AQL): That level of percent within limits (PWL) to which the Engineer will consider the work completely acceptable.
Acceptance Plan: Factors that comprise the Engineer's determination of the degree of compliance with contract requirements and value of the product. These factors include the Engineer's sampling, testing, and inspection.
Delaware Asphalt Pavement Association (DAPA): The organization representing the interests of hot-mix asphalt producers and Contractors. The Engineer has a copy of the DAPA officers' names and point(s) of contact.
Dispute Resolution: The procedure used to resolve conflicts resulting from discrepancies between the Engineer's and the Contractor's results of sufficient magnitude to impact payment. The testing will take place at a location and time mutually agreeable by both the Engineer and the Contractor.
Full Depth Construction – Construction of an adequate pavement box on a subgrade and subbase prepared by the contractor
Independent Assurance: An unbiased and independent verification of the Quality Assurance system used, and the reliability of the test results obtained in regular sampling and testing activities. The results of Independent Assurance are not to be directly used as a basis of material acceptance.
Job Mix Formula (JMF)/Mixture Identification (ID): The target values for individual aggregate size gradation percentages and the asphalt percentage, the sources of each of the component materials, the proposed proportions of component materials to be used to meet those target values, the asphalt proportion, and the mixing temperature. The Engineer will assign uniquely individual mixture identification for each JMF submitted and approved.
Lower Quality Index (QL): The index reflecting the statistic related to the lower boundary to which a sample (or sample statistic) may deviate from the target value and still be considered acceptable.

Mean: A statistical measure of the central tendency – the average value.
Operational Day: A day in which the Engineer has approved a lane closure for the Contractor to perform work within an approved MOT plan.
Percent Within Limits (PWL): That amount of material or workmanship that has been determined, by statistical method, to be within the pre-established characteristic boundary(ies).
Qualified Laboratory: A laboratory mutually agreed upon by both DAPA and the Engineer as having proper test equipment that has been calibrated in accordance to AASHTO.
Qualified Technician: Personnel mutually agreed upon by both DAPA and the Engineer as having adequate training, experience, and abilities to perform the necessary testing. The minimum qualifications are either a recognized nationally accredited or certified Superpave testing certificate or been working in hot-mix asphalt testing for at least one year.
Quality Assurance (QA): All those planned and systematic actions necessary to provide adequate confidence that a product or service will satisfy given requirements for quality.
Quality Control (QC): The sum total of the activities performed by the Contractor in order to assure that the product meets contract requirements.
Quality Control (QC) Plan: The detailed description of the type and frequency of inspection, sampling, and testing deemed necessary to measure and control the various properties governed by the Specifications. The QC Plan must address the actions needed to keep the process in control, detect when the process is going out of control, and responses to correct the situation(s).

Quality Level Analysis: A statistical procedure that provides a method for estimating the percentage of each lot or sublot of material, product, item of construction, or completed construction that may be expected to be within specified tolerances.
Standard Deviation: A term used in statistics to indicate the value calculated from the square root of the difference between the individual measurements in a group and their average. Standard deviation is calculated by taking the square root of the sum of the squares of the differences of each of n values and the mean value, this sum first divided by (n-1).
Target Value: The acceptable value for a controlling characteristic of a product. The JMF will establish each of these values for the material.
Test Methods: Shall be AASHTO test methods. Copies of these test methods shall be available at each qualified laboratory.
Upper Quality Index (QU): The index reflecting the statistic related to the upper boundary to which a sample (or sample statistic) may deviate from the target value and still be considered acceptable.

Volumetric Properties: Air voids, voids in mineral aggregates (VMA), voids filled with asphalt (VFA), and dust to effective asphalt.

.03 Equipment.

(a) Material Production Test Equipment.

The Contractor shall establish, maintain, and operate a qualified testing laboratory at the production plant site of sufficient size and layout that will accommodate the testing operations of both the Contractor and the Engineer. The Contractor shall maintain all the equipment used for handling, preparing, and testing materials in proper operating condition. For any laboratory equipment malfunction, the Contractor shall remedy the situation within one working day or the Engineer may reject production. In the case of an equipment malfunction, and while waiting for repairs to equipment, the Engineer may elect to test the material at either another production facility or the Engineer's laboratory to obtain payment factors.

The following shall be the minimum calibrations for the referenced equipment:

- SUPERPAVE^{R} Gyratory Compactor: once every year; verified once every month by the Engineer.
- Ovens: once every three months, verified once every month.
- Vacuum Container and Gauge (Rice Bowls): once every three months, verified once every month.
- Balances and Scales: once every year, verified once every month.
- Thermometers: once a year; verified once every month.
- Gyratory Compactor molds and base plates: once every year
- Mechanical Shakers: once every year
- Sieve Verifications: once every year

All calibrations shall be documented and on file for review by the Engineer at any time.

(b) Pavement Construction Test Equipment.

The Contractor shall furnish and use in-place density gauges, or coring equipment, or both, as necessary to meet the requirements of these Specifications.

.04 Quality Control (QC) Plan.

(a) Material Production QC.

(1) Job Mix Formula – Material Production.

The Contractor shall submit for approval to the Engineer the job mix formula (JMF) design of the component materials and target characteristic values for each mixture proposed for use. Once the JMF is submitted to the Engineer, the Engineer will have up to three weeks to review the submitted information. However, a provision for a more timely approval is available to the Contractor; first, the Contractor shall submit the proper documentation on Pinepave mixture design software for the Engineer's approval. After that approval from the Engineer, the Contractor shall produce the new mixture for a non-Department project. The Engineer will test the material, by taking three series per the specifications. If the Engineer's test results are within the specifications, then the mixture will be approved by the Engineer for Department projects.

The component materials design shall include designating the source and the expected proportion (within 1 percent for the aggregate components, and within 0.1 percent for the other components) of each component to be used in order to produce workable hot-mix asphalt having the specified properties. For plant component feed adjustments, RAP can be considered in the same manner as an individual aggregate component. The JMF target characteristic values include the mixing temperature range, core temperature range for gyration, the percentage of the asphalt cement component (both total and virgin), and the percentages of the aggregate amounts retained on the sieves to be addressed by the JMF as shown in Table 1.

The Contractor shall provide an ignition oven correction number for each JMF. The Contractor shall also supply to the Engineer weighed material of each JMF so correction numbers can be established for the Engineer's equipment for Dispute Resolution samples.

Prior to starting production of a new mixture, the Contractor shall submit a JMF. For any mixture that has a 20% or greater failure rate on any combined volumetric criteria, the JMF will not be approved for use on Department contracts. In order to be approved, a re-design of the mixture will have to be completed by the Contractor for review and approval by the Engineer. The Contractor shall uniquely title each JMF. The Contractor shall submit test data with each JMF and tests performed by a Qualified Laboratory on representative materials, verifying the adequacy of the design. Refer to the specifications for each mix type in order to determine the design requirements. The JMF sieve percentage values shall conform to the ranges shown in Table 1.

If there is a change in the source of any of the component materials, other than asphalt, if there is a change in the proportions of the aggregate components or the percent passing for each sieve by more than 5 percent from the submitted JMF, or if there is a change in the percentage of the asphalt cement component by 0.2 percent or more, which causes the volumetrics to change from the originally submitted JMF, a new JMF is required. Also, if the asphalt cement target percentage is lowered, all volumetric criteria must still be achieved.

According to the Contractor's QC Plan, the Contractor shall inform the Engineer of any proposed changes to an existing JMF. The Contractor shall notify the Engineer by electronic mail of the proposed changes. The Engineer will reply to the proposed changes within one operational day and notify the Contractor of the effective date of the changes.

Although a new JMF is not required, the Contractor must notify the Engineer of any change in the proportions of the components. This notification shall include the total change made from the approved JMF proportions, and the effective time of the change.

All submitted JMF's shall correspond to the Pinepave mixture design software. The Engineer, for evaluation of the submitted JMF, will use the first three test samples. These test results acquired during production shall be within the following range compared to the submitted JMF on the Pinepave mixture design software: G_{mm}: + / -0.030 and G_{mb}: + / - 0.040

Table 1 - Aggregate Gradation - JMF and Control Point Information

Sieves to be addressed by JMF/Range values are percentages passing by weight

Sieve Size mm (inch)	4.75 mm	4.75mm Range	9.5 mm	9.5mm Range	12.5 mm	12.5mm Range	19.0 mm	19.0mm Range	25.0 mm	25.0mm Range
37.5(1.5)	No		No		No		No		Yes	100
25.0(1.0)	No		No		No		Yes	100	Yes	90-100
19.0 (3/4)	No		No		Yes	100	Yes	90-100	Yes	20-90
12.5(1/2)	Yes	100	Yes	100	Yes	90-100	Yes	23-90	Yes	
9.5 (3/8)	Yes	95-100	Yes	90-100	Yes	28-90	Yes		Yes	
4.75(#4)	Yes	90-100	Yes	32-90	Yes		Yes		Yes	

Table 1 - Aggregate Gradation - JMF and Control Point Information										
Sieves to be addressed by JMF/Range values are percentages passing by weight										
Sieve Size mm (inch)	**4.75 mm**	**4.75mm Range**	**9.5 mm**	**9.5mm Range**	**12.5 mm**	**12.5mm Range**	**19.0 mm**	**19.0mm Range**	**25.0 mm**	**25.0mm Range**
2.36(#8)	Yes		Yes	32-67	Yes	28-58	Yes	23-49	Yes	19-45
(#16)	Yes	30-60	Yes		Yes		Yes		Yes	
(#30)	Yes		Yes		Yes		Yes		Yes	
(#50)	Yes		Yes		Yes		Yes		Yes	
(#100)	Yes		Yes		Yes		Yes		Yes	
.075(#200)	Yes	6-12	Yes	2-10	Yes	2-10	Yes	2-8	Yes	1-7

(2) Process Control – Material Production.

The Contractor shall submit in writing (letter or electronic mail) a QC Plan from each proposed production plant to the Engineer; no hot-mix asphalt material will be accepted until the Engineer approves the QC Plan. This plan must be submitted to the Engineer on an annual basis for review and approval prior to material production. The Engineer will send a signed copy back to the Contractor stating that it is approved. The approved QC Plan shall govern contractor operations.

The following are considered significant violations to the Contractor's QC Plan:

Using testing equipment that is knowingly out of calibration or is not working properly.
Reporting false information such as test data, JMF information, or any info requested by DelDOT
When the Contractor fails to comply to their approved QC Plan in reference to materials testing
Substantial deviations to AASHTO or DelDOT procedures when running tests, sampling stockpiles, or testing hot mix.
The use of any material not listed in the JMF.
The use of the wrong PG graded asphalt.
If samples fall within the Contractors action points in the QC Plan but the Contractor fails to take the corrective action in the approved QC Plan

If a Contractor is found in violation of any of these items, they will receive a written warning for their first violation. If the Contractor is found in violation a second time on any of the criteria, they will forfeit any bonus from that day's production. If the Contractor is found in violation a third time on any of the criteria, they will receive a five percent (5%) deduction for that day's production. If the Contractor is found in violation a fourth time, the plant will not be approved for production until such time that the Contractor addresses the violation of the QC plan to the satisfaction of the Engineer. If the Engineer approves the changes in advance, the Contractor may make changes to the QC Plan. All changes shall be submitted and approved in writing by the Engineer.

The QC Plan shall include actions that will assure all materials and products will conform to the specifications, whether manufactured or processed by the Contractor, or procured from suppliers, subcontractors, or vendors. The Contractor shall perform the inspection and tests required to substantiate product conformance to contract requirements. The Contractor shall document QC inspections and tests, and provide copies to the Engineer when requested. The Contractor shall maintain records of all inspections and tests for at least one year. The records shall include the date, time, and nature of deficiency or deficiencies found; the quantities of material involved until the deficiency was corrected; and the date, time, and nature of corrective actions taken.

In the QC Plan, the Contractor shall detail the type and frequency of inspection, sampling, and testing deemed necessary to measure and control the various properties of material and construction governed by the Specifications. The QC Plan shall include the following elements as a minimum:

Production Plant – make, type, capacity, and location.
Production Plant Calibration – components and schedule; address documentation.
Personnel – include name and telephone number for the following individuals:
- Person responsible for quality control.
- Qualified technician(s) responsible for performing the inspection, sampling, and testing.
- Person who has the authority to make corrective actions on behalf of the Contractor.

Testing Laboratory – state the frequency of accuracy checks and calibrations of the equipment used for testing; address documentation.
Locations where samples will be obtained and the sampling techniques for each test
Load number of QC samples (1-10 if QA sample is not within trucks 1-10)
Tests to be performed and their normal frequency; the following, at a minimum, shall be conducted:
- Mixture Temperature: each of the first five trucks, and each load that is sampled for QC or acceptance testing.
- Gradation analysis of aggregate (and RAP) stockpiles – one washed gradations per week for each aggregate stockpile; RAP: five gradations and asphalt cement contents for dedicated stockpiles where new material is not being added; one gradation and asphalt cement content test per week for stockpiles where material is continually being added to the stockpile.
- Gradation analysis of non-payment sieves
- Dust to effective asphalt calculation
- Moisture content analysis of aggregates – daily.
- Gradation analysis of the combined aggregate cold feed – one per year per mixture.
- Bulk specific gravity and absorption of blended material – one per year per mixture.
- Ignition Oven calibration – one per year per mixture.
- Hot-Bins: one per year per mixture.
- Others, as appropriate.

Procedures for reporting the results of inspection and tests (include schedule).
Procedures for dealing with non-compliant material or work.
Presentation of control charts. The Contractor shall plot the results of testing on individual control charts for each characteristic. The control charts shall be updated within one working day as test results for each sublot become available. The control charts shall be easily and readily accessible at the plant laboratory. The following parameters shall be plotted from the testing:
- Asphalt cement content.
- Volumetrics (air voids, voids in mineral aggregates [VMA])
- Gradation values for the following sieves:
  - 4.75 mm (#4).
  - 2.36 mm (#8).
  - 0.075 mm (#200).

Operational guidelines (trigger points) to address times when the following actions would be considered:
- Increased frequency of sampling and testing.
- Plant control/settings/operations change.
- JMF adjustment.
- JMF change (See Section .04(a)(1)).
- Change in the source of the component materials.
- Calibration of material production equipment (asphalt pump, belt feeders, etc.).
- Rejection of material.

When any point of non-compliance with the QC plan, or material not meeting the Specifications, comes to the attention of either the Contractor or the Engineer, the other party shall be notified immediately, and the Contractor shall take appropriate corrective actions. Failure to take corrective actions immediately shall be cause for rejection of material or work by the Engineer.

(b) Pavement Construction – Process Control.

The Contractor shall perform Quality Control of pavement compaction by testing in-place pavement with a density gauge or by testing cores extracted from the pavement. The use of the nuclear density gauge shall conform to ASTM D2950; the use of other density gauges shall be as per the manufacturer's recommendations and approved by the Engineer. The Contractor may use any method to select locations for the Quality Control.

.05 Acceptance Plan.

(a) Material Production – Tests and Evaluations.

The Engineer will conduct acceptance tests. The Engineer will directly base acceptance on the acceptance test results, the asphalt cement quality, the Contractor's QC Plan work, and the comparisons of the acceptance test results to the QC test results. The Engineer may elect to utilize test results of the Contractor in some situations toward judging acceptance. All acceptance tests shall be performed by qualified technicians at qualified laboratories following AASHTO or DelDOT procedures, and shall be evaluated using Quality Level Analysis.

The Contractor shall supply, capture, and mark samples, as directed, from delivery trucks before the trucks leave the production plant. The sample shall represent the material produced by the Contractor, and shall be of sufficient size to allow the Engineer to complete all required acceptance tests. The Engineer will direct the Contractor when to capture these samples, on a statistically random, unbiased basis, established before production begins each day based upon the anticipated production tonnage. The captured sample shall be from the Engineer specified delivery truck; if the Contractor visually observes the specified delivery truck sample and does not want this sample to be sampled and tested for acceptance, that delivery truck will not be sent to a Department project. The next visually acceptable delivery truck to the Contractor shall be sampled for acceptance testing.

The first sample of the production day will be randomly generated by the Engineer between loads 0 and 12 (0-250 tons). Subsequent samples will be randomly generated by the Engineer on 500-ton sub-lots for the production day. Unacceptable samples may be a basis for rejection of material if the QC plan is not followed as approved for sample retrieval. If the Contractor wishes to perform parallel tests with the Engineer, or to capture samples to be retained for possible Dispute Resolution, each of the samples for these purposes shall be obtained at the same time and location as the acceptance test sample. Either splitting a large sample or getting multiple samples that equally represent the material is acceptable. The Engineer will perform all splitting and handling of samples after they are obtained by the Contractor.

The Engineer will evaluate and accept the material on a lot basis. All the material within a lot shall have the same JMF (mixture ID). The lot size shall be targeted for 2000 tons or a maximum period of three days, whichever is reached first. If the 2000th ton target lot size is achieved during a production day, the lot size shall extend to the end of that production day. The Contractor may interrupt the production of one JMF in order to produce different material; this type of interruption will not alter the determination of the size or limits of material represented by a lot. The Engineer will evaluate each lot on a sublot basis. The size for each sublot shall be 100 to 500 tons and testing for the sub lots will be completed on a daily basis. For each sublot, the Engineer will evaluate one sample.

The target size of sub-lots within each lot, except for the first sample of the production day, is equal-sized 500 ton sub lots and will be based upon anticipated production, however, more or fewer sublots, with differing sizes, may result due to the production schedule and conditions. If the actual production is less than anticipated, and it's determined a sample will not be obtained (based upon the anticipated tonnage), a new sample location will be determined on a statistically random, unbiased basis based upon the new actual production. If the actual production is going to be 50 tons or greater over the anticipated sub lot production, a new sample location will be determined on a statistically random, unbiased basis based upon the new actual production. The Engineer will combine the evaluation and test results for all of the applicable sublots in order to evaluate each individual lot.

If the Engineer is present, and the quantity exceeds 25 tons, a statistically random sample will be used for analysis. When the anticipated production is less than 100 tons and greater than 25 tons, and the Engineer is not present, the contractor shall randomly select a sample using the Engineer's random location program. The captured sample shall be placed in a suitable box, marked to the attention of the Engineer, and submitted

to the Engineer for testing. A box sample shall also be obtained by the contractor at the same time and will be used as the Dispute Resolution sample if requested by the Engineer. The contractor shall also obtain one liquid asphalt sample (1 pint) per grade of asphalt used per day and properly label it with all pertinent information.

The Engineer will conduct the following tests in order to characterize the material for the pavement compaction quality, and to judge acceptance and the pay adjustment for the material:

AASHTO T312 – Preparing a mixture samples using a gyratory compactor.
AASHTO T166, Method C (Rapid Method) – Bulk specific gravity of compacted samples.
AASHTO T308 – Asphalt cement content.
AASHTO T30 – Aggregate gradations, using samples from the asphalt cement content test.
AASHTO T209 – Theoretical maximum specific gravity.
ASTM Provisional Test Method – Rapid Drying of Compacted and Loose Bituminous Asphalt Specimens using Vacuum Drying Method

(b) Pavement Construction – Tests and Evaluations.

The Engineer will directly base acceptance on the compaction acceptance test results, and on the inspection of the construction, the Contractor's QC Plan work, ride smoothness as referenced in the contract documents, lift thickness as referenced in the contract documents, joint quality as referenced in the contract documents, surface texture as referenced in the contract documents, and possibly the comparisons of the acceptance test results to the independent test results. For the compaction acceptance testing, the Engineer will sample the work on a statistically random basis, and will test and evaluate the work using lots.

Prior to paving a road segment, the Contractor shall notify the Engineer of any locations within that road segment that may not be suitable to achieve minimum (93%) compaction due to existing conditions. The Contractor shall schedule and hold a meeting in the field with the Engineer in order to discuss all areas that may potentially be applicable to Table 5a before paving starts. Areas that will be considered for Table 5a will be investigated in accordance to the method described in Appendix B. If this meeting is not held prior to paving, no areas will be considered for Table 5a. Areas of allowable exemptions that will not be cored include the following: partial-depth patch areas, driveway entrances, paving locations of less than 100 tons, areas around manholes and driveway entrances, and areas of paving that are under 400 feet in continuous total length and/or 5 feet in width.

The exempt areas around manholes will be a maximum of 4 feet transversely on either side from the center of the manhole, and 20 feet longitudinally on either side from the center of the manhole. The exempt areas around driveway entrances shall be the entire width of the driveway, and 3 feet from the edge of the longitudinal joint next to the driveway. Areas of exemption that will be cored for informational purposes only shall include: areas where the mat thickness is less than three times the nominal maximum aggregate size as directed by the Engineer, violations of Section 401.08 in the Standard Specifications as directed by the Engineer, and areas shown to contain questionable subgrade properties as proven by substantial yielding under a fully legally loaded truck. Failure to obtain core samples in these areas will result in zero payment for compaction regardless of the exempt status.

The Engineer will evaluate and accept the compaction work on a daily basis. Payment for the compaction will be calculated by using the material production lots as referenced in **.05 Acceptance Plan (a) Material Production – Tests and Evaluation** and analyzing the compaction results over the individual days covered in the material production lot. The compaction results will be combined with the material results to obtain a payment for this item.

The minimum size of a compaction lot shall be 100 tons. If the compaction lot is between 101 and 1000 tons, the Engineer shall randomly determine four compaction acceptance test locations. If the compaction lot is between 1001 and 1500 tons, the Engineer shall randomly determine six compaction acceptance test locations. If the compaction lot is between 1501 and 2000 tons, the Engineer shall randomly determine eight compaction acceptance test locations. If the compaction lot is greater than 2000 tons, the Engineer shall randomly determine two compaction acceptance test locations per 500 tons.

If a randomly selected area falls within an Engineer approved exemption area, the Engineer will select one more randomly generated location to be tested per the requirements of this Specification. If that cannot be accomplished, or if an entire location has been declared exempt, the compaction testing shall be performed

as per these Specifications but a note will be added to the results that the location was an Engineer approved exempt location.

Testing locations will be a minimum of 1.5 feet from the newly placed longitudinal joint and 50 feet from a new transverse joint. If the Contractor chooses to cut companion cores, they shall be located within one foot of the Engineers cores along the longitudinal direction and in-line with the Engineers cores in the longitudinal plane.

Exactly at the locations marked by the Engineer, the Contractor shall cut a core, 6 inches in diameter, through the full lift depth. Cores submitted that are not from the location designated by the Engineer will not be tested and will be paid at zero pay.

The Contractor shall notify the Engineer prior to starting paving operations with approximations of the tonnage to be placed. The Contractor is then responsible for notifying the appropriate Engineer test personnel within 12 hours of material placement. The Engineer will then have 24 hours to mark the core locations. After determination of locations, the Contractor shall complete testing within two operational days of the locations being marked. If the cores are not cut within two operational days, the area in question will be paid at zero pay for compaction testing.

The Contractor shall provide any traffic control required for the structural number investigation, sampling, and testing work at no additional cost to the Department.

The Contractor shall cut each core with care in order to prevent damaging the core. The pavement shall have a maximum temperature of 140 F when cores are cut from it. Immediately upon removal of a core from the roadway, the Contractor shall adequately label it. The Contractor shall protect the core by supplying a 6-inch plastic concrete cylinder mold, or an approved substitute, and placing the core in it. If more than one core is in the same mold, the Contractor shall place paper between them. The Contractor shall attach a completed QC test record for the representative area to the corresponding core. The Engineer will also complete a test record for areas tested for the QA report and provide to Materials & Research. At the end of every production day, the Contractor shall deliver the cores to the Engineer for testing, processing, and report distribution.

The Contractor shall repair the core hole per Appendix A, Repairing Core Holes in Hot-Mix Asphalt Pavements. Core holes shall be filled immediately. Failure to repair core holes at the time of coring will result in zero pay for compaction testing for the area in question.

The Engineer will conduct the following tests on the applicable portion of the cores in order to evaluate their quality:

AASHTO T166, Method C (Rapid Method) – to determine the bulk specific gravity of the cores.
AASHTO T209 – to calculate the theoretical maximum specific gravity and the density of the non-compacted mixtures.
ASTM Provisional Test Method – Rapid Drying of Compacted and Loose Bituminous Asphalt Specimens using Vacuum Drying Method.

The Engineer will use the average of the last five test values of the same JMF (mixture ID) material at the production plant in order to calculate the average theoretical maximum specific gravity of the cores. The average will be based on the production days test results and as many test results needed from previous days production to have an average of five samples. If there are less than five values available, the Engineer will use the JMF design value in addition to the available values to calculate the average theoretical maximum specific gravity.

.06 Payment and Pay Adjustment Factors.

The Contractor shall include the costs for all materials, labor, equipment, tools, and incidentals necessary to meet the requirements of this specification in the bid price per ton for the hot-mix asphalt. Payment to the Contractor for the hot-mix asphalt item(s) will be based on the Contract price per ton and the pay adjustments described in this specification. The Engineer will determine pay adjustments for the hot-mix asphalt item(s) based on the Acceptance Plan. The Engineer will determine both a pay adjustment for the material and a pay adjustment for the pavement construction. Note that the material portion of the total pay

adjustment is 70 percent and the pavement construction portion is 30 percent. For replaced material or work, the Engineer will not apply the Pay Adjustment applicable to the material or work replaced; a new Pay Adjustment will be calculated based on the qualities of the new material. Even if one portion of the pay adjustment (material or construction) is not applied, the Engineer may apply the pay adjustment to the other portion. All adjustments (bonus or penalty) shall be paid under this item number in the contract.

(a) Material Production – Pay Adjustment.

The Engineer will determine the material pay adjustment by evaluating the production material based on the following parameters:

Gradation of the 2.36 mm (#8) sieve.
Gradation of the 0.075 mm (#200) sieve.
Asphalt cement content.
Air void content

Using the JMF target value, the single test tolerance (from Table 3), and the test values, the Engineer will use the following steps to determine the material pay adjustment factor for each lot of material:

1. For each parameter, calculate the mean value and the standard deviation of the test values for the lot to the nearest 0.1 unit.
2. For each parameter, calculate the Upper Quality Index (QU):
   QU = ((JMF target) + (single test tolerance) – (mean value)) / (standard deviation).
3. For each parameter, calculate the Lower Quality Index (QL):
   QL = ((mean value) - (JMF target) + (single test tolerance)) / (standard deviation).
4. For each parameter, locate the values for the Upper Payment Limit (PU) and the Lower Payment Limit (PL) from Table 2 – Quality Level Analysis by the Standard Deviation Method. (Use the column for "n" representing the number of sublots in the lot. Use the closest value on the table when the exact value is not listed).
5. Calculate the PWL for each parameter from the values located in the previous step:
   PWL = PU + PL – 100.
6. Calculate each parameter's contribution to the payment adjustment by multiplying its PWL by the weight factor shown in Table 3 for that parameter.
7. Add the calculated adjustments of all the parameters together to determine the Composite PWL for the lot.
8. From Table 4, locate the value of the Pay Adjustment Factor corresponding to the calculated PWL.
9. For each lot, determine the final material price adjustment:

Final Pay Adjustment =
(Lot Quantity) x (Item Bid Price) x (Pay Adjustment Factor) x 70%. This final pay calculation will be paid to the tenth of a percent.

In lieu of being assessed a pay adjustment penalty, the Contractor may choose to remove and replace the material at no additional cost to the Department. If the PWL of any single material characteristic is below 60, the Engineer may require the removal and replacement of the material at no additional cost to the Department.

The test results from the Engineer on production that is less than 100 tons will be combined with the two most recently completed Engineer tests with the same Mixture ID to calculate payment for the lot encompassing the single test. If that cannot be accomplished, the approved JMF will be used to calculate payment for the lot encompassing the single test. Payment for previously closed lots will not be affected by the analysis.

When a sample is out of the acceptable tolerance for any Materials pay criteria, that sample will be isolated. For payment purposes, the test result of the out of acceptable tolerance sample will be combined with the two previous acceptable samples of the same JMF and analyzed per this specification. The material that is considered out of the acceptable tolerance will only include the material within the represented sub-lot (i.e., a maximum of 500 tons). If the previous acceptable test result is from the previous production day, only the material produced on the second production day will be considered out of tolerance. All future sub lots will not include the isolated test.

If, during production, a QA sample test result does not meet the acceptable tolerances and the Contractors QC sample duplicates the QA sample test result, the Contractor can make an appropriate change to the mixture (within the JMF boundaries), and request to have that sample further isolated. If this request is approved, and the Contractor has made a change, the third load after the change will be tested. If that sample test result shows compliance with the specifications, the material that is considered out of the acceptable tolerance will include the material from the previous acceptable test result to the third load after the initially sampled and tested sample. If the sample does not meet the specification requirements, the Engineer will no longer accept material. Production may resume when changes have been made and an acceptable sample and test result is obtained.

Table 2 – Quality Level Analysis by the Standard Deviation Method

PU or PL	QU and QL for "n" Samples						
	n = 3	n = 4	n = 5	n = 6	n = 7	n = 8	n = 9
100	1.16	1.50	1.79	2.03	2.23	2.39	2.53
99		1.47	1.67	1.80	1.89	1.95	2.00
98	1.15	1.44	1.60	1.70	1.76	1.81	1.84
97		1.41	1.54	1.62	1.67	1.70	1.72
96	1.14	1.38	1.49	1.55	1.59	1.61	1.63
95		1.35	1.44	1.49	1.52	1.54	1.55
94	1.13	1.32	1.39	1.43	1.46	1.47	1.48
93		1.29	1.35	1.38	1.40	1.41	1.42
92	1.12	1.26	1.31	1.33	1.35	1.36	1.36
91	1.11	1.23	1.27	1.29	1.30	1.30	1.31
90	1.10	1.20	1.23	1.24	1.25	1.25	1.26
89	1.09	1.17	1.19	1.20	1.20	1.21	1.21
88	1.07	1.14	1.15	1.16	1.16	1.16	1.17
87	1.06	1.11	1.12	1.12	1.12	1.12	1.12
86	1.04	1.08	1.08	1.08	1.08	1.08	1.08
85	1.03	1.05	1.05	1.04	1.04	1.04	1.04
84	1.01	1.02	1.01	1.01	1.00	1.00	1.00
83	1.00	0.99	0.98	0.97	0.97	0.96	0.96
82	0.97	0.96	0.95	0.94	0.93	0.93	0.93
81	0.96	0.93	0.91	0.90	0.90	0.89	0.89
80	0.93	0.90	0.88	0.87	0.86	0.86	0.86
79	0.91	0.87	0.85	0.84	0.83	0.82	0.82
78	0.89	0.84	0.82	0.80	0.80	0.79	0.79
77	0.87	0.81	0.78	0.77	0.76	0.76	0.76
76	0.84	0.78	0.75	0.74	0.73	0.73	0.72
75	0.82	0.75	0.72	0.71	0.70	0.70	0.69
74	0.79	0.72	0.69	0.68	0.67	0.66	0.66

Table 2 – Quality Level Analysis by the Standard Deviation Method							
PU or PL	QU and QL for "n" Samples						
	n = 3	n = 4	n = 5	n = 6	n = 7	n = 8	n = 9
73	0.75	0.69	0.66	0.65	0.64	0.63	0.63
72	0.74	0.66	0.63	0.62	0.61	0.60	0.60
71	0.71	0.63	0.60	0.59	0.58	0.57	0.57
70	0.68	0.60	0.57	0.56	0.55	0.55	0.54
69	0.65	0.57	0.54	0.53	0.52	0.52	0.51
68	0.62	0.54	0.51	0.50	0.49	0.49	0.48
67	0.59	0.51	0.47	0.47	0.46	0.46	0.46
66	0.56	0.48	0.45	0.44	0.44	0.43	0.43
65	0.52	0.45	0.43	0.41	0.41	0.40	0.40
64	0.49	0.42	0.40	0.39	0.38	0.38	0.37
63	0.46	0.39	0.37	0.36	0.35	0.35	0.35
62	0.43	0.36	0.34	0.33	0.32	0.32	0.32
61	0.39	0.33	0.31	0.30	0.30	0.29	0.29
60	0.36	0.30	0.28	0.27	0.27	0.27	0.26
59	0.32	0.27	0.25	0.25	0.24	0.24	0.24

Table 3 - Material Parameter Weight Factors		
Material Parameter	Single Test Tolerance (+/-)	Weight Factor
Asphalt Content	0.4	0.30
#8 Sive (19 mm or >)	7.0	0.30
#8 Sieve (12.5 mm or <)	5.0	0.30
#200 Sieve (0.075 mm) Sieve	2.0	0.30
Air Voids (4.0% Target)	1.5	0.10

Table 4 - PWL Pay Adjustment Factors	
PWL	Pay Adjustment Factor (%)
100	+5
99	+4
98	+3
97	+2
96	+1
95	0

Table 4 - PWL Pay Adjustment Factors	
PWL	**Pay Adjustment Factor (%)**
94	(-1)
93	(-2)
92	(-3)
91	(-4)
PWL (when <91)	(PWL - 100)

(b) Pavement Construction – Pay Adjustments.

The Engineer will determine the pavement construction pay adjustment by evaluating the construction of the pavement, based on the following parameter:

Degree of compaction of the in-place material

Using the test values for the cores, the Engineer will use the following steps to determine the pavement construction pay adjustment for each lot of work. Note that the material portion of the total pay adjustment is 70 percent and the pavement construction portion is 30 percent.

1. Calculate the average density values from the sublot tests values, to the nearest 0.1 unit.
2. Calculate the Degree of Compaction:
   Degree of Compaction =
   ((Core Bulk Specific Gravity) / (Theoretical Maximum Specific Gravity)) x 100%.
3. The average compaction for the sublots shall be averaged together for the compaction level of the lot. The lots compaction test level shall be averaged to the whole percent.
4. Locate the value of the Payment Adjustment Factor corresponding to the calculated degree of compaction from Table 5 or Table 5a.
5. Determine the pavement construction price adjustment by using the following formula:
   Pay adjustment = (Lot Quantity) x (Bid Price) x (Pay Adjustment Factor) x 30%.

Table 5: Compaction Price Adjustment Highway Locations	
Degree of Compaction (%)	**Pay Adjustment Factor (%)**
>97	-100*
96	-3
95	0
94	0
93	+5
92	0
91	-15
90	-25
89	-30
≤88	-100*

* or remove and replace it at Engineer's discretion

Table 5a: Compaction Price Adjustment Other[1] Locations	
Degree of Compaction (%)	**Pay Adjustment Factor (%)**
>96	-100*
95	-2
94	0
93	+3
92	0
91	0
90	0
89	-1
88	-5
87	-15
86	-25
85	-30
84	-100*

* or remove and replace at Engineer's discretion

[1] This chart is to be used for areas where the structural value of the area to be paved is less than 1.75 as determined by the Engineer. See Appendix B – Method for Obtaining Cores for Determination of Roadway Structure. This chart is applicable to rehabilitation work only; full depth construction will not be considered for Table 5a.

.07 Dispute Resolution.

Disputes or questions about any test result shall be immediately brought to the attention of the Contractor and the Engineer. When there is a significant alleged discrepancy regarding the Engineer's acceptance test results, the Contractor must claim a dispute within two operational days of the test date. The following dispute resolution procedures will be used.

The Engineer and the Contractor will review the sample quality, the test method, the laboratory equipment, and the laboratory technician. If these factors are not the cause of the dispute, a third party dispute resolution will be used.

For third party resolution testing, it can be either at another Contractor's laboratory, the Engineer's laboratory, or an independent accredited laboratory. Unless otherwise mutually agreed upon by DAPA and the Engineer, the Engineer's qualified laboratory in Dover and qualified personnel shall conduct the necessary testing for third party Dispute Resolution after the Engineer has provided reasonable notice to allow the Contractor to witness this testing.

When disputes over production testing occur, the samples used for Dispute Resolution testing will be those samples the Contractor properly captured, labeled, and stored, as described in the second paragraph of the section of these specifications titled **.05 Acceptance Plan, (a) Material Production – Tests and Evaluations**. If no samples are available, the original testing results will be used for payment calculations.

Dispute Resolution samples for air void content will be heated by a microwave oven.

If there is a discrepancy between the Engineer's acceptance test result and the Contractor's test result, the Contractor may ask for the Dispute Resolution sample to be tested. If the Dispute Resolution sample substantiates the original acceptance test result, the Contractor, after two such Dispute Resolution samples, will be charged a fee of $125 for all further Dispute Resolution cores that substantiate the acceptance

test result. If the Dispute Resolution sample substantiates the Contractor's test result, the Contractor will not be charged a fee.

When disputes over compaction core test results occur, the Engineer's acceptance core will be used for the dispute resolution sample. The Contractor will be advised on when the testing will occur as referenced above to witness the testing.

The results of the dispute resolution testing shall replace all of the applicable disputed test results for payment purposes.

7/28/11

Appendix A - Repairing Core Holes in Hot-Mix Asphalt Pavement

Description.

This appendix describes the procedure required to acceptably repair core holes in a bituminous concrete pavement.

Materials and Equipment.

The following material shall be available to complete this work:

Patch Material –A DelDOT approved High Performance Cold Patch material shall be used.

The following equipment shall be available to complete this work:

Sponge or other absorbent material – Used to extract water from the hole.
Compaction Hammer – Shall be mechanical, with a flat, circular tamping face smaller than 6 inches in diameter. The tamping head shall be connected to an electrical, pneumatic, or gasoline driven tamping device.

Construction Method.

After core removal from the hole, remove all excess water from within the hole, and prevent water from re-entering the hole.

Place the patch material in lifts no greater than 3 inches. If the hole is deeper than 3 inches, use two lifts of approximately equal depths so that optimum compaction is achieved. Make sure that the patch surface matches the grade of the existing roadway. Make every effort to achieve the greatest possible compaction

Performance Requirements.

The Engineer will judge the patch on the following basis:

The patch shall be well compacted
The patch surface shall match the grade of the surrounding roadway surface.

Basis of Payment.

No measurement or payment will be made for the patching work. The Contractor must gain the Engineer's acceptance of the patching work before the Engineer will accept the material represented by the core.

Appendix B - Method for Obtaining Cores for Determination of Roadway Structure

The Contractor is responsible for obtaining cores in areas that they propose are eligible for compaction price adjustments according to Table 5a in this specification. Table 5a is not applicable for new full-depth pavement box construction. Cores submitted for this process shall be obtained according to the following process.

1. Contact Materials & Research (M&R) personnel to determine if information about the area is already available. If M&R has already obtained cores in the location that is being investigated, the contractor may opt to use the laboratory information for the investigation and not core the area on their own.

2. If M&R does not have information concerning the section of the roadway, the contractor needs to contact M&R to arrange for verification of coring operations. Arrangements shall be made to allow for an individual from M&R to be on the site when the cores are obtained. Cores will be turned over to M&R for evaluation.

3. The contractor is responsible for providing all traffic control and repairing core holes in accordance to 401699 Appendix A – Repairing Core Holes in Hot-Mix Asphalt Pavements.

4. Cores are to be taken throughout the entire project for the area in question. Cores will be spaced, from the start of the project in increments determined based on field and project specifics. Cores will be evenly distributed throughout the project location. The cores will be taken in the center of the lane in question.

5. Additional cores may be taken at other locations, if surface conditions indicate that there may be a substantial difference in the underlying section. The location of these cores should be documented and submitted to M&R.

6. Cores shall be full depth and include underlying materials. If there is a stone base included in the pavement section, at a minimum 1 core must have information concerning the thickness of the base. This is determined by augering to the subgrade surface.

7. The calculations used to determine the structural capacity of the roadway is as follows. If the contractor finds, upon starting the coring process, that the areas are of greater thickness than applicable to Table 5a, they may terminate the coring process on their own and retract the request.

Structural Number Calculations

Each pavement box material is assigned a structural coefficient based upon AASHTO design guides. The structural coefficient is used to determine the total strength of the pavement section.

Materials used in older pavement sections are assigned lower structural coefficients to compensate for aging of the materials. The coefficients used to determine the structural number of an existing pavement are:

Existing Material	Structural Coefficient
HMA	0.32
Asphalt Treated Base	0.26
Soil Cement	0.16
Surface Treatment (Tar & Chip)	0.10
GABC	0.14
Concrete	0 - 0.7*

* The Structural Coefficient of Concrete is dependent upon the condition of the concrete. Compressive strengths & ASR analysis are used to determine condition – contact the Engineer if this situation arises.

Newly placed materials use a different set of structural coefficients. They are as follows:

New Material	Structural Coefficient
HMA	0.40
Asphalt Treated Base (BCBC)	0.32
Soil Cement	0.20
GABC	0.14

Example:

Location includes placement of a 1.25" Type C overlay on 2.25" Type B. Existing roadway is cored and is shown to consist of 2" HMA on 7" GABC.

Calculation:

For the Type B lift the calculation would be:

Existing HMA	2 * 0.32	=	0.64
GABC	7 * 0.14	=	0.98
			1.62

For the Type C lift the calculation would be:

Newly Placed B	2.25 * 0.4	=	0.90
Existing HMA	2 * 0.32	=	0.64
GABC	7* 0.14	=	0.98
			2.52

401713 - EMULSIFIED ASPHALT

Description:

This item shall be used with item 401636 - COLD RECYCLED BITUMINOUS PAVEMENT or 304508 - BITUMINOUS STABILIZED FULL-DEPTH RECLAMATION.

Materials:

Recycling agents, such as CSS 1h emulsion, will be accepted under certification from the Contractor. All recycling agents delivered shall be sampled in the presence of the Engineer. The contractor shall place a representative sample in a clean plastic container, note the date of sample, load number, and gallons verified. The sample shall be provided to the Engineer for testing.

Method of Measurement and Basis of Payment:

Measurement and Payment will be at the contract unit price per gallon of emulsified asphalt used and will be verified by the Engineer by delivery tickets and/or metering devices on the equipment. Each day, prior to the start of work, and at the end of the workday, all quantities will be verified, in writing, with the Engineer.

6/3/11

401752 – SAFETY EDGE FOR ROADWAY PAVEMENT

Description:

This work consists of the construction of safety edge(s) along bituminous concrete pavement or P.C.C. pavement in accordance with the details and notes on the Plans and as directed by the Engineer.

Construction Methods:

The safety edge shall not be constructed adjacent to curb or in front of guardrail sections.

In bituminous concrete pavement sections, prior to the construction of the safety edge, the fill or in situ material at the edge of pavement shall be compacted so that it is level with the top of the pavement, prior to the final surface overlay.

In bituminous concrete pavement sections, the contractor shall attach a device to the screed of the paver unit that confines the material at the end of the gate and extrudes the asphalt material in such a way that results in a compacted wedge shape pavement edge of 32 degrees (+/- 2 degrees). Contact shall be maintained between the device and the road shoulder surface. The device shall be manufactured so that it can be easily adjusted to transition at cross roads, driveways and obstructions without stopping the paver unit. The device's shape shall constrain the asphalt and cause compaction, as well as increase the density of the extruded profile.

In bituminous concrete pavement sections, the Transtech Shoulder Wedge Maker, Advant-Edge or an approved equal shall be used to produce the safety edge. Contact information for these wedge shape compaction devices is listed below:

Transtech Systems, Inc.
1594 State Street
Schenectady, NY 12304
1-800-724-6306
www.transtechsys.com

or

Advant-Edge Paving Equipment, LLC
33 Old Niskayuna Road
Loudonville, NY 12211
1-814-422-3343
www.advantedgepaving.com

or an approved equal.

In P.C.C. pavement sections, the paver screed shall be modified to provide a chamfer at the end of the P.C.C. pavement in accordance with the details and notes on the Plans, or as directed by the Engineer.

Method of Measurement:

Safety Edge will not be measured for payment.

Basis of Payment:

The cost associated with the construction of safety edge(s), including but not limited to the wedge device, preparation and compaction of the fill or in situ material, and placement of the safety edge in accordance with the Plans and Details shall be incidental to the bituminous concrete pavement or P.C.C. pavement item being placed.

1/21/2011

401754 – FOG SEAL

Description:

This work consists of preparing the surface, furnishing and applying an emulsified asphalt and water mixture as a surface seal.

Materials:

Materials for fog seal shall be a 1:1 mixture CSS-1h, which conforms to Section 811 of the Standard Specifications, and water, which conforms to Section 803 of the Standard Specifications. A Certificate of Analysis shall be submitted for each lot of CSS-1h for approval. The percentage of residual asphalt of the CSS-1h shall be no less that 57 percent. The emulsion should be diluted no more than 24 hours before its intended use. This is to avoid settlement of the diluted emulsion. The emulsion may be circulated using a centrifugal or other suitable pump to ensure uniformity.

Equipment:

Distributors. The distributors used shall be capable of uniformly applying the bituminous material in liquid form. Devices to control the pressure, volume, and temperature shall be provided. Each distributor shall have an approved calibration chart, be equipped with an approved sampling device, and conform to the following:

a. *Pressure.* The pressure shall be supplied by a positive displacement pump or air compressor. The pressure shall be uniform throughout the entire width of spray. If pressure is supplied by an air compressor, automatic controls must be provided to maintain sufficient and even pressure throughout the application of an entire load.

b. *Temperature.* The distributor shall be equipped with a heating system that applies heat uniformly across the width of the tank. Provisions shall be made for circulating or agitating the material whenever necessary while heating. The distributor shall be equipped with a thermometer marked in degrees Fahrenheit (Celsius) of sufficient range to determine the actual temperature of the material.

c. *Tachometer.* All distributors shall be provided with an approved tachometer recording feet (meters) per minute with a tabulation of feet (meters) per load with adjustments. Each load tabulation shall start at zero. There shall also be a totaling tabulation of this instrument.

d. *Volume.* A tachometer shall give correct readings of the speed, and the volumetric efficiency of the distributor shall ensure the correct volume at various speeds. Tests shall be required to prove the volumetric efficiency of the distributor at various speeds as directed by the Engineer.

e. *Circulating System.* All pump distributors shall be equipped with a circulating system designed to maintain a homogenous liquid while circulating in the distributor tank. This circulating system shall also be arranged to circulate the material in the tank truck before application.

   Air distributors shall be equipped with a device for agitating the bituminous material in the tank trucks when necessary.

f. *Tests.* Necessary tests shall be made to determine the accuracy of all pressure gauges, tachometers, and pump efficiencies. The tests shall be made by the Contractor when and as required by the Engineer.

g. *Spray Bars.* Each distributor shall be equipped with spray bars capable of applying material uniformly throughout the entire length of the spray bars when they are extended. Spray bar extensions shall be provided for applying up to a 12' (7.3 m) width in one operation. Spray bars shall be equipped with a cleaning device and a shut-off valve to prevent dribbling, dripping, or streaking.

h. *Tank Capacity Gauge.* A float or other approved type tank capacity gauge shall be furnished to indicate the volume in the tank in not less than 25 gal (100 L) units. The gauge shall have adjustments for correction.

Tanks shall have a minimum capacity of 750 gal (2800 L).

The rate of application of the distributer shall be calibrated by an approved method determined by the Engineer.

If the Engineer deems that the equipment applying the material is inadequate or fails to comply with all regulations, the Engineer will order the equipment to be removed from the job and require that another unit be placed on the work.

Application of Fog Seal Material:

The fog seal shall be applied in one application at the rates specified using the pressure distributor for the full width of the sealing operation, unless otherwise directed. Apply at the temperature that is recommended by the manufacture.

The nozzles of the spray bar shall be kept clean at all times. If one or more nozzles becomes blocked during the application of bituminous materials, the distributor shall be stopped immediately, and the nozzles shall be cleaned. The streaked areas shall be made uniform using a hand hose or other approved methods.

If the Contractor is unable to keep the application uniform, the operation shall be discontinued until a more experienced operator or a better distributor, or both, can be provided; or, the Contractor shall take such other precautions as may be necessary to keep the application within specified limits.

When applying bituminous materials adjacent to structures or curbs, the Contractor shall furnish and use effective means of protecting the structures or curbs from discoloration.

Construction Methods:

The surface upon which the fog seal is to be placed shall be cleaned thoroughly to the satisfaction of the Engineer. The fog seal shall be applied at a rate of 0.05 to 0.17 gal/yd^2 at ambient temperature. The application rate appropriate for the surface being sealed shall be determined by the Engineer. This rate will be determined by test strip. Apply the fog seal when the air and surface temperature is 60°F and above. Measure the air and surface temperature in the shade away from artificial heat. The application shall not begin if rain or high winds are eminent. The Engineer will determine when weather conditions are suitable for application. The fog seal should be a thin, uniform coating sufficient to seal the underlying pavement. The fog seal shall be applied using pressurized distributing equipment with a spray bar or other approved distribution system. During the application of the fog seal, care shall be taken to prevent splattering of adjacent pavement, curb and gutter and structures. Surface preparation shall be completed by removing all vegetation prior to sweeping with a power broom followed by a final sweeping with a approved vacuum truck. The preparation shall be done just prior to the application of the fog seal and be approved by the Engineer.

Method of Measurement:

The quantity of Emulsified Asphalt fog seal will be measured as the actual number of gallons of fog seal applied. The quantity will be determined by any or all of the following methods and should be verified for accuracy by computations based on field measurements taken on and along the completed finished surfaces. Multiple layers will not be measured separately.

1. **Truck Measurement:** If bituminous materials are delivered to the Project in tank trucks, distributor tanks, or drums, the Contractor shall not remove any bituminous material from the transporting vehicle or container until necessary measurements have been made, nor shall the transporting vehicle or container be released until final outage has been measured. If weighing is not convenient, the Contractor shall furnish the Engineer with a certified chart showing the dimensions and volume of each container together with a gauge or calibrated measuring rod which will permit the volume of the material to be determined by vertical measurement.

2. **Metering:** The volume may be determined by metering, in which case the metering device used and the method of using it shall be subject to the approval of the Engineer.

3. **Time of Deliveries:** The arrival and departure of vehicles delivering bituminous materials to the Project site shall be so scheduled that the Engineer is afforded proper time for the measurements of delivered volume and final outage. The Engineer will make the necessary measurements only during the Contractor's normal daily working hours.

Basis of Payment:

The quantity of the fog seal will be paid for at the Contract unit price per gallon of diluted CSS-1h. Price and payment will constitute full compensation for preparing the surface, mobilizing and furnishing all equipment, materials, and labor; placing the material; and for all labor, equipment, tools and incidentals necessary to complete the work.

2/1/11

401800 - WMA, SUPERPAVE, TYPE C, 115 GYRATIONS, PG 64-22 (CARBONATE STONE)
401801 - WMA, SUPERPAVE, TYPE C, 160 GYRATIONS, PG 64-22 (CARBONATE STONE)
401802 - WMA, SUPERPAVE, TYPE C, 205 GYRATIONS, PG 64-22 (CARBONATE STONE)

401803 - WMA, SUPERPAVE, TYPE C, 115 GYRATIONS, PG 70-22 (CARBONATE STONE)
401804 - WMA, SUPERPAVE, TYPE C, 160 GYRATIONS, PG 70-22 (CARBONATE STONE)
401805 - WMA, SUPERPAVE, TYPE C, 205 GYRATIONS, PG 70-22 (CARBONATE STONE)

401806 - WMA, SUPERPAVE, TYPE C, 115 GYRATIONS, PG 76-22 (CARBONATE STONE)
401807 - WMA, SUPERPAVE, TYPE C, 160 GYRATIONS, PG 76-22 (CARBONATE STONE)
401808 - WMA, SUPERPAVE, TYPE C, 205 GYRATIONS, PG 76-22 (CARBONATE STONE)

401809 - WMA, SUPERPAVE, TYPE B, 115 GYRATIONS, PG 64-22
401810 - WMA, SUPERPAVE, TYPE B, 160 GYRATIONS, PG 64-22
401811 - WMA, SUPERPAVE, TYPE B, 205 GYRATIONS, PG 64-22

401812 - WMA, SUPERPAVE, TYPE B, 115 GYRATIONS, PG 70-22
401813 - WMA, SUPERPAVE, TYPE B, 160 GYRATIONS, PG 70-22
401814 - WMA, SUPERPAVE, TYPE B, 205 GYRATIONS, PG 70-22

401815 - WMA, SUPERPAVE, TYPE B, 115 GYRATIONS, PG 76-22
401816 - WMA, SUPERPAVE, TYPE B, 160 GYRATIONS, PG 76-22
401817 - WMA, SUPERPAVE, TYPE B, 205 GYRATIONS, PG 76-22

401818 - WMA, SUPERPAVE, BITUMINOUS CONCRETE BASE COURSE, 115 GYRATIONS, PG 64-22
401819 - WMA, SUPERPAVE, BITUMINOUS CONCRETE BASE COURSE, 160 GYRATIONS, PG 64-22
401820 - WMA, SUPERPAVE, BITUMINOUS CONCRETE BASE COURSE, 205 GYRATIONS, PG 64-22

401821 - WMA, SUPERPAVE, TYPE C, 160 GYRATIONS, PG 64-22, PATCHING
401822 - WMA, SUPERPAVE, TYPE B, 160 GYRATIONS, PG 64-22, PATCHING
401823 - WMA, SUPERPAVE, BITUMINOUS CONCRETE BASE COURSE, 160 GYRATIONS, PG-64-22, PATCHING

401824 - WMA, SUPERPAVE, TYPE C, 160 GYRATIONS, PG-64-22, WEDGE
401825 - WMA, SUPERPAVE, TYPE B, 160 GYRATIONS, PG-64-22, WEDGE

401826 - WMA, SUPERPAVE, TYPE C, 115 GYRATIONS, PG 64-22, (NON-CARBONATE STONE)
401827 - WMA, SUPERPAVE, TYPE C, 160 GYRATIONS, PG 64-22, (NON-CARBONATE STONE)
401828 - WMA, SUPERPAVE, TYPE C, 205 GYRATIONS, PG 64-22, (NON-CARBONATE STONE)

401829 - WMA, SUPERPAVE, TYPE C, 115 GYRATIONS, PG 70-22, (NON-CARBONATE STONE)
401830 - WMA, SUPERPAVE, TYPE C, 160 GYRATIONS, PG 70-22, (NON-CARBONATE STONE)
401831 - WMA, SUPERPAVE, TYPE C, 205 GYRATIONS, PG 70-22, (NON-CARBONATE STONE)

401832 - WMA, SUPERPAVE, TYPE C, 115 GYRATIONS, PG 76-22, (NON-CARBONATE STONE)
401833 - WMA, SUPERPAVE, TYPE C, 160 GYRATIONS, PG 76-22, (NON-CARBONATE STONE)
401834 - WMA, SUPERPAVE, TYPE C, 205 GYRATIONS, PG 76-22, (NON-CARBONATE STONE)

401835 - THIN WMA, SUPERPAVE, TYPE C, 115 GYRATIONS, PG 64-22

401836 - THIN WMA, SUPERPAVE, TYPE C, 160 GYRATIONS, PG 64-22
401837 - THIN WMA, SUPERPAVE, TYPE C, 115 GYRATIONS, PG 70-22
401838 - THIN WMA, SUPERPAVE, TYPE C, 160 GYRATIONS, PG 70-22
401839 - THIN WMA, SUPERPAVE, TYPE C, 115 GYRATIONS, PG 76-22
401840 - THIN WMA, SUPERPAVE, TYPE C, 160 GYRATIONS, PG 76-22

Description:

Warm mix asphalt (WMA) is the generic term used to describe the reduction in production, paving, and compaction temperatures achieved through the application of one or more WMA technologies.

WMA may be produced by one or a combination of several technologies involving asphalt foaming processes and equipment or additives that facilitate the reduction of the temperature at which the mix can be placed and satisfactorily compacted thereby permitting the mix to be produced at reduced temperatures from a comparable mix without the Warm Mix Technology.

The following Subsections of the Standard Specifications shall be applicable: 401.01, 401.03 - 401.10, 401.12, and 401.13. All other subsections have been modified herein.

The Contractor shall read and thoroughly understand the requirements of the QA/QC specification as defined in item 401699. It is the responsibility of the Contractor to determine all costs associated with meeting these requirements and to include them in the per ton bids for the various Superpave bituminous concrete items. The Contractor shall also be aware that the pay adjustment factors in item 401699 will be applied to the Superpave item payments to determine the bonus or penalty for the item.

Materials:

If the Contractor proposes to use a combination of materials that are not covered by this Specification, the mix design shall be submitted and reviewed by the Engineer 30 calendar days prior to use.

Conform to the requirements of Subsections 823.01, 823.05- 823.17, and 823.25 - 823.28 of the Standard Specifications and the following for bituminous materials:

Asphalt Binder:

The asphalt binder shall meet the requirements of Superpave performance-grade asphalt binder, as referenced in the Plans, according to M 320 [1], Table 1 and tested according to AASHTO R29 with the following test ranges:

TEST PROCEDURE	AASHTO REFERENCE	SPECIFICATION LIMITS
Temperature, °C	M 320	Per Grade
Original DSR, G*/sin (δ)	T 315	1.00 - 2.20 kPa
RTFO DSR, G*/sin (δ)	T 315	>/= 2.20 kPa
PAV DSR, G* sin (δ)	T 315	</=5000 kPa
BBR Creep Stiffness, *S*	T 313	</= 300.0 kPa
BBR *m*-value	T 313	>/=0.300

Note 1: The exception to M 320 is that the original DSR shall be 1.00 to 2.20 kPa

Substitution of a higher temperature grade will require prior approval by the Engineer.

The highest low temperature grade virgin binder to be used is -22.

Depending on the level of RAP used, the low temperature properties, per T 313, may be different than stated in M 320 or the previous table.

Recycled Materials:

The percentage allowance of recycled asphalt pavement shall be controlled through the use of the Materials & Research recycled mixture program available through the Materials & Research Section. The program can be used by the Contractor to determine which materials and combinations of materials can be used to meet the specified material on the contract.

No recycled asphalt shingles shall be used in WMA.

Mineral Aggregate:

Conform to Section 805 and the following criteria. These criteria apply to the combined aggregate blend.

DESIGN ESAL'S (MILLIONS)	COARSE AGGREGATE ANGULARITY[1] (% MIN)		FINE AGGREGATE ANGULARITY[2] (% MIN)		CLAY CONTENT[3] (% - MIN)	FLAT AND ELONGATED [4] (% - MAX)
	≤ 100 mm	> 100 mm	≤ 100 mm	> 100 mm		
< 0.3	55/-	-/-	-	-	40	-
0.3 to < 3	75/-	50/-	40	40	40	10
3 to <10	85/80[5]	60/-	45	40	45	
10 < 30	95/90	80/75	45	40	45	
30	100/100	100/100	45	45	50	

[1]Coarse Aggregate Angularity is tested according to D5821.
[2]Fine Aggregate Angularity is tested according to TP33.
[3]Clay Content is tested according to T176.
[4]Flat and Elongated is tested according to D4791 with a 5:1 aspect ratio.
[5] 85/80 denotes that 85% of the coarse aggregate has one fractured face and 80% has two or more fractured faces.

The following source properties apply to the individual aggregates in the aggregate blend for the proposed JMF.

TEST METHOD	SPECIFICATION LIMITS
Toughness, T96 Percent Loss, Maximum	40
Soundness, T104 Percent Loss, Maximum for five cycles	20
Deleterious Materials, T112 Percent, Maximum	10
Moisture Sensitivity, T283 Percent, Minimum	80

Supply all polish values to the Engineer upon request. The polish value of the composite aggregate blend for any roadway with a minimum average daily traffic volume (ADT) of 8000 vehicles and a posted speed of 35 mph (60 kph) or greater shall be greater than 8.0 when tested according to Maryland State Highway Administration 'MSMT 411 - Laboratory Method of Predicting Frictional Resistance of Polished Aggregates and Pavement Surfaces'. RAP shall be assigned a value of 4.0.

Mineral Filler:

Conform to M17.

Warm Mix Additives:

For any WMA technology requiring addition of any material by the producer during production, the following information will be submitted with the proposed JMF for review and approval at least 30 calendar days prior to production:

1. WMA technology and/or additive information.
2. WMA technology manufacturer's recommendation for usage.
3. WMA technology target dosage rate and tolerance envelope. Support tolerance envelope with test data demonstrating acceptable mix production properties conforming to all sections of this specification.
4. WMA technology manufacturer's material safety data sheets (MSDS).
5. Documentation of past WMA technology field application including points of contact.
6. Temperature ranges for mixing and compacting.
7. Laboratory test data, samples, and sources of all mix components, and asphalt binder viscosity-temperature relationships.

The contractor shall follow the manufacturer's recommendation for incorporating additives and WMA technologies into the mix. The contractor shall also comply with the manufacturer's recommendation regarding receiving, storage, and delivery of additives.

If the producer performs blending of the WMA technology in their tank, a separate Quality Control plan shall be submitted by the producer to the Department for review and approval at least 30 calendar days prior to production.

Mixture Requirements:

Mix Design. Develop and submit a job mix formula for each mixture according to R35. Each mix design shall be capable of being produced, placed, and compacted as specified. Apply all mix design requirements for Superpave to the development of the WMA mix design.

Gradation: The FHWA Superpave 0.45 Power Chart shall be used to define permissible gradations for the specified mixture. Type C shall be either a No.4 (4.75 mm), 3/8" (9.5 mm), or 1/2" (12.5 mm) Nominal Maximum Aggregate Size Hot-Mix. Unless otherwise noted in the Plans, the Type C shall meet the 3/8" (9.5 mm) Nominal Maximum Aggregate Size. Type B Hot-Mix shall be the 3/4" (19.0 mm) Nominal Maximum Aggregate Size and the Bituminous Concrete Base Course (BCBC) shall be the 1" (25.0 mm) Nominal Maximum Aggregate Size. Target values for percent passing each standard sieve for the design aggregate structure shall comply with the Superpave control points and should avoid the restricted zone. Percentages shall be based on the washed gradation of the aggregate according to T11.

Thin WMA, Type C shall be a No. 4 (4.75 mm) Nominal Maximum Aggregate Size Only.

In addition to the results of the material requirements specified above, the following material properties shall be provided by the Contractor: bulk specific gravity $G_{sb,}$ apparent specific gravity G_{sa}, and the absorption of the individual aggregate stockpiles to be used, tested according to T84 and T85 and reported to three decimal places along with the specific gravity of the mineral filler to be used, tested according to T100 and reported to three decimal places.

Superpave Gyratory Compactive (SGC) Effort:

The Superpave Gyratory Compaction effort employed throughout mixture design, field quality control, or field quality assurance shall be as indicated below. All mixture specimens tested in the SGC shall be compacted to N_{Max} Height data provided by the SGC shall be employed to calculate volumetric properties at $N_{INITIAL}$, N_{DEISGN}, and N_{MAX}

Superpave Gyratory Compactive (SGC) Effort:

DESIGN TRAFFIC LEVEL (MILLION ESAL'S)	$N_{INITIAL}$	N_{DESIGN}	N_{MAX}
0.3 to < 3	7	75	115
3 to < 30	8	100	160
30	9	125	205

Volumetric Design Parameters. The design aggregate structure at the target asphalt cement content shall satisfy the volumetric criteria below:

DESIGN ESAL'S (MILLION)	REQUIRED DENSITY (% OF THEORETICAL MAXIMUM SPECIFIC GRAVITY)			VOIDS-IN-MINERAL AGGREGATE (% - MINIMUM) NOMINAL MAX. AGGREGATE (mm)					VOIDS FILLED WITH ASPHALT (% - MINIMUM)
	$N_{INITIAL}$	N_{DESIGN}	N_{MAX}	25.0	19.0	9.5	12.5	4.75	
0.3 to < 3	≥90.5	96.0	≤ 98.0	12.5	13.5	15.5	14.5	16.5	65.0 - 78.0
3 to < 10	89.0								65.0 - 75.0[1]
10 < 30									
30									

Air voids (V_a) at N_{design} shall be 4.0% for all ESAL designs. Air voids (V_a) at N_{max} shall be a minimum of 2.0% for all ESAL designs

The dust to effective binder ratio for the mix having aggregate gradations above the Primary Control Sieve (PCS) Control Points shall be 0.6-1.2. For aggregate gradations below the PCS Control Points, the dust to binder ratio shall be 0.8-1.6. For the No. 4 (4.75 mm) mix, the dust to binder ratio shall be 0.9-2.0 whether above or below the PCS Control Points.

For 3/8" (9.5 mm) Nominal Maximum Aggregate Size mixtures, the specified VFA range shall be 73.0% to 76.0% and for 4.75 mm Nominal Maximum Size mixtures, the range shall be 75 % to 78% for design traffic levels 3 million ESALs.

Gradation Control Points:

The combined aggregates shall conform to the gradation requirement specified in the following table when tested according to T11 and T27.

Nominal Maximum Aggregates Size Control Points, Percent Passing										
	25.0 mm		19.0 mm		12.5 mm		9.5 mm		4.75 mm	
SIEVE SIZE	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
37.5 mm	100	-	-	-	-	-	-	-	-	-
25.0 mm	90	100	100	-	-	-	-	-	-	-
19.0 mm	-	90	90	100	100	-	-	-	-	-
12.5 mm	-	-	-	90	90	100	100	-	100	-
9.5 mm	-	-	-	-	-	90	90	100	95	100
4.75 mm	-	-	-	-	-	-	-	90	90	100
2.36 mm	19	45	23	49	28	58	32	67	-	-

Nominal Maximum Aggregates Size Control Points, Percent Passing										
	25.0 mm		19.0 mm		12.5 mm		9.5 mm		4.75 mm	
SIEVE SIZE	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
1.18 mm	-	-	-	-	-	-	-	-	30	60
0.075 mm	1	7	2	8	2	10	2	10	6	12

Note: The aggregate gradation for each sieve must fall within the minimum and maximum limits.

Gradation Classification:

The Primary Control Sieve (PCS) defines the break point of fine and coarse mixtures. The combined aggregates shall be classified as coarse graded when it passes below the Primary Control Sieve (PCS) control point as defined below. All other gradations shall be classified as fine graded.

PCS CONTROL POINT FOR MIXTURE NOMINAL MAXIMUM AGGREGATES SIZE (% PASSING)					
Nominal maximum Aggregates Size	25.0 mm	19.0 mm	12.5 mm	9.5 mm	4.5 mm
Primary Control Sieve	4.75 mm	4.75 mm	2.36 mm	2.36 mm	1.18 mm
PCS Control Point	40	47	39	47	30-60

Plant Production Tolerances:

Volumeric Property	Superpave Criteria
Air Voids (V_a) at (%) N_{max} Air Voids (V_a) at N_{design} (%)	2.0 (min) 5.5 (max)
Voids in Mineral Aggregate (VMA) at N_{design} 25.0 mm Bituminous Concrete Base Course 19.0 mm Type B Hot-Mix 12.5 mm Type C Hot-Mix 9.5 mm Type C Hot-Mix 4.5 mm Type C Hot-Mix	 -1.2 +2.0

Design Evaluation:

The contractor shall furnish a Job Mix Formula (JMF) for review and approval. The Engineer may elect to evaluate the proposed JMF and suitability of all materials. All materials requested by the Engineer shall be provided at the contractor's expense to the Central Laboratory in Dover in a timely manner upon request. To verify the complete mixture design and evaluate the suitability of all materials, the following approximate quantities are required:

5.25 gal (20 liters) of the asphalt binder;
0.13 gal (0.5 liters) sample of liquid heat-stable anti-strip additive;
254 lb. (115 kg) of each coarse aggregate;
154 lb. (70 kg) of each intermediate and fine aggregate;
22 lb. (10 kg) of mineral filler; and
254 lb. (115 kg) of RAP, when applicable.

The proposed JMF shall include the following:

Plot of the design aggregate structure on the FHWA Superpave 0.45 power chart showing the maximum density line, Superpave control points, and recommended restricted zone.

Plot of the three trial asphalt binder contents at ±0.5% gyratory compaction curves where the percent of maximum specific gravity (% of G_{mm}) is plotted against the log base ten of the number of gyrations (log (N)) showing the applicable criteria for $N_{initial}$, N_{design}, and $N_{max.}$

Plot of the percent asphalt binder by total weight of the mix (P_b) versus the following:

% of G_{mm} at N_{design}, VMA at N_{desgin}, VFA at N_{design}, Fines to effective asphalt binder (P_{be}) ratio, and unit weight (kg/m²) at both N_{design} and N_{max}.

Summary of the consensus property standards test results for the design aggregate structure, summary of the source property standards test results for the individual aggregates in the design aggregate structure, target value of the asphalt binder content, and a table of G_{mm} of the asphalt mixture for the four trial asphalt binder contents determined according to T209.

The JMF shall also include the NCAT Ignition Oven calibration for the specific materials utilized for this mix.

Construction:

Production Plants. The contractor shall modify and/or operate their production plant as required by the manufacturer to introduce the WMA technology.

Weather Limitations. Place mix only on dry, unfrozen surfaces.

The minimum ambient temperature shall be 32 degrees F.

The following table of ambient temperatures for various binder grades and lift thicknesses for placement with the following parameters:

- Minimum surface temperature of 32 degrees F
- Maximum production temperature of 275 degrees F
- Maximum wind speed of 8 miles per hour

Lift Thickness (in)	PG Binder		
	76-22	70-22	64-22
1.50	50F	45F	40F
2.00	40F	38F	35F
3.00	32F	32F	32F

Construction outside of these conditions will be at the discretion of the Engineer.

Compaction:

Compaction shall be tested and paid per Item 401699 - Quality Control/Quality Assurance of Bituminous Concrete .05 (b) Pavement Construction - Tests and Evaluations.

Method of Measurement and Basis of Payment:

Method of Measurement and Basis of Payment will be in accordance with Subsections 401.14 and 401.15 of the Standard Specifications.

The item 401699, will define adjustment factor to be applied to the bituminous concrete payments for bonus or penalty.

710502 - ADJUSTING CATCH BASINS
710504 - ADJUSTING MANHOLES

Description:

This work consists of adjusting the catch basins frames and grates and/or manholes frames and covers to match proposed grades as indicated on the Plans and/or as directed by the Engineer.

Materials:

The materials required for adjustment/construction shall conform to the requirements of Section 710 of the Standard Specifications.

Construction Methods:

Frames, grates and covers of catch basins and/or manholes as applicable shall be removed prior to paving operations and all masonry found in poor condition within 1.5 feet (0.5 meters) from the top of the grates shall be removed and rebuilt with materials conforming with the existing structures and as indicated herein

Method of Measurement:

The quantity of catch basins and/or manholes adjusted will be measured as the actual number of each completed and accepted.

Basis of Payment:

The quantity of catch basins and/or manholes adjusted will be paid for at the Contract unit price per each. Price and payment shall constitute full compensation for furnishing and placing all materials, excavation, backfill and backfilling, removing and resetting the grates, frames, covers as applicable, for all labor, equipment, tools and necessary incidentals to complete the work.

8/28/01

744500 - CONDUIT JUNCTION WELL, TYPE 6, 17" x 30" PRECAST POLYMER CONCRETE
744506 - CONDUIT JUNCTION WELL, TYPE 7, 36" x 60" PRECAST POLYMER CONCRETE
744507 - CONDUIT JUNCTION WELL, TYPE 8, 30" x 48" PRECAST POLYMER CONCRETE
744509 - CONDUIT JUNCTION WELL, TYPE 10, 24" x 36" PRECAST POLYMER CONCRETE
744520 - CONDUIT JUNCTION WELL, TYPE 1, 20" x 20" PRECAST CONCRETE
744523 - CONDUIT JUNCTION WELL, TYPE 4, 20" x 42 ½" PRECAST CONCRETE
744524 - CONDUIT JUNCTION WELL, TYPE 5, 24" x 16" PRECAST CONCRETE

Description:

This work consists of supplying, constructing and installing conduit junction wells. Types 1, 4 and 5 are precast concrete and Types 6, 7, 8 and 10 are precast polymer concrete. Sizes shown for precast concrete junction wells represent inside dimensions, while those listed for precast polymer concrete junction wells are outer dimensions.

Materials:

Concrete shall conform to Section 812, Class B of the Standard Specifications.

Castings shall conform to Section 708.05 of the Standard Specifications.

Frames and lids shall be in accordance with Sections 708 and 744 of the Standard Specifications.

Types 6, 7, 8 and 10 are precast polymer concrete stackable boxes with no base.

Precast polymer concrete is reinforced by heavy-weave fiberglass with a compressive strength of 9,000-15,000 psi (62 - 103 MPa), impact energy of 30-72 ft. lbs. (40 - 98 N-m) and a tensile strength of 800-1,100 psi (5.6 - 7.6 MPa). Precast polymer concrete should be tested according to the requirements of ASTM Method D-543, Section 7, Procedure 1 for chemical resistance.

All precast polymer concrete covers shall be the heavy-duty type with a design load of 15,000 lbs. (6.8 tonnes) over a 10" (255 mm) square. The coefficient of friction should be greater than 0.5. The precast polymer concrete cover logo shall bear the inscription "DelDOT" (Types 6, 8, and 10) or "DelDOT TRAFFIC FIBER OPTICS" (Type 7).

Construction Methods:

The conduit junction well shall conform to the dimensions shown on the Standard Construction Details, in these specifications, or on the manufacturer's specifications and shall be built so as to ensure that the cast iron frame and lid or polymer concrete box and cover are set level with the surrounding surface when constructed within pavement, sidewalks, etc., and set above grade and graded to drain away from the junction well when constructed in unpaved areas. More than one conduit may extend into the well and shall conform to the dimensions shown on the Standard Construction Details or these specifications. A stone base shall be built for all types of junction wells.

Method of Measurement:

The quantity of junction wells shall be the actual number of conduit junction wells by type, which are supplied, constructed, complete in place, and accepted, including frames and lids or precast polymer concrete covers and stone base. Frames and lids or precast polymer concrete covers must be installed prior to acceptance of this item.

Payment for all conduits extending into the junction well shall be included in the items for conduit installation.

The length of ALL conduits within a junction well shall conform to the Standard Construction Details or as directed by Engineer. Payment for cutting existing conduit as directed by Engineer, where a junction well is replaced with a larger type of junction well is included in the bid price. The removal and replacement of cables within the conduits to be shortened shall be handled under other items of this contract.

Basis of Payment:

Payment for conduit junction wells as measured above shall be made at the Contract unit price per each junction well of the type indicated, completely installed and constructed, including excavation and backfilling. Price and payment will constitute full compensation for all labor, equipment, tools, and incidentals required to complete the work.

01/29/03

744519 - RELOCATION OF EXISTING JUNCTION WELL

Description:

This work consists of relocating an existing Type 1, Type 4, Type 5, Type 6, Type 7, Type 8, or Type 10 junction well to clear utilities or other construction work. This item may consist of moving a junction well from a few inches (centimeters) to no more than six feet (1.8 m) in any direction in sodded or dirt areas only. Moves of more than six feet (1.8 m) shall be paid under other items in this contract.

Construction Methods:

The junction well shall be relocated in a manner so as not to damage the junction well, frame and lid, or precast polymer concrete cover. Any conduit or cables that need to be removed or installed shall be paid under separate items in this contract.

If the conduit that is connected to the junction well needs to be moved with the junction well, the conduit is to be exposed to the distance necessary to move the junction well, caution is to be used as not to place excessive stress on the conduit or its couplings.

The entire work area where the junction well and conduits are relocated shall be backfilled and tamped as directed by the Engineer. Any extra fill needed to complete the backfill shall be considered part of this item.

Method of Measurement:

The quantity of relocated junction wells to be measured under this item shall be the actual number of junction wells relocated complete, in place, and accepted.

Any conduits that need to be added to extend into the junction well shall be paid for under "Supply of Conduit".

Basis of Payment:

The number of junction wells relocated, as determined above, shall be paid for at the Contract unit price per each. Price and payment will constitute full compensation for all labor, equipment, tools, and incidentals required to complete the work.

01/15/03

745520 - SUPPLY OF 4" SCHEDULE 40 HDPE CONDUIT
745521 - SUPPLY OF 4" SDR-13.5 HDPE CONDUIT
745522 - SUPPLY OF 3" SCHEDULE 80 PVC CONDUIT
745523 - SUPPLY OF 4" SCHEDULE 40 PVC CONDUIT
745524 - SUPPLY OF 4" SCHEDULE 80 PVC CONDUIT
745525 - SUPPLY OF 4" GALVANIZED STEEL CONDUIT
745526 - SUPPLY OF 3" GALVANIZED STEEL CONDUIT
745527 - SUPPLY OF 2 1/2" GALVANIZED STEEL CONDUIT
745528 - SUPPLY OF 2" GALVANIZED STEEL CONDUIT
745529 - SUPPLY OF 1 1/2" GALVANIZED STEEL CONDUIT
745530 - SUPPLY OF 1" GALVANIZED STEEL CONDUIT
745531 - SUPPLY OF 3/4" GALVANIZED STEEL CONDUIT
745532 - SUPPLY OF 3" SCHEDULE 40 PVC CONDUIT
745533 - SUPPLY OF 2 1/2" SCHEDULE 40 PVC CONDUIT
745534 - SUPPLY OF 2" SCHEDULE 40 PVC CONDUIT
745535 - SUPPLY OF 1 1/2" SCHEDULE 40 PVC CONDUIT
745536 - SUPPLY OF 3/4" ALUMINUM RIGID CONDUIT
745537 - SUPPLY OF 3/4" FLEXIBLE METALLIC-LIQUIDTIGHT CONDUIT
745538 - SUPPLY OF 1 1/2" FLEXIBLE METALLIC-LIQUIDTIGHT CONDUIT
745539 - SUPPLY OF 2" NONMETALLIC POLE RISER SHIELD
745540 - SUPPLY OF 3" NONMETALLIC POLE RISER SHIELD
745541 - SUPPLY OF 4" NONMETALLIC POLE RISER SHIELD
745579 - SUPPLY OF 2 ½" SCHEDULE 80 PVC CONDUIT

Description:

This work consists of supplying a conduit or shield, of the type required and as specified in the contract documents or as directed by the Engineer.

Materials:

All conduits shall be UL listed and nonmetallic pole risers shall be Rural Utility Service (RUS) listed.

4" (100 mm) high density polyethylene (HDPE) schedule 40, or SDR-13.5 smooth wall conduit with permanently pre-lubricated lining, meeting ASTM D247, ASTM D3035 and NEMA TC7 specifications.

4" (100 mm) through 1-1/2" (38 mm) schedule 40 or 4" (100 mm) through 3" (75 mm) schedule 80 rigid polyvinyl chloride (PVC) conduit, meeting Commercial Standard CS-272-65 (PVC), ASTM D-1785 and U.C. Standard 651 specifications.

4" (100 mm) through 3/4" (19 mm) rigid galvanized steel conduit meeting National Electric Code 2002, Article 344.

3/4" (19 mm) aluminum rigid conduit meeting National Electric Code 2002, Article 344

3/4" (19 mm) and 1-1/2" (38 mm) liquidtight flexible metallic conduit meeting National Electric Code 2002, Article 350.

2" (50 mm), 3" (75 mm), and 4" (100 mm) nonmetallic pole riser shield with belled ends meeting NEMA TC-19 specifications.

In addition to any normal markings provided by the manufacturer, HDPE and PVC conduit shall have the following longitudinally printed on it in white letters: "DelDOT Traffic Fiber Optic Cable."

Method of Measurement:

The quantity of conduit or shield will be measured as the number of linear feet (meters) of conduit or shield supplied and accepted. The length of liquidtight flexible metallic conduit shall be measured including all fittings; no additional request for payment will be accepted based upon liquidtight fittings of 90-degrees, 45-degrees, straight, or swivel.

The length of any conduit that is reduced or divided (with a junction box or conduit body) shall be measured as part of the larger conduit. The nonmetallic pole riser shield length shall include any adapter required.

Basis of Payment:

The quantity of linear feet of conduit or shield will be paid for at the Contract unit price per linear foot (meter). Price and payment shall include full compensation for all materials and labor, and incidentals including fittings and bushings, necessary to complete the item.

07/14/2011

745542 - INSTALLATION OF CONDUIT UNDER EXISTING PAVEMENT - DIRECTIONAL BORE
745543 - INSTALLATION OF CONDUIT UNDER EXISTING PAVEMENT - OPEN CUT
745544 - INSTALLATION OF CONDUIT IN UNPAVED TRENCH
745545 - INSTALLATION OF CONDUIT ON WOOD POLE
745546 - INSTALLATION OF CONDUIT ON STRUCTURE
745547 - INSTALLATION OF ADDITIONAL CONDUITS IN TRENCH OR OPEN CUT PAVEMENT
745548 - INSTALLATION OF ADDITIONAL CONDUITS IN DIRECTIONAL BORE

Description:

This work consists of installing trade sized rigid galvanized, PVC or HDPE conduit with all necessary fittings, under existing pavement either by directional bore or open cut, in unpaved trench, on wood pole, or on structure other than bridge or overpass. Installation of additional conduit in trench or open cut pavement or in a directional bore shall also be covered under this item.

The structure can be sign structure, tower, building or other type of structure. Installation of conduit on a bridge, highway and railroad overpass is not included in this payment item, and shall be covered under other items of these specifications.

The Contractor shall be responsible for correcting any existing conduit which is disturbed during installation.

Materials:

Weatherhead for galvanized or PVC conduit.
Insulated grounding bushing with knockouts.
Condulets for conduit sizes.
Anchors.
One hole conduit hangers: Steel City Series 6H or 6H-B, Grainger Industrial Supply Item # 6XCXX, Dale Electric Supply Co.- Conduit Hangers, Arlington Industries - Pipe Hangers Series 2000 or 2200, Raco/Hubbell Inc. - Conduit Hangers or Approved Equal.
End caps.
LONG sweep sections for conduit sizes.

Construction Methods:

The Department has the right to reject any installation method proposed for a given work site. PVC shall not be installed under existing pavement unless it is on a continuous roll or with the Engineer's written approval.

Conduit installed underground shall be installed in a straight line between terminal points. In straight runs, junction well spacing shall be no more than 900 feet (275 m) for fiber optic conduit or no more than 300 feet (90 m) for copper conduit, or as directed by the Engineer. If bends are required during installation, they must be sweeping bends. The Engineer will be consulted before any bends are installed to ensure that the proper arc is provided.

Conduit shall have a minimum cover as measured from the finished grade of 24 inches (600 mm) and a maximum cover of 48 inches (1.2 m).

The opening shall be filled half way with the cover material, and tamped down firmly before filling in the remainder of the opening. Additional lifts shall be used as required to install the warning tape at the specified depth. All cover material shall be free of rocks, debris, vegetation or other deleterious material that may damage the conduit. An underground utility warning tape shall be installed as specified in this section and the remainder of the fill shall be added, tamping down the top layer.

Conduit not terminated to a base or in a junction well shall be terminated 2 feet (600 mm) beyond the edge of the pavement unless otherwise directed by the Engineer, and properly capped. Tape is NOT an approved method. Conduit shall not extend more than 3 inches (75 mm) inside a junction well. See Standard Construction Details for typical methods of termination.

All underground conduits shall be marked in the ground with a warning tape. The marking tape shall be buried directly above the conduit run that it identifies, at a depth of approximately 12 inches (300 mm) below final grade. The tape identifying ALL conduits shall be at least 6 inches (150 mm) wide, and have a minimum thickness of 3 mils and 500 percent elongation.

The color of the warning tape identifying fiber optic cable should be bright orange (preferably AULCC orange), and shall read "WARNING - OPTICAL CABLE" or other wording approved by the Engineer that conveys the same message. The color of the tape identifying all other cables shall be bright red, and shall read "WARNING—BURIED ELECTRIC BELOW" or other wording approved by the Engineer that conveys the same message.

Using conduit tools, rigid metallic conduit shall be cut, reamed, and threaded. The thread length shall be as necessary to ensure that the sections of conduits when screwed into a coupling and tightened correctly will butt together and the joint will be watertight.

A three-piece threaded union, as approved by the Engineer, shall be used to join two threaded lengths of conduit in the case where a standard coupling will not work. A threaded union shall not be used in a conduit run that is to be driven. **At no time is a threadless coupling or a split-bolt coupling to be used for direct buried conduit.**

All lengths of HDPE conduit shall be connected with irreversible fusion couplings. Mechanical and removable couplings will not be accepted.

All lengths of PVC conduit shall be connected by one conduit end fitting inside the flared end of the other conduit section. If this is not possible, then a coupling may be used. Regardless of how connection is made, all joints shall be sealed with the appropriate epoxy to ensure that the two conduit pieces bond to one another to form a solid waterproof link.

Using conduit tools, the conduit shall be cut and prepared. If approved by the Engineer, a coupler module may be used where conduit segments do not align properly to allow the flared end of one conduit segment to mate with the normal end of the other segment.

Sealed end caps (with knockouts if empty) shall be placed on the ends of all conduits by after compressed air has been used to clear all foreign matter.

If not already pre-installed by the manufacturer, a polyester or polypropylene pulling rope or tape (fish wire) with a minimum rated strength of 1250 pounds (5560 N) shall be installed in each conduit for future use. In instances where the Contractor installs the cable, the fish wire may be eliminated.

<u>Installation Of Conduit Under Existing Pavement - Directional Bore</u>:

Directional bore shall be used for installation of conduits under existing pavement with a conduit diameter not less than 1-1/2" (38 mm). The size of a bore shall not exceed the outside diameter of the conduit by more than 1 inch (25 mm). If it does, cement grout shall be pumped into the void.

<u>Installation Of Conduit Under Existing Pavement - Open Cut</u>:

Installation by cutting a slot in the existing pavement with masonry saw shall be used for conduits not less than 1-1/2" (38 mm) diameter. The Engineer must first approve all open cutting of roadways. The minimum size of open cut for a paved roadway shall be 18 inches (450 mm). The Contractor shall be responsible for the removal of all cut pavement and the replacement and correction of any damaged pavement once the conduit(s) are installed.

Installation Of Conduit In Unpaved Trench:

Trenching or other approved method shall be used for installation of conduit in unpaved trench or under new pavement. Backfill in conduit trenches shall be compacted thoroughly as it is being placed. At the discretion of the Engineer, sod, that must be removed for the placement of conduit, shall either be removed by the use of an approved sod cutter and then replaced or 6 inches (150 mm) of topsoil shall be placed and the surface seeded in accordance with Section 734001 - Seeding. In areas where new pavement is to be placed or in areas where total reconstruction is taking place, sodding or seeding may not be required by the Engineer.

Installation Of Conduit On Wood Pole:

Conduit installed on wood pole shall be installed in a straight vertical line. The conduit shall be attached to the wood pole with 2 hole straps spaced not more than 36 inches (1 m) apart with the top-most strap being 12 inches (300 mm) from the weatherhead and the lower-most being 12 inches (300 mm) from the condulet. A weatherhead matching the diameter of the conduit shall be installed on the upper end of the conduit. A condulet of the same size as the conduit being installed, but not smaller than 2 inches (50 mm) shall be placed 48 inches (1.2 m) above finished grade. Install two, 2 hole straps of the proper size, evenly spaced below the condulet. Nonmetallic pole risers (U-guard) shall be installed on wood poles to allow interduct to be connected directly to messenger cable. The underground conduit shall be as close to the base of the pole as possible. If the nonmetallic pole riser is not the same size as the conduit, an adapter shall be used at no additional cost to the Department. The nonmetallic pole riser shall be attached to the wood pole with 1/4" (6 mm) x 1-1/2" (38 mm) galvanized lag bolts with washers. Lag bolts will be used every 36 inches (1 m) on BOTH sides of the nonmetallic pole riser, and in the top most and bottom most set of slots.

Installation Of Conduit On Structure:

Conduit installed on structure shall consist of drilling anchors into concrete, brick, stone, steel or wood and mounting the conduit with the proper clamps or hangers. The conduit shall be attached to the structure by use of one-hole conduit hangers and approved anchors not more than 36 inches (1 m) apart. Any 90-degree turns in the conduit run shall be accomplished by placing the proper size and type sweeping bends for the application needed.

Installation Of Additional Conduit In Trench Or Open Cut Pavement:

In the case of slotted or trenched installations, the Contractor shall install additional conduits at the same time as the initial installation. The Engineer shall indicate the quantity of conduits to be installed during a build. Additional conduits may be stacked one on top of the other, side by side or in a matrix. The orientation shall be at the Contractor's discretion, but conduits shall not twist around one another or be allowed to deviate from straight line paths except in the case of bend installations. Conduits installed at the same time in the same trench or slot shall remain oriented the same in relation to one another throughout the conduit run.

Installation Of Additional Conduits In Directional Bore:

In the case of a directional bore that more than one conduit shall be installed, the Contractor shall, at the same time as the initial installation, install one (1) or more additional conduits. The Engineer shall indicate the quantity of conduits to be installed during a build. The additional conduits may be stacked one on top of the other, side by side or in a matrix. The orientation shall be at the Contractors discretion, but conduits shall not twist around one another or be allowed to deviate from straight line paths except in the case of a gentle bend. Conduits installed at the same time, in the same bore shall remain oriented in the same relation to one another throughout the conduit run.

Method of Measurement:

The quantity of conduit installed as specified, shall be measured as the number of linear feet (meters) of conduit installed as specified, complete in place, and accepted.

The length of conduit installed under existing pavement by a directional bore shall be measured along the path of the bore from the point that cannot be trenched to the point that trenching can resume. The length of conduit installed by cutting a slot in the existing pavement, in unpaved trench or under new pavement, on wood pole, or on structure shall be measured along the conduit.

Basis of Payment:

The quantity of conduit will be paid for at the Contract unit price per linear foot (meter). Price and payment shall include full compensation for all materials and labor, topsoil and seed if needed, and incidentals necessary to complete the item.

6/6/11

746774 - SUPPLY AND INSTALLATION OF LOOP DETECTOR WIRE

Description:

This work consists of sawing a cut in existing pavement, furnishing and installing loop detector wire in the saw cut and sealing the saw cut with an approved sealer, in accordance with the Standard Details, these specifications, or as directed by the Engineer.

Materials:

The loop detector wire shall be a shielded four-conductor controlled capacitance cable with conductors twisted 6 turns per foot and enclosed in an aluminized polyester shield within a polyethylene jacket, rated to 600 volts. The interior of the cable is filled with a water blocking material. The four conductors are AWG # 18 stranded copper with color-coded polypropylene insulation. Color rotation is black, red, white, and green. The loop detector wire shall have an UV stable high-density polyethylene outer cover that is chemical resistant and waterproof with a wall thickness of 0.032 inches (0.8 mm). The cable shall have a temperature tolerance range of -65 to +176 degrees Fahrenheit (-54 to +80 degrees Celsius). Outside diameter of the cable is 0.25 inches (6 mm).

Flexible embedding sealer shall be a cold poured, resilient type epoxy joint sealer, Bondo P-606 or Duracote - D115 for concrete or asphalt pavement or E-Poxy Industry 36-1 for concrete or E-Poxy Industry11-1 for asphalt pavement, or approved equal.

A sealer accelerant or retarder may be added at the discretion of the Contractor.

3/8" (10 mm) closed cell foam backer rod

Construction Methods:

The saw cut shall be 1/4" (6 mm) wide and 3" (76 mm) deep. It shall be cut in the directions and sizes specified on the Standard Details or as directed by the Engineer. Contractor shall remove sharp edges in the saw cut and round the corners.

The saw cut shall be blown out with compressed air to remove all dust, water and particles of loose material.

A 3/8" (10 mm) backer rod will be placed into the bottom of the saw cut. The loop detector wire will then be installed using blunt tools so as to prevent damage to the polyethylene outer cover. One end of a loop detector wire shall be tagged to indicate start ("S"). All loop detector wires shall be laid in saw cuts in a clockwise rotation beginning with "S". The Engineer may require a High Voltage Ground Test with a 500 VDC megger after the loop detector installation is complete and prior to sealing saw cuts. If the resistance to ground is less than 100 megohms, this work will be rejected. Loop detectors also should be checked for continuity between the four conductors with an ohm-meter. If there is any resistance between colors or there is an open flow from color to color, this work will be rejected.

A sealer and sealer accelerant or retarder (if necessary) shall be applied in accordance with the manufacturer's directions and protected from traffic until it has set. A minimum of 1 inch of sealer shall be installed on top of the loop detector wire.

Two loop detector wires shall be installed in a saw cut from the loop to the edge of the road. These two wires shall then extend from the end of the saw cut to a junction well (see Standard Details). Wires shall be parallel and taped every 12" (305 mm) to 18" (457 mm) from the end of the saw cut to a junction well. A conduit may need to be installed between the end of the saw cut and junction well as directed by the Engineer. In this case the loop detector wire shall be installed in the conduit.

The loop detector wire shall be continuous and without splices from the junction well, through the saw cuts and conduit (if any).

Method of Measurement:

The quantity of loop detector wire to be measured under this item shall be the number of linear feet (meters) of saw cut in which loop detector wire is installed, sealed, tested, and accepted.

The additional loop detector wire needed beyond the saw cut to reach the junction well and sealer accelerant or retarder shall be incidental to this item and there shall be no separate measurement or payment. Any required conduit will be paid under a separate item.

Supply and installation of the conduit from the end of the saw cut to the junction well shall be covered under other items of this Contract. Installation of the loop detector wire in this conduit shall be incidental to this item and there shall be no separate measurement or payment.

Splicing of the loop detector wire to a lead-in cable in a junction well shall not be covered under this item and shall be paid separately under another item of this Contract.

Basis of Payment:

The quantity of detector wire supplied and installed will be paid for at the Contract unit price per linear foot (meter) of sawcut. Price and payment shall constitute full compensation for furnishing and placing all materials including loop detector wire, backer rod, sealer, labor, equipment, tools, and incidentals necessary to complete this item.

5/7/10

746776 - LOOP DETECTOR SPLICE

Description:

This work consists of splicing a loop detector wire to a loop detector lead-in cable ("home run").

Materials:

Soldering iron
Rosin core solder
3/16" (5 mm) heat shrink tubing
Splicing kit
Vinyl tape – black, white, red, green, yellow, and blue

Construction Methods:

Each conductor to be spliced shall have sufficient wire jacket removed, with wire strippers or other approved tool, to expose 1/2 inch (13 mm) of the copper conductor. The use of any tool that might nick the conductor or cut a strand of wire is specifically prohibited.

Each conductor not to be spliced shall be inspected and trimmed as necessary to ensure that the copper conductor does not extend beyond the insulation.

When splicing a loop detector wire to a lead-in cable, the two ends of the loop detector wire forming one loop shall be spliced first. The method of splicing the two ends of the loop detector wire forming one loop is described below:

Splice the green, red and black conductors of start end ("S" or "In") of the loop detector wire to the white, green and red conductors of the finish end ("F" or "Out") of the same wire as follows:

- Green of "S" to White of "F"
- Red of "S" to Green of "F"
- Black of "S" to Red of "F"

A maximum of two loops shall be spliced to one loop detector lead in cable. The method of splicing two loops (Loop 1 and Loop 2) to a loop detector lead in cable is described below:

1. Splice Loop 1 "S" White to a lead in cable White and Loop 1 "F" Black to a lead in cable Black.

2. Splice Loop 2 "S" White to a lead in cable Green and Loop 2 "F" Black to a lead in cable Red.

Conductors to be soldered shall be placed side by side with the exposed copper aligned. The copper shall then be twisted clockwise with pliers until a good mechanical connection is effected. The splice shall be coated with flux, heated with a soldering iron, and soldered in a manner, which minimizes insulation damage. After each soldered connection is completed, it shall be properly insulated with heat shrink tubing.

After the electrical and mechanical connection is completed and before the splicing kit is applied, a test shall be made by the Contractor to ensure that all circuits are complete. A splicing kit shall be installed as per manufacturer's instructions. A communication test will be performed at the cabinet by the Department technician after the splicing kit is applied. The Department will be notified of the test results. If the communication test fails the Contractor shall remake the splice at his own expense.

Each loop detector lead-in cable shall be identified with a distinctive band(s) at each end of the run. Additionally the loop "number" will be identified. Based upon direction of travel, the loop will be identified from left to right, closest to stop bar to furthest away, by a distinctive number of colored bands. System loops

will also have a white band AFTER the color band. The following colors will be used as the distinctive band to denote direction of travel:

North Bound	---	RED
East Bound	---	GREEN
South Bound	---	YELLOW
West Bound	---	BLUE

If a splice is found to be faulty within 90 calendar days of installation, it shall be the Contractor's responsibility to remake the splice at his own expense.

Method of Measurement:

The quantity of splices shall be measured as the number of loop detectors connected to a lead-in cable in accordance with these specifications, complete in place, and accepted. Splicing the "S" end to the "F" end of the loop detector wire forming one loop shall not be considered a separate loop detector splice.

Basis of Payment:

The quantity of splices installed will be paid for at the Contract unit price per each. Price and payment will constitute full compensation for all materials, labor, equipment, tools, and incidentals required to complete the work.

05/07/10

746843 - POLE BASE TYPE 1
746844 - POLE BASE TYPE 2
746845 - POLE BASE TYPE 2A
746846 - POLE BASE TYPE 2B
746847 - POLE BASE TYPE 3
746848 - POLE BASE TYPE 3A
746849 - POLE BASE TYPE 3B
746850 - POLE BASE TYPE 4
746851 - POLE BASE TYPE 5
746852 - POLE BASE TYPE 6

Description:

This work consists of constructing and furnishing round or square pole bases Types 1, 2, 2A, 2B, 3, 3A, 3B, 4, 5, and 6 for poles in accordance with the Standard Construction Details and at locations as directed by the Engineer.

Materials:

The concrete for pole bases shall conform to Section 812, Class B.

Bar reinforcement shall meet the requirements of Section 603 Grade 60.

Ground rods shall be copper clad, approved by the Underwriter's Laboratory and be supplied with approved clamps for connecting the grounding conductor to the rod.

Conduit for sweeps shall meet the requirements for galvanized rigid steel conduit in Section 745.

Anchor bolts will be supplied by the same entity that supplies the poles. This is the case for all poles types, with the exception of Type 4. For Type 4, drop-ins are used for breakaway and the Contractor will supply the anchor bolts for Type 4. The anchor bolts and nuts for Types 5 and 6 shall not be hot-dipped galvanized and these anchor bolts and nuts shall meet the requirements of AASHTO M 314. Anchor bolts shall have a minimum yield strength of 55,000 psi (380,000 kPa).

Construction Methods:

The bases shall conform to the dimensions as indicated on the Standard Construction Details. A ground rod shall be installed as shown. A minimum of 8 feet (2.5 m) of the ground rod must be driven into undisturbed soil.

If a utility or a right-of-way conflict is found when a Type 2 or Type 3 base is specified in the Plans, an alternate base of equivalent strength may be used as directed by the Engineer. A Type 2 base has two equivalents, namely Types 2A and 2B. A Type 3 base has two equivalents, namely Types 3A and 3B.

Though the contract calls for the use of a round pole base, the Contractor may use a square base at its discretion.

The end of the conduit sweeps in the ground shall be extended outside the concrete and any forms or sheeting by 12 inches (300 mm) and capped or connected to the existing conduit. If the conduit is to be capped underground for future use, it must be sealed with a galvanized threaded conduit plug. Tape is NOT an approved conduit plug. The location of the conduits shall be marked on the base with arrows drawn in the wet concrete within 6 inches (150 mm) of the outer edge.

Excavation for the pole bases may not exceed the dimension of the foundation by more than 12 inches (300 mm) in any one direction. If a form is used in the excavation more than 18 inches (450 mm) below the

ground surface, it is necessary that the area between the form and excavation be filled and tamped on all sides in layers not to exceed 6 inches (150 mm).

Where a pole base is to be placed in existing concrete pavement such as a sidewalk, the concrete shall be saw cut in a square pattern or removed to the nearest joint. In other pavement material, a round hole may be cut using an appropriate tool. Any damage to the existing pavement shall be repaired at the Contractor's expense and shall meet the approval of the Engineer. Any removal or replacement of any type of pavement under this item shall be an incidental cost to this item.

The bases shall be edged and have a broom finish.

Where water or highly unstable material is encountered during the excavation for the pole base, pole base sheeting may be required and the following steps shall apply:

1. The condition exists in the upper half of the excavation. Stop all work until the Bridge Design Section reviews the condition.

2. The condition exists below the upper half of the excavation:
   a. For a proposed Type 4 Base, increase the depth to 4 feet (1.2 m).
   b. For a proposed Type 5 Base, substitute a Type 1 Base.
   c. For a proposed Type 1, 2, or 3 Pole Base, substitute a Type 3A Pole Base for all but a Type 3B Pole Base. The depth of the base shall be as determined in (e) below, or 9 feet (2.7 m), whichever is greater.
   d. For a proposed Type 6 Pole Base, substitute a Type 2 Pole base and increase the depth in accordance with (e) below.
   e. Determine the depth of the base, which would be in the unsatisfactory area. Multiply that depth by 0.7 and add the result to the original required depth of the base to obtain the final depth of the base. The reinforcing bars shall be extended using the required pattern to match the final depth in accordance with the requirements of Section 603.07 of the Standard Specifications.

Method of Measurement:

The quantity of pole bases will be measured as the actual number of bases constructed, complete in place and accepted. Excavation and backfilling around the base and the two conduit sweeps in the base are included in this item.

Any increase in the vertical dimension required herein shall be paid for separately under another item of this contract.

Payment for any additional sweeps shall be paid for separately under the appropriate conduit items. The Contractor's use of square base rather than a specified round base shall not result in any additional cost to the Department.

Basis of Payment:

The quantity of pole bases will be paid for at the Contract unit price for each pole base type. If an alternate pole base type is selected by the Engineer, payment will be the Contract unit price for the alternate selected. Price and payment will constitute full compensation for furnishing and placing all materials; for a minimum of two conduit sweeps extending into the base; for excavating, backfilling and compacting around the base; for repairs to damaged existing pavement; for removal or replacement of pavement; and for all labor, equipment, tools, and incidentals required to complete the work.

01/15/03

748502 - RAISED/RECESSED PAVEMENT MARKER

Description:

This work consists of furnishing and installing raised/recessed pavement markers in accordance with the Plans and these specifications.

Materials:

The cast iron housing shall meet the requirements of ASTM A 536-84, Grade 72-45-84.

The reflectors shall meet the requirements of ASTM D 4383-03.
For installation on interstates, freeways, and principal arterials, the pavement marker shall have red reflectorized material on the back side (the side not facing the direction of traffic).

Epoxy shall meet the requirements of AASHTO M237, Type IV.

The followings models have been tested and approved by the Department and shall be used:

1. (Ennis Paint) Stimsonite - Avery Dennison Model 101LPCR Snow Plowable Marker.

2. Ray-O-Lite Model 300 Snow Plowable Marker with Model 2004 Reflector.

3. Or Approved Equal.

Construction Methods:

Pavement shall be saw cut to match the bottom contour of the marker housing using a saw and blade suitable for the pavement material being sawed. The depth of the cut slot must allow the housing to be set in epoxy, with leveling lugs resting on the pavement surface, so that the front edge of marker is at or below the surface of the pavement. Excessive saw cuts must be repaired to the satisfaction of the Engineer. When cutting is complete, the slot shall be cleaned as recommended by the manufacturer of the epoxy material. The epoxy and pavement marker will be installed in the prepared contour slot in the pavement per the manufacturer's recommendations.

Method of Measurement:

The quantity of raised/recessed pavement markers will be measured as the actual number installed and accepted.

Basis of Payment:

The quantity of raised/recessed pavement markers will be paid for at the Contract unit price per each. Price and payment will constitute full compensation for furnishing all materials, installation, saw-cutting, cleaning, disposal of discarded materials, for all labor, tools, equipment, all necessary incidentals associated with the item to complete the work.

05/11/2011

748506 - PERMANENT PAVEMENT STRIPING, EPOXY RESIN PAINT, WHITE/YELLOW, 4″
748507 - PERMANENT PAVEMENT STRIPING, EPOXY RESIN PAINT, WHITE/YELLOW, 6″
748508 - PERMANENT PAVEMENT STRIPING, EPOXY RESIN PAINT, WHITE/YELLOW, 8″
748509 - PERMANENT PAVEMENT STRIPING, EPOXY RESIN PAINT, WHITE/YELLOW, 12″
748510 - PERMANENT PAVEMENT STRIPING, SYMBOL/LEGEND, EPOXY RESIN PAINT
748535 - PERMANENT PAVEMENT STRIPING, EPOXY RESIN PAINT, BLACK, 4″
748536 - PERMANENT PAVEMENT STRIPING, EPOXY RESIN PAINT, BLACK, 6″
748537 - PERMANENT PAVEMENT STRIPING, EPOXY RESIN PAINT, BLACK, 8″
748538 - PERMANENT PAVEMENT STRIPING, EPOXY RESIN PAINT, BLACK, 10″
748539 - PERMANENT PAVEMENT STRIPING, EPOXY RESIN PAINT, BLACK, 12″
748540 - PERMANENT PAVEMENT STRIPING, EPOXY RESIN PAINT, BLACK, 16″
748548 - PERMANENT PAVEMENT STRIPING, EPOXY RESIN PAINT, WHITE/YELLOW, 5"
748549 -PERMANENT PAVEMENT STRIPING, EPOXY RESIN PAINT, WHITE/YELLOW, 10"
748557 - PERMANENT PAVEMENT STRIPING, EPOXY RESIN PAINT, BLACK, 3"
748559 - PERMANENT PAVEMENT STRIPING, EPOXY RESIN PAINT, BLACK, 5"

Description:

This work consists of furnishing and applying white or yellow, epoxy reflectorized pavement markings or black epoxy contrast pavement markings at the locations and in accordance with the patterns indicated on the Plans, or as directed by the Engineer, and in accordance with these specifications.

The white/yellow epoxy marking material shall be hot-applied by spray methods onto bituminous and/or Portland cement concrete pavement surfaces as required by the Plans. Following an application of double drop glass beads of two sizes and upon curing, the resultant epoxy marking shall be an adherent reflectorized stripe of the specified thickness and width that is capable of resisting deformation by traffic. All marking materials shall be certified lead free and free of cadmium, mercury, hexvalent chromium, and other toxic heavy metals.

The black epoxy marking shall be a two-component, hot-spray applied epoxy resin pavement marking material to be used for pavement marking on Portland cement concrete pavement surfaces. Following an aggregate drop, and upon curing, it shall produce an adherent stripe of specified thickness and width capable of resisting wear from traffic. Black contrast pavement markings will be required on all Portland cement concrete pavements.

Materials Requirements:

A. White and Yellow Reflectorized Epoxy

1. Epoxy Composition Requirements:

The epoxy resin composition shall be specifically formulated for use as a pavement marking material and for hot-spray application at elevated temperatures. The type and amounts of epoxy resins and curing agents shall be at the option of the manufacturer, providing the other composition and physical requirements of this specification are met.

The epoxy marking material shall be a two-component (Part A and Part B), 100% solids type system formulated and designed to provide a simple volumetric mixing ratio (e.g. two volumes of Part A to one volume of Part B).

Component A of both white and yellow shall conform to the following requirements:

	% BY WEIGHT	
	WHITE:	**YELLOW:**
Pigments	Titanium Dioxide - 18% Min. (ASTM D476, Type II)	Organic Yellow - 6%-10%
Epoxy Resin	75% Min., 82% Max.	70% Min., 77% Max.

The entire pigment composition shall consist of either titanium dioxide and/or organic yellow pigment. No extender pigments are permitted. The white pigment upon analysis, shall contain a minimum of 16.5% TiO_2 (100% purity).

Epoxy Content-WPE (Component A) - The epoxy content of the epoxy resin will be tested in accordance with ASTM D1652 and calculated as the weight per epoxy equivalent (WPE) for both white and yellow. The epoxy content will be determined on a pigment free basis. The epoxy content (WPE) shall meet a target value provided by the manufacturer and approved by the Department's Material and Research Section (from now on will be addressed as Department). A $\pm$ 50 tolerance will be applied to the target value to establish the acceptance range.

Amine Value (Component B) - The amine value of the curing agent shall be tested in accordance with ASTM D2074-66 to determine its total amine value. The total amine value shall meet a target value provided by the manufacturer and approved by the Department. A $\pm$50 tolerance will be applied to the target value to establish the acceptance range.

Toxicity - Upon heating to application temperature, the material shall not exude fumes which are toxic or injurious to persons or property.

Viscosity - Formulations of each component shall be such that the viscosity of both components shall coincide (within 10%) at a recommended spray application.

2. Physical Properties of Mixed Composition:

Unless otherwise noted, all samples are to be prepared and tested at an ambient temperature of 73 ± 5 F. (23 ± 3 C).

a. Color. The white epoxy composition when applied at a minimum wet film thickness of 20$\pm$1 mils (500 µm) as applicable and allowed to dry, shall plot within the boundaries described by the four corner points listed in Tables 1 and 2 of ASTM D 6628-01 when measured in accordance with the test methods prescribed in Section 7 of ASTM D 6628-01.

The yellow epoxy composition when applied at a minimum wet film thickness of 20$\pm$1 mils (500 µm) as applicable and allowed to dry, shall plot within the boundaries described by the four corner points listed in Tables 1 and 2 of ASTM D 6628-01 when measured in accordance with the test methods prescribed in Section 7 of ASTM D 6628-01.

b. Directional Reflectance. The white epoxy composition (without glass spheres) shall have a daylight directional reflectance of not less than 84% relative to a magnesium oxide standard when tested in accordance with Method 6121 of Federal Test Method Standard No. 141.

The yellow epoxy composition (without glass spheres) shall have a daylight directional reflectance of not less than 55% relative to a magnesium oxide standard when tested in accordance with Method 6121 of Federal Test Method Standard No. 141.

c. Drying Time (Laboratory). The epoxy composition, when mixed in the proper ratio and applied at a 20±1 mils (500 µm) minimum wet film thickness, and immediately dressed with large reflective glass spheres (Federal Spec. Type 4)at a rate of 12 lb/gal (1.4 kg/l) of epoxy pavement marking materials, immediately followed by a second drop of AASHTO M-247 Type 1 glass spheres applied at a rate of 12 lb/gal (1.4 kg/L) of epoxy pavement marking material, shall exhibit a no-track condition in 15 minutes or less (ASTM D711). A Bird Applicator or any other doctor blade shall be used to produce a uniform film thickness.

d. Drying Time (Field). When installed at a minimum wet film thickness of 20±1 mils (500 or 625 um) and reflectorized with glass spheres, the maximum drying times shall correspond to these temperatures:

80 F (27 C)	10 minutes
70 F (21 C)	10 minutes
60 F (16 C)	15 minutes
50 F (10 C)	25 minutes
40 F (4 C)	45 minutes
35 F (2 C)	60 minutes

The composition shall dry to no-tracking in approximately 10 minutes, and after thirty (30) minutes shall show no damaging effect from traffic. Dry to no-tracking shall be considered as the condition where no visual deposition of the epoxy marking to the pavement surface is observed when viewed from a distance of 100 feet (30 meters), after a passenger car is passed over the line. Regardless of the temperature at the time of installation, the installation contractor shall be responsible for protection of the markings material until dry to a non-tracking state.

e. Abrasion Resistance. The wear index of the composition shall not exceed 82 when tested in accordance with ASTM C501 using a CS-17 wheel and under a load of 1000 grams for 1000 cycles.

f. Tensile Strength. The tensile strength of the epoxy composition shall not be less than 6000 psi (41 MPa) when tested in accordance with ASTM D638 using a Type IV specimen [0.125 ± 0.010 (3.18 ± 0.25 mm) thick]. Tests shall be conducted at an ambient temperature of 75 ± 5 F (24 ± 3 C). The testing machine shall operate at a speed of 0.20 (5.1 mm) per minute.

The total conditioning or drying period, from the time the epoxy composition is first mixed to the time of testing, shall not be less than 24 hours nor more than 96 hours.

Test specimens for tensile strength determination will be prepared as follows:

A 1/8 inch (3 mm) thick sheet of epoxy material is cast from a reservoir-type mold, fabricated from polyterrafluorethylene (PTFE), 1/8 deep x 10 x 10 (3 mm deep x 250 mm x 250 mm).

Prior to casting, the mold is sprayed with a suitable release agent. A sufficient amount of epoxy composition is mixed in the proper proportions (A:B) and poured level with the top of the mold. Care should be taken so as not to decrease or exceed the 1/8 (3 mm) thickness.

After a period of 1 to 4 hours, the material will have set into a semi-rigid sheet that is flexible enough to die-cut yet rigid enough to retain its shape. While the material is in this plastic state, five (5) specimens shall be die-cut and then placed on a flat, smooth, PTFE surface for the completion of the specified conditioning period.

g. Compressive Strength. The compressive strength of the epoxy composition shall not be less than 12,000 psi (83 MPa) when tested in accordance with ASTM D695 except that a compression tool shall not be necessary. The test specimen shall be a right cylinder [0.50 inch diameter by 1.0 inch length (12 mm diameter by 25 mm

length)]. Tests shall be conducted at an ambient temperature of 75 ± 5 F (24 ± 3 C).

The total conditioning or drying period, from the time the epoxy composition is first mixed to the time of testing shall not be less than 24 hours nor more than 96 hours.

Test specimens for compressive strength determinations will be prepared as follows:

Five molds will be prepared from 1/2 (12 mm) I.D., 1/16 (1.5 mm) wall thickness acrylic tubing, cut in 1 1/2 (38 mm) lengths. After spraying the inside of the mold with a suitable release agent,[1] the cylindrical tubes are placed in a vertical position on a PTFE sheet base. A sufficient amount of epoxy composition is thoroughly mixed in the proper proportions (A:B) and poured into the mold to a depth of approximately 1 1/4 (32 mm). After a minimum of 72 hours curing, the specimens are removed from the molds and machined to a length of 1 ± 0.002 (25 mm ± 0.05 mm).

h. Hardness. The epoxy composition when tested in accordance with ASTM D2240 shall have a Shore D hardness of between 75 and 100. Samples shall be allowed to dry for not less than 24 hours nor more than 96 hours prior to testing.

B. Reflective Glass Spheres/Beads

Reflective glass spheres for drop-on application shall conform to the following requirements:

The glass spheres shall be colorless; clean; transparent; free from milkiness or excessive air bubbles; and essentially clean from-surface scarring or scratching. They shall be spherical in shape and at least 80% of the glass beads shall be true spheres when tested in accordance with ASTM D1155. At least 80% of the Type IV beads shall be true spheres as measured by the visual method.

The refractive index of the spheres shall be a minimum of 1.50 as determined by the liquid immersion method at 77 F (25 C).

The silica content of the glass spheres shall not be less than 60%.

The crushing resistance of the spheres shall be as follows: A 40 lb. (18 kg) dead weight, for 20 to 30 (850 µm to 600 µm) mesh spheres shall be the average resistance when tested in accordance with ASTM D1213.

The glass spheres shall have the following grading when tested in accordance with ASTM D1214.

M247 AASHTO Type 1 Glass Spheres

U.S. Standard Sieve	% Retained	% Passing
#20 (850µm)	0	100
#30 (600µm)	5-25	75-95
#50 (300µm)	40-65	15-35
#100 (150µm)	15-35	0-5
Pan	0-5	

Type 4 Large Spheres

U.S. Standard Sieve	% Retained	% Passing
#10 (2000 µm)	0	100
#12 (1680 µm)	0-5	95-100
#14 (1410 µm)	5-20	80-95

#16 (1190 µm)	40-80	10-40
#18 (1000 µm)	10-40	0-5
#20 (850 µm)	0-5	0-2
Pan	0-2	

The AASHTO M247 Type 1 glass spheres shall be treated with a moisture-proof coating. They shall show no tendency to absorb moisture in storage and shall remain free of clusters and hard lumps. They shall flow freely from dispensing equipment at any time when surface and atmosphere conditions are satisfactory for marking operations. The moisture-resistance of the glass spheres shall be determined in accordance with AASHTO M247 test method 4.4.1.

Type IV glass spheres shall be treated with an adhesion coating. They shall show no tendency to absorb moisture in storage and shall remain free of clusters and hard lumps. They shall flow freely from dispensing equipment at any time when surface and atmosphere conditions are satisfactory for marking operations. The adhesion coating property of the Type IV beads shall be tested in accordance with the dansyl-chloride test.

C. Black Epoxy Contrast Markings

Epoxy Resin Requirements: The two-component, 100% solids, paint shall be formulated and designed to provide a simple volumetric mixing ratio (e.g. 2 part component A to 1 part component B) specifically for service as a hot-spray applied binder for black aggregate in such a manner as to produce maximum adhesion. The material shall be composed of epoxy resins and pigments only.

The paint shall be well mixed in the manufacturing process and shall be free from defects and imperfections that may adversely affect the serviceability of the finished product. The paint shall not thicken, curdle, gel, settle excessively, or otherwise display any objectionable properties after storage. Individual components shall not require mixing prior to use when stored for a maximum of 6 months.

The overall paint composition shall be left to the discretion of the manufacturer, but shall meet the following requirements:

Composition:	Component	Percent By Weight
	Carbon Black (ASTM D476 Type III)	7±2 percent, by weight
	Talc	14±2 percent, by weight
	Epoxy Resin	79±4 percent, by weight

D. Black Aggregate

The moisture resistant aggregate shall meet the gradation requirements (AASHTO T27) as follows:

Sieve Size	Percent Retained
#30	18-28%
#40	60-80%
#50	2-14%

The moisture resistant aggregate shall have a ceramic coating. The aggregate shall be angular with no dry dispensement pigment allowed.

Hardness:	The black aggregate hardness shall be 6.5-7 on Moh's Mineral Scale.
Porosity:	The black aggregate porosity shall be less than two (2) percent.

Moisture Content: The black aggregate moisture content shall be less than a half (.5) percent.

E. Packaging and Shipment

Epoxy pavement marking materials shall be shipped to the job site in strong substantial containers. Individual containers shall be plainly marked with the following information:

a. Name of Product
b. Lot Number
c. Batch Number
d. Test Number
e. Date of Manufacture
f. Date of expiration of acceptance (12 months from date of manufacture)
g. The statement (as appropriate)
   Part A - Contains Pigment & Epoxy Resin
   Part B - Contains Catalyst
h. Quantity
i. Mixing proportions, Application Temperature and Instructions
j. Safety Information
k. Manufacturer's Name and Address

Reflective glass spheres shall be shipped in moisture resistant bags. Each bag shall be marked with the name and address of the manufacturer and the name and net weight of the material.

F. The Department reserves the right to randomly take a one-quart sample of white, yellow and hardener, of the epoxy material or glass spheres without prior notice for testing to ensure the epoxy material meets specifications.

Epoxy Application Equipment:

Application equipment for the placement of epoxy reflectorized pavement markings shall be approved by the Department, prior to the start of work.

At any time throughout the duration of the project, the Contractor shall provide free access to his epoxy application equipment for inspection by the Engineer or his authorized representative.

In general, the application equipment shall be a mobile, truck mounted and self contained pavement marking machine, specifically designed to apply epoxy resin materials and reflective glass spheres in continuous and skip-line patterns. The application equipment shall be maneuverable to the extent that straight lines can be followed and normal curves can be made in a true arc. In addition, the truck mounted unit shall be provided with accessories to allow for the marking of legends, symbols, crosswalks, and other special patterns.

The Engineer may approve the use of a portable applicator in lieu of truck mounted accessories, for use in applying special markings only, provided such equipment can demonstrate satisfactory application of reflectorized epoxy markings in accordance with these specifications.

The applicator shall be capable of installing up to 20,000 lineal feet (6,100 lineal meters) of epoxy reflectorized pavement markings in an 8-hour day and shall include the following features:

1. The applicator shall provide individual material reservoirs, or space, for the storage of Part A and Part B of the epoxy resin composition; for the storage of water; and for the storage of reflective glass spheres.

2. The applicator shall be equipped with heating equipment of sufficient capacity to maintain the individual epoxy resin components at the manufacturer's recommended temperature for spray application and for heating water to a temperature of approximately 140 F (60 C).

3. The glass spheres shall be gravity dropped upon 20 mils (500 um) of epoxy pavement markings to produce a wet-night-reflective pavement marking. The large spheres (Federal Spec. Type 4) shall be applied at a rate of 12 pounds per gallon (1.4 kg/L) of epoxy pavement marking material, immediately followed by a second drop of AASHTO M-247 Type 1 glass spheres applied rate of 12 pounds per gallon (1.4 kg/L) of epoxy pavement marking material. This application rate and the following gradation shall conform to FHWA's FP-96: Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects (pages 757-761 Type 3 and Type 4 Beads).

4. The applicator shall be equipped with metering devices or pressure gauges, on the proportioning pumps. Metering devices or pressure gauges shall be visible to the Engineer.

5. The applicator shall be equipped with all the necessary spray equipment, mixers, compressors, and other appurtenances to allow for the placement of epoxy reflectorized pavement markings in a simultaneous sequence of operations as described below in Construction Details, D. Applications of Epoxy Reflectorized Pavement Markings of this Special Provisions.

Construction Details.

A. General: All pavement marking and patterns shall be placed as shown on the Plans or as directed by the Engineer.

Before any pavement markings work is begun, a schedule of operations shall be submitted for the approval of the Engineer. This schedule shall be submitted 2 weeks prior to the application of the striping.

At least five (5) days prior to starting striping the Contractor shall provide the Engineer with the epoxy manufacturer's written instructions for use. These instructions shall include but not be limited to: mixing ratios, application temperatures, and recommendations for use of water spray.

The application of pavement markings shall be done in the general direction of traffic. Striping against the direction of traffic flow shall not be allowed.

The Contractor shall be responsible for removing, to the satisfaction of the Engineer, tracking marks, spilled epoxy or epoxy markings applied in unauthorized areas.

The hot water spray shall not be used in conjunction with markings applications on any pavement surface, or on any existing durable type marking, unless specifically recommended by the manufacturer of the epoxy material.

B. Atmospheric Conditions: Epoxy pavement markings shall only be applied during conditions of dry weather and on substantially dry pavement surfaces. At the time of installation the pavement surface temperature shall be a minimum of 35 F (2 C) and the ambient temperature shall be a minimum of 35 F (2 C) and rising. The Engineer shall be the sole determiner as to when atmospheric conditions and pavement surface conditions are such to produce satisfactory results.

C. Surface Preparations: The Contractor shall clean the pavement or existing durable marking to the satisfaction of the Engineer.

Surface cleaning and preparation work shall be performed only in the area of the epoxy markings application.

At the time of application all pavement surfaces and existing durable markings shall be free of oil, dirt, dust, grease and similar foreign materials. The cost of cleaning these contaminants shall be included in the bid price of this item. Also, the item shall include the cost of removal of the curing component in the area of the epoxy markings application, if concrete curing compounds on new portland cement concrete surfaces have been used. Waterblasting will not be permitted for removal.

D. Application of White/Yellow Epoxy Reflectorized Pavement Markings: White/yellow epoxy reflectorized pavement markings shall be placed at the widths and patterns designated on the Contract Plans.

Markings operations shall not begin until applicable surface preparation work is completed, and approved by the Engineer.

White/yellow epoxy pavement markings shall be applied at a minimum uniform thickness of 20 mils (500 µm) on all Portland cement concrete and bituminous concrete pavement, including Stone Matrix Asphalt.

Large reflective glass spheres (Federal Spec. Type 4) shall be applied at the rate of 12 pounds per gallon (1.4 kg/L) of epoxy pavement marking material, immediately followed by a second drop of AASHTO M-247 Type 1 glass spheres applied at a rate of 12 pounds per gallon (1.4 kg/L) of epoxy pavement marking material. Glass spheres shall uniformly cover the length and width of the pavement marking.

E. Application of Black Epoxy Contrast Pavement Markings: Black epoxy contrast pavement markings shall be placed at the widths designated on the Contract Plans.

Markings operations shall not begin until applicable surface preparation work is completed, and approved by the Engineer.

Black epoxy contrast pavement markings shall be applied at a minimum uniform thickness of 20 mils (500 µm) on all Portland cement concrete surfaces followed by a single drop of graded black aggregate.

The width of black epoxy line shall be applied for the following situations:

Center Skip Line - On Portland cement concrete pavements a black contrast skip line shall be 10 feet (3 m) in length of the same width as the white epoxy reflectorized skip. It is to lead the white skip and stop at the beginning of the white skip. The black contrast skip is to have a single application of graded black aggregate.

Edge Lines - All edge lines on Portland cement concrete pavements shall have a base of black contrast markings which is 4 inches (100 mm) wider than the reflective white or yellow marking. The black contrast marking is to be applied first with a single drop of graded black aggregate. Once it has cured sufficiently so as not to track, the reflectorized white or yellow line is to be applied on top of it. The reflective line is to be centered along the black contrast line such that a minimum of 2 inches (50 mm) of black contrast marking is visible on either side of the reflective marking.

F. Defective Epoxy Pavement Markings: Epoxy reflectorized pavement markings, which after application and curing are determined by the Engineer to be defective and not in conformance with this specification, shall be repaired. Repair of defective markings shall be the responsibility of the Contractor and shall be performed to the satisfaction of the Engineer as follows:

1. Insufficient film thickness [(less than 20±1 mils (500 µm) as applicable] and line widths; insufficient glass bead coverage or inadequate glass bead retention.

   Repair Method: Prepare the surface of the defective epoxy marking by shot blasting, sand blasting, or water blasting. No other cleaning methods will be allowed. Surface preparation

shall be performed to the extent that a substantial amount of the reflective glass spheres are removed and a roughened epoxy marking surface remains.

Immediately after surface preparation remove loose particles and foreign debris by brooming or blasting with compressed air.

Repair shall be made by re-striping over the cleaned surface, in accordance with the requirements of this specification and at a full 20±1 mils (500 µm) minimum line thickness as applicable.

2. Uncured or discolored epoxy (brown patches); insufficient bond to pavement surface (or existing durable marking).

Uncured epoxy shall be defined as applied material that fails to cure (dry) in accordance with the requirements of this specification under MATERIALS, A, 2d. DRYING TIME (FIELD); or applied material that fails to cure (dry) within a reasonable time period under actual field conditions, as defined by the Engineer.

Discoloration (brown patches) shall be defined as localized areas or patches of brown or grayish colored epoxy marking material. These areas often occur in a cyclic pattern and also, often are not visible until several days or weeks after markings are applied.

Repair Method: The defective epoxy marking shall be completely removed and cleaned to the underlying pavement surface to the satisfaction of the Engineer.

The extent of removal shall be the defective area plus any adjacent epoxy pavement marking material extending one foot (300 mm) any direction.

After surface preparation work is complete, repair shall be made by re-applying epoxy over the cleaned pavement surface in accordance with the requirements of this specification.

3. Reflectivity for epoxy resin paint.

After satisfactory completion of all striping work and written notification from the Contractor, the Department shall test the striping to ensure it has the minimum reflectivity. The testing will be completed within 30 calendar days from notification. The Contractor may request that tests be conducted on completed phases or portions of the work. Approval of such a request will be at the discretion of the Engineer. Testing will be done using a Delta LTL 2000 Retrometer (30 meter geometry). Five readings will be taken per line per mile (1.6 km). Projects less than 1 mile (1.6 km) in length will have a minimum of 5 readings per line. These readings will then be averaged for the overall project average.

The required average minimum initial reflectivity reading in millicandellas shall be:

White 450
Yellow 325

Any single reading shall not be less than 350 millicandellas for white and 250 millicandellas for yellow. Without exception, any pavement markings installed that does not meet the above average minimum initial reflectivity numbers shall be removed and replaced, at the installation contractor's expense.

Other defects not noted above, but determined by the Engineer to need repair, shall be repaired or replaced as directed by and to the satisfaction of the Engineer.

All work in conjunction with the repair or replacement of defective epoxy reflectorized pavement markings shall be performed by the Contractor at no additional cost to the State.

Method of Measurement:

The quantity of permanent pavement striping (white, yellow, or black epoxy resin paint) will be measured by the number of linear feet (meters) of pavement striping line and number of square feet (meter) of symbol installed on the pavement and accepted in accordance with the Plans.

Basis of Payment:

The quantity of permanent pavement striping (white, yellow, or black epoxy resin paint) payment will be paid for at the Contract unit price per linear foot (meter) for 4 , 6 , 8 , 10 , 12 , 16 (100 mm, 150 mm, 200 mm, 250 mm, 300 mm, or 400 mm) line and the Contract unit price per square foot (meter) of symbol. The quantity of permanent pavement marking (white, yellow, or black epoxy resin paint) will be paid for at the Contract unit price per linear foot (meter) of line and the Contract unit price per square foot (meter) of symbol. Price and payment shall include cleaning and preparing the pavement surface, and placing all materials, for all labor, tools, equipment and incidentals necessary to complete the work.

NOTE:

For information only:

The following manufacturers are known to us which manufacturer Epoxy Resin Paint for Pavement Striping. The Department does not endorse or require the use of any of the manufacturers listed below. However, a bidder wishes to use another manufacturer's product, it shall be submitted for review and approval prior to submitting a bid proposal. Should the product be deemed unacceptable by the Department, the successful bidder will be required to use only an approved product.

1. POLY CARB, Inc.
   33095 Bainbridge Road
   Solon, Ohio 44139
   Tel. 1-800-CALLMIX

2. IPS - Ennis Paint
   P.O. Box 13582
   Research Triangle Park, North Carolina 27709
   Tel. 1-877-477-7623

3. Epoplex
   One Park Avenue
   Maple Shade, NJ 08052
   Tel. 1-800-822-6920

4. Or an approved equal.

4/22/2010

748541 - PREFORMED RETROREFLECTIVE THERMOPLASTIC PAVEMENT MARKINGS, 4”
748542 - PREFORMED RETROREFLECTIVE THERMOPLASTIC PAVEMENT MARKINGS, 6"
748543 - PREFORMED RETROREFLECTIVE THERMOPLASTIC PAVEMENT MARKINGS, 8"
748544 - PREFORMED RETROREFLECTIVE THERMOPLASTIC PAVEMENT MARKINGS, 12”
748545 - PREFORMED RETROREFLECTIVE THERMOPLASTIC PAVEMENT MARKINGS, 16"
748546 - PREFORMED RETROREFLECTIVE THERMOPLASTIC PAVEMENT MARKINGS, SYMBOL/LEGEND
748553 - PREFORMED RETROREFLECTIVE THERMOPLASTIC PAVEMENT MARKINGS, BIKE SYMBOL
748554 - PREFORMED RETROREFLECTIVE THERMOPLASTIC PAVEMENT MARKINGS, PEDESTRIAN SYMBOL
748555 - PREFORMED RETROREFLECTIVE THERMOPLASTIC PAVEMENT MARKINGS, HANDICAP SYMBOL

Description:

This work consists of furnishing and installing preformed retroreflective thermoplastic pavement marking with a preapplied Federal Specification Type IV glass bead coating throughout its entire cross section on bituminous asphalt pavement at the locations and in accordance with the patterns on the Plans, or as directed by the Engineer.

The preformed retroreflective markings shall conform to the size and dimensions as shown in the Federal “Standard Highway Signs” book found at: http://mutcd.fhwa.dot.gov/SHSe/pavement.pdf as referred to in the Delaware Manual on Uniform Traffic Control Devices, Part 3, Markings.

Materials:

General: Only materials listed on the Department’s Approved Pavement Markings Material List will be used for this item. The preformed retroreflective markings shall be fusible to bituminous asphalt pavement by means of the normal heat of a propane type of torch. Adhesives, primers or sealers are not necessary prior to the preformed retroreflective markings application on bituminous asphalt pavement.

The preformed retroreflective markings shall conform to pavement contours, breaks and faults through the action of traffic at normal pavement temperatures. The markings shall have resealing characteristics and be capable of fusing to itself and previously applied worn hydrocarbon and/or alkyd thermoplastic pavement markings.

The preformed retroreflective markings shall be capable of application on bituminous asphalt pavement wearing courses during the paving operation in accordance with the manufacturer's instructions. After application the markings shall be immediately ready for traffic. The preformed retroreflective markings shall be suitable for use for one year after the date of receipt when stored in accordance with the manufacturer's recommendations.

The preformed retroreflective thermoplastic markings shall not be brittle and must be sufficiently cohesive and flexible at temperatures exceeding 50ºF (10ºC) for one person to carry without the danger of fracturing the material prior to application.

Composition: The retroreflective pliant rosin ester thermoplastic pavement markings shall consist of a homogeneous mixture of high quality polymeric thermoplastic binders, pigments, fillers and glass beads. The thermoplastic material must conform to AASHTO M249-79(86) with the exception of the relevant differences due to the material being preformed, and identified herein.

Intermix Glass Beads: The preformed retroreflective material shall contain a minimum of 30% glass spheres which shall conform to AASHTO M247-81 Type 1. Glass spheres shall have a minimum of 80% true spheres overall.

Top Beads: To provide the required retroreflectivity, the preapplied factory top coating of glass beads shall be a combination of both Federal Spec. Type IV and AASHTO M247-81 Type I beads. Federal Spec. Type IV beads shall be evenly disbursed across the entire surface of the product at a minimum rate of 4 lb. (1.8 kg) per 100 ft^2 (9.3 m^2) and the AASHTO at 3 lb.(1.4 kg) per 100 ft^2 (9.3 m^2). In combination, the total glass bead coverage shall be 7-8 lb. (3.2-3.6 kg) per 100 ft^2 (9.3 m^2). The AASHTO M247-81 Type I beads shall have a minimum of 80% true spheres overall and the Federal Spec. Type IV beads shall be 80% true spheres on the 12 and 14 sieves and shall be no less than 75% true spheres on the remaining sieves.

Retroreflectivity: After satisfactory completion of all striping work and written notification from the contractor, the Department shall test the striping to ensure it has the minimum reflectivity. The testing will be completed within 30 calendar days from notification. Testing will be done using a Delta LTL 2000 Retrometer (30 meter geometry). The required minimum initial reflectivity reading in millicandellas shall be:

White 300
Yellow 200
Blue 200

Skid Resistance: The surface of the preformed retroreflective thermoplastic markings shall provide a pre-appled minimum skid resistance value of 45-51 BPN and a post-applied minimum skid resistance value of 45-55 BPN when tested according to ASTM E303-74.

Thickness: The thickness of the supplied material shall have a minimum average thickness of .090" (90 mils) for all Longitudinal lines and a thickness of .125" (125 mils) for all transverse lines and symbols/legends.

Tensile Strength and Elongation: The preformed retroreflective thermoplastic material shall have a minimum tensile strength of 150 lb. per square inch (1054 kg per square mm) of cross section, at .002" (2.28 mil) thickness, when tested according to ASTM D638-76 except that a sample 6" by 1" (150 mm by 25 mm) shall be tested at a temperature between 70ºF and 80ºF (21ºC and 27ºC) using a jaw speed of 10" to 12" (250 mm to 300 mm) per minute. The sample shall have a maximum elongation of 20% at break when tested by this method.

Flexibility: The preformed retroreflective thermoplastic marking material shall have flexibility at 50ºF such that when a 1" by 6" (25 mm by 150 mm) sample is bent through an arc of 90 degrees at a uniform rate in 10 seconds (9 degrees per second) over a 1" (25 mm) mandrel, no cracking occurs in the test sample. The sample must be conditioned prior to testing at 50ºF±2 degrees (10ºC) for a minimum of four hours. At least two specimens tested must meet the flexibility requirements at 50ºF (10ºC) for a passing result.

Environmental Resistance: The applied markings shall be resistance to deterioration due to exposure to sunlight, water, oil, diesel fuels, gasoline, pavement oil content, salt and adverse weather conditions.

Effective Performance Life: When properly applied, in accordance with manufacturer's instructions, the preformed retroreflective pavement markings shall be neat and durable. The markings shall remain skid resistant and show no lifting, shrinkage, tearing, roll back or other signs of poor adhesion for a period of one winter season.

Oil/grease Resistant Test: The preformed retroreflective thermoplastic material shall not dissolve or smear after rubbing a small amount of motor oil on a small piece of the thermoplastic material for two minutes.

Bond Strength: The material shall exhibit a bond strength to Portland Cement Concrete (PCC) equal or exceed 180 psi when tested at room temperature (73.4±3ºF) (23ºC) in accordance to ASTM Standard Test Method for Bond Strength of thermoplastic marking Material D4796-88. Place a coarse brick in a 400ºF (204ºC) oven for 5 minutes. Prepare a 4 square inch test specimen. Place the test specimen on the brick and

further heat in the 400ºF (204ºC) oven for 15 minutes. The test specimen is then allowed to cool to room temperature and prepared for testing.

Low Temperature Cracking (Stress) Resistance for Extended Period: The material shall be tested according to AASHTO T250 Section 7 with Section 7.2.3 modified for and extended cold temperature 15 degrees ±3ºF (-9.4±2ºC) exposure period 72 hours. Any cracking shall constitute failure of the material for PCC road surfaces.

Impact Resistance (Gardner Falling Weight): A 2" by 7.5" (50 by 190 mm) specimen shall be applied on a course concrete brick. Using a Gardner Impact Tester, a 2 lb (.91 kg) weight is dropped from a height of 80" (2032 mm). The specimen when tested at room temperature 73.4±3ºF (23ºC) should show no sign of cracking. (Test procedure is in accordance with ASTM D5420-93).

Packaging: The flexible preformed retroreflective thermoplastic marking materials, for use as transverse or longitudinal markings as well as legends, arrows and symbols shall be available in flat form material or in rolls. Flat material shall be supplied in maximum of 4' (1.2 m) lengths up to 2' (.6 m) in width. The material shall be packed in suitable cartons clearly labeled for ease of identifying the contents.

Construction Methods:

The markings shall be applied in strict accordance with the manufacturer's recommendations on clean and dry surfaces. Marking configurations shall be in accordance with the "Delaware Manual on Uniform Traffic Control Devices, Part 3, Markings."

The preformed retroreflective thermoplastic material shall be fusible to the pavement by means of a propane torch recommended by the manufacturer. Preheating the surface to remove any latent moisture will be done just prior to the placement and installation of the Symbol/ Legend.

No markings shall be placed when the ambient temperature is below 40ºF (4ºC). The material shall be kept in a location above 55ºF (13ºC) until just before application.

The supplier shall provide technical services as may be required.

Method of Measurement:

The quantity of pavement striping (748541-748545) will be measured by the number of linear feet (linear meters) of 4”, 6”, 8”, 12”, or 16” pavement striping line placed and accepted. The quantity of symbol/ legend (748546) will be measured by the number of square feet (meters) of symbol/legend placed and accepted. The quantity of bike symbol, pedestrian symbol, and handicap symbol (748551-748553) will be measured as each placed and accepted. The dimensions for the symbol/legends are as follows:

Bike Rider with Helmet shall be 3’ X 5’.
Pedestrian shall be 4’ X 8’.
Handicap Symbol shall be 40” X 40”.

Basis of Payment:

The quantity of pavement striping payment will be paid for at the Contract unit price per linear foot (linear meter) for 4”, 6”, 8”, 12” and 16” (100 mm, 150 mm, 200 mm, 300 mm, and 400 mm) line. The quantity of symbol/legend will be paid for at the Contract unit price per square foot (meter). The quantity of bike symbol, pedestrian symbol, and handicap symbol will be paid for at the Contract unit price per each. Price and payment shall include cleaning and preparing the pavement surface, and placing all materials, for all labor, tools, equipment and incidentals necessary to complete the work.

Warranty:

The Contractor shall warrant to the Department that the installed retroreflective preformed thermoplastic pavement markings are free of defects, as hereafter defined, for a period of one winter season beginning at the initial acceptance of the marking installation by the Department. The initial acceptance of the marking installation will occur upon the satisfactory correction of all deficiencies noted in the marking installation during the Final Inspection of the project. The markings shall be warranted against failure due to blistering, excessive cracking, bleeding, staining, discoloration, oil content of the pavement materials, smearing and spreading under heat, deterioration due to contact with grease deposits, oil, diesel fuel, or gasoline drippings, chipping, spalling, poor adhesion to the pavement materials, vehicular damage, and wear from normal maintenance activities including snow plowing.

The Contractor shall repair all defective areas identified by the Department after initial installation or during the Warranty Period. All repairs shall begin immediately following the notice to the Contractor by the Department unless weather limitations prevent the corrective work. Should the contractor not commence work within the period stated in the notice, weather permitting, and pending severity, the Department reserves the right to remedy the condition and charge the contractor for the work. Any corrective work shall be as recommended by the manufacturer of the marking material and approved by the Department. The Department shall be given notification before the Contractor begins corrective work to allow for inspection of the operation. All costs associated with the repair work shall be the responsibility of the contractor. These costs shall include, but are not limited to, removal, material, maintenance of traffic, etc.

2/28/09

760502 - PAVEMENT MILLING, TAPER CUT

Description:

This work consists of furnishing a pavement milling machine and milling or planing the existing bituminous concrete pavement to the average depths and widths in accordance with the locations, notes on the Plans and as directed by the Engineer.

The pavement milling machine shall be one with a proven record for use in milling/planing hot-mix pavement. The Contractor shall reuse, salvage, or dispose of the milled material as indicated on the Plans.

Construction Methods:

Milling and/or planing shall consist of one pass with a specified depth at one edge (face of the curb) and 0 depth at the other edge, or in cases where excessive crown is being removed, the required number of passes to mill a specified depth at the existing road centerline and 0 depth at the edges. The depth shall be as shown on the Plans or as directed by the Engineer.

Method of Measurement:

The quantity of taper cut milling will be measured in square yards per inch of depth (square meters per 25 mm of depth). The average depth shall be determined by either measuring the actual depth removed at face of the curb and dividing by two or measuring the actual depth removed at road centerline and dividing by two, whichever case is applicable.

Basis of Payment:

The quantity of taper cut milling will be paid for at the Contract unit price per square yard per inch of depth (square meter per 25 mm of depth). Price and payment will constitute full compensation for furnishing milling machine with operator and milling/planing the roadway, removal and disposal or salvaging the milled material and for transporting, as indicated on the Plans, for all labor, equipment, tools, and necessary incidentals to complete the work.

10/25/01

760507 - PROFILE MILLING, HOT-MIX
760508 - PROFILE MILLING, CONCRETE

Description:

This work consists of furnishing a pavement-milling machine or cold planer and planing the existing bituminous concrete pavement or P.C.C. Pavement at the locations and to the nominal depths shown on the Plans and/or as directed by the Engineer to obtain a smooth profile on the existing roadway surface. Unless otherwise noted on the Plans or specifications the Contractor shall reuse, salvage and/or dispose of the milled material.

Equipment:

The milling equipment shall be a commercially designed and manufactured milling machine capable of performing the work in a manner satisfactory to the Engineer.
The machine shall be power-operated and self-propelled, shall have sufficient power, traction and stability to remove a thickness of material to a specified depth. In addition, the machine must accurately and automatically establish profile grades by referencing the existing pavement surface. This shall be accomplished by means of 1.) a ski of 30 (9 m) minimum length with an accuracy of ±0.125 in 30 (3 mm in 9 m) or 2.) a minimum of three (3) ultra sonic, non-ground contacting sensors with an accuracy of ±0.100 in 25 (2.5 mm in 7.5 m). If noted on the Plans, a profile grade shall be established independent of the existing pavement surface. In such case the machine shall be capable of following the independent grade line (e.g. string line). The machine shall have an automatic system for controlling grade elevation and cross slope. The machine shall also be equipped with a means to effectively control dust generated by the cutting operation.

Construction Methods:

The surface resulting from the planing operation shall be in accordance with notes and details on the Plans and shall be characterized by uniform, discontinuous longitudinal striations and shall not be gouged or torn. Imperfections exceeding 5/16" (8 mm) at any point along the surface as a result of missing teeth or faulty operation shall be removed by approved methods.

Before opening the milled surface to traffic, all loose material shall be removed from the surface with a power vacuum sweeper.

Whenever the milling operation causes water to pond or lay within the wheelpaths of the roadway the Contractor shall alleviate this problem by cutting bleeders into the shoulder or median to provide positive drainage. Cost for such work will be incidental to this item.

If the road is to remain open to traffic, longitudinal vertical drop-offs in excess of 2" (50 mm) at lane lines or at the centerline shall not be left overnight.

Transverse faces at the beginning and end of the milling operation existing at the end of a work period shall be tapered 20:1 or flatter in a manner approved by the Engineer to avoid a hazard for traffic.

Surface material that cannot be removed by cold planing equipment because of physical or geometrical restraints shall be removed by other methods acceptable to the Engineer.

If independent grade reference is required, it shall be designated in the Plans and/or Contract documents and elevations shall be provided by the Plans or at the direction of the Engineer.

If a severe bump exist in the pavement surface extra effort shall be taken at these locations to improve the profile. Manual changes to the cutter head may be needed at these locations to achieve this. It is the intent to remove bumps and irregularities in the pavement and produce a smooth milled surface for hot-mix resurfacing.

If the existing bituminous surface is over concrete the intent is to remove all of the existing bituminous material to the top of the concrete surface unless otherwise directed by the Plans or the Engineer.

If milling to remove open graded hot mix, the milling operation must remove all of the open graded hot mix from the roadway surface.

Method of Measurement:

The quantity of pavement milling will be measured as the number of square yards per inch (square meters per 25 mm) of depth as shown on the Plans or established by the Engineer. The nominal depth shown on the Plans and initially set on the milling machine, even though it will vary automatically during profiling, will be the depth measured and paid.

Basis of Payment:

The quantity of pavement milling will be paid for at the Contract unit price per square yard per inch (square meter per 25 mm) of depth. Price and payment will constitute full compensation for furnishing an accepted pavement-milling machine and operator, for removal and disposal of the milled material or delivery to a designated site, for transporting equipment, for all labor, tools equipment and incidentals necessary to complete the item.

5/02/02

763502 - MAINTENANCE OF RAILROAD TRAFFIC (NORFOLK SOUTHERN)

1. AUTHORITY OF RAILROAD ENGINEER AND STATE ENGINEER:

The authorized representative of the Railroad Company, hereinafter referred to as Railroad Engineer, shall have final authority in all matters affecting the safe maintenance of Railroad traffic of his/her Company including the adequacy of the foundations and structures supporting the Railroad tracks.

The authorized representative of the State, hereinafter referred to as the Engineer, shall have authority over all other matters as prescribed herein and in the Project Specifications.

2. NOTICE OF STARTING WORK:

A. The Contractor shall not commence any work on Railroad rights-of-way until he/she has complied with the following conditions:

a. Given the Railroad written notice, with copy to the Engineer who has been designated to be in charge of the work, at least ten days in advance of the date he/she proposes to begin work on Railroad rights-of-way.

Crossing Surfaces

Chief Engineer - D&C
Norfolk Southern Corp.
175 Spring Street, SW
Building Box 142
Atlanta, Georgia 30303

Warning Devices

Chief Engineer - S&C
Norfolk Southern Corp.
99 Spring Street, SW
Building Box 123
Atlanta, Georgia 30303

Bridges & Structures

Chief Engineer
Bridges and Structures
Norfolk Southern Corp.
99 Spring Street, SW
Atlanta, Georgia 30303

b. Obtained written authorization from the Railroad to begin work on Railroad rights-of-way, such authorization to include an outline of specific conditions with which he/she must comply.

c. Obtained written approval from the Railroad of Railroad Protective Insurance Liability coverage as required by paragraph 14 herein.

d. Furnished a schedule for all work within the Railroad rights-of-way as required by paragraph 7,B,1.

B. The Railroad's written authorization to proceed with the work shall include the names, addresses, and telephone numbers of the Railroad's representatives who are to be notified as hereinafter required. Where more than one representative is designated, the area of responsibility of each representative shall be specified.

3. INTERFERENCE WITH RAILROAD OPERATIONS:

A. The Contractor shall so arrange and conduct his/her work that there will be no interference with Railroad operations, including train, signal, telephone and telegraphic services, or damage to the property of the Railroad Company or to poles, wires, and other facilities of

tenants on the rights-of-way of the Railroad Company. Whenever work is liable to affect the operations or safety of trains, the method of doing such work shall first be submitted to the Railroad Engineer for approval, but such approval shall not relieve the Contractor from liability. Any work to be performed by the Contractor which requires flagging service or inspection service shall be deferred by the Contractor until the flagging service or inspection service required by the Railroad is available at the job site.

B. Whenever work within Railroad rights-of-way is of such a nature that impediment to Railroad operations such as use of runaround tracks or necessity for reduced speed is unavoidable, the Contractor shall schedule and conduct his/her operations so that such impediment is reduced to the absolute minimum.

C. Should conditions arising from, or in connection with the work, require that immediate and unusual provisions be made to protect operations and property of the Railroad, the Contractor shall make such provisions. If in the judgment of the Railroad Engineer, or in his/her absence, the Engineer, such provisions is insufficient, either may require or provide such provisions as he/she deems necessary. In any event, such unusual provisions shall be at the Contractor's expense and without cost to the Railroad or the State.

4. TRACK CLEARANCES:

The minimum track clearances to be maintained by the Contractor during construction are shown on the Project Plans. However, before undertaking any work within Railroad right-of-way, or before placing any obstruction over any track, the Contractor shall:

1. Notify the Railroad's representative at least 72 hours in advance of the work.

2. Receive assurance from the Railroad's representative that arrangements have been made for flagging service as may be necessary.

3. Receive permission from the Railroad's representative to proceed with the work.

4. Ascertain that the Engineer has received copies of notice to the Railroad and of the Railroad's response thereto.

5. CONSTRUCTION PROCEDURES:

A. General:

Construction work and operations by the Contractor on Railroad property shall be:

1. Subject to the inspection and approval of the Railroad.

2. In accord with the Railroad's written outline of specific conditions.

3. In accord with the Railroad's general rules, regulations and requirements including those relating to safety, fall protection and personal protective equipment.

4. In accord with these Special Provisions.

B. Excavation:

The subgrade of an operated track shall be maintained with edge of berm at least 10'-0" (3.05 m) from centerline of track and not more than 24 (600 mm) below top of rail. Contractor will not be required to make existing section meet this specification if substandard, in which case existing section will be maintained.

C. Excavation for Structures:

The Contractor will be required to take special precaution and care in connection with excavating and shoring pits, and in driving piles or sheeting for footings adjacent to tracks to provide adequate lateral support for the tracks and the loads which they carry, without disturbance of track alignment and surface, and to avoid obstructing track clearances with working equipment, tools or other material. The procedure for doing such work, including need of and plans for shoring, shall first be approved by the Engineer and the Railroad Engineer, but such approval shall not relieve the Contractor from liability.

D. Blasting:

1. The Contractor shall obtain advance approval of the Railroad Engineer and the Engineer for use of explosives on or adjacent to Railroad property. The request for permission to use explosives shall include a detailed blasting plan. If permission for use of explosives is granted, the Contractor will be required to comply with the following:

(a) Blasting shall be done with light charges under the direct supervision of a responsible officer or employee of the Contractor and a licensed blaster.

(b) Electric detonating fuses shall not be used because of the possibility of premature explosions resulting from operation of two-way radios.

(c) No blasting shall be done without the presence of an authorized representative of the Railroad. At least 72 hours advance notice to the person designated in the Railroad's notice of authorization to proceed (see Section 2. Notice of Starting Work) will be required to arrange for the presence of an authorized Railroad representative and such flagging as the Railroad may require.

(d) Have at the job site adequate equipment, labor and materials and allow sufficient time to clean up debris resulting from the blasting without delay to trains, as well as correcting at his/her expense any track misalignment or other damage to Railroad property resulting from the blasting as directed by the Railway's authorized representative. If his/her actions result in delay of trains, the Contractor shall bear the entire cost thereof.

2. The Railroad representative will:

(a) Determine approximate location of trains and advise the Contractor the appropriate amount of time available for the blasting operation and clean-up.

(b) Have the authority to order discontinuance of blasting if, in his/her opinion, blasting is too hazardous or is not in accord with these Special Provisions.

E. Maintenance of Railroad Facilities:

1. The Contractor will be required to maintain all ditches and drainage structures free of silt or other obstructions which may result from his/her operations and provide and maintain any erosion control measures as required. The Contractor will promptly repair eroded areas within Railroad rights-of-way and repair any other damage to the property of the Railroad or its tenants.

2. All such maintenance and repair of damages due to the Contractor's operations shall be done at the Contractor's expense.

F. Storage of Materials and Equipment:

Materials and equipment shall not be stored within 25 (7.6 m) of the centerline of Railroad's track or where they will interfere with Railroad operations, nor on the rights-of-way of the Railroad Company without first having obtained permission from the Railroad Engineer, and such permission will be with the understanding that the Railroad Company will not be liable for damage to such material and equipment from any cause and that the Railroad Engineer may move or require the Contractor to move, at the Contractor's expense, such material and equipment.

All grading or construction machinery that is left parked near the track unattended by a watchman shall be effectively immobilized so that it cannot be moved by unauthorized persons. The Contractor shall protect, defend, indemnify and save Railroad, and any associated, controlled or affiliated corporation, harmless from and against all losses, costs, expenses, claim or liability for loss or damage to property or the loss of life or personal injury, arising out of or incident to the Contractor's failure to immobilize grading or construction machinery.

G. Cleanup:

Upon completion of the work, the Contractor shall remove from within the limits of the Railroad rights-of-way, all machinery, equipment, surplus materials, falsework, rubbish or temporary buildings of the Contractor, and leave said rights-of-way in a neat condition satisfactory to the Chief Engineer of the Railroad or his/her authorized representative.

6. DAMAGES:

A. The Contractor shall assume all liability for any and all damages to his/her work, employees, servants, equipment and materials caused by Railroad traffic.

B. Any cost incurred by the Railroad for repairing damages to its property or to property of its tenants, caused by or resulting from the operations of the Contractor, shall be paid directly to the Railroad by the Contractor.

7. FLAGGING SERVICES:

A. When Required:

Under the terms of the agreement between the State and the Railroad, the Railroad has sole authority to determine the need for flagging required to protect its operations. In general, the requirements of such services will be whenever the Contractor's personnel or equipment are or are likely to be, working on the Railroad's right-of-way, or across, over, adjacent to, or under a track, or when such work has disturbed or is likely to disturb a Railroad structure or the Railroad roadbed or surface and alignment of any track to such extent that the movement of trains must be controlled by flagging.

Normally, the Railroad will assign one flagman to a project; but in some cases, more than one may be necessary, such as yard limits where three (3) flagmen may be required. However, if the Contractor works within distances that violate instructions given by the Railroad's authorized representative or performs work that has not been scheduled with the Railroad's authorized representative, a flagman or flagmen may be required full time until the project has been completed.

B. Scheduling and Notification:

1. Not later than the time that approval is initially requested to begin work on Railroad right-of-way, Contractor shall furnish to the Railroad and the State a schedule for all work required to complete the portion of the project within Railroad right-of-way

and arrange for a job site meeting between the Contractor, the State, and the Railroad's authorized representative. Flagman or flagmen may not be provided until the job site meeting has been conducted and the Contractor's work scheduled.

2. The Contractor will be required to give the Railroad representative at least 10 working days of advance written notice of intent to begin work within Railroad right-of-way in accordance with this special provision. Once begun, when such work is then suspended at any time, or for any reason, the Contractor will be required to give the Railroad representative at least 3 working days of advance notice before resuming work on Railroad right-of-way. Such notices shall include sufficient details of the proposed work to enable the Railroad representative to determine if flagging will be required. If such notice is in writing, the Contractor shall furnish the Engineer a copy; if notice is given verbally, it shall be confirmed in writing with copy to the Engineer. If flagging is required, no work shall be undertaken until the flagman, or flagmen is present at the job site. It may take up to 30 days to obtain flagging initially from the Railroad. When flagging begins, the flagman is usually assigned by the Railroad to work at the project site on a continual basis until no longer needed and cannot be called for on a spot basis. If flagging becomes unnecessary and is suspended, it may take up to 30 days to again obtain from the Railroad. Due to Railroad labor agreements, it is necessary to give 5 working days notice before flagging service may be discontinued and responsibility for payment stopped.

3. If, after the flagman is assigned to the project site, an emergency arises that requires the flagman's presence elsewhere, then the Contractor shall delay work on Railroad right-of-way until such time as the flagman is again available. Any additional costs resulting from such delay shall be borne by the Contractor and not the State or Railroad.

C. Payment:

1. The State will be responsible for paying the Railroad directly for any and all costs of flagging which may be required to accomplish the construction.

2. The charge to the State by the Railroad will be the actual cost based on the rate of pay for the Railroad's employees who are available for flagging service at the time the service is required.

3. Work by a flagman in excess of 8 hours per day or 40 hours per week, but not more than 12 hours a day will result in overtime pay at 1 and 1/2 times the appropriate rate. Work by a flagman in excess of 12 hours per day will result in overtime at 2 times the appropriate rate. If work is performed on a holiday, the flagging rate is 2 and 1/2 times the normal rate.

4. Railroad work involved in preparing and handling bills will also be charged to the State. Charges to the State by the Railroad shall be in accordance with applicable provisions of Subchapter B, Part 140, Subpart I and Subchapter G, Part 646, Subpart B of the Federal-Aid Policy Guide issued by the Federal Highway Administration on December 9, 1991, including all current amendments. Flagging costs are subject to change.

D. Verification:

1. The Contractor and State will review and sign the Railroad flagman's time sheet (Form 11123), attesting that the flagman was present during the time recorded. Flagmen may be removed by the Railroad if form is not signed. If flagman is removed, the Contractor will not be allowed to re-enter the Railroad right-of-way until the issue is resolved. Any complaints concerning flagman or flagmen must be resolved in a timely manner. If need for flagman or flagmen is questioned, please

contact Railroad's Engineer, Grade Separation Structures (404)529-1641. All verbal complaints will be confirmed in writing by the Contractor within 5 working days with a copy to the Engineer. Address all written correspondence to:

CROSSING SURFACES

Office of Chief Engineer
Bridges & Structures
Norfolk Southern Corp.
99 Spring Street, SW
Atlanta, Georgia 30303
Attn: T. D. Wyatt
Engineer Grade Separation

2. The Railroad flagman assigned to the project will be responsible for notifying the Project Engineer upon arrival at the job site on the first day (or as soon thereafter as possible) that flagging services begin and on the last day that he/she performs such services for each separate period that services are provided. The Project Engineer will document such notification in the project records. When requested, the Project Engineer will also sign the flagman's diary showing daily time spent and activity at the project site.

8. HAUL ACROSS RAILROAD:

A. Where the Plans show or imply that materials of any nature must be hauled across a Railroad, unless the Plans clearly show that the State has included arrangements for such haul in its agreement with the Railroad, the Contractor will be required to make all necessary arrangements with the Railroad regarding means of transporting such materials across the Railroad. The Contractor will be required to bear all costs incidental to such crossings whether services are performed by his/her own forces or by Railroad personnel.

B. No crossing may be established for use of the Contractor for transporting materials or equipment across the tracks of the Railroad Company unless specific authority for its installation, maintenance, necessary watching and flagging thereof and removal, until a private crossing agreement has been executed between the Contractor and Railroad.

9. WORK FOR THE BENEFIT OF THE CONTRACTOR:

A. All temporary or permanent changes in wire lines or other facilities which are considered necessary to the project are shown on the Plans; included in the force account agreement between the State and the Railroad or will be covered by appropriate revisions to same which will be initiated and approved by the State and/or the Railroad.

B. Should the Contractor desire any changes in addition to the above, then he/she shall make separate arrangements with the Railroad for same to be accomplished at the Contractor's expense.

10. COOPERATION AND DELAYS:

A. It shall be the Contractor's responsibility to arrange a schedule with the Railroad for accomplishing stage construction involving work by the Railroad or tenants of the Railroad. In arranging his/her schedule he/she shall ascertain, from the Railroad, the lead time required for assembling crews and materials and shall make due allowance therefore.

B. No charge or claim of the Contractor against either the State or the Railroad will be allowed for hindrance or delay on account of railway traffic; any work done by the Raiload or other delay incident to or necessary for safe maintenance of railway traffic or for any delays due to compliance with these special provisions.

11. TRAINMAN'S WALKWAYS:

Along the outer side of each exterior track of multiple operated track, and on each side of single operated track, an unobstructed continuous space suitable for trainman's use in walking along trains, extending to a line not less than 10 (3.05 m) from centerline of track, shall be maintained. Any temporary impediments to walkways and track drainage encroachments or obstructions allowed during work hours while Railroad's protective service is provided shall be removed before the close of each work day. If there is any excavation near the walkway, a handrail, with 10 - 0 (3.05 m) minimum clearance from centerline of track, shall be placed.

12. GUIDELINES FOR PERSONNEL ON RAILROAD RIGHT-OF-WAY:

A. All persons shall wear hard hats. Appropriate eye and hearing protection must be used. Working in shorts is prohibited. Shirts must cover shoulders, back and abdomen. Working in tennis or jogging shoes, sandals, boots with high heels, cowboy and other slip-on type boots is prohibited. Hard-sole, lace-up footwear, zippered boots or boots cinched up with straps which fit snugly about the ankle are adequate. Safety boots are strongly recommended.

B. No one is allowed within 25 (7.6 m) of the centerline of track without specific authorization from the flagman.

C. All persons working near track while train is passing are to lookout for dragging bands, chains and protruding or shifted cargo.

D. No one is allowed to cross tracks without specific authorization from the flagman.

E. All welders and cutting torches working within 25 (7.6 m) of track must stop when train is passing.

F. No steel tape or chain will be allowed to cross or touch rails without permission.

13. GUIDELINES EQUIPMENT ON RAILROAD RIGHT-OF-WAY:

A. No crane or boom equipment will be allowed to set up to work or park within boom distance plus 15 (4.6 m) of centerline of track without specific permission from Railroad official and flagman.

B. No crane or boom equipment will be allowed to foul track or lift a load over the track without flag protection and track time.

C. All employees will stay with their machines when crane or boom equipment is pointed toward track.

D. All cranes and boom equipment under load will stop work while train is passing (including pile driving).

E. Swinging loads must be secured to prevent movement while train is passing.

F. No loads will be suspended above a moving train.

G. No equipment will be allowed within 25 (7.6 m) of centerline of track without specific authorization of the flagman.

H. Trucks, tractors or any equipment will not touch ballast line without specific permission from railroad official and flagman.

I. No equipment or load movement within 25 (7.6 m) or above a standing train or railroad equipment without specific authorization of the flagman.

J. All operating equipment within 25 (7.6 m) of track must halt operations when a train is passing. All other operating equipment may be halted by the flagman if the flagman views the operation to be dangerous to the passing train.

K. All equipment, loads and cables are prohibited from touching rails.

L. While clearing and grubbing, no vegetation will be removed from Railroad embankment with heavy equipment without specific permission from the Railroad Engineer and flagman.

M. No equipment or materials will be parked or stored on Railroad's property unless specific authorization is granted from the Railroad Engineer.

N. All unattended equipment that is left parked on Railroad property shall be effectively immobilized so that it cannot be moved by unauthorized persons.

O. All cranes and boom equipment will be turned away from track after each work day or whenever unattended by an operator.

14. INSURANCE:

A. In addition to any other forms of insurance or bonds required under the terms of the Contract and specifications, the Prime Contractor will be required to carry insurance of the following kinds and amounts:

1. Commercial General Liability Insurance having a combined single limit of not less than $2,000,000 per occurrence for all loss, damage, cost and expense, including attorneys' fees, arising out of bodily injury liability and property damage liability during the policy period. Said policy shall include "explosion, collapse, and underground harzard" ("XCU") coverage, shall be endorsed to name Railroad specified in item A.2.c. below as an additional insured, and shall include a severability of interests provision.

2. Railroad Protective Liability Insurance having a combined single limit of not less than $2,000,000 each occurrence and $6,000,000 in the aggregate applying separately to each annual period. If the project involves track over which passenger trains operate, the insurance limits required are not less than a combined single limit of $5,000,000 each occurrence and $10,000,000 in the aggregate applying separately to each annual period. Said policy shall provide coverage for all loss, damage or expense arising from bodily injury and property damage liability, and physical damage to property attributed to acts or omissions at the job site.

The standards for the Railroad Protective Liability Insurance are as follows:

The insurer must be rated A - or better by A.M. Best Company, Inc.

The policy must be written using one of the following combinations of Insurance Services Office ("ISO") Railroad Protective Liability Insurance Form Numbers:

CG 00 35 01 96 and CG 28 31 10 93; or
CG 00 35 07 98 and CG 28 31 07 98.

The named insured shall read:

[Name of railroad that owns the track]; and
Norfolk Southern Railway Company
Three Commercial Place
Norfolk, Virginia 23510-2191
Attn: Mr. Chris Bremus, Risk Manager

The description of operations must appear on the Declarations, must match the project description in this agreement, and must include the appropriate Department project and contract identification numbers.

The job location must appear on the Declarations and must include the city, state, and appropriate highway name/number.

The name and address of the prime contractor must appear on the Declarations.

The name and address of the Department must be identified on the Declarations as the "Involved Governmental Authority or Other Contracting Party".

Other endorsements/forms that will be accepted are:

Broad Form Nuclear Exclusion - Form IL 00 21
30-day Advance Notice of Non-renewal or cancellation
Required State Cancellation Endorsement
Quick Reference or Index Form CL/IL 240

Endorsements/forms that are NOT acceptable are:

Any Pollution Exclusion Endorsement except CG 28 31
Any Punitive or Exemplary Damages Exclusion
Known injury or Damage Exclusion form CG 00 59
Any Common Policy Conditions form
Any other endorsement/form not specifically authorized in item no. 2.h. above.

B. If any part of the work is sublet, similar insurance, and evidence thereof as specified in A.1 above, shall be provided by or on behalf of the subcontractor to cover its operations on Railroad's right of way.

C. Prior to entry on Railroad right-of-way, the original Railroad Protective Liability Insurance Policy shall be submitted by the Prime Contractor to the Department at the address below for its review and transmittal to the Railroad. In addition, certificates of insurance evidencing the Prime Contractor's and any subcontractors' Commercial General Liability Insurance shall be issued to the Railroad and the Department at the addresses below, and forwarded to the Department for its review and transmittal to the Railroad. The certificates of insurance shall state that the insurance coverage will not be suspended, voided, cancelled, or reduced in coverage or limits without (30) days advance written notice to Railroad and the Department. No work will be permitted by Railroad on its right-of-way until it has reviewed and approved the evidence of insurance required herein.

STATE	**RAILROAD**
Mr. James Hoagland Contract Services Administrator Delaware Department of Transportation 800 Bay Road, Box 778 Dover, DE 19903	Mr. Chris Bremus Risk Manager Norfolk Southern Corp. Three Commercial Place Norfolk, VA 23510-2191

15. FAILURE TO COMPLY:

In the event the Contractor violates or fails to comply with any of the requirements of these Special Provisions:

A. The Railroad Engineer may require that the Contractor vacate Railroad property.

B. The Engineer may withhold all monies due the Contractor on monthly statements.

Any such orders shall remain in effect until the Contractor has remedied the situation to the satisfaction of the Railroad Engineer and the Engineer.

16. PAYMENT FOR COST OF COMPLIANCE:

The payment for the item shall be made for at the Contract unit price per Lump Sum bid for "Maintenance of Railroad Traffic", which price and payment shall constitute full compensation for maintaining Railroad traffic during the life of the project; submission of drawings and procedures to the Railroad; for all incidental costs imposed by the Railroad on the Contractor in accordance with the terms and conditions set in these Specifications; meeting all insurance requirements as described herein; for any cost incidental to or arising from the need to meet any or all requirements outlined, herein; for all materials, labor, tools, equipment, and incidentals necessary to complete the work.

NOTE:

As stated above in this specification, the Department will pay the Railroad directly for protective services required for this project. Should the Contractor wish to use a method or sequence of construction requiring more Railroad protective services than the method and sequence of construction shown in the Plans, cost for such extra Railroad protective services will be deducted from monies due the Contractor.

Also, the Contractor's attention is drawn to the portion of the second paragraph in Section 7. Flagging Services that reads:

"However, if the Contractor works within distances that violate instructions given by the Railroad's authorized representative or performs work that has not been scheduled with the Railroad's authorized representative, a flagman or flagmen may be required full time until the project has been completed."

If such "full time" flagging requirements are imposed by the Railroad because of the Contractor's negligence or willful disregard of Railroad requirements, the Contractor will be held responsible for extra cost involved. Time charges for flagging services provided, but not need for legitimate pursuit of construction will be recorded and charges for such flagging time will be deducted from monies due the Contractor.

There is approximately _1__ freight trains that use this line per day.

09/16/09

763643 - MAINTENANCE OF TRAFFIC – ALL INCLUSIVE

Description:

This item shall consist of furnishing, installing, maintaining and/or relocating the necessary temporary traffic control devices used to maintain vehicular, bicycle and pedestrian traffic, including persons with disabilities in accordance with the Americans with Disabilities Act, as amended. All work shall be performed in a manner that will provide reasonably safe passage with the least practicable obstruction to all users, including vehicular, bicycle and pedestrian traffic.

All requirements of the Delaware Manual on Uniform Traffic Control Devices (MUTCD), Part 6, herein referred to as the Delaware MUTCD. (latest edition with all revisions made up to the date of Advertisement of this project) shall apply for all temporary traffic control devices. Any, and all, control, direction, management and maintenance of traffic shall be performed in accordance with the requirements of the Delaware MUTCD, notes on the Plans, this specification, and as directed by the Engineer.

The Contractor shall be aware that the Case Diagrams and safety measures outlined in the Delaware MUTCD are for common construction situations and modifications may be warranted based on the complexity of the job. The Contractor shall submit justification for modifications to the Temporary Traffic Control Plan (TTCP) to the Engineer for approval prior to implementation.

The Department reserves the right to impose additional restrictions, as needed, for the operational movement and safety of the traveling public. The Department reserves the right to suspend the Contractor's operations until compliance with the Engineer's directive for remedial action, based on but not limited to the following reasons:

1. The Contractor's operations are not in compliance with the Delaware MUTCD, the specifications or the Plans.

2. The Contractor's operations have been deemed unsafe by the Traffic Safety Engineer or District Safety Officer.

Materials and Construction Methods:

The Contractor shall submit a Temporary Traffic Control Plan (TTCP) or a Letter of Intent to use the Plan recommended Delaware MUTCD Case Diagram(s) at or prior to the pre-construction meeting. The Contractor shall submit the TTCP for all Contractor and subcontractor work to be performed on the project for the Department's approval before the start of work.

When specified by a note in the Plans, the Contractor shall be required to have an American Traffic Safety Services Association (ATSSA) certified Traffic Control Supervisor on the project. The authorized designee must be assigned adequate authority, by the Contractor, to ensure compliance with the requirements of the Delaware MUTCD and provide remedial action when deemed necessary by the Traffic Safety Engineer or the District Safety Officer. The ATSSA certified Traffic Control Supervisor's sole responsibility shall be the maintenance of traffic throughout the project. This responsibility shall include, but is not limited to, the installation, operations, maintenance and service of temporary traffic control devices. Also required is the daily maintenance of a log to record maintenance of traffic activities, i.e., number and location of temporary traffic control devices; and times of installation, changes and repairs to temporary traffic control devices. The ATTSA Traffic Control Supervisor shall serve as the liaison with the Engineer concerning the Contractor's maintenance of traffic. The name, contact number and certification for the designated Traffic Control Supervisor shall be submitted at or prior to the pre-construction meeting. The cost of the ATSSA certified Traffic Control Supervisor shall be incidental to this item.

Temporary traffic control devices shall be maintained in good condition in accordance with the brochure entitled "Quality Guidelines for Temporary Traffic Control Devices", published by the American Traffic Safety Services Association (ATSSA). Any temporary traffic control devices that do not meet the quality guidelines shall be removed and replaced with acceptable devices. Failure to comply will result in work stoppage with time charges continuing to be assessed.

Any existing signs that conflict with any temporary or permanent construction signs shall be covered as needed or as directed by the Engineer. The cost for temporarily covering conflicting signs shall be incidental to this item.

Access to all transit stops located within the project limits shall be maintained unless otherwise directed by the Plans or the Engineer. Maintaining access shall include maintaining an area for the transit vehicle and also an accessible path for pedestrians to safely access the transit stop.

The Contractor shall notify the Engineer, in writing, no less than fourteen (14) calendar days prior to the start of any detour(s) and road closures. The Engineer will notify the following entities:

- Local 911 Center
- Local School Districts
- Local Post Offices
- DelDOT's Transportation Management Center (TMC)
- Town Managers
- Local Police
- DelDOT's Public Relations
- Delaware Transit Corporation (DTC)

Immediately prior to the implementation of any lane or road closures, the Engineer shall notify the DelDOT TMC at (302) 659-4600. Notifications shall also be provided when the closures are lifted. The Engineer shall notify TMC and the District Safety Officer if any lane closures cannot be removed prior to the end of the allowable work hours.

The Contractor shall notify the local 911 center if access to a fire hydrant is temporarily restricted. The Contractor shall provide written confirmation to the Engineer that the local 911 center has been notified.

If a detour is required during any part or the entire period of this Contract, an approved detour plan shall be obtained from the Department's Traffic Safety Section. All signs, barricades and other temporary traffic control devices required as part of the approved detour plan shall be installed and maintained by the Contractor on the route that is closed and on the detour route. Road closures without an approved detour plan shall not be allowed. If a road is closed without an approved detour plan, the Contractor's operations shall be stopped immediately.

The Contractor shall provide and maintain ingress and egress for each property abutting the construction area and each property located between the diversion points of any detour and the actual construction site. Construction activities which may temporarily or otherwise interfere with property access shall be coordinated in advance with the affected property owners.

The Contractor shall conduct construction operations in a manner which will minimize delays to traffic, and shall meet the following requirements:

1. If work is being performed within 200 feet in any direction of an intersection that is controlled by a traffic signal, the flagger(s) shall direct the flow of traffic in concert with the traffic signals in construction areas to avoid queuing, unless active work prohibits such action. The flagger shall direct traffic to prevent traffic from queuing through an intersection (i.e., blocking an intersection). Only a Traffic Officer may direct traffic against the operation of a traffic signal and only until the operation occurring within the intersection is completed.

2. When a lane adjacent to an open lane is closed to travel, the temporary traffic control devices shall be set 2 feet (0.61 m) into the closed lane from the edge of the open lane, unless an uncured patch exists or actual work is being performed closer to the open lane with minimum restriction to traffic.

3. Except for "buffer lanes" on high volume and/or high speed roadways, lanes shall not be closed unless construction activity requiring lane closure is taking place, or will take place within the next hour. Lanes shall be reopened immediately upon completion of the work.

Moving operations will require the lane closures be shortened as the work progresses and as traffic conditions warrant to minimize the length of the closure. The Contractor shall conduct construction operations in a manner so as to minimize disruption to traffic during peak hours and periods of heavy flow. The Department reserves the right to stop or change the Contractor's operations, if in the opinion of the Engineer, such operations are unnecessary at that time or the operations are unnecessarily impeding traffic.

4. Work in the vicinity of traffic signals, shall be scheduled to minimize the time during which the signal is operated without detectors, and prior approval from the Engineer shall be required. TMC shall be notified in advance of cutting a loop detector, and be immediately notified once the loop detector has been reinstalled. The Contractor shall provide sufficient advance notice of the loop detector work with the Engineer to ensure the aforementioned requirements are met.

It is required that all temporary traffic control work and related items shall either be performed entirely by the Contractor's own organization, or totally subcontracted. Maintenance of equipment shall not be subject to this requirement.

Any deficiencies related to temporary traffic control that are reported to the Contractor in writing shall be corrected within 24 hours or as directed by the Engineer. Failure to comply will result in non-payment for those devices that are found to be deficient for the duration of the deficiency. Serious deficiencies that are not corrected immediately shall result in suspension of work until items identified are brought back into compliance.

At the end of each day's work, the Contractor shall correct all pavement edge drop-offs in accordance with Table 6G-1 in the Delaware MUTCD. This corrective work shall be accomplished with Temporary Roadway Material (TRM) unless an alternate method is specified in the Plans. All ruts and potholes shall be filled with TRM as soon as possible but no later than the end of each work day. Placement and Payment of TRM shall be completed in accordance with Section 402 of the Standard Specifications. If temporary elimination of a drop-off hazard cannot be accomplished, then the area should be properly marked and protected with temporary traffic control devices such as temporary barricades, warning signs, flashing lights, etc. as required by Section 6G.21 of the Delaware MUTCD.

All open trench excavation accessible by vehicular traffic must be backfilled prior to the end of each working day. Steel plates shall not be used except in emergency situations and only with prior written approval from the Engineer unless otherwise directed by the Plans.

The Contractor shall submit, at or prior to the preconstruction meeting, detailed drawings including but not limited to existing striping lengths, lane and shoulder widths, turn lane lengths, locations of stop bars, turn arrows, crosswalks and railroad crossings. The drawings shall depict the existing pavement markings for each project location. These drawings will be reviewed by the Department's Traffic Section to determine the need for modification(s) for compliance with the Delaware MUTCD. Temporary pavement markings, on the final pavement surface, shall match the Plan dimensions and layout or the approved drawings of the permanent markings in compliance with Section 3 of the Delaware MUTCD. All conflicting or errant striping shall be removed as directed by the Engineer in compliance with the specifications for Item 748530 (Removal of Pavement Striping).

At the end of each day's operation and before traffic is returned to unrestricted roadway use, temporary striping shall be utilized when the existing pavement is milled and hot mix will not be placed the same day or more than a single course of hot mix is to be placed or permanent roadway striping cannot be placed on the same day as the placement of the final course of hot mix. Placement of temporary striping shall receive prior approval from the Engineer and the contractor shall apply temporary pavement markings in accordance with the requirements of Section 748 of Delaware Standard specifications and the Delaware MUTCD. Payment for temporary pavement striping shall be made at the unit price bid for item 748 - Temporary Striping. Payment for final striping will be included in the applicable striping item.

The Contractor shall have temporary striping/delineating materials (such as raised markers, tape, and other approved materials) available at the job site for verification by the Department prior to starting the hot-

mix paving operation on roads to be immediately opened to traffic. These materials shall be used by the Contractor for temporary markings if he/she fails to apply temporary marking paint, etc., as required by the Delaware MUTCD. No paving operations on roads to be immediately opened to traffic will be allowed unless such verification has been made for the availability of the materials at the job site.

Travel lane and ramp closings on multilane highways and Interstates shall not be permitted during the following holiday periods:

- December 24 through December 27 (Christmas Day)
- December 31 through January 3 (New Years Day)
- Friday prior to Easter through Easter Sunday
- Thursday prior to Memorial Day through the Tuesday following Memorial Day
- Dover International Speedway Race Weekends (Thursday prior to the race event through the day after the race event)
- July 3 through July 5 (Independence Day)
- Thursday prior to Labor Day through the Tuesday following Labor Day
- Wednesday prior to Thanksgiving Day through the Monday following Thanksgiving Day

Additional time restrictions may apply as noted in the project plans or as directed by the Engineer. Any requests to waive any restrictions must be made in writing to the Engineer for review and approval. A copy of the request shall be provided to the District Safety Officer for review.

Certification:

Temporary traffic control devices used on all highways open to the public in this State shall conform to the Delaware MUTCD. All devices shall be crashworthy in accordance with the National Cooperative Highway Research Program (NCHRP) Report 350, the memorandum issued August 28, 1998 by The USDOT Federal Highway Administration, and/or in accordance with the latest edition of the Manual for Assessing Safety Hardware (MASH), published by the American Association of State Highway and Transportation Officials (AASHTO).

The Contractor shall submit certification for temporary traffic control devices or vendors used specifically on this project at or prior to the pre-construction meeting.

Certification of compliance with NCHRP report 350 and/or MASH is required for the following categories of temporary traffic control devices:

Category I contains small and lightweight channelizing and delineating control devices which includes cones, tubular markers, flexible delineator post and drums, all without any accessories or attachments.

Category II includes temporary traffic control devices that are not expected to produce significant vehicular velocity changes to impacting vehicles. These devices which shall weigh 45 kg or less, include Type I, II and III barricades, portable sign supports with signs, and intrusion alarms. Also included are drums, cones, and vertical panels with accessories or attachments.

Category III includes temporary traffic control devices that are expected to cause significant vehicular velocity changes to impacting vehicles. These devices which weigh more than 45 kg include temporary barrier, temporary impact attenuators, and truck-mounted attenuators.

Category IV includes portable or trailer-mounted devices such as arrow panels, variable message signs, temporary traffic signals and temporary area lighting.

For Category I devices, the manufacturer or Contractor may self-certify that the devices meet the NCHRP-350 and/or MASH criteria. The Contractor shall supply the Federal Highway Administration's NCHRP-350 and/or MASH acceptance letter for each type of device that falls under Category II and III devices.

Basis of Payment:

Payment will be made at the Lump Sum price for "Maintenance of Traffic", for which price and payment constitutes full compensation for all maintenance of traffic activities accepted by the Engineer, which shall include the cost of furnishing and relocating permanent and temporary traffic control signs, traffic cones or drums, submission of temporary traffic control plan(s), submission of existing pavement marking drawings, submission of all required certifications, labor, equipment and incidentals necessary to complete the item. Payment to furnish and maintain other temporary traffic control devices including but not limited to Portable P.C.C. Safety Barrier, Truck Mounted Attenuators, Portable Changeable Message Signs, Arrow Panels and Portable Light Assemblies will be made at the contract unit price for each item.

NOTE

If the Contractor does not complete the Contract work within the Contract completion time (including approved extension time), the Contractor shall be responsible for providing the necessary temporary traffic control devices that are required to complete any remaining work. The costs of such temporary traffic control shall be borne by the Contractor. No additional payment will be made to the Contractor to maintain traffic in accordance with the Delaware MUTCD, contract plans and specifications. Temporary traffic control items include, but not be limited to, warning lights, warning signs, barricades, plastic drums, P.C.C. safety barrier, flaggers, traffic officers, arrow panels, message boards, and portable impact attenuators.

A breakout sheet is attached to the Proposal that lists the locations for Maintenance of Traffic. The Contractor shall specify a cost for each location. The lump sum price for Item 763643 shall be the sum of the cost for all locations listed. The calendar days on the breakout sheet will only be used to determine the compensation for maintenance of traffic activities directly associated with new items of work at and/or extended limits of the original Contract location(s); and/or quantity additions to the original Contract bid item(s) which have been added after the Contract is deemed substantially complete by the Engineer and the Contract time has been stopped in accordance with subsection 105.20 and then only if the Original Contract Duration, including all approved time extensions, has been fully exhausted. Repair or replacement of defective work will not be considered for any additional maintenance of traffic compensation. The completed breakout sheet shall be attached to the Bid Proposal. Failure to submit the breakout sheet with the Bid Proposal will result in it being declared non responsive and rejected.

The Department reserves the right to delete from the Contract one or more of the locations listed and the lump sum price to be paid will be reduced in accordance with the Contractor's cost listed for that/those location(s). There will be no extra compensation to the Contractor if such deletion is made.

6/21/2011

STATE OF DELAWARE
DEPARTMENT OF TRANSPORTATION
800 BAY ROAD
P.O. BOX 778
DOVER, DELAWARE 19903

SHAILEN P. BHATT
SECRETARY

UTILITY STATEMENT

STATE CONTRACT No. T201206304
Project I.D. No. 12-06304
Pavement & Rehabilitation, South II-IV, 2012

SUSSEX COUNTY

No utility relocation involvement is anticipated, should any conflicts be encountered during construction requiring adjustment and/or relocation to the aforementioned utilities' existing facilities, the necessary relocation work shall be accomplished by the respective agencies, as directed by the District Engineer.

Any adjustments and/ or relocations of municipally owned sewer or water facilities shall be done by the State's contractor in accordance with the respective agencies' standard specifications as directed by the District Engineer.

Note:

Verizon Delaware LLC maintains aerial/underground facilities throughout the limits of the project with necessary manhole lid adjustments. All adjustments shall be performed as warranted at the following locations by the State's contractor through an agreement between the owner and the State of Delaware.

General Notes

1. The Contractor's attention is directed to Section 105.09 Utilities, Delaware Standard Specifications, August 2001. The Contractor shall contact Miss Utility (1-800-282-8555) two working days prior to any excavation. The Contractor is responsible for the support and protection of all utilities when excavating. The Contractor is responsible for ensuring proper clearances, including safety clearances, from overhead utilities for construction equipment. The Contractor is advised to check the site for access purposes for his equipment and, if necessary, make arrangements directly with the utility companies for field adjustments for adequate clearances.

2. It is understood and agreed that the Contractor has considered in his bid all permanent and temporary utility appurtenances in their present and relocated positions as shown on the plans or described in the Utility Statement or are readily discernible and that no additional compensation will be allowed for any delays, inconvenience, or damage due to any interference from the utility facilities and appurtenances or the operation of moving them, except that the Contractor may be granted an equitable extension of time.

DelDOT

3. Coordination and cooperation among the Utility Companies and the State's Contractor are of prime importance. Therefore, the Contractor is directed to contact the following Utility Company representatives with any questions regarding this work prior to submitting bids and work schedules. Proposed work schedules should reflect the Utility Companies' proposed relocations. The Utility Companies do not work on weekends or legal holidays.

George Zang	**Verizon Delaware LLC**	**(302) 422-1238**

DIVISION OF TRANSPORTATION SOLUTIONS

8.16.2011
DATE

UTILITY COORDINATOR

STATE OF DELAWARE
DEPARTMENT OF TRANSPORTATION
PO BOX 778
DOVER, DELAWARE 19903

CERTIFICATE OF RIGHT-OF-WAY STATUS

STATE PROJECT NO. T201206304

F.A.P. No. N/A for R/W

PAVE AND REHABILITATION, SOUTH II-IV, 2011

SUSSEX COUNTY

Certificate of Right-of-Way Status – Stipulated

As required by 23CFR Part 635, all necessary right of way has been acquired in accordance with current State/Federal rules and regulations covering the acquisition of real property.

This is to certify that all project rights of way are currently available except for the following intersection:

S251: US 9 @ Gills Neck Road/Cape Henlopen High School

We do not currently know the right of way needs for this intersection. It is understood that should the Traffic Section be unsuccessful in their attempts to conclude successful property rights acquisition negotiations, this intersection will be deleted from the project. Team Support has not reviewed the Traffic work portion of this Pave and Rehabilitation project, with the exception of any prepared right of way plots that have been individually reviewed. No right of way verification or review of preexisting signal agreements has been done by Team Support.

Town Agreements from Frankford, Georgetown & Lewes have been requested and received.

It is further certified that there were no individuals or families displaced by this project. Therefore the provisions of 49 CFR Part 24 is not applicable to the project.

There are no improvements to be removed or demolished as part of this project.

REAL ESTATE SECTION

Carol V. O'Donoghue
Assistant Chief, Real Estate

September 7, 2011

STATE OF DELAWARE
DEPARTMENT OF TRANSPORTATION
800 BAY ROAD
P.O. BOX 778
DOVER, DELAWARE 19903

CLEON L. CAULEY, SR.
ACTING SECRETARY

June 22, 2011

ENVIRONMENTAL REQUIREMENTS

FOR
State Contract No. T201206304
Federal Aid No.: None

Contract Title: Pavement & Rehabilitation, South II-IV, 2012

In accordance with the procedural provisions for implementing the National Environmental Policy Act of 1969, as amended, the referenced project has been processed through the Department's Environmental Review Procedures and has been classified as a Level D/ Class II Action.

Due to the nature of the proposed construction activities, permits are not required for this project. However, the following construction requirements and special provisions have been developed to minimize and mitigate impact to the surrounding environs. These requirements by DelDOT not specified within the contract, but listed below, are the responsibility of the contractor and is subject to risk of shut down at the contractor's expense if not followed.

GENERAL REQUIREMENTS:

1. All construction debris, excavated material, brush, rocks, and refuse incidental to such work shall be placed either on shore above the influence of flood waters or on some suitable dumping ground.

2. That effort shall be made to keep construction debris from entering adjacent waterways or wetlands. Any debris that enters those areas shall be removed immediately.

3. The disposal of trees, brush, and other debris in any stream corridor, wetland, surface water, or drainage area is prohibited.

DelDOT

CANNOT BE USED FOR BIDDING

BID PROPOSAL FORMS

CONTRACT T201206304.01

CONTRACT ID: T201206304.01 PROJECT(S): T201206304

All figures must be typewritten.

CONTRACTOR :_____

SECTION 0001 Category 0001

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE DOLLARS	UNIT PRICE CTS	BID AMOUNT DOLLARS	BID AMOUNT CTS
0010	302005 GRADED AGGREGATE BASE COURSE, TYPE B	988.000 TON				
0020	304508 BITUMINOUS STABILIZED FULL-DEPTH RECLAMATION	243318.000 SY				
0030	401636 COLD RECYCLED BITUMINOUS PAVEMENT	774585.000 SYIN				
0040	401696 ENTRANCE, DRIVEWAY AND INTERSECTINGSTREET PAVING SURCHARGE	1063.000 TON				
0050	401713 EMULSIFIED ASPHALT	942725.000 GAL				
0060	401754 FOG SEAL	5761.000 GAL				
0070	401801 WMA, SUPERPAVE, TYPE C, 160 GYRATIONS, PG 64-22 (CARBONATE STONE)	25384.000 TON				
0080	401833 WMA, SUPERPAVE, TYPE C, 160 GYRATIONS, PG 76-22, (NON-CARBONATE STONE)	28213.000 TON				
0090	705002 P.C.C. SIDEWALK, 6"	240.000 SF				

CANNOT BE USED FOR BIDDING

CONTRACT ID: T201206304.01 PROJECT(S): T201206304

All figures must be typewritten.

CONTRACTOR :_____

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE DOLLARS	UNIT PRICE CTS	BID AMOUNT DOLLARS	BID AMOUNT CTS
0100	705007 SIDEWALK SURFACE DETECTABLE WARNING SYSTEM	40.000 SF				
0110	705009 CURB RAMP, TYPE 2, 3, AND/OR 4	700.000 SF				
0120	710002 ADJUSTING AND REPAIRING EXISTING MANHOLE	12.000 EACH				
0130	710502 ADJUSTING CATCH BASINS	2.000 EACH				
0140	732004 TOPSOIL (TON)	4808.000 TON				
0150	734013 PERMANENT GRASS SEEDING, DRY GROUND	56491.000 SY				
0160	743004 FURNISH AND MAINTAIN PORTABLE CHANGEABLE MESSAGE SIGN	80.000 EADY				
0170	743010 FURNISH AND MAINTAIN TRUCK MOUNTED ATTENUATOR, TYPE II	95.000 EADY				
0180	743052 FLAGGER, SUSSEX COUNTY, STATE	6622.000 HOUR	42.00000		278124.00	
0190	743064 FLAGGER, SUSSEX COUNTY, STATE, OVERTIME	1168.000 HOUR	60.90000		71131.20	

CANNOT BE USED FOR BIDDING

CONTRACT ID: T201206304.01 PROJECT(S): T201206304

All figures must be typewritten.

CONTRACTOR :_____

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE DOLLARS	UNIT PRICE CTS	BID AMOUNT DOLLARS	BID AMOUNT CTS
0200	744519 RELOCATION OF EXISTING JUNCTION WELL	2.000 EACH				
0210	744523 CONDUIT JUNCTION WELL, TYPE 4, 20" X 42 1/2" PRECAST CONCRETE	2.000 EACH				
0220	745527 SUPPLY OF 2 1/2" GALVANIZED STEEL CONDUIT	80.000 LF				
0230	745544 INSTALLATION OF CONDUIT IN UNPAVED TRENCH	80.000 LF				
0240	746774 SUPPLY AND INSTALLATION OF LOOP DETECTOR WIRE	3080.000 LF				
0250	746776 LOOP DETECTOR SPLICE	36.000 EACH				
0260	746850 POLE BASE, TYPE 4	4.000 EACH				
0270	748015 PERMANENT PAVEMENT STRIPING, SYMBOL/LEGEND ALKYD-THERMOPLAST IC	1914.500 SF				
0280	748019 TEMPORARY MARKINGS, PAINT, 4"	910514.000 LF				
0290	748026 TEMPORARY MARKINGS, PAINT SYMBOL/LEGEND	2615.500 SF				

CANNOT BE USED FOR BIDDING

CONTRACT ID: T201206304.01 PROJECT(S): T201206304

All figures must be typewritten.

CONTRACTOR :_____

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE DOLLARS	UNIT PRICE CTS	BID AMOUNT DOLLARS	BID AMOUNT CTS
0300	748502 RAISED/RECESSED PAVEMENT MARKER	1202.000 EACH				
0310	748541 PREFORMED RETROREFLECTIVE THERMOPLASTIC PAVEMENT MARKINGS, 4"	930.000 LF				
0320	748542 PREFORMED RETROREFLECTIVE THERMOPLASTIC PAVEMENT MARKINGS, 6"	930.000 LF				
0330	748548 PERMANENT PAVEMENT STRIPING, EPOXY RESIN PAINT, WHITE/YELLOW, 5"	455257.000 LF				
0340	748553 PREFORMED RETROREFLECTIVE THERMOPLASTIC PAVEMENT MARKINGS, BIKE SYMBOL	8.000 EACH				
0350	750000 ADJUST WATER VALVE BOXES	5.000 EACH				
0360	758000 REMOVAL OF EXISTING PORTLAND CEMENTCONCRETE PAVEMENT, CURB, SIDEWALK, ETC.	14.000 SY				
0370	760502 PAVEMENT MILLING, TAPER CUT	3638.000 SYIN				
0380	760507 PROFILE MILLING, HOT-MIX	180.000 SYIN				

CANNOT BE USED FOR BIDDING

CONTRACT ID: T201206304.01 PROJECT(S): T201206304

All figures must be typewritten.

CONTRACTOR :_____

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE DOLLARS	UNIT PRICE CTS	BID AMOUNT DOLLARS	BID AMOUNT CTS
0390	761001 BUTT JOINTS, HOT MIX	4689.000 SY				
0400	762001 SAW CUTTING, HOT MIX	1970.000 LF				
0410	762002 SAW CUTTING, CONCRETE, FULL DEPTH	40.000 LF				
0420	763000 INITIAL EXPENSE	LUMP	LUMP			
0430	763502 MAINTENANCE OF RAILROAD TRAFFIC	LUMP	LUMP			
0440	763643 MAINTENANCE OF TRAFFIC, ALL INCLUSIVE	LUMP	LUMP			
	SECTION 0001 TOTAL					
	TOTAL BID					

CANNOT BE USED FOR BIDDING

CANNOT BE USED FOR BIDDING

BREAKOUT SHEETS

THE FOLLOWING SHEETS MUST BE COMPLETED AND RETURNED WITH THE PROPOSAL AT THE TIME OF BID. FAILURE TO COMPLETE THE BREAKOUT SHEETS AS REQUIRED WILL RESULT IN THE BID BEING DECLARED NON-RESPONSIVE AND WILL NOT BE CONSIDERED. BREAKOUT SHEETS MUST BE COMPLETED REGARDLESS OF WHETHER BIDDING BY ELECTRONIC MEANS OR TYPEWRITTEN HARD COPY.

SECTION 1 **BREAKOUT SHEET - 1** **CONTRACT NO.T201206304**

ITEM 763643 - Maintenance of Traffic- All Inclusive

Location No.	Location - Description	MOT Case Number	Unit of Measurement	Unit Price	Calendar Days
1	Indian Mission Rd - Route 24 to Route 9	6, 15	L.S.	$	
2	Kings Highway	6, 15	L.S.	$	
3	Park Ave - Park Ave to S. Bedford (Truck Route 9)	6, 15	L.S.	$	
4	Park Ave - Park Ave to Park Ave (Truck Route 9)	6, 15	L.S.	$	
5	Park Ave - Park Ave to Route 9 (Truck Route 9)	6, 15	L.S.	$	
6	Sussex Pines - Zoar Rd to Woods Branch Rd	6, 15	L.S.	$	
7	Springfield Rd - Park Avenue to Gravel Hill Rd	6, 15	L.S.	$	
8	Hollyville Rd - Harmons Hill Rd to Rt 24	6, 15	L.S.	$	
9	Zoar Rd - S. Bedford St to Woods Branch Rd	6, 15	L.S.	$	
10	Omar Rd - Powell Farm Rd to Honolulu Rd	6, 15	L.S.	$	
Total Lump Sum Bid for Item No. 763643 - Maintenance of Traffic - All Inclusive $_____ (LS Bid Price for 763643) *Total Days should equal original contract duration					Total Days*

CANNOT BE USED FOR BIDDING

"ATTENTION"

TO BIDDERS

This Bid Proposal includes breakout sheets. The breakout sheets **MUST ACCOMPANY** the bid proposal at the time of bid. Failure to return completed breakout sheets **WILL RESULT** in the bid proposal being declared non-responsive and **REJECTED** as irregular.

CANNOT BE USED FOR BIDDING

CERTIFICATION

Contract No. __T201206304.01 _

The undersigned bidder, _____ whose address is _____ _____ and telephone number is _____ _____ hereby certifies the following:

I/We have carefully examined the location of the proposed work, the proposed plans and specifications, and will be bound, upon award of this contract by the Department of Transportation, to execute in accordance with such award, a contract with necessary surety bond, of which contract this proposal and said plans and specifications shall be a part, to provide all necessary machinery, tools, labor and other means of construction, and to do all the work and to furnish all the materials necessary to perform and complete the said contract within the time and as required in accordance with the requirements of the Department of Transportation, and at the unit prices for the various items as listed on the preceding pages.

The foregoing quantities are considered to be approximate only and are given as the basis for comparison of bids. The Department of Transportation may increase or decrease the amount of any item or portion of the work as may be deemed necessary or expedient. Any such increase or decrease in the quantity for any item will not be regarded as a sufficient ground for an increase or decrease in the unit prices, nor in the time allowed for the completion of the work, except as provided in the contract.

Accompanying this proposal is a surety bond or a security of the bidder assigned to the Department of Transportation, for at least ten (10) percentum of total amount of the proposal, which deposit is to be forfeited as liquidated damages in case this proposal is accepted, and the undersigned shall fail to execute a contract with necessary bond, when required, for the performance of said contract with the Department of Transportation, under the conditions of this proposal, within twenty (20) days after date of official notice of the award of the contract as provided in the requirement and specifications hereto attached; otherwise said deposit is to be returned to the undersigned.

I/We are licensed, or have initiated the license application as required by Section 2502, Chapter 25, Title 30, of the Delaware Code.

By submission of this proposal, each bidder and each person signing on behalf of any bidder, certifies as to its own organization, under penalty of perjury, that to the best of each signer's knowledge and belief:

1. The prices in this proposal have been arrived at independently without collusion, consultation, communication, or Agreement with any other bidder or with any competitor for the purpose of restricting competition.
2. Unless required by law, the prices which have been quoted in this proposal have not been knowingly disclosed and will not knowingly be disclosed by the bidder, directly or indirectly, to any other bidder or competitor prior to the opening of proposals.
3. No attempt has been made or will be made by the bidder to induce any other person, partnership, or corporation to submit or not to submit a proposal for the purpose of restricting competition.

I/We acknowledge receipt and incorporation of addenda to this proposal as follows:

No.	Date	No.	Date	No.	Date	No.	Date	No.	Date

(FAILURE TO ACKNOWLEDGE RECEIPT OF <u>ALL</u> ADDENDA WILL RESULT IN THE BID BEING DECLARED NON-RESPONSIVE.)

CANNOT BE USED FOR BIDDING

Sealed and dated this _____ day of _____ in the year of our Lord two thousand and _____ _____ (20__).

_____
Name of Bidder (Organization)

Corporate Seal

By: _____
Authorized Signature

Attest _____

_____
Title

SWORN TO AND SUBSCRIBED BEFORE ME this ____ day of _____, 20___.

Notary Seal

_____
Notary

BID BOND

TO ACCOMPANY PROPOSAL
(Not necessary if security is used)

KNOW ALL MEN BY THESE PRESENTS That:_____ _____of_____ in the County of _____and State of _____ ____ as **Principal**, and _____ of _____ in the County of _____ and State of _____ as **Surety**, legally authorized to do business in the State of Delaware ("**State**"), are held and firmly unto the **State** in the sum of _____ _____Dollars ($_____), or _____ percent not to exceed _____ _____ Dollars ($_____) of amount of bid on Contract No._T201206304.01 _, to be paid to the **State** for the use and benefit of its Department of Transportation ("**DelDOT**") for which payment well and truly to be made, we do bind ourselves, our and each of our heirs, executors, administrators, and successors, jointly and severally for and in the whole firmly by these presents.

NOW THE CONDITION OF THIS OBLIGATION IS SUCH That if the above bounden **Principal** who has submitted to the **DelDOT** a certain proposal to enter into this contract for the furnishing of certain materiel and/or services within the **State**, shall be awarded this Contract, and if said **Principal** shall well and truly enter into and execute this Contract as may be required by the terms of this Contract and approved by the **DelDOT**, this Contract to be entered into within twenty days after the date of official notice of the award thereof in accordance with the terms of said proposal, then this obligation shall be void or else to be and remain in full force and virtue.

Sealed with _____ seal and dated this _____ day of _____ in the year of our Lord two thousand and _____ (20__).

SEALED, AND DELIVERED IN THE presence of

_____
Name of Bidder (Organization)

Corporate Seal

By: _____
Authorized Signature

Attest _____

_____
Title

_____
Name of **Surety**

Witness:_____

By: _____

_____
Title

CANNOT BE USED FOR BIDDING