# STATE OF DELAWARE

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DelDOT in order to bid.

# DEPARTMENT OF TRANSPORTATION

# BID PROPOSAL

for

# CONTRACT T201606902.01

## CONVERSION ROADS, SOUTH, 2016

SUSSEX COUNTY

ADVERTISEMENT DATE: November 30, 2015

COMPLETION TIME: 110 Calendar Days

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

Bids will be received in the Bidder's Room at the Delaware Department of Transportation's Administration Building, 800 Bay Road, Dover, Delaware until 2:00 P.M. local time **December 29, 2015**

**Contract No.T201606902.01**

**CONVERSION ROADS, SOUTH, 2016**
SUSSEX COUNTY

## GENERAL DESCRIPTION

### 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 labor and materials for Conversion Roads, South, 2016, and other incidental construction in accordance with the location, notes and details shown on the plans and as directed by the Engineer.

### COMPLETION TIME

All work on this contract must be complete within 110 Calendar Days. It is the Department's intent to issue a Notice to Proceed such that work starts on or about March 1, 2016.

### PROSPECTIVE BIDDERS NOTES:

1. BIDDERS MUST BE REGISTERED with DelDOT and request a cd of the official plans and specifications in order to submit a bid. Contact DelDOT at dot-ask@state.de.us, or (302) 760-2031.
2. QUESTIONS regarding this project are to be e-mailed to dot-ask@state.de.us no less than six business days prior to the proposal opening date in order to receive a response. Please include T201606902.01 in the subject line. Responses to inquiries are posted on-line at http://www.bids.delaware.gov.
3. This project incorporates the electronic bidding system **Expedite**, **version 5.9a**. Bidders will find the installation file on the plan holders bid file disk. The installation file and instructions are also available on DelDOT's Website at: http://www.deldot.gov/information/business/bids/const_proj_bid_info.shtml.
4. Each proposal must be accompanied by a deposit of either surety bond or security for a sum equal to at least 10% of the bid.
5. No retainage will be withheld on this contract.
6. The Department's External Complaint Procedure can be viewed on DelDOT's Website at; http://www.deldot.gov/information/business/, or you may request a copy by calling (302) 760-2555.

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7. **SPECIFICATIONS**: New Supplemental Specifications to the August 2001 Standard Specifications were issued November 24, 2014 and apply to this project. They can be viewed here. The Department is currently updating the August 2001 Specifications for Road and Bridge Construction. Through this update, some Divisions were renumbered and some new ones were created and added. The ***Specifications Note*** document is for the use by the bidders to reference the new numbers to the past numbers used for bidding purposes on previous Department contracts.
8. **PLEASE NOTE** the requirements of special provision 'Changes to Project Documents During Advertisement' have moved to Supplemental Specifications, the special provision is no longer needed.
9. **BREAKOUT SHEETS** MUST be submitted either with your bid documents; or within seven (7) calendar days following the bid due date by the lowest apparent bidder. Refer to instructions adjacent to the Breakout Sheets in this document.

**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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# GENERAL NOTICES

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.

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.

CONTRACTOR / SUBCONTRACTOR LICENSE: 29 DEL. C. §6967:
(b) No agency shall accept a proposal for a public works contract unless such contractor has provided a proper and current copy of its occupational and/or business license, as required by Title 30, to such agency.

(c) Any contractor that enters a public works contract must provide to the agency to which it is contracting, within 30 days of entering such public works contract, copies of all occupational and business licenses of subcontractors and/or independent contractors that will perform work for such public works contract. However, if a subcontractor or independent contractor is hired or contracted more than 20 days after the contractor entered the public works contract the occupational or business license of such subcontractor or independent contractor shall be provided to the agency within 10 days of being contracted or hired.

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.

RIGHT TO AUDIT

The Department shall have the right to audit the books and records of the contractor or any subcontractor under this contract or subcontract to the extent that the books and records relate to the performance of the contract or subcontract. The books and records shall be maintained by the contractor for a period of 3 years from the date of final payment under the prime contract and by the subcontractor for a period of 3 years from the date of final payment under the subcontract (*29 Del.C. §6930*)

**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.

REQUIREMENT BY DEPARTMENT OF LABOR FOR SWORN PAYROLL INFORMATION

Title 29 Del.C. §6960 stipulates;

(b) Every contract based upon these specifications shall contain a stipulation 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. The specifications shall further stipulate 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.

(c) Every contract based upon these specifications shall contain a stipulation that sworn payroll information, as required by the Department of Labor, be furnished weekly. The Department of Labor shall keep and maintain the sworn payroll information for a period of 6 months from the last day of the work week covered by the payroll.

Bidders are specifically directed to note the Department of Labor's prevailing wage 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."

Contractor may contact:

Department of Labor
Division of Industrial Affairs
4425 No. Market Street
Wilmington, DE 19802
Telephone (302) 761-8200

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 13, 2015 - AMENDED JULY 15, 2015

| CLASSIFICATION | NEW CASTLE | KENT | SUSSEX |
|---|---|---|---|
| BRICKLAYERS | 49.39 | 49.39 | 14.51 |
| CARPENTERS | 42.55 | 51.86 | 41.22 |
| CEMENT FINISHERS | 31.06 | 30.92 | 19.65 |
| ELECTRICAL LINE WORKERS | 22.50 | 22.50 | 21.25 |
| ELECTRICIANS | 63.60 | 63.60 | 63.60 |
| IRON WORKERS | 42.20 | 23.87 | 25.35 |
| LABORERS | 31.10 | 34.12 | 37.75 |
| MILLWRIGHTS | 16.11 | 15.63 | 13.49 |
| PAINTERS | 63.14 | 63.14 | 63.14 |
| PILEDRIVERS | 66.42 | 23.75 | 26.95 |
| POWER EQUIPMENT OPERATORS | 39.15 | 32.92 | 29.04 |
| SHEET METAL WORKERS | 22.75 | 20.31 | 18.40 |
| TRUCK DRIVERS | 32.31 | 20.65 | 25.55 |

CERTIFIED : 11/24/15

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 MECHANICS RATE.

THESE RATES ARE BRING PROVIDED IN ACCORDANCE WITH DELAWARE'S FREEDOM OF INFORMATION ACT.

**Re: Contract # T201606902.01, Conversion Roads, South 2016, Sussex County, DE**

# 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 applicable item(s) 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

**NOTE**:

**PLEASE NOTE** revised Supplemental Specifications to the August 2001 Standard Specifications were issued November 24, 2014 and apply to this project. They can be viewed here and at www.deldot.gov.

**SPECIFICATIONS**: The Department is currently updating the August 2001 Specifications for Road and Bridge Construction. Through this update, some Divisions were renumbered and some new ones were created and added. The ***Specifications Note*** document is for the use by the bidders to reference the new numbers to the past numbers used for bidding purposes on previous Department contracts.

## 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 link for the posting is http://www.deldot.gov/information/business/bids/asphalt_cement_english.shtml.

The Project Asphalt Cement Base Price will be the Delaware Posted Asphalt Cement Price in effect on the date of advertisement.

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 using the weight of eligible asphalt that is shown on the QA/QC pay sheets as a percentage for the delivered material.

If the mix was not inspected and no QA/QC pay sheet was generated, then the asphalt percentage will be obtained from the job mix formula for that mix ID.

The asphalt percentage eligible for cost adjustment shall only be the virgin asphalt cement added to the mix.

There shall be no separate payment per ton cost of asphalt cement. That cost shall be included in the various unit prices bid per 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 per ton for the project will be the Delaware Posted Asphalt Cement Price in effect on the date of project advertisement.

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 or more of hot-mix bid quantity in case of Sections 401, 402 and 403; and 15,000 gallons or more in case of Sections 304, 404 and 405.

5/05/15

## 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 bituminous concrete 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.

11/12/2013

## 401699 - QUALITY CONTROL/QUALITY ASSURANCE OF BITUMINOUS CONCRETE

### .01 Description

This item shall govern the Quality Assurance Testing for supplying bituminous asphalt plant materials and constructing bituminous asphalt pavements and the calculation for incentives and disincentives for materials and construction. The Engineer will evaluate all materials and construction for acceptance. The procedures for acceptance are described in this Section. 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 bituminous asphalt. Payment to the Contractor for the bituminous asphalt item(s) will be based on the Contract price per ton and the pay adjustments described in this specification.

### .02 Bituminous Concrete Production – Quality Acceptance

**(a) Material Production - Tests and Evaluations.**

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 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.

Supply and capture samples, as directed by the Engineer under the purview of the Engineer from delivery trucks before the trucks leave the production plant. Hand samples to the Engineer to be marked accordingly. 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. The Contractor may visually inspect the specified delivery load during sampling and elect to reject the load. If the contractor elects to reject the specified delivery truck, each subsequent load will be inspected until a visually acceptable load is produced for acceptance testing. All visually rejected loads shall not be sent to a Department project.

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. Samples not retrieved in accordance with the Contractor's QC plan will be deemed unacceptable and may be a basis for rejection of material produced. Parallel tests or dispute resolution tests will only be performed on material captured at the same time and location as the acceptance test sample. Parallel test samples or Dispute Resolution samples will be created by splitting a large sample or obtaining multiple samples that equally represent the material. The Engineer will perform all splitting and handling of material after it is obtained by the Contractor.

The Contractor may retain dispute resolution samples or perform parallel tests with the Engineer on any acceptance sample.

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 2000$^{th}$ 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 and Determining the Density of Hot Mix Asphalt (HMA) Specimens by Means of the Superpave Gyratory Compactor
- AASHTO T166, Method C (Rapid Method) - Bulk Specific Gravity of Compacted Hot Mix Asphalt (HMA) Using Saturated Surface Dry Specimens
- AASHTO T308 - Determining the Asphalt Binder Content of Hot Mix Asphalt (HMA) by the Ignition Method
- AASHTO T30 - Mechanical Analysis of Extracted Aggregate
- AASHTO T209 - Theoretical Maximum Specific Gravity and Density of Hot Mix Asphalt (HMA)
- ASTM D7227 - Standard Practice for Rapid Drying of Compacted Asphalt Specimens using Vacuum Drying Apparatus

**(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 based on daily production.

Notify the Engineer of any locations within that road segment that may not be suitable to achieve minimum (93%) compaction due to existing conditions prior to paving the road segment. 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 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 **.02 Acceptance Plan**

**(a) Material Production - B 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 1.0 feet from the newly placed longitudinal joint and 50 feet from a new transverse joint.

Cut one six (6) inch diameter core through the full lift depth at the exact location marked by the Engineer. Cores submitted that are not from the location designated by the Engineer will not be tested and will be paid at zero pay.

Notify the Engineer prior to starting paving operations with approximate 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 mark core locations within 24 hours of notification. 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. Provide any traffic control required for the structural number investigation, sampling, and testing work at no additional cost to the Department.

Commence coring of the pavement after the pavement has cooled to a temperature of 140°F or less. Cut each core with care in order to prevent damaging the core. Damaged cores will not be tested. Label each core with contract number, date of construction, and number XX of XX upon removal from the roadway Place cores in a 6-inch diameter plastic concrete cylinder mold or approved substitute for protection. Separate cores in the same cylinder mold with paper. Attach a completed QC test record for the represented area with the corresponding cores. The Engineer will also complete a test record for areas tested for the QA report and provide to Materials & Research. Deliver the cores to the Engineer for testing, processing, and report distribution at the end of each production day.

Repair core holes per Appendix A, Repairing Core Holes in Bituminous 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) – Bulk Specific Gravity of Compacted Hot Mix Asphalt (HMA) Using Saturated Surface Dry Specimens
- AASHTO T209 - Theoretical Maximum Specific Gravity and Density of Hot Mix Asphalt
- ASTM D7227 - Standard Practice for Rapid Drying of Compacted Asphalt Specimens using Vacuum Drying Apparatus

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.

**.03 Payment and Pay Adjustment Factors.**

The Engineer will determine pay adjustments for the bituminous asphalt item(s) in accordance with this specification. The Engineer will determine a pay adjustment factor for the material produced and a pay adjustment factor for the pavement construction. Pay adjustments for material and construction will be calculated independently. When the pay adjustment calculation for either material or construction falls to zero payment per tables 4, 5, or 5a, the maximum pay adjustment for the other factor will not exceed 100.

Pay Adjustment factors will only be calculated on in place material. Removed material will not be used in payment adjustment calculations.

Material Production Pay Adjustments will be calculated based upon 70% of the contract unit price and calculated according to section .03(a) of this specification. Pavement construction Pay Adjustments will be calculated based upon 30% of the contract unit price and calculated according to section .03(b) of this specification.

**(a) Material Production - Pay Adjustment.**

Calculate the material pay adjustment by evaluating the production material based on the following parameters:

**Table 2 - Material Parameter Weight Factors**

| Material Parameter | Single Test Tolerance (+/-) | Weight Factor |
|---|---|---|
| Asphalt Content | 0.4 | 0.30 |
| #8 Sieve (>=19.0 mm) | 7.0 | 0.30 |
| #8 Sieve (<=12.5 mm) | 5.0 | 0.30 |
| #200 Sieve (0.075mm Sieve) | 2.0 | 0.30 |
| Air Voids (4.0% Target) | 2.0 | 0.10 |

Using the JMF target value, the single test tolerance (from Table 2), 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 3 - 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 2 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. When all properties of a single test are within the single test tolerance of Table 2, Pay Adjustment factors shall be determined by Column B. When any property of a single test is outside of the Single Test Tolerance parameters defined in Table 2, the Material Pay Adjustment factor shall be determined by Column C.

9. For each lot, determine the final material price adjustment:

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

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. When the PWL of any material parameter in Table 2 is below 60, the Engineer may require the removal and replacement of the material at no additional cost to the Department. Test results on removed material shall not be used in calculation of future PWL calculations for Mixture ID.

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 outside of the allowable single test tolerance for any Materials criteria in Table 2, 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. The pay factors for the out of tolerance sample lot will be calculated using column C of table 4.

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. After the Contractor has made appropriate changes, the Contractor will visually inspect each produced load. The first visually acceptable load will be sampled and 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 3 – 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 |
| 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 |

**Table 3 – 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 |
| 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 4 - PWL Pay Adjustment Factors**

| PWL | Pay Adjustment Factor (%) Column B | Pay Adjustment Factor (%) Column C |
|---|---|---|
| 100 | +5 | 0 |
| 99 | +4 | -1 |
| 98 | +3 | -2 |
| 97 | +2 | -3 |
| 96 | +1 | -4 |
| 95 | 0 | -5 |

| | | |
|---|---|---|
| 94 | -1 | -6 |
| 93 | -2 | -7 |
| 92 | -3 | -8 |
| 91 | -4 | -9 |
| PWL<91 | PWL - 100 | 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. .

1. Calculate the core bulk specific gravity values from the sublot tests values, to the nearest 0.001 unit. Obtain the Theoretical maximum Specific Gravity values from the corresponding laboratory sublot tests.
2. Calculate the Degree of Compaction:

   Degree of Compaction =

   ((Core Bulk Specific Gravity) / (Theoretical Maximum Specific Gravity)) x 100% recorded to the nearest 0.1%.
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 and recorded to the nearest 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:

   Construction Pay adjustment = (Lot Quantity) x (Bid Price) x (Pay Adjustment Factor) x 30%.

**Table 5: Compaction Price Adjustment Highway Locations**

| Degree of Compaction (%) | Range | Pay Adjustment Factor (%) |
|---|---|---|
| >= 97.0 | >= 96.75 | -100* |
| 96.5 | 96.26 – 96.74 | -5 |
| 96.0 | 95.75 – 96.25 | -3 |
| 95.5 | 95.26 – 95.74 | -2 |
| 95.0 | 94.75 – 95.25 | 0 |
| 94.5 | 94.26 – 94.74 | 0 |
| 94.0 | 93.75 – 94.25 | 1 |
| 93.5 | 93.26 – 93.74 | 3 |

| | | |
|---|---|---|
| 93.0 | 92.75 – 93.25 | 5 |
| 92.5 | 92.26 – 92.74 | 3 |
| 92.0 | 91.75 – 92.25 | 0 |
| 91.5 | 91.26 – 91.74 | 0 |
| 91.0 | 90.75 – 91.25 | -5 |
| 90.5 | 90.26 – 90.74 | -15 |
| 90.0 | 89.75 – 90.25 | -20 |
| 89.5 | 89.26 – 89.74 | -25 |
| 89.0 | 88.75 – 89.25 | -30 |
| 88.5 | 88.26 – 88.74 | -50 |
| =<88.0 | =<88.25 | -100* |

* or remove and replace it at Engineer's discretion

| **Table 5A: Compaction Price Adjustment Other[1] Locations** | | |
|---|---|---|
| Degree of Compaction | Range | Pay Adjustment Factor (%) |
| >= 97.0 | >= 96.75 | -100* |
| 96.5 | 96.26 – 96.74 | -5 |
| 96.0 | 95.75 – 96.25 | -3 |
| 95.5 | 95.26 – 95.74 | -2 |
| 95.0 | 94.75 – 95.25 | 0 |
| 94.5 | 94.26 – 94.74 | 0 |
| 94.0 | 93.75 – 94.25 | 0 |
| 93.5 | 93.26 – 93.74 | 1 |
| 93.0 | 92.75 – 93.25 | 3 |
| 92.5 | 92.26 – 92.74 | 1 |
| 92.0 | 91.75 – 92.25 | 0 |
| 91.5 | 91.26 – 91.74 | 0 |
| 91.0 | 90.75 – 91.25 | 0 |
| 90.5 | 90.26 – 90.74 | 0 |
| 90.0 | 89.75 – 90.25 | 0 |
| 89.5 | 89.26 – 89.74 | 0 |
| 89.0 | 88.75 – 89.25 | -1 |
| 88.5 | 88.26 – 88.74 | -3 |
| 88.0 | 87.75 – 88.25 | -5 |

| | | |
|---|---|---|
| 87.5 | 87.26 – 87.74 | -10 |
| 87.0 | 86.75 – 87.25 | -15 |
| 86.5 | 86.26 – 86.74 | -20 |
| 86.0 | 85.75 – 86.25 | -25 |
| 85.5 | 85.26 – 85.74 | -30 |
| 85.0 | 84.75 – 85.25 | -40 |
| 84.5 | 84.26 – 84.74 | -50 |
| =< 84.0 | =<84.25 | -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.

**.04 Dispute Resolution.**

Disputes or questions about any test result shall be brought to the attention of the Contractor and the Engineer within two operational days of reported test results. 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.

Third party resolution testing can be performed at either 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 properly captured, labeled, and stored, as described in the second paragraph of the section of these specifications titled **.02 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. The Contractor may request up to two dispute resolution samples be tested per calendar year without charge. Any additional Dispute Resolution samples run at the Contractors request where the results substantiate the acceptance test result will be assessed a fee of $125. Any additional Dispute Resolution samples that substantiate the Contractors test result will not be assessed the 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.

## Appendix A - Repairing Core Holes in Bituminous Asphalt Pavement

**Description.**

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

**Materials and Equipment.**

The following material shall be available to complete this work:

- Patch Material - 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 - mechanical (electrical, pneumatic, or gasoline driven) tamping device with a flat, circular tamping face smaller than 6 inches in diameter.

**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 and compact with mechanical tamping device. 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.

**Appenidx 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 Bituminous 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 |

11/3/14

# 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, Carlson Safety Edge End Gate 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

Carlson Paving Products
18425 50th Ave. E
Tacoma, WA 98446
1-253-278-9426
www.carlsonpavingproducts.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.

10/15/2013

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

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

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

**401809 - BITUMINOUS CONCRETE, SUPERPAVE, TYPE B, 115 GYRATIONS, PG 64-22**
**401810 - BITUMINOUS CONCRETE, SUPERPAVE, TYPE B, 160 GYRATIONS, PG 64-22**
**401811 - BITUMINOUS CONCRETE, SUPERPAVE, TYPE B, 205 GYRATIONS, PG 64-22**

**401812 - BITUMINOUS CONCRETE, SUPERPAVE, TYPE B, 115 GYRATIONS, PG 70-22**
**401813 - BITUMINOUS CONCRETE, SUPERPAVE, TYPE B, 160 GYRATIONS, PG 70-22**
**401814 - BITUMINOUS CONCRETE, SUPERPAVE, TYPE B, 205 GYRATIONS, PG 70-22**

**401815 - BITUMINOUS CONCRETE, SUPERPAVE, TYPE B, 115 GYRATIONS, PG 76-22**
**401816 - BITUMINOUS CONCRETE, SUPERPAVE, TYPE B, 160 GYRATIONS, PG 76-22**
**401817 - BITUMINOUS CONCRETE, SUPERPAVE, TYPE B, 205 GYRATIONS, PG 76-22**

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

**401821 - BITUMINOUS CONCRETE, SUPERPAVE, TYPE C, 160 GYRATIONS, PG 64-22, PATCHING**
**401822 - BITUMINOUS CONCRETE, SUPERPAVE, TYPE B, 160 GYRATIONS, PG 64-22, PATCHING**
**401823 - BITUMINOUS CONCRETE, SUPERPAVE, BITUMINOUS CONCRETE BASE COURSE, 160 GYRATIONS, PG 64-22, PATCHING**
**401824 - BITUMINOUS CONCRETE, SUPERPAVE, TYPE C, 160 GYRATIONS, PG-64-22, WEDGE**
**401825 - BITUMINOUS CONCRETE, SUPERPAVE, TYPE B, 160 GYRATIONS, PG-64-22, WEDGE**

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

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

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

**401835 - THIN BITUMINOUS CONCRETE, SUPERPAVE, TYPE C, 115 GYRATIONS, PG 64-22**
**401836 - THIN BITUMINOUS CONCRETE, SUPERPAVE, TYPE C, 160 GYRATIONS, PG 64-22**
**401837 - THIN BITUMINOUS CONCRETE, SUPERPAVE, TYPE C, 115 GYRATIONS, PG 70-22**
**401838 - THIN BITUMINOUS CONCRETE, SUPERPAVE, TYPE C, 160 GYRATIONS, PG 70-22**
**401839 - THIN BITUMINOUS CONCRETE, SUPERPAVE, TYPE C, 115 GYRATIONS, PG 76-22**
**401840 - THIN BITUMINOUS CONCRETE, SUPERPAVE, TYPE C, 160 GYRATIONS, PG 76-22**

**.01 Description:**

This specification shall govern the production and construction of bituminous concrete pavement. 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.

Payment for bituminous concrete shall be in accordance with item 401699. 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. Payment adjustment factors will be calculated in accordance with the latest version of item 401699.

Bituminous concrete 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.

**.02 Materials:**

Use materials conforming to standard specifications 823.

Materials for bituminous concrete shall conform to the requirements of Subsections 823.01, 823.05-823.17, and 823.25 - 823.28 of the Standard Specifications and the following. 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.

a) **Asphalt Binder:**

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[1] |
| RTFO DSR, G*/sin (δ) | T 315 | >/= 2.20 kPa |

| TEST Procedure | AASHTO REFERENCE | SPECIFICATION LIMITS |
|---|---|---|
| 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 Recycled materials used, the low temperature properties, per T 313, may be different than stated in M 320 or the previous table.

b) **Recycled Materials:**

**RAP (Recycled Asphalt Pavement):** Bituminous concrete pavement mechanically processed to a homogenous consistency to be recycled through the production plant for use in a new bituminous concrete mixture.

The percentage allowance of recycled materials (recycled asphalt pavement and/or shingles) 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.

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

c) **Shingles:**

**RAS (Recycled Asphalt Shingles):** Materials reclaimed from the shingle manufacturing process such as tabs, punch-outs, and damaged new shingles mechanically broken down with 100% passing the ½ in (12.5 mm) sieve. Shipping, handling, and shredding costs are incidental to the price of Superpave item.

Post-consumer shingles or used shingles are not acceptable. Fiberglass-backed and organic felt-backed shingles shall be kept separate. Both materials shall not be used in the same mixture at the same time. All shingles shall be free of all foreign material and moisture.

The use of Recycled Asphalt Shingles will be considered for 115 gyration mix designs upon demonstration by the producer of adequate blending of the binder verified by laboratory testing on plant produced material.

**d) 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 | - |
| **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 | 10 |

[1]Coarse Aggregate Angularity is tested according to ASTM D5821.
[2]Fine Aggregate Angularity is tested according to AASHTO TP-33.
[3]Clay Content is tested according to AASHTO T176.
[4]Flat and Elongated is tested according to ASTM 4791 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**, AASHTO T96<br>Percent Loss, Maximum | 40 |
| **Soundness**, AASHTO T104<br>Percent Loss, Maximum for five cycles | 20 |
| **Deleterious Materials**, AASHTO T112<br>Percent, Maximum | 10 |
| **Moisture Sensitivity**, AASHTO T283<br>Percent, Minimum | 80 |

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, the polish value of the composite aggregate blend shall be greater than 8.0 when tested according to Maryland State Highway Administration MSMT 411 B ALaboratory Method of Predicting Frictional Resistance of Polished Aggregates and Pavement Surfaces.@ RAP shall be assigned a value of 5.0. The Contractor shall supply all polish values to the Engineer upon request.

e) **Mineral Filler:**

Conform to AASHTO M17.

f) **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.

Follow the manufacturer's recommendation for incorporating additives and WMA technologies into the mix. 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.

g) **Anti-stripping additives**

Conform to standard specifications Section 829 and blend with the asphalt cement in accordance with this specification. Incorporate anti-stripping additives when the Tensile Strength Ratio (TSR) as determined in accordance with AASHTO T283 is less than 80 or when specified for use by the Engineer.

**.03 Bituminous Concrete Production – Quality Control**

**(a) Process Control - Material Production Quality Control.**

Submit through 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 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 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.
- Load number of QC samples (1-10 if QA sample is not within trucks 1-10)
- Locations where samples will be obtained and the sampling techniques for each test
- 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 on 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 401644 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.

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
- Failure to perform materials testing per their approved QC Plan
- Deviating from AASHTO or DelDOT testing procedures.
- Use of any material or the use of a JMF component in a proportion that exceeds the allowable tolerance as specified in section 04(a)(1) of this specification not listed in the JMF.
- Use of the wrong PG graded asphalt.
- Failure to take corrective action per action points in the Contractors approved QC plan.

The following steps will be taken for violations listed above:

1. First offence: Written notice of violation to the Contractor
2. Second offence: Written notice of violation and forfeiture of any bonus (material production or pavement construction) payment eligibility under 401699 section .03 for that production shift.

3. Third offence: Written notice of violation, forfeiture of bonus payment eligibility, and a 5% deduction of payment based upon contract unit price in addition to any calculated pay adjustment factors per 401699 Section 03.
4. Fourth offence: Written notice of violation, forfeiture of bonus payment eligibility, 50% deduction of payment based upon contract unit price in addition to any calculated payment adjustment factor per 401699 Section 03, and immediate suspension of the Contractor until corrective actions are taken. Corrective actions shall be submitted in writing to the Engineer for approval. The Engineer may request a meeting with the Contractor to discuss proposed changes prior to lifting suspension.

Violations of Contractor QC plans shall be kept on record for a period of 1 year from the date of violation at the Central Lab.

**(b) Material Production Test Equipment.**

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.

Facilities for the use of the Engineer and inspectors shall be a minimum of 600 square feet of floor space conditioned to maintain constant temperature of 77F with two windows and a door equipped with functional locks and latches, located such that plant activities are plainly visible from one window of the building. Work space shall be furnished with illumination, tables, chairs, desks, telephone, and water including drinking water, sanitary facilities, fuel, and power necessary to conduct all necessary tests.

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 suspend production. In the case of an equipment malfunction, the Engineer may elect to test the material at another qualified testing laboratory while waiting for repairs to equipment.

Maintain minimum calibration records 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.

**(c) Material Production Test Methods**

- AASHTO T312 - Preparing and Determining the Density of Hot Mix Asphalt (HMA) Specimens by Means of the Superpave Gyratory Compactor
- AASHTO T166, Method C (Rapid Method) - Bulk Specific Gravity of Compacted Hot Mix Asphalt (HMA) Using Saturated Surface Dry Specimens
- AASHTO T308 - Determining the Asphalt Binder Content of Hot Mix Asphalt (HMA) by the Ignition Method
- AASHTO T30 - Mechanical Analysis of Extracted Aggregate
- AASHTO T209 - Theoretical Maximum Specific Gravity and Density of Hot Mix Asphalt (HMA)
- ASTM D7227 - Standard Practice for Rapid Drying of Compacted Asphalt Specimens using Vacuum Drying Apparatus

**.04 Job Mix Formula (JMF)**

**Mix Design.** Develop and submit a job mix formula for each mixture according to AASHTO R35. Each mix design shall be capable of being produced, placed, and compacted as specified. Assign a unique identification number to each JMF.

a) Development of JMF

**Gradation**: Use the FHWA Superpave 0.45 Power Chart 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 bituminous concrete. Unless otherwise noted in the Plans, the Type C shall meet the 3/8" (9.5 mm) Nominal Maximum Aggregate Size. Type B bituminous concrete 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 AASHTO T11.

In addition to the results of the material requirements specified above, the following material properties shall be provided by the contractor: bulk specific gravity Gsb, apparent specific gravity Gsa, and the absorption of the individual aggregate stockpiles to be used, tested according to AASHTO T84 and AASHTO T85 and reported to three decimal places along with the specific gravity of the mineral filler to be used, tested according to AASHTO 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 $N_M$ Height data provided by the SGC shall be employed to calculate volumetric properties at $N_I$, $N_D$, and $N_M$

**Superpave Gyratory Compactive (SGC) Effort:**

| DESIGN TRAFFIC LEVEL (MILLION ESAL'S) | $N_{INITIAL}$ | $N_{DESIGN}$ | $N_{MAXIMUM}$ |
|---|---|---|---|
| 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 (%) |
|---|---|---|---|---|---|---|---|---|---|
| | $N_{INITIAL}$ | $N_{DESIGN}$ | $N_{MAX}$ | 25.0 | 19.0 | 9.5 | 12.5 | 4.75 | |
| 0.3 to < 3 | ≤ 90.5 | - | - | - | - | - | - | - | 65.0 - 78.0 |
| 3 to < 10 | - | - | - | - | - | - | - | - | - |
| 10 < 30 | - | - | - | - | - | - | - | - | - |
| ≤ 30 | ≤ 89.0 | 96.0 | ≤ 98.0 | 12.5 | 13.5 | 15.5 | 14.5 | 16.5 | 65.0 - 75.0[1] |

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 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 T-11 and T-27.

TABLE 1

| 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 | - | - |
| **1.18 MM** | - | - | - | - | - | - | - | - | 30 | 60 |
| **0.075 MM** | 1 | 7 | 2 | 8 | 2 | 10 | 2 | 10 | 6 | 12 |

Note: The aggregate's 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 (%) $N_m$ | 2.0 (min) |
| Air Voids ($V_a$) at $N_{design}$ (%) | 6.0 (max) |
| Voids in Mineral Aggregate (VMA) at $N_{design}$ | |

| Volumeric Property | Superpave Criteria |
|---|---|
| 25.0 mm Bituminous Concrete Base Course | -1.5 |
| 19.0 mm Type B Hot-Mix | +2.0 |
| 12.5 mm Type C Hot-Mix | |
| 9.5 mm Type C Hot-Mix | |
| 4.5 mm Type C Hot-Mix | |

**The proposed JMF shall include the following:**

Submit for approval to the Engineer the following documentation on Pinepave mixture design software prior to starting production of a new mixture:

1. Job mix formula (JMF) design of the component materials and target characteristic values for each mixture proposed for use. 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 bituminous concrete meeting the specified properties. Recycled Asphalt Pavement (RAP) is one individual aggregate component regardless of fractionation size. Recycled Asphalt Shingles (RAS) is a separate component from RAP.

2. 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.

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

4. 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 $N_i$, $N_d$, and $N_m$.

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

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

6. 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 AASHTO T209.

7. 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.

   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.

8. Provide raw material of each JMF so NCAT Ignition Oven calibration correction numbers can be established for the Engineers and Contractors ovens. The Engineer shall provide an ignition oven correction number for each JMF.

**.05 Approval of JMF**

The Engineer will have up to three weeks once the JMF is submitted to review the submitted information.

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: Gmm: + / -0.030 and Gmb: + / - 0.040

a) **Design Evaluation:**

The Engineer may elect to evaluate the proposed JMF and suitability of all materials through laboratory trial batches. 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.

For more expeditious approval, the Contractor may undertake the following steps:

1. Submit the proper documentation on Pinepave mixture design software.
2. Produce the new mixture for a non-Department project. The Engineer will test the material, by taking three series per section 401800 03(c). The mixture will be approved by the Engineer for Department projects if the test results are within the specifications.

A new JMF is required when any of the following conditions occur:

- A change in the source of any of the aggregate component materials
- A change in the proportion of any aggregate component by more than 5.0%
- A change in the aggregate components resulting in a change in percent passing any sieve as identified in Table 1 by more than 5% of the JMF target.
- A change in the target AC content by more than 0.20% from the JMF target to maintain other Volumetric properties of the approved JMF.
- For any mixture that has a 20% or greater failure rate on any combined volumetric criteria.

Although a new JMF is not required, 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. This notification shall include the total change made from the approved JMF proportions, and the effective time of the change. The Engineer will reply to the proposed changes within one operational day and notify the Contractor of the effective date of the changes.

**.06 Construction.**

**(a) Pavement Construction Test Equipment**.

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

**Weather Limitations.**

Place mix only on dry, unfrozen surfaces and only when weather conditions allow for proper production, placement, handling, and compacting.

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

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

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

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

**Compaction:**

**(b) Pavement Construction - Process Control.**

Perform Quality Control of pavement compaction by testing in-place pavement density by the following methods.

- ASTM D2950 Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods; the use of other density gauges shall be as per the manufacturer's recommendations.
- AASHTO T166, Method C (Rapid Method) Bulk Specific Gravity of Compacted Hot Mix Asphalt (HMA) Using Saturated Surface Dry Specimens
- ASTM D7227 - Standard Practice for Rapid Drying of Compacted Asphalt Specimens using Vacuum Drying Apparatus

Cores may be cut on the first day of paving or once after the change of a JMF for gauge calibration. The number of cores obtained for calibration purposes shall not exceed the number of QA samples obtained by the Department for payment. The Contractor may use any method to select locations for the Quality Control calibration cores.

Repair all core holes in accordance with 401699 Appendix A.

**Method of Measurement:**

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

**Basis of Payment:**

All work completed under this item shall be considered for full payment and subsequently modified in accordance with the procedures enumerated under 401699.

Material production quality shall be evaluated per item 401699 - Quality Control/Quality Assurance of Bituminous Concrete .03 (a) Material Production - Tests and Evaluations.

Compaction quality shall be evaluated per Item 401699 - Quality Assurance of Bituminous Concrete .03 (b) Pavement Construction - Tests and Evaluations.

10/29/2014

**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"**
**748568 - PERMANENT PAVEMENT STRIPING, EPOXY RESIN PAINT, BLACK, 9"**
**748569 - PERMANENT PAVEMENT STRIPING, EPOXY RESIN PAINT, BLACK, 14"**

**Description:**

This work consists of striping layout,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$\pm$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$\pm$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 -White Edge lines on Portland cement concrete pavements shall have a 3 inch black contrast line running parallel to the white edge line. The contrast line shall be to the inside or travel lane side of the edge line. The black contrast marking is to be applied with a single drop of graded black aggregate. Once it has cured sufficiently so as not to track, the reflectorized white line is to be applied along side of the contrast line and the two lines shall adjoin each other.

Dotted Line: All dotted 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 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 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 LTL-X 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 3", 4", 5", 6", 8", 9", 10", 12", 14", 16" (75 mm, 100 mm, 125 mm, 150 mm, 200 mm, 225 mm, 250 mm, 300 mm, 350 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 striping layout, 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.

8/7/2013

**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 ±3°F (-9.4±2°C) 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±3°F (23°C) 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 40°F (4°C). The material shall be kept in a location above 55°F (13°C) 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

## 763502 - MAINTENANCE OF RAILROAD TRAFFIC (DCLR)

Delaware Coast Line Railroad

**Description:**

The item shall consist of complying with all the terms and conditions set and defined under these specifications and notes on the Plans while performing the construction activities of this contract. For this Contract, the term Railroad shall be understood to mean the Delaware Coast Line Railroad (DCLR) as the operating railroad and the term Owner shall mean the State of Delaware -Delaware Transit Corporation (DTC).

**No work shall commence on Railroad Right-of-Way until all insurance has been submitted and approved by the Railroad and the Engineer.**

Under this Contract, the General Contractor and all of the Subcontractors working within the track envelope shall be required to obtain and hold in force for the life of the Contract, all of the following insurances to the amounts listed. The track envelope shall be defined as any contractor working within twenty-five (25) feet vertically (as measured from the top of the rail) or horizontally (as measured from the centerline of the track out from each side) of the railroad tracks.

In the event of multiple tracks, the horizontal measurement shall be taken from twenty-five (25) feet outside of the centerline of the outside tracks. The track envelope shall include all areas between the twenty-five (25) foot measurements.

Proof of meeting these insurance values shall be by submission of Certificates of Insurance from their Insurance carriers. Only the cost of the Railroad Protective Liability Insurance shall be paid by this Item. The Railroad Protective Insurance may be issued as separate policies for each individual General Contractor and applicable Subcontractor(s), or may be a singular policy supplied by the General Contractor that specifically covers the General and all Subcontractors.

Should the General or any of his Subcontractors whose work does not actually involve track or signalization work, find themselves working within the track envelope (as by definition above) feel that an exemption should be issued for the Railroad Protective Liability Insurance coverage, then the Railroad may issue such an exemption. This exemption will only apply to the Railroad Protective Liability Insurance and all other insurance listed within this specification shall still be required from all Contractors.

The General Contractor or any of his Subcontractors must make written application to be considered for this exemption directly to the Railroad. If any exemption(s) are issued, a credit will be deducted based on a negotiated amount for this insurance. The decision of the Railroad is final.

**Insurance:**

Before any work on the project is commenced, the Contractor shall be required to carry insurance of the following kinds and amounts in addition to any other forms of insurance or bonds required under the terms of the contract and specifications.

**Insurance Requirements:**

The General Contractor and all of the Subcontractors working within the track envelope, as defined above, shall be required to secure, at its sole cost and expense, various types of insurance coverage with various limits. These insurance coverages must be in a form and be underwritten by insurance companies that meet with the Owner's and Railroad's approval. The types of insurance required include:

1. Railroad Protective Liability Insurance (during construction or maintenance only)
2. Commercial General Liability Insurance
3. Automobile Liability Insurance
4. All Risk Property Insurance
5. Worker's Compensation Insurance

Specific insurance requirements for the above listed Policy types are as follows:

1. **Railroad Protective Liability Insurance**

Railroad Protective Liability (RRP) Insurance covering the Operations performed by Contractor or any subcontractor within twenty-five (25) vertically or horizontally of railroad tracks. The Contractor and any Subcontractors working within that envelope shall have limits of liability of not less than two million dollars ($2,000,000) each occurrence, combined single limit for losses arising out of injury to or death of all persons, and for physical loss or damage to or destruction of property, including the loss of use thereof. A six million dollar ($6,000,000) annual aggregate shall apply.

The certificate shall name the State of Delaware - Delaware Transit Corporation (DTC), 119 Lower Beech Street, Wilmington, DE 19805, as the certificate holder.

The certificate shall also name the State of Delaware - Delaware Transit Corporation (DTC), and the Delaware Coast Line Railroad (DCLR) as additional insureds. Insurance shall be returned to the certificate holder at the above address. Construction will not be authorized until all insurance requirements are satisfied.

2. **Commercial General Liability Insurance**

Commercial General Liability Insurance covering liability of Contractor with respect to all operations to be performed and all obligations assumed by Contractor under the terms of the Agreement. Products completed operations, independent contractors and contractual liability coverages are to be included, with the contractual exclusion related to construction/demolition activity within twenty-five (25) feet of the railroad and any Explosion/Collapse/Underground (X-C-U) exclusions deleted.

Coverage under this policy shall have limits of liability of not less than two million dollars ($2,000,000) each occurrence, combined single limit, for bodily injury (including disease or death), personal injury and property damage (including loss of use) liability. The insurance amount may be achieved via an excess or umbrella policy in order to meet this limit.

The certificate shall name the State of Delaware - Delaware Transit Corporation (DTC), 119 Lower Beech Street, Wilmington, DE 19805, as the certificate holder.

The certificate shall also name the State of Delaware - Delaware Transit Corporation (DTC) and the Delaware Coast Line Railroad (DCLR) as additional insureds. Insurance shall be returned to the certificate holder at the above address. Construction will not be authorized until all insurance requirements are satisfied.

3. **Automobile Liability Insurance**

Automobile Liability Insurance covering the liability of Contractor arising out of the use of any vehicles which bear, or are required to bear, license plates according to the laws of the jurisdiction in which they are to be operated, and which are not covered under Contractor's Commercial General Liability insurance. Coverage under this policy shall have limits of liability of not less than $1 million each occurrence, combined single limit, for bodily injury and property damage (including loss of use) liability. In the event Contractor or any subcontractor will be transporting and/or disposing of any hazardous material or waste off of the jobsite, a MCS-90 Endorsement is to be added to this policy and the limits of liability are to be increased to $5 million dollars ($5,000,000) each occurrence.

The certificate shall name the State of Delaware - Delaware Transit Corporation (DTC), 119 Lower Beech Street, Wilmington, DE 19805, as the certificate holder.

The certificate shall also name the State of Delaware - Delaware Transit Corporation (DTC) and the Delaware Coast Line Railroad (DCLR) as additional insureds. Insurance shall be returned to the certificate holder at the above address. Construction will not be authorized until all insurance requirements are satisfied.

4. **All Risk Property Insurance**

All Risk Property Insurance covering physical loss or damage to all property used in the performance of the Operations. The policy shall have limits of liability adequate to cover all property of Contractor (including personal property of others in Contractor's care, custody or control) and shall include a waiver of subrogation against the State of Delaware - Delaware Transit Corporation (DTC), 119 Lower Beech Street, Wilmington, DE 19805.

5. **Worker's Compensation Insurance**

Workers' Compensation Insurance complying with the requirements of the statutes of the jurisdiction(s) in which the Operations will be performed, covering all employees of Contractor Employer's Liability coverage with limits of not less than one million dollars ($1,000,000) each accident or illness shall be included. In the event the Operations are to be performed on or over navigable waterways, a Longshoremen and Harbor Workers' Compensation Act Endorsement and a Maritime Coverage Endorsement are to be added, including coverage for wages, transportation, maintenance and cure.

The Contractor shall furnish to the Owner a Certificate of Insurance for all insurance listed above except for the Railroad's Protective Public Liability Insurance. Its submittal shall include the original of the AAR-AASHTO policy for Railroad's Protective Public Liability Insurance.

Each insurance policy shall be endorsed to provide that the insurance company shall notify the Owner by registered or certified mail at least thirty days in advance of termination of any change in the policy. It is agreed that the providing of any conductors, flagmen or other employees shall not relieve Contractor from liability or payment for any damages caused by its operations.

**Protection of Railroad Traffic:**

The Contractor shall conduct the work in such a manner as to safeguard the train operations, tracks, facilities and property of the Railroad. All work affecting the Railroad property, right-of-way, or facilities shall be subject to the approval of the Railroad or his designated representative.

The Contractor's operations adjacent to, over or under the Railroad's tracks, right-of-way, and property shall be governed by the Owner’s and/or the Railroad's standards, whichever is more stringent, or by such other requirements as specified by the Owner’s or Railroad's representative so as to insure safe operation of trains avoiding delay to trains, and safety of all concerned including Contractor's forces.

An operating track shall be considered obstructed or fouled when any object is brought closer than fifteen (15) feet horizontally from the center of track and projects above the top of tie. A power line shall be considered fouled when any object is brought to a point less than eight (8) feet therefrom. A signal line shall be considered fouled when any object is brought nearer than six (6) feet to any wire or cable. Cranes, trucks and other equipment shall be considered as fouling the track, power line or signal line when failure of equipment whether working or idle with or without load will obstruct the track or other Railroad facilities.

Equipment used by Contractor shall be in first-class condition to preclude any failure that would cause delay interfering with operation of trains or damage to Railroad facilities.

Contractor's equipment shall not be placed or put in operation adjacent to the Railroad's tracks or facilities without obtaining clearance from the Railroad's representative. All such equipment shall be operated by the Contractor in a manner satisfactory to the Railroad.

Minimum overhead and lateral clearances as specified by the Railroad are to be maintained during the performance of the work. Existing overhead and lateral clearance are to be maintained during construction unless a temporary reduction in clearance for construction purposes is approved by the Railroad. All wire and attachments shall be treated as live unless notified by the Railroad's representative that same have been grounded and de-energized. Particular attention shall be given to the use of hand lines containing metal strands which can not be permitted when working near or above exposed live wires. Metal ladders or ladders reinforced by metal in a longitudinal direction shall not be used near exposed wires. When working over wires, tools and materials not in use shall be stored in a manner to prevent them from falling. Tools or materials shall not be thrown to or from men working over the wires and men on the ground. Contractor shall

be responsible for locating and protecting all underground facilities. The Contractor shall give notice to the Railroad at least fourteen (14) calendar days in advance of the time work is to be commenced.

The Railroad will assign, at their expense, conductors and/or flagmen, or other similar qualified employees to protect its trains and facilities when in the opinion of its representative the construction work will cause or may cause a hazard to the Railroad's facilities and the safe operation of trains. The providing of such watchmen, inspectors, and other precautionary measures, shall not, however, relieve the Contractors from liability for payment of damages caused by his operations. This inspection service, if required, shall be supplied at no expense to the Contractor.

Should the Contractor request from the Railroad, the services of conductors and/or flagmen, employed by the Railroad, for their piece of mind and safety, a separate and private agreement shall be entered into by both the Railroad and Contractor for those services. Payment of any and all costs under that agreement shall be between the Railroad and the Contractor only.

No operations of Contractor shall be carried out without all the necessary protection to properly safeguard the work.

The Contractor shall be responsible for damage to Railroad facilities or property arising out of the prosecution of its work. The Railroad shall undertake any necessary repair work at the sole cost and expense of the Contractor. Billing for the work shall be in accordance with standard billing procedures.

**Payment of Railroad Services:**

It is a requirement of this contract that Contractor shall reimburse the Railroad in full for work undertaken by the Railroad on behalf of Contractor in accordance with provision of these special requirements. Final contract payment will not be made to the Contractor until the Railroad certifies that all its bills against Contractor have been paid in full.

**Basis of Payment:**

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 as required 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 condition set in these Specifications; and meeting Railroad Protective Liability Insurance insurance requirements as described herein.

Payment for the Railroad Protective Liability Insurance requirements and all other required Insurance not normally held in force by the contractor shall be made under this Item. All other Insurances (such as, but not limited to, auto, etc.) required for this Contract shall be considered incidental to the Contract.

Also included are any costs 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.

1/29/15

## 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.

**Note that if the Contractor chooses to replace any additional pipes under a road closure, any additional Maintenance of Traffic costs shall be included in his/her bid.**

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 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

JENNIFER COHAN
SECRETARY

**UTILITY STATEMENT**
**November 10, 2015**
**STATE CONTRACT # T2016-069-02**
**F.A.P. # NONE**
**P6#16-44001**
**MAINTENANCE SUPPORT-SOUTH DISTRICT**
**CONVERSION ROADS, SOUTH, 2016**

| Location:# | Location Rd | Description From / To |
|---|---|---|
| 1 | S206 (Cedar Neck Rd) | New Hot Mix near S14 / S210 (Bucks Rd) |
| 2 | S247 (Log Cabin Hill Rd) | S258 (Hudson Rd) / Rt. 9 Project Limits |
| 3 | S251 (Neptune Rd) | S248 (Gravel Hill Rd) / S319 (Sand Hill Rd) |
| 4 | S252 (Huff Rd) | S248 (Gravel Hill Rd) / S319 (Sand Hill Rd) |
| 5 | S291 (Martin Farm Rd) | S22 (Indian Mission Rd) / S262 (Fisher Rd) |
| 6 | S337 (Handy Rd) | S113 (DuPont Blvd) / Hot Mix Pavement |
| 7 | S342 (Sandy Landing Rd) | S26 (Vines Creek Rd) / End of Roadway |
| 8 | S472 (Phillips Hill Rd) | S62 (E Trap Pond Rd) / S431 (Conaway Rd) |
| 9 | S505 (Rider Rd) | S24 (Sharptown Rd) / S76 (Columbia Rd) |
| 10 | S50A (Turn Point Rd) | New Hot Mix / End State Maintenance |
| 11 | S557 (Briarhook Rd) | S554 (Hill Rd) / S30 (Atlanta Rd) |
| 12 | S585 (Woodbridge Rd) | Hot Mix Pavement / S32 (Scotts Store Rd) |
| 13 | S613 (Memory Rd) | S36 (Shawnee Rd) / Kent County Line |

The following utility companies maintain facilities within the project limits:

**Sussex County Engineering**
**City of Milford**
**Town of Millsboro**
**Town of Greenwood**
**Comcast Cable**
**Mediacom**
**Delmarva Power & Light, Electric Distribution**
**Delaware Electric Co-op**
**Eastern Shore Natural Gas**
**Chesapeake Utilities**
**Artesian Water**
**Sussex Shores Water**
**Verizon Delaware, LLC**

Utility adjustments and/or relocations shall be performed as narrated, but are not limited to the following:

**Sussex County Engineering**

The Sussex County Engineering maintains facilities within the project limits of location # 10 with no anticipated impacts.

**City of Milford**

The City of Milford Dept. maintains facilities within the project limits at location #1 with no anticipated impacts.

**Town Of Millsboro**

The Town of Millsboro maintains facilities within the project limits at location #6 with no anticipated impacts.

**Town of Greenwood**

The Town of Greenwood maintains facilities within the project limits at location #12 with no anticipated impacts.

Relocations and/or adjustments of Sussex County sewer facilities or any municipality facilities shall be performed by the State's contractor in accordance with the respective agencies' standard specifications as directed by the District Engineer. The State contractor shall notify Sussex County Engineering a minimum of seven (7) calendar days in advance of the State contractor performing any necessary facility adjustments.

Outside of the companies and facilities discussed above, no additional utility relocation involvement is anticipated. Should any conflicts be encountered during construction requiring adjustment and/or relocation the necessary relocation work shall be accomplished by the respective agencies, as directed by the District Engineer. The State contractor shall coordinate any potential conflicts with utility companies and provide adequate notice prior to performing work. Any adjustments and/or relocations of municipally owned sewer or water facilities shall be performed by the State's contractor in accordance with the respective agencies' standard specifications as directed by the District Engineer.

**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. **The information shown in the Contract Documents, including the Utility Statement and the Utility Schedule contained herein, concerning the location, type and size of existing and proposed utilities, their locations, and construction timing has been compiled by the preparer based on information furnished by each of the involved Utility Companies. It shall be the responsibility of the State's Contractor to verify all information and coordinate with the Utility Companies prior to and during construction, as specified in Section 105.09 of the Standard Specifications.**

3. **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.**

4. **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 <u>not</u> work on weekends or legal holidays.**

| | | |
|---|---|---|
| **Brad Hawkes** | **Sussex County Engineering** | **302-855-7703** |
| **Eugene Helmick** | **City of Milford** | **302-422-6616** |
| **Kenny Nibblet** | **Town of Millsboro** | **302-934-8171** |
| **John McDonnell** | **Town of Greenwood** | **302-349-4534** |
| **Tammy House** | **Comcast Cable Communications, Inc** | **302-841-6305** |
| **David Rickards** | **Mediacom Communications** | **302-462-5091x330** |
| **William Whitaker** | **Delmarva Power & Light, Elec. Dist.** | **302-934-3356** |
| **Tom Wright** | **Delaware Electric Cooperative, Inc** | **302-349-3130** |
| **Jason Woody** | **Eastern Shore Natural Gas** | **302-734-6710** |
| **Mark Paker** | **Chesapeake Utilities** | **302-734-6797** |
| **Carmen Hunter** | **Artesian Water** | **302-453-7153** |
| **Brad Dorey** | **Sussex Shores Water Company** | **302-539-7611** |
| **George Zang** | **Verizon Delaware, LLC** | **302-422-1238** |

5. **As outlined in Chapter 3 of the DelDOT Utilities Manual, individual utility companies are responsible for obtaining all required permits from municipal, State and federal government agencies and railroads. This includes but is not limited to water quality permits/DNREC Water Quality Certification, DNREC Subaqueous Lands/Wetlands permits, DNREC Coastal Zone Consistency Certification, County**

**Floodplain permits (New Castle County only), U.S. Coast Guard permits, US Army Corps 404 permits, sediment and erosion permits, and railroad crossing permits.**

6. **Individual utility companies are required to restore any areas disturbed in conjunction with their relocation work. If an area is disturbed by a utility company and is not properly restored, the Department may have the highway contractor perform the necessary restoration. Any additional costs incurred as a result will be forwarded to the utility company.**

**DIVISION OF TRANSPORTATION SOLUTIONS**

| | |
|---|---|
| **UTILITY COORDINATOR** | 10 Nov 2015<br>**DATE** |

**STATE OF DELAWARE**
**DEPARTMENT OF TRANSPORTATION**
**PO BOX 778**
**DOVER, DELAWARE 19903**

# CERTIFICATE OF RIGHT-OF-WAY STATUS

**STATE PROJECT NO. T201606902**

**F.A.P. NO. N/A for R/W**

**CONVERSION ROADS, SOUTH, 2016**

**SUSSEX COUNTY**

**Certificate of Right-of-Way Status – 100%**

**Status - LEVEL 1**

**As required by 23 CFR, Part 635, and other pertinent Federal and State regulations or laws, the following certifications are hereby made in reference to this highway project:**

All necessary real property interests have been acquired in accordance with current FHWA/State directives covering the acquisition of real property; and,

All necessary rights-of-way, including control of access rights when pertinent, have been acquired including legal and physical possession; and,

All project rights of way are currently available in accordance with the project right-of-way plans; and,

**Any residential displaced individuals or families have been relocated to decent, safe and sanitary housing, or adequate replacement housing has been made available in accordance with the provisions of the current Federal Highway Administration (FHWA) directive(s) covering the administration of the Highway Relocation Assistance Program; and,**

All occupants have vacated the lands and improvements; and,

The State has physical possession and the right to remove, salvage, or demolish any improvements acquired as part of this project, and enter on all land.

RIGHT OF WAY SECTION

Robert Cunningham
Chief of Right of Way

November 16, 2015

STATE OF DELAWARE
DEPARTMENT OF TRANSPORTATION
800 BAY ROAD
P.O. BOX 778
DOVER, DELAWARE 19903

JENNIFER COHAN
SECRETARY

November 18, 2015

ENVIRONMENTAL REQUIREMENTS

FOR
State Contract No. T201606902
Federal Aid No.: N/A

Contract Title: Conversion Roads, South, 2016

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 are 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.

4. DelDOT Environmental Studies Section (302) 760-2264 must be notified if there are any changes to the project methods, footprint, materials, or designs, to allow the Department to coordinate with the appropriate resource agencies (COE, DNREC, and SHPO), for approval.

STATE OF DELAWARE
DEPARTMENT OF TRANSPORTATION
800 BAY ROAD
P.O. BOX 778
DOVER, DELAWARE 19903

JENNIFER COHAN
SECRETARY

# RAILROAD STATEMENT
## For

**State Contract No.:** T201606902

**Federal Aid No.:**

**Project Title:** Conversion Roads, South, 2016

**The following railroad companies maintain facilities within the contract limits:**

- ☐ Amtrak
- ☐ CSX
- ☑ Delaware Coast Line
- ☐ East Penn
- ☐ Maryland & Delaware
- ☐ Norfolk Southern
- ☐ Wilmington & Western
- ☐ None

DOT Inventory No.: 516204P No. Trains/Day: 1/week Passenger Trains (Y / N): N

**In accordance with 23 CFR 635, herein is the railroad statement of coordination (check one):**

☐ No Railroad involvement.

☑ Railroad Agreement unnecessary but railroad flagging required. The contractor shall follow requirements stated in the DelDOT Maintenance of Railroad Traffic Item in the Special Provisions. Contractor shall coordinate railroad flagging with DelDOT's Railroad Program Manager at (302) 760-2183.

☐ Railroad Agreement required. The necessary railroad agreement, attached, is complete and fully executed. Railroad related work to be undertaken and completed as required for proper coordination with physical construction schedules. The Contractor shall follow requirements stated in the DelDOT Maintenance of Railroad Traffic Item in the Special Provisions. Contractor shall coordinate railroad flagging with DelDOT's Railroad Program Manager at (302) 760-2183.

**Approved As To Form:**

Robert A. Perrine
DelDOT Railroad Program Manager

10/16/15
DATE

# BID PROPOSAL FORMS

CONTRACT T201606902.01

CONTRACT ID: T201606902.01 PROJECT(S): T201606902

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 |
|---|---|---|---|---|---|---|
| SECTION 0001 Category 0001 | | | | | | |
| 0010 | 208000 EXCAVATION AND BACKFILLING FOR PIPE TRENCHES | 778.000 CY | | | | |
| 0020 | 209013 BORROW, TYPE F | 697.000 TON | | | | |
| 0030 | 210000 FURNISHING BORROW TYPE "C" FOR PIPE, UTILITY TRENCH, AND STRUCTURE BACKFILL | 434.000 CY | | | | |
| 0040 | 302005 GRADED AGGREGATE BASE COURSE, TYPE B | 705.000 TON | | | | |
| 0050 | 401696 ENTRANCE, DRIVEWAY AND INTERSECTINGSTREET PAVING SURCHARGE | 396.000 TON | | | | |
| 0060 | 401800 BITUMINOUS CONCRETE, SUPERPAVE, TYPE C, 115 GYRATIONS, PG 64-22 (CARBONATE STONE) | 28881.000 TON | | | | |
| 0070 | 401822 BITUMINOUS CONCRETE, SUPERPAVE, TYPE B, 160 GYRATIONS, PG 64-22, PATCHING | 366.000 TON | | | | |
| 0080 | 401825 BITUMINOUS CONCRETE, SUPERPAVE, TYPE B, 160 GYRATIONS, PG 64-22, WEDGE | 1386.000 TON | | | | |

CANNOT BE USED FOR BIDDING

CONTRACT ID: T201606902.01 PROJECT(S): T201606902

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 |
|---|---|---|---|---|---|---|
| 0090 | 406001 BITUMINOUS CONCRETE PATCHING | 5120.000 SYIN | | | | |
| 0100 | 612021 REINFORCED CONCRETE PIPE, 15", CLASS IV | 365.000 LF | | | | |
| 0110 | 612022 REINFORCED CONCRETE PIPE, 18", CLASS IV | 95.000 LF | | | | |
| 0120 | 612023 REINFORCED CONCRETE PIPE, 24", CLASS IV | 260.000 LF | | | | |
| 0130 | 612034 REINFORCED CONCRETE PIPE, 36", CLASS IV | 300.000 LF | | | | |
| 0140 | 710001 ADJUSTING AND REPAIRING EXISTING DRAINAGE INLET | 1.000 EACH | | | | |
| 0150 | 743010 FURNISH AND MAINTAIN TRUCK MOUNTED ATTENUATOR, TYPE II | 70.000 EADY | | | | |
| 0160 | 743052 FLAGGER, SUSSEX COUNTY, STATE | 2780.000 HOUR | | | | |
| 0170 | 743064 FLAGGER, SUSSEX COUNTY, STATE, OVERTIME | 490.000 HOUR | | | | |
| 0180 | 748015 PERMANENT PAVEMENT STRIPING, SYMBOL/LEGEND ALKYD-THERMOPLAST IC | 272.000 SF | | | | |

CANNOT BE USED FOR BIDDING

CONTRACT ID: T201606902.01 PROJECT(S): T201606902

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 |
|---|---|---|---|---|---|---|
| 0190 | 748019 TEMPORARY MARKINGS, PAINT, 4" | 60658.000 LF | | | | |
| 0200 | 748541 PREFORMED RETROREFLECTIVE THERMOPLASTIC PAVEMENT MARKINGS, 4" | 2100.000 LF | | | | |
| 0210 | 748548 PERMANENT PAVEMENT STRIPING, EPOXY RESIN PAINT, WHITE/YELLOW, 5" | 139068.000 LF | | | | |
| 0220 | 758000 REMOVAL OF EXISTING PORTLAND CEMENTCONCRETE PAVEMENT, CURB, SIDEWALK, ETC. | 16.000 SY | | | | |
| 0230 | 761001 BUTT JOINTS, HOT MIX | 6188.000 SY | | | | |
| 0240 | 762001 SAW CUTTING, BITUMINOUS CONCRETE | 3500.000 LF | | | | |
| 0250 | 762002 SAW CUTTING, CONCRETE, FULL DEPTH | 48.000 LF | | | | |
| 0260 | 763000 INITIAL EXPENSE | LUMP | LUMP | | | |
| 0270 | 763502 MAINTENANCE OF RAILROAD TRAFFIC | LUMP | LUMP | | | |
| 0280 | 763643 MAINTENANCE OF TRAFFIC, ALL INCLUSIVE | LUMP | LUMP | | | |

CANNOT BE USED FOR BIDDING

CONTRACT ID: T201606902.01 PROJECT(S): T201606902

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 |
|---|---|---|---|---|---|---|
| 0290 | 908001 TOPSOIL (TON) | 3277.000 TON | | | | |
| 0300 | 908014 PERMANENT GRASS SEEDING, DRY GROUND | 47985.000 SY | | | | |
| 0310 | 908015 PERMANENT GRASS SEEDING, WET GROUND | 410.000 SY | | | | |
| | SECTION 0001 TOTAL | | | | | |
| | TOTAL BID | | | | | |

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# BREAKOUT SHEET INSTRUCTIONS

**BREAKOUT SHEET(S) MUST BE SUBMITTED EITHER WITH YOUR BID DOCUMENTS; OR WITHIN SEVEN (7) CALENDAR DAYS FOLLOWING THE BID DUE DATE BY THE LOWEST APPARENT BIDDER.**

BREAKOUT SHEETS ARE TO BE SUBMITTED TO DELDOT'S CONTRACT ADMINISTRATION AS SHOWN BELOW. BREAKOUT SHEETS CANNOT BE CHANGED AFTER AWARD. THE DEPARTMENT WILL REVIEW THE FIGURES SUBMITTED ON THE BREAKOUT SHEET(S) TO ENSURE THEY MATCH THE RESPECTIVE LUMP SUM BID AMOUNT(S). MATHEMATICALLY INCORRECT BREAKOUT SHEETS WILL BE RETURNED FOR IMMEDIATE CORRECTION.

BREAKOUT SHEETS MAY BE SUBMITTED;

VIA E-MAIL TO: DOT-ASK@STATE.DE.US
SUBJECT: **T201606902.01** Breakout Sheet

OR MAILED TO: DELDOT
CONTRACT ADMINISTRATION
PO BOX 778, DOVER, DE 19903

'BREAKOUT SHEET' AND THE PROJECT NUMBER
MUST APPEAR ON THE ENVELOPE.

**BREAKOUT SHEET - 1** **CONTRACT NO.T201606902.01**

**ITEM 763643 - Maintenance of Traffic- All Inclusive**

| Location No. | Location - Description | MOT TA Number | Unit of Measurement | Unit Price |
|---|---|---|---|---|
| 1 | S206- CEDAR NECK RD | TA- 10 | L.S. | $ |
| 2 | S247- LOG CABIN HILL RD | TA-10 & Detour | L.S. | $ |
| 3 | S251- NEPTUNE RD | TA- 10 | L.S. | $ |
| 4 | S252- HUFF RD | TA- 10 | L.S. | $ |
| 5 | S291- MARTIN FARM RD | TA- 10 | L.S. | $ |
| 6 | S337- HANDY RD | TA- 10 | L.S. | $ |
| 7 | S342 - SANDY LANDING RD | TA- 10 | L.S. | $ |
| 8 | S472 - PHILLIP HILL RD | TA-10 & Detour | L.S. | $ |
| 9 | S50A- TURNING POINT RD | TA- 10 | L.S. | $ |
| 10 | S505 - RIDER RD | TA- 10 | L.S. | $ |
| 11 | S557 - BRIAR HOOK RD | TA-10 & Detour | L.S. | $ |
| 12 | S585 - WOODBRIDGE RD | TA- 10 | L.S. | $ |
| 13 | S613 - MEMORY RD | TA- 10 | 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

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# "ATTENTION"

# TO BIDDERS

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BREAKOUT SHEETS ARE TO BE SUBMITTED TO DELDOT'S CONTRACT ADMINISTRATION AS SHOWN BELOW. BREAKOUT SHEETS CANNOT BE CHANGED AFTER AWARD. THE DEPARTMENT WILL REVIEW THE FIGURES SUBMITTED ON THE BREAKOUT SHEET(S) TO ENSURE THEY MATCH THE RESPECTIVE LUMP SUM BID AMOUNT(S). MATHEMATICALLY INCORRECT BREAKOUT SHEETS WILL BE RETURNED FOR IMMEDIATE CORRECTION.

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PO BOX 778, DOVER, DE 19903

'BREAKOUT SHEET' AND THE PROJECT NUMBER
MUST APPEAR ON THE ENVELOPE.

**CERTIFICATION**
Contract No. T201606902.01

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 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |

**BIDDERS MUST ACKNOWLEDGE RECEIPT OF ALL ADDENDA**

**MUST INSERT DATE OF FINAL QUESTIONS AND ANSWERS ON WEBSITE:** _____

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Contract No. T201606902.01

**AFFIRMATION**:

Within the past five (5) years, has your firm, any affiliate, any predecessor company or entity, owner, Director, officer, partner or proprietor been the subject of a Federal, State, Local government suspension or debarment?

**YES**_____ **NO**_____ if yes, please explain _____

---

Sealed and dated this _____ day of _____ in the year of our Lord two thousand _____ ( 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

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**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 bound unto the **State** in the sum of _____ _____Dollars ($_____), or _____ percent not to exceed _____ _____ Dollars ($_____) of amount of bid on Contract No. T201606902.01, 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