

STATE OF DELAWARE

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DEPARTMENT OF TRANSPORTATION

BID PROPOSAL

for

CONTRACT T201409502.01

CARPENTERS PIT ROAD IMPROVEMENTS

KENT COUNTY

ADVERTISEMENT DATE: May 18, 2015

COMPLETION TIME: 32 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 **June 16, 2015**

CARPENTERS PIT ROAD IMPROVEMENTS
KENT COUNTY

GENERAL DESCRIPTION

LOCATION

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

DESCRIPTION

The improvements consist of furnishing all labor and materials for this project. This contract includes road work, drainage, signing, paving, guardrail and pavement markings, as well as 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 32 Calendar Days. The Contract Time includes an allowance for 2 Weather Days. It is the Department's intent to issue a Notice to Proceed such that work starts on or about September 17, 2015.

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 T201409502.01 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.
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.

**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 or 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 forth 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

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	48.84	48.84	48.84
PILEDRIERS	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: 5/1/15

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 MECHANIC'S RATE.

PROJECT: T201409502.01 Carpenters Pit Road Improvements, Kent County

SUPPLEMENTAL SPECIFICATIONS TO THE AUGUST 2001 STANDARD SPECIFICATIONS

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

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

To access the Website;

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

The full Website Link is;

http://www.deldot.gov/information/pubs_forms/manuals/standard_specifications/index.shtml

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

The Contractor shall make himself aware of these revisions and corrections (Supplemental Specifications), and apply them to the 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](http://www.deldot.gov) 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

302514 - MILLED HOT-MIX BASE COURSE

Description:

It is the intent of this Special Provision to qualify the use of milled hot-mix asphalt pavement material in lieu of graded aggregate as a base course. All requirements of Section 302 shall remain in effect except as modified below:

Materials:

The material used to construct milled hot-mix asphalt pavement base courses shall be uniformly graded with a maximum size of 1 1/2" (38 mm).

Subgrade Preparation:

The subgrade shall be properly constructed in accordance with Subsection 202.06. No base course material shall be placed until the subgrade has been approved by the Engineer.

Placement:

- a. *Equipment.* The milled material shall be spread uniformly by an approved spreading machine or box in such a manner that no segregation occurs. A conventional motor grader will not be approved for placement of milled material on mainline roadway sections.

Where it is not possible to use a spreading machine or box in patching or other tight areas, other approved methods can be used only in such manner that no segregation occurs. Compaction shall be uniformly attained by approved rollers or compactors. No milled materials shall be placed until approved equipment is on the Project site and is operational.

- b. *Spreading and Compacting.* Milled material shall be placed in successive layers. Each layer shall be placed in a level, uniform cross-section not to exceed 12" (300 mm) in depth, loose measurement, unless otherwise approved by the Engineer. The milled material shall be deposited and spread parallel to the centerline and the layer shall extend to the full width as shown on the Plans. The milled material shall be handled so that no segregation of fine or coarse particles occurs. No more than 1,000 cu yd (300 m³) of material, as measured along the roadway centerline, shall be spread in advance of compaction operations. Each layer shall be properly compacted as specified, before starting the next layer.

Compaction or rolling shall be performed parallel to the roadway centerline starting at the edges and progressing toward the center. It shall continue until each layer is thoroughly and uniformly compacted to the full width as shown on the Plans.

The milled material shall be compacted by the following method: a sheepsfoot roller (minimal 50 ton static roller) shall make the required number of passes on the base material to achieve the target density followed by a back-drag by either a bulldozer or a motor grader. After the pavement base material has been placed, a 15 ton/1800 vpm (minimum) vibratory steel wheel roller shall compact the base material. Compaction will be measured per subsection *Performance* below. In small areas where the above noted equipment cannot be used, the contractor must request approval from the Department to place the millings with other equipment. The Department reserves the right to reject or approve the areas for placement of millings as determined by the Engineer.

After compaction, all voids in the surface of each layer will be filled with millings and compacted (with the vibratory steel wheel roller) until the layer of base material is well bonded and firm, as determined by the Engineer.

In no case shall vehicles be allowed to travel in a single track or to form ruts in the base course. If any sharp irregularities are formed in the subgrade or base course material, the affected area shall be scarified to a depth of 6" (150 mm) and compacted to conform to the requirements of Section 202 or this Section.

- c. *Performance.* Compaction of milled hot-mix asphalt pavement base courses will be monitored by measuring the in-place density using a nuclear density gauge and comparing it to a control strip target density. The mean base compaction shall be at least 98% of the control strip target density and sufficiently uniform that individual test results are at least 96% of the control strip target density, the base course represented by the test will be considered defective and the Contractor shall further compact the area. After further compaction, the original test site and one other randomly selected site within the area will be tested. The average of two test results will be included in the mean density for that day's placement.

To determine the control strip target density, a control strip with a minimum length of 300 (90 m) shall be constructed at the beginning of work on each pavement base. Each control strip is to remain in place and become a section of the completed roadway. A control strip shall have an area of at least 400 yd² (325 m²). For small areas, the Contractor may request to have a test strip waived. This request shall be submitted to the Engineer for review.

Upon completion of the rolling, the mean density of the control strip will be determined by averaging the results of ten nuclear density tests taken at randomly selected sites within the control strip. The mean density of the control strip shall be the target density for the remainder of the pavement base course which it represents. Compaction shall be expressed as a percentage of the target density.

The finished surface of the graded aggregate base course shall not vary from that required on the Plans by more than 1/2 (13 mm) when tested with a 10 (3.048 m) straightedge applied to the surface parallel to the centerline of the pavement and when tested with a template cut to the cross-section of the pavement. The actual thickness of the graded aggregate base course shall not be more than 1/2 (13 mm) less than the thickness shown on Plans. Those portions of completed base course not meeting these performance requirements shall be completely removed and replaced with proper material placed in accordance with this Section.

A straightedge meeting the approval of the Engineer shall be supplied by the Contractor at each placement operation. The straightedge shall be constructed of rigid materials that resist warping and bending.

Method of Measurement:

The quantity of milled hot-mix base course will be measured by the cubic yard (cubic meter) and will be paid for under Item 302007 - Graded Aggregate Base Course. The volume of cubic yards (cubic meters) will be measured as the number of square yards (square meters) of surface area of milled hot-mix base course, placed and accepted, multiplied by the depths shown on the Plans. If the depth of milled hot-mix base course, placed and accepted, is greater than the depth shown on the Plans, the Plan depth will be used to measure the quantity of payment.

If the limits of measurement for pay quantities for milled hot-mix base course are designated on the Plans, the quantity of milled hot-mix base course measured for payment will be the number of square yards (square meters) of surface area multiplied by the depth placed within the payment lines and grades shown on the Plans.

If the limits are not designated on the Plans, or have been changed by the Engineer, in-place dimensions of the accepted milled hot-mix base course will be established. The computation of quantity will be made from cross-sections taken after the completion of work under this Section.

Materials placed beyond the designated lines and grades as shown on the Plans or beyond the limits established by the Engineer will not be measured for payment.

There will be no separate payment made for filling voids with millings as required under Placement subsection (b) *Spreading and Compaction*.

Basis of Payment:

Millings used for Base Course will be paid at the unit bid price for Item 302007 - Graded Aggregate Base Course, Type B. All costs to bring the millings into compliance with the requirements of 302514 are incidental to Item 302007. No payment will be made under this item 302514.

Price and payment will constitute full compensation for hauling, stockpiling (includes any double handling of material), preparing the subgrade, placing and compacting the materials, and for all labor, equipment, tools and incidental required to complete the work.

No additional compensation will be made to the Contractor to crush, screen or otherwise modify the milled hot-mix base course to meet the necessary gradation.

No payment will be made for materials placed beyond the designated lines and grades as shown on the Plans or beyond the limits established by the Engineer.

10/31/05

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 2000th ton target lot size is achieved during a production day, the lot size shall extend to the end of that production day. The Contractor may interrupt the production of one JMF in order to produce different material; this type of interruption will not alter the determination of the size or limits of material represented by a lot. The Engineer will evaluate each lot on a subplot basis. The size for each subplot shall be 100 to 500 tons and testing for the sub lots will be completed on a daily basis. For each subplot, 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 Gyrotory 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

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):

$$QU = ((\text{JMF target}) + (\text{single test tolerance}) - (\text{mean value})) / (\text{standard deviation}).$$
3. For each parameter, calculate the Lower Quality Index (QL):

$$QL = ((\text{mean value}) - (\text{JMF target}) + (\text{single test tolerance})) / (\text{standard deviation}).$$
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

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
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
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 subplot tests values, to the nearest 0.001 unit. Obtain the Theoretical maximum Specific Gravity values from the corresponding laboratory subplot tests.
2. Calculate the Degree of Compaction:
Degree of Compaction =
 $((\text{Core Bulk Specific Gravity}) / (\text{Theoretical Maximum Specific Gravity})) \times 100\%$ 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 Other¹ 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.

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

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

1. Contact Materials & Research (M&R) personnel to determine if information about the area is already available. If M&R has already obtained cores in the location that is being investigated, the contractor may opt to use the laboratory information for the investigation and not core the area on their own.
2. If M&R does not have information concerning the section of the roadway, the contractor needs to contact M&R to arrange for verification of coring operations. Arrangements shall be made to allow for an individual from M&R to be on the site when the cores are obtained. Cores will be turned over to M&R for evaluation.
3. The Contractor is responsible for providing all traffic control and repairing core holes in accordance to 401699 Appendix A - Repairing Core Holes in 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	$7 * 0.14 = 0.98$
	<u>1.62</u>

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	$7 * 0.14 = 0.98$
	<u>2.52</u>

06/05/14

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, TYPE C, 160 GYRATIONS, PG 64-22 (CARBONATE
STONE)**
- 401802 - BITUMINOUS CONCRETE, TYPE C, 205 GYRATIONS, PG 64-22 (CARBONATE
STONE)**
- 401803 - BITUMINOUS CONCRETE, TYPE C, 115 GYRATIONS, PG 70-22 (CARBONATE
STONE)**
- 401804 - BITUMINOUS CONCRETE, TYPE C, 160 GYRATIONS, PG 70-22 (CARBONATE
STONE)**
- 401805 - BITUMINOUS CONCRETE, TYPE C, 205 GYRATIONS, PG 70-22 (CARBONATE
STONE)**
- 401806 - BITUMINOUS CONCRETE, TYPE C, 115 GYRATIONS, PG 76-22 (CARBONATE
STONE)**
- 401807 - BITUMINOUS CONCRETE, TYPE C, 160 GYRATIONS, PG 76-22 (CARBONATE
STONE)**
- 401808 - BITUMINOUS CONCRETE, 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 320¹, 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, $G^*/\sin(\delta)$	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 $\frac{1}{2}$ 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 gyrations 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

¹Coarse Aggregate Angularity is tested according to ASTM D5821.

²Fine Aggregate Angularity is tested according to AASHTO TP-33.

³Clay Content is tested according to AASHTO T176.

⁴Flat and Elongated is tested according to ASTM 4791 with a 5:1 aspect ratio.

⁵85/80 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 Percent Loss, Maximum	40
Soundness , AASHTO T104 Percent Loss, Maximum for five cycles	20
Deleterious Materials , AASHTO T112 Percent, Maximum	10
Moisture Sensitivity , AASHTO T283 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 subplot 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[®] 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 G_{sb} , apparent specific gravity G_{sa} , 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										
SIEVE SIZE	25.0 MM		19.0 MM		12.5 MM		9.5 MM		4.75 MM	
	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:

Volumetric 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}	
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 gyrations, 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 $\pm 0.5\%$ gyratory compaction curves where the percent of maximum specific gravity ($\% \text{ of } G_{mm}$) 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:
 $\% \text{ of } G_{mm} \text{ at } N_d$, VMA at N_d , VFA at N_d , Fines to effective asphalt binder (P_{be}) ratio, and unit weight (kg/m^3) 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: G_{mm} : ± 0.030 and G_{mb} : ± 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

715500 - UNDERDRAIN OUTLET PIPE, 6
715504 - UNDERDRAIN OUTLET PIPE, 8

Description:

This work consists of furnishing and placing underdrain outlet pipe in accordance with the locations, notes and details shown on the Plans and as directed by the Engineer.

Materials and Construction Methods:

The materials and construction methods for underdrain outlet pipe shall conform to the applicable requirements of Section 715 of the Standard Specifications, except there shall be no requirements for filter fabric and Del. No. 8 stone around the pipe and the pipe shall not be perforated. The material for underdrain outlet pipe shall be the same as for perforated pipe underdrains.

The installed under drain outlet pipe shall be video inspected in accordance with Subsection 715.07 of the Standard Specifications.

Method of Measurement:

The quantity of underdrain outlet pipe will be measured from end to end in linear feet (linear meters) of pipe completed and accepted.

Basis of Payment:

The quantity of underdrain outlet pipe will be paid for at the Contract unit price per linear foot (linear meter) of the diameter as specified on the Plans. Price and payment will constitute full compensation for furnishing all materials, excavation and backfilling, connectors, bolts to block outlet opening to prevent small animals from entering, video inspection for all labor, tools, equipment and incidentals to complete the item.

10/29/01

720544 - REFLECTORS, WHITE, CONCRETE
720545 - REFLECTORS, YELLOW, CONCRETE

Description:

This work consists of furnishing and installing white and/or yellow reflectors on P.C.C. Safety Barrier or on concrete surfaces in accordance with the details and at the designated locations as shown on the Plans and/or as directed by the Engineer.

Materials and Construction Methods:

The reflector and related hardware shall be approved prior to its installation.

The reflector unit shall be installed to the P.C.C. Safety Barrier or to any other required concrete objects in accordance with the manufacturer's recommendations and/or notes on the Plans.

Method of Measurement:

The quantity of reflectors will be measured as the actual number of reflectors installed and accepted.

Basis of Payment:

The quantity of reflectors will be paid for at the Contract unit price per each. Price and payment will constitute full compensation for furnishing the reflector, installing, labor, equipment, tools, and incidentals necessary to complete the work.

10/29/01

720585 - GUARDRAIL END TREATMENT ATTENUATOR, TYPE 1 - 31
720586 - GUARDRAIL END TREATMENT ATTENUATOR, TYPE 2 - 31
720588 - GUARDRAIL END TREATMENT ATTENUATOR, TYPE 3 - 31

Description:

This work consists of furnishing and installing an impact attenuating guardrail end treatment in accordance with the locations, notes and details on the Plans, the Standard Construction Details, these Special Provisions, and as directed by the Engineer.

Materials:

The end treatment system shall meet the requirements of NCHRP Report No. 350 Test Level 3. The Guardrail End Treatment, Type 1 shall be designed for installation parallel to the roadway. The Guardrail End Treatment, Type 2 shall be designed for installation with the end flared back from the roadway. The Guardrail End Treatment, Type 3 shall be designed for installation where 2 runs of guardrail come together.

The entire end treatment shall be designed for quick and easy replacement after an impact.

Guardrail End Treatment Attenuator Type 1 shall have a minimum of 2 square feet (0.2 square meters) of yellow retroreflective material on the nose. Guardrail End Treatment Attenuator, Type 2 and Type 3 shall have a minimum of 3 square feet (0.3 square meters) of yellow retroreflective material on the nose.

The Contractor shall submit shop drawings, the manufacturer's certification, and the manufacturer's installation instructions to the Engineer. Installation cannot begin until these submissions have been approved by the Engineer.

Construction Methods:

The end treatment system shall be fabricated and installed in accordance with the manufacturer's recommendations and details shown on the Plans.

The end treatment system shall be installed so that there is no rigid object projecting more 4 (100 mm) above ground level in that portion of the attenuator impacted and broken away by an errant vehicle. It is the intent that the errant vehicle not be snagged by an embedded component of the end treatment attenuator.

The grading between the edge of pavement and the end treatment shall be 10:1 or flatter for the length of the end treatment.

Reflectorized washers are not to be used on attenuators unless specified and/or approved by the manufacturer.

The Guardrail End Treatment Attenuator, Type 1 shall be installed with steel tubes and soil plates for the first 4 (min.) wood post. As an alternate, the first 4 (min.) post may be hinged, breakaway steel post if the manufacturer's specifications permit.

Unless otherwise noted on the Plans, the Guardrail End Treatment Attenuator, Type 1 shall be installed with a 25:1 taper beginning 50' (15 m) from the end of the end treatment.

Method of Measurement:

The quantity of guardrail end treatment attenuators will be measured as the number of each type fabricated, installed and accepted.

Note: All guardrail end treatment attenuators will be considered as 50 feet (15 meters) long. The 50' (15 m) length will begin at the center of the nose post and extend back along the attenuator and guardrail to which it is attached. Any guardrail within the 50' (15 m) length will be considered as part of the guardrail end treatment attenuator and not be measured separately. Measurement for the guardrail will begin 50' (15 m) from the center of the nose post of the attenuator.

Basis of Payment:

The quantity of guardrail end treatment attenuators will be paid for at the Contract unit price per each type of guardrail end treatment attenuator. Price and payment will constitute full compensation for furnishing all materials, fabrication and installation and for all materials, labor, equipment, tools and incidentals required to complete the work.

Note: When this item is completely installed, the Contractor may notify the Engineer and request acceptance. The Engineer will make an inspection of the installation and the Contractor shall correct any deficiencies. Once the corrective work is completed to the satisfaction of the Engineer, the installation will be accepted and the Contractor will be relieved from the responsibility for this item. If this item is damaged before the final acceptance of the project, and the damage is not the result of the Contractor's negligence, the Engineer will notify the Contractor to make repairs, and the Contractor will make repairs at the unit price bid (in the case of complete replacement) or at a negotiated price (in the case of partial replacement or repair). Damage caused by the Contractor shall be repaired at no cost to the Department.

8/12/2013

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% TiO₂ (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 ± 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 ± 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 ± 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 ± 1 mils (500 μm) as applicable and allowed to dry, shall plot within the boundaries described by the four corner points listed in Tables 1 and 2 of ASTM D 6628-01 when measured in accordance with the test methods prescribed in Section 7 of ASTM D 6628-01.

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

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

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

- d. Drying Time (Field). When installed at a minimum wet film thickness of 20 ± 1 mils (500 or 625 μm) 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" \pm 0.010" (3.18 \pm 0.25 mm) thick]. Tests shall be conducted at an ambient temperature of 75 \pm 5 F (24 \pm 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 polytetrafluorethylene (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 \pm 5 F (24 \pm 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" \pm 0.002" (25 mm \pm 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>U.S. Standard Sieve</u>	<u>% Retained</u>	<u>% Passing</u>
#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>U.S. Standard Sieve</u>	<u>% Retained</u>	<u>% Passing</u>
#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:	<u>Component</u>	<u>Percent By Weight</u>
	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:

<u>Sieve Size</u>	<u>Percent Retained</u>
#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.

<u>Hardness:</u>	The black aggregate hardness shall be 6.5-7 on Moh's Mineral Scale.
<u>Porosity:</u>	The black aggregate porosity shall be less than two (2) percent.
<u>Moisture Content:</u>	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 \pm 1 mils (500 μ m) 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 \pm 1 mils (500 μ m) 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

748530 - REMOVAL OF PAVEMENT STRIPING

Description:

This work consists of removing pavement markings of all kinds including paint, tape, etc., in accordance with this special provision, notes on Plans and/or as directed by the Engineer. The Contractor shall coordinate with the Engineer for maintaining traffic during the operation, prior to starting the work.

Materials and Construction Methods:

Paint and Epoxy Resins:

Shot/abrasive grit blasting or water blasting equipment shall be used for removal of markings from pavement surfaces.

Alkyd Thermoplastic:

In addition to the removal techniques discussed for paint and epoxy, grinding (erasing machines) equipment may also be used for removal of markings from pavement surfaces.

The removal operation shall be performed in a manner that will not damage the pavement surface.

The Contractor shall collect and dispose of all shot/abrasive grit and pavement marking materials removed from the pavement surface. Washing or sweeping such material to the roadside will not be permitted.

After removal of striping on bituminous concrete asphalt sealer shall be used to cover any exposed aggregate or embedded paint at no additional cost.

Method of Measurement:

The quantity of pavement striping removal will be measured as the number of square feet (meters) of pavement striping removed and accepted. The area of lines will be calculated by multiplying the nominal width of line times the length and the area of symbols will be as specified in Subsection 748.10 of the Standard Specifications.

Basis of Payment:

The quantity of pavement striping removal will be paid for at the Contract unit price per square foot (meter) for "Removal of Pavement Striping". Price and payment shall be full compensation for furnishing all materials, removing the pavement markings, disposing of the removed marking material, covering up the exposed aggregate, and for all labor, equipment, tools and incidentals necessary to complete the work.

Note:

There will be no measurement and payment for removal of pavement markings placed incorrectly by the Contractor.

5/21/2013

- 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 alkyl 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 50°F (10°C) 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 ft² (9.3 m²) and the AASHTO at 3 lb. (1.4 kg) per 100 ft² (9.3 m²). In combination, the total glass bead coverage shall be 7-8 lb. (3.2-3.6 kg) per 100 ft² (9.3 m²). 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-applied 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 70°F and 80°F (21°C and 27°C) 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 50°F 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 50°F±2 degrees (10°C) for a minimum of four hours. At least two specimens tested must meet the flexibility requirements at 50°F (10°C) 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±3°F) (23°C) in accordance to ASTM Standard Test Method for Bond Strength of thermoplastic marking Material D4796-88. Place a coarse brick in a 400°F (204°C) oven for 5 minutes. Prepare a 4 square inch test specimen. Place the test specimen on the brick and further heat in the 400°F (204°C) 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 $\pm 3^{\circ}\text{F}$ ($-9.4 \pm 2^{\circ}\text{C}$) 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 $73.4 \pm 3^{\circ}\text{F}$ (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

749687 - INSTALLATION OR REMOVAL OF TRAFFIC SIGN ON SINGLE SIGN POST

Description:

This work consists of installing or removing traffic sign(s) on a single post or other type of pole at the locations indicated on the Plans or as directed by the Engineer. This specification also includes installation of posts in boring holes constructed under other items.

A single sign totaling more than 9 square feet, or with any dimension, length or width, greater than or equal to 48 inches shall be installed on multiple sign posts under Item 749690 - Installation or Removal of Traffic Sign on Multiple Sign Posts.

Materials:

The Department will provide all sign materials to be used on this project. The Contractor shall contact the DelDOT Sign Shop Supervisor with project plans and quantity sheets at 302-760-2581. Sign fabrication orders require a minimum of four (4) weeks for completion. Orders placed with less than 4 weeks lead-time will result in a delay. Any delay caused by inadequate lead-time due to a late order will be the sole responsibility of the Contractor. The Contractor shall pick-up the sign materials from the DelDOT Sign Shop and deliver them to the job site without any damage to the sign materials.

Construction Methods:

The Contractor shall pick-up necessary signs, sign posts, hardware, and extensions from the Department and install the signs in the locations indicated on the Plans in accordance with the Delaware MUTCD or as directed by the Engineer. The Contractor shall be responsible for obtaining all necessary utility clearances before the signs may be installed. Signs and plaques shall be mounted no lower than the minimum mounting height specified in the Delaware MUTCD. Signs and plaques shall be mounted no higher than one foot above the minimum mounting height specified in the Delaware MUTCD. Any excess sign post protruding above the top of the top sign shall be cut off and removed. For sign removals, the sign posts shall have all nuts, bolts, and other connectors removed. The disturbed ground shall be graded and backfilled accordingly. The Contractor is responsible for disposal of all signing material removed from the project.

Method of Measurement:

The number of single sign installations or removals will be measured as the actual number of signs installed or removed and accepted.

Basis of Payment:

The quantity of single sign post installations or removals will be paid for at the Contract unit price per each. Price and payment will constitute full compensation for installing or removing signs and sign materials, pick-up and delivery of sign materials, grading disturbed areas, and for all labor, equipment, tools, and incidentals required to complete the work. Signs that are not installed in accordance with the Delaware MUTCD or signs installed in the incorrect location shall be moved at no additional cost to the Department.

5/28/2013

763501 - CONSTRUCTION ENGINEERING

Description:

This work consists of construction lay out including; stakes, lines and grades as specified below. Subsection 105.10 Construction Stakes, Lines and Grades of the Standard Specifications is voided.

Based on contract plans and information provided by the Engineer, the Contractor shall stake out right-of-way and easements lines, limits of construction and wetlands, slopes, profile grades, drainage system, centerline or offset lines, benchmarks, structure working points and any additional points to complete the project.

The Engineer will only establish the following:

- (a) Original and final cross-sections for borrow pits.
- (b) Final cross-sections for all excavation items.
- (c) Line and grade for extra work added on to the project plans.

Equipment:

The Contractor shall use adequate equipment/instruments in a good working order. He/she shall provide written certification that the equipment/instrument has been calibrated and is within manufacturer's tolerance. The certification shall be dated a maximum of 9 months before the start of construction. The Contractor shall renew the certification a minimum of every 9 months. The equipment/instrument shall have a minimum measuring accuracy of [3mm+2ppmxD] and an angle accuracy of up to 2.0 arc seconds or 0.6 milligons. If the Contractor chooses to use GPS technology in construction stakeout, the Contractor shall provide the Engineer with a GPS rover for the duration of the contract. The GPS rover shall be in good working condition and of similar make and model used by the Contractor. The Contractor shall provide up to 8 hours of formal training on the Contractor's GPS system to a maximum of four Engineer's appointees. At the end of the contract, the Engineer will return the GPS rover to the Contractor. If any of the equipment/instruments are found to be out of adjustment or inadequate to perform its function, such instrument or equipment shall be immediately replaced by the Contractor to the satisfaction of the Engineer. The Contractor may utilize GPS equipment to perform the excavation and embankment for the project as indicated on the plans. Use of this procedure and equipment is intended for grading the subgrade surface only; it is not intended for use in constructing final surface grades. GPS technology and machine control technology shall not be used in the construction of bridge or structures such as, but not limited to, curb, drainage inlets, manholes, junction boxes, pole bases and pipe inverts.

Engineering/Survey Staff:

The Contractor shall provide and have available for the project an adequate engineering staff that is competent and experienced to set lines and grades needed to construct the project. The engineering personnel required to perform the work outlined herein shall have experience and ability compatible with the magnitude and scope of the project. Additionally, the Contractor shall employ an engineer or surveyor licensed in the State of Delaware to be responsible for the quality and accuracy of the work done by the engineering staff. When individuals or firms other than the Contractor perform any professional services under this item, that work shall not be subject to the subcontracting requirements of Subsection 108.01 of the Standard Specifications. The Contractor shall assume full responsibility for any errors and/or omissions in the work of the engineering staff described herein. If construction errors are caused due to erroneous work done under Construction Engineering the Contractor accepts full responsibility, no matter when the error is discovered. Consideration will not be given for any extension of contract time or additional compensation due to delays, corrective work, or additional work that may result from faulty and erroneous construction stakeout, surveying, and engineering required by this specification.

Construction Methods:

Performance Requirements:

- (a) Construction Engineering shall include establishing the survey points and survey centerlines; finding, referencing, offsetting the project control points; running a horizontal and vertical

circuit to check the accuracy of given control points. Establishing plan coordinates and elevations marks for culverts, slopes, subbase, subsurface drains, paving, subgrade, retaining walls, and any other stakes required for control lines and grades; and setting vertical control elevations, such as footings, caps, bridge seats and deck screed. The Contractor shall be responsible for the preservation of the Department's project control points and benchmarks. The Contractor shall establish and preserve any temporary control points (traverse points or benchmarks) needed for construction. Any project control points (traverse points) or benchmarks conflicting with construction of the project shall be relocated by the Contractor. The Contractor as directed by the Engineer must replace any or all stakes that are destroyed at any time during the life of the contract. The Contractor shall re-establish centerline points and stationing prior to final cross-sections by the Engineer. The Vertical Control error of closure shall not exceed 0.05 ft times [Square root of number of miles in the level run] (0.01 m times [square root of number of kilometers]). The Horizontal Control accuracy ratio shall not exceed an error of closure of 1 foot per 20,000 feet (1 meter per 20,000 meters or 1:20,000) of distance traversed prior to adjustment.

- (b) The Contractor shall perform construction centerline layout of all roadways, ramps and connections, etc. from project control points set by the Engineer. The Contractor using the profiles and typical sections provided in the plans shall calculate proposed grades at the edge of pavement or verify information shown on Grades and Geometric sheets.
- (c) The Contractor shall advise the Engineer of any horizontal or vertical alignment revisions needed to establish smooth transitions to existing facilities. The Contractor shall immediately bring to the attention of the Engineer any potential drainage problem within the project limits. The Engineer must approve any proposed variation in profile, width or cross slope.
- (d) The Contractor shall establish the working points, centerlines of bearings on bridge abutments and on piers, mark the location of anchor bolts to be installed, check the elevation of bearing surfaces after they are ground and set anchor bolts at their exact elevation and alignment as per Contract Plans. Before completion of the fabrication of beams for bridge superstructures, the Contractor shall verify by accurate field measurements the locations both vertically and horizontally of all bearings and shall assume full responsibility for fabricated beams fitting and bearing as constructed. After beam erection and concurrently with the Department project surveyors, the Contractor shall survey top of beam elevations at a maximum of 10-ft (3.0-meter) stations and compute screed grades. These shall be submitted to the Engineer for review and approval before the stay in place forms are set. Construction stakes and other reference control marks shall be set at sufficiently frequent intervals to assure that all components of the structure are constructed in accordance with the lines and grades shown on the plans. The Contractor will be responsible for all structure alignment control, grade control and all necessary calculations to establish and set these controls.
- (e) The Contractor, using contract plans, shall investigate proposed construction for possible conflicts with existing and proposed utilities. The Contractor shall then report such conflicts to the Engineer for resolution. All stakes for advanced utility relocation, which will be performed by others, shall be paid for under item 763597 – Utility Construction Engineering.
- (f) The Contractor shall be responsible for the staking of all sidewalk and curb ramp grades in accordance with the plans and the Departments Standard Construction Details. The Contractor shall review the stakeout with the Engineer prior to construction. The Engineer must approve any deviation from plans, Department Standard Construction Details and Specifications in writing. The Contractor shall be responsible for any corrective actions resulting from problems created by adjustments if they fail to obtain such approval.
- (g) If wetland areas are involved and specifically defined on the Plans the following shall apply:
 - i. It is the intent of these provisions to alert the Contractor, that he/she shall not damage or destroy wetland areas, which exist beyond the construction limits. These provisions will be strictly enforced and the Contractor shall advise his/her personnel and those of any Subcontractor of the importance of these provisions.

- ii. All clearing operations and delineation of wetlands areas shall be performed in accordance with these Special Provisions. Before any clearing operation commences the Contractor shall demarcate wetlands at the Limits of Construction throughout the entire project as shown on the Plans labeled as Limits of Construction or Wetland Delineation to the satisfaction of the Engineer.
- iii. The material to be used for flagging the limits of construction shall be orange vinyl material with the wording "Wetland Boundary" printed thereon. In wooded areas, the flagging shall be tied on the trees, at approximate 20-foot (6.1 meter) intervals through wetland areas. In open field and yard areas that have been identified as wetlands, 3 foot (one meter) wooden grade stakes shall be driven into the ground at approximate 20 foot (6.1 meter) intervals and tied with the flagging.
- iv. If the flagging has been destroyed and the Engineer determines that its use is still required, the Contractor shall reflag the area at no cost to the Department. If the Contractor, after notification by the Engineer that replacement flagging is needed, does not replace the destroyed flagging within 48 hours, the Engineer may proceed to have the area reflagged. The cost of the reflagging by the Engineer will be charged to the Contractor and deducted from any monies due under the Contract.
- v. At the completion of construction, the Contractor shall remove all stakes and flagging.
- vi. The Contractor shall be responsible for any damages to wetlands located beyond the construction limits, which occurs from his/her operations during the life of the Contract. The Contractor shall restore all temporarily disturbed wetland areas to their preconstruction conditions. This includes restoring bank elevations, streambed and wetland surface contours and wetlands vegetation disturbed or destroyed. The expense for this restoration shall be borne solely by the Contractor.

Submittals:

All computations necessary to establish the exact position of all work from the control points shall be made and preserved by the Contractor. All computations, survey notes and other records necessary to accomplish the work shall be made available to the Department in a neat and organized manner at anytime as directed by the Engineer. The Engineer may check all or any portion of the stakeout survey work or notes made by the Contractor and any necessary correction to the work shall be made as soon as possible. The Contractor shall furnish the Engineer with such assistance as may be required for checking all lines, grades, and measurements established by the Contractor and necessary for the execution of the work. Such checking by the Engineer shall not relieve the Contractor of his/her responsibility for the accuracy or completeness of the work.

The Contractor shall submit any of the following at the Engineer's request:

- (a) Proposed method of recording information in field books to ensure clarity and adequacy.
- (b) A printout of horizontal control verification, as well as coordinates, differences and error of closure for all reestablished or temporary Control Points.
- (c) A printout of vertical control verification, with benchmark location elevation and differences from plan elevation.
- (d) Sketch of location of newly referenced horizontal control, with text printout of coordinates, method of reference and field notes associated with referencing control.
- (e) Description of newly established benchmarks with location, elevation and closed loop survey field notes.
- (f) All updated electronic and manuscript survey records.
- (g) Stakeout plan for each structure and culvert.

- (h) Computations for buildups over beams, screed grades and overhang form elevations.
- (i) A report showing differences between supplied baseline coordinates and field obtained coordinates, including a list of preliminary input data.
- (j) Any proposed plan alteration to rectify a construction stakeout error, including design calculations, narrative and sealed drawings.
- (k) Baseline for each borrow pit location.
- (l) Detailed sketch of proposed overhead ground mounted signs or signals showing obstructions that may interfere with their installation.
- (m) Copies of cut sheets.

Method of Measurement:

The quantity of Construction Engineering will not be measured.

Basis of Payment:

Payment will be made at the Lump Sum price bid for the item "Construction Engineering". The price bid shall include the cost of furnishing all labor, equipment, instruments, stakes and other material necessary to satisfactorily complete the work as herein described under this item for all roads and structures that are a part of the contract. Adjustment in payment will be made for the deletion or addition of work not shown in the contract documents.

Monthly payment will be made under this item in proportion to the amount of work done as determined by the Engineer.

6/11/2012

763597 - UTILITY CONSTRUCTION ENGINEERING

Description:

Utility Construction Engineering consists of providing construction and right-of-way/easement information to utility companies performing work (as defined in the Utility Statement) within the project limits. This may include but not necessarily be limited to staking right-of-way/easement lines, tops of cuts, bottoms of slopes, clear zones, drainage facilities, fill and cut grades, and other features that will enable utility companies to coordinate their work and correctly locate/relocate their facilities. Engineering/surveying required for utility work bid as part of the Contract is included in item 763501.

It is the intent of this item to cover engineering/surveying work that is done solely for utility companies and that is beyond the work performed under item 763501 - Construction Engineering. Work covered under Utility Construction Engineering will generally fall into two categories:

1. Engineering/surveying work that is not necessary for construction of the project, i.e. staking the clear zone line, providing cut/fill grades at proposed utility pole locations, staking back of drainage structures, and staking right-of-way lines where construction of the project (exclusive of utilities) is obviously well within the right-of-way.
2. Engineering/surveying work that is necessary for construction, but has to be provided for utility companies well in advance of the Contractor's need and will likely need to be redone later. This can essentially be any of the Construction Engineering work that when done early cannot be reasonably expected to remain undisturbed until needed for construction of the project (non-utility).

The Engineer must approve all requests for Utility Construction Engineering before the work begins. To this end, the Contractor should instruct utility companies to submit their requests to the Engineer. The Engineer will decide if the requested work meets the criteria for Utility Construction Engineering or is normal Construction Engineering and pass the requests along with his/her decisions to the Contractor. When the Engineer determines that the requested work qualifies as Utility Construction Engineering, the Department will reimburse the Contractor on a per hourly basis for each and every hour the Contractor's survey crew is in the field actively engaged in performing the Utility Construction Engineering work. The survey crew size shall be adequate to efficiently perform the work required and shall meet the approval of the Engineer. Office work associated with Utility Construction Engineering will be considered as incidental to the item.

The personnel engaged in and the equipment used for Utility Construction Engineering shall meet the requirements as described in item 763501 - Construction Engineering.

Method of Measurement:

The quantity of Utility Construction Engineering will be measured as the actual number of hours the Contractor's survey crew is in the field actively engaged in utility construction engineering work.

Basis of Payment:

The quantity of Utility Construction Engineering will be paid for at the Contract unit price per hour. Price and payment will constitute full compensation for furnishing all labor, equipment, instruments, stakes and other materials necessary to complete the work.

02/28/09



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

SHAILEN P. BHATT
SECRETARY

UTILITY STATEMENT
January 15, 2015
CARPENTERS PIT ROAD IMPROVEMENTS
State Contract #: T201409502
KENT COUNTY, DELAWARE

The following companies may own and/or maintain facilities within the contract limits:

- | | |
|---------------------------------------|----------------|
| • Delaware Electric Cooperative, Inc. | Electric |
| • Verizon of Delaware Inc. | Telephone |
| • Comcast Cable Co. | Communications |
| • City of Milford | Sewer |
| • City of Milford | Water |

The following is a breakdown of the utilities involved, adjustments and/or relocations as required. All relocations shall be done in advance of the construction after the proposed right of way and construction has been staked.

Delaware Electric Cooperative, Inc. maintains the following aerial electric facilities within the project limits:

1. Delaware Electric Cooperative, Inc. maintains a 12KV electric system beginning on pole # 46943 located on the southwest corner of New Wharf Road and Calvary Road/ Big Stone Beach Road. The line begins on pole # 46943 and heads east to pole # 46944 on the West side of Calvary Road at Station 419+68.
2. Line begins on pole # 46944 and heads North on the West side of Calvary Road to pole # 46945 outside of the project limits. The line continues heading North to the project limits.
3. Line begins on pole # 46945 and then heads East crossing Big Stone Beach Road to pole # 54555 outside of the project limits.

The proposed changes to the facilities include, but are not limited to:



1. The following pole locations and guy wires will be relocated and/or adjusted by Delaware Electric Cooperative, Inc.:

- Station 419+68 left of centerline, DEC pole #46944
- Station 419+99 left of centerline, DEC pole #46943
- NW corner of Big Stone Beach Road and New Wharf Road, DEC pole #46945
- New pole on NW corner of Big Stone Beach Road and New Wharf Road
- Guy wires at 419+88 left of centerline
- Guy wires at 419+30 left of centerline
- New underground cable to be installed from DEC pole #46944 south to 157716

DEC will require approximately 30 calendar days to do this work after the company has been given 30 calendar days advanced notice to proceed.

Any additional relocations will be performed by the company during the construction of this project and the time to complete the relocation(s) will depend on the nature of the work.

Verizon of Delaware Inc. maintains the following aerial facilities within the project limits:

1. An aerial Fiber Optic Cable begins on DEC pole # YE81E /E116/2 on the West side of Calvary Road at Station 410+80 and heads North on the West side of Calvary Road to pole #46944 at Station 419+68 and continues to beyond Station 420+39. The line then crosses New Wharf Road and continues north to the project limits.

The proposed aerial changes to the facility include, but are not limited to:

1. The aerial Fiber Optic cable on the DEC pole line from Station 411+00 to beyond Station 420+39 will transfer to new relocated pole UP46944 after DEC relocates.

Verizon of Delaware Inc. maintains the following underground facilities within the project limits:

1. Verizon has underground cables on the South side of New Wharf Road crossing under Calvary Road at Station 420+21 and tying into an existing telephone box at station 420+10 right.
2. Verizon has underground cables that cross from the southeast corner of the New Wharf Road and Calvary Road intersection underneath of New Wharf Road to the northeast side of the intersection.

The proposed changes to the underground facilities include, but are not limited to:

1. An existing Verizon 100 pair buried cable along the Southside of New Wharf Rd from Proposed Pedestal YE86A/5 to YE86A/6 and a 100 pair buried cable under

New Wharf Rd from Pedestal YE86A/6 to YE86A/7 will be replaced by directional bore.

2. New proposed Verizon Telephone Boxes at the following Stations:
 - a) 420+21 right of centerline
 - b) 419+80 left of centerline
 - c) Big Stone Beach Northeast corner of intersection

The company can begin their aerial work after DEC has completed their relocation of the above described relocated pole. Coordination shall be required with DEC and Verizon.

Verizon will require approximately 30 calendar days to do this work after the company has been given 30 calendar days advanced notice to proceed.

Any additional relocations will be performed by the company during the construction of this project and the time to complete the relocation(s) will depend on the nature of the work.

Comcast Cable Co. maintains the following aerial facilities within the project limits:

1. An aerial line begins on DEC pole # YE81E /E116/2 on the West side of Calvary Road at Station 410+80 and heads North on the West side of Calvary Road to pole #46944 at Station 419+68 and continues to beyond Station 420+39. The line then crosses New Wharf Road and continues north to the project limits.

The proposed changes to the facilities include, but are not limited to:

1. The aerial Fiber Optic cable on the DEC pole line from Station 411+00 to beyond Station 420+39 will transfer to new relocated pole UP46944 after DEC relocates.

The company can begin their work after DEC has completed their relocation of the above described relocated pole. Coordination with DEC and Comcast shall be required.

Comcast will require approximately 30 calendar days to do this work after the company has been given 30 calendar days advanced notice to proceed.

Any additional relocations will be performed by the company during the construction of this project and the time to complete the relocation(s) will depend on the nature of the work.

City of Milford (Sewer) maintains the following underground facilities within the project limits:

1. Line begins on the East side of Calvary Road at Station 400+00 and heads North to Station 406+50, where it crosses Calvary Road and heads west to the project limits.

There are no apparent conflicts with the existing sewer facilities. Should any conflicts be encountered during construction requiring adjustment and/or relocation to the aforementioned utilities' existing facilities, the City shall be notified and the necessary relocation work shall be accomplished by the Contractor, as directed by the Engineer, in accordance with the City's requirements.

City of Milford (Water) maintains the following underground facilities within the project limits:

1. Line begins on the West side of Calvary Road at Station 400+00 and heads North to Station 404+90, where the line tees. One line crosses Calvary Road and heads east to the project limits, and the other line heads west to the project limits.

There are no apparent conflicts with the existing water facilities. Should any conflicts be encountered during construction requiring adjustment and/or relocation to the aforementioned utilities' existing facilities, the City shall be notified and the necessary relocation work shall be accomplished by the Contractor, as directed by the Engineer, in accordance with the City's requirements.

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 utility companies for field adjustments for adequate clearances.
2. It is understood and agreed that the contractor has considered in his bid all permanent and temporary utility appurtenances in their present or relocated positions as shown on the plans or described in the utility statement and/or are readily discernible and that no additional compensation will be allowed for any delays, inconvenience, or damage sustained by him/her due to any interference from the utility facilities and appurtenances

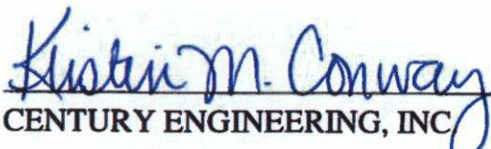
or the operation of moving them, except that the contractor may be granted an equitable extension of time.

3. The Contractor shall follow all requirements of the Delaware Code, Title 26, Chapter 8. Underground Utility Damage Prevention and Safety. Chapter 8 includes, among other requirements, Section 806. Duties of Excavators which contains the requirement for the Contractor to excavate prudently and carefully and to take all reasonable steps necessary to properly protect, support and backfill underground utility lines. This protection shall include but may not be limited to hand digging, within the limits of the planned excavation or demolition, starting 2 feet of either side of the extremities of the underground utility line for other than parallel type excavations and at reasonable distances along the line of excavation for parallel type excavations.
4. The Contractor shall note that the 16 Delaware Code, Chapter 74B, Section 7405B requires notification to and mutually agreeable measures from the public utility for any person intending to carry on any function, activity, work or operation within dangerous proximity of any high voltage overhead lines.
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.

NOTE: Coordination and cooperation among the utilities and the State's Contractor are of prime importance, therefore, the Contractor is directed to contact the following Utility Representatives with any questions in regard to this work prior to submitting bids and work schedules. Proposed work schedules should reflect the Utility Companies' proposed relocations.

Mr. Troy Dickerson	Delaware Electric Cooperative	(302)-349-3125
Mr. George Zang	Verizon Delaware Inc.	(302)-422-1238
Mr. Jim Spencer	Comcast Cable Co.	(302)-786-6048
Mr. Hans Medlarz	City of Milford, Public Works	(302)-422-6616

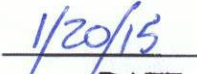
PREPARED AND RECOMMENDED BY:


CENTURY ENGINEERING, INC


DATE

APPROVED AS TO FORM BY:


UTILITIES SECTION, DELDOT


DATE

G:\PROJECTS\08536.00 (Milford Carpenters Pit Rd Bridge Extension)\DESIGN PROJECT INFO\Comments and Submissions\Utility Companies\FinalUtilityStatement.doc

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

CERTIFICATE OF RIGHT-OF-WAY STATUS

STATE PROJECT NO. T201409502

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

CARPENTERS PIT ROAD IMPROVEMENTS

KENT 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
Transportation Solutions

February 9, 2015



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

JENNIFER COHAN
SECRETARY

April 27, 2015

ENVIRONMENTAL REQUIREMENTS

FOR

State Contract No. T201409502

Federal Aid No.: N/A

Contract Title: Carpenters Pit Road Improvements

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. The following special provisions have been developed to mitigate and/or minimize impacts.

PERMIT REQUIREMENTS:

The construction work that will occur to upgrade Carpenters Pit Road, Kent County, Delaware requires permit approval from the agencies listed below. It is the responsibility of the contracting agency -- the Delaware Department of Transportation, Division of Transportation Solutions -- to obtain the necessary permits to ensure that the contractor complies with the requirements and conditions established by the regulatory agencies. The permit coordination for this project is complete. Written authorization from the permitting agencies is not required and paperwork for on-site posting is not anticipated. As such, the construction work that will occur is authorized under the permits/exemptions listed below:

REQUIRED PERMITS AND APPROVAL STATUS:

- **U.S. Army Corps of Engineers (COE)** - Nationwide Permit (NWP) #14 - CENAP-OP-R-2012-19-23, *issued 2/3/15, expires 3/16/2017*
- **Delaware Department of Natural Resources and Environmental Control (DNREC) Wetlands & Subaqueous Lands Section (WLSL)** - Wetlands Permit: WE-065/15; Subaqueous Lands Permit: SP-064/15, *issued 4/20/15, expires 4/20/18*

- **DNREC Coastal Zone Management (CZM)** – *issued*
- **DNREC Water Quality Certification** – *issued*

SPECIFIC REQUIREMENTS:

Additional requirements by DelDOT not specified within the permits, but listed below, are also the responsibility of the contractor. Noncompliance with these requirements may result in shut down of the project at the contractor's expense.

1. The contractor shall employ measures during construction to prevent spills of fuels or lubricants. If a spill should occur, efforts shall be undertaken to prevent its entry into wetlands, aquatic, or drainage areas. Any spills entering wetlands, aquatic, or drainage areas shall be removed immediately. The Division of Water Resources (DNREC), Wetlands & Aquatic Protection Branch, 302-739-4691, shall be notified of any spill(s) within six (6) hours of their occurrence. That office will determine the effectiveness of spill and contamination removal and specify remediation efforts as necessary.
2. All construction debris, excavated material, brush, rocks, and refuse incidental to the work shall be placed either on shore above the influence of flood waters or on some suitable disposal site approved by the department.
3. The disposal of trees, brush, and other debris in any stream corridor, wetland surface water or any drainage ditch is prohibited.
4. There shall be no stockpiling of construction materials or temporary fills in wetlands or subaqueous lands unless otherwise specified on project plans and approved by permitting agencies that govern them. It is the contractor's responsibility to coordinate and secure those additional permits/amendments in deviating from the plan.
5. Construction debris shall be kept from entering adjacent waterways, wetlands, ground cover, or drainage areas. Any debris that enters these areas shall be removed immediately. Netting, mats, or establishing confined work areas in stages may be necessary to address these issues.
6. Refuse material resulting from routine maintenance of worker equipment and heavy machinery is prohibited from being disposed or deposited onto or into the ground. All used oils and filters must be recycled or disposed of properly.
7. Use of harmful chemical wash water to clean equipment or machinery is discouraged. If undertaken, the residue water and/or material must be collected or contained such that it will be disposed of properly. It shall not be deposited or disposed of in waterways, streams, wetlands, or drainage areas.
8. The contractor shall follow all requirements as indicated in the Environmental Compliance Sheet. It is be the contractor's responsibility to ensure that workers also follow this requirement. As part of the restrictions, please note the timetables reflected in the contract for the in-stream/water work for endangered species protection.

9. Fill material shall be free of oil and grease, debris, wood, general refuse, plaster and other pollutants, and shall contain no broken asphalt.

ENVIRONMENTAL COMPLIANCE:

1. Specifically, please note the environmental requirements as indicated on the Environmental Compliance Sheet and those as indicated the DNREC Subaqueous Lands Permit:

- The proposed work is located in a State Natural Area and a Habitat of Conservation Concern. All work shall be completed in a manner that minimized intrusion into these areas. See DNREC SP-2.
- A modified grass seed mix has been included on the project. Reference project note #28 (sheet 5) and DNREC SP-4.
- Clearing of the wetlands and impacts to mature trees shall be kept to the minimum necessary for the construction of the project. EC sheet note 2E and DNREC SP-7.
- No heavy equipment shall be used or placed in the wetlands or subaqueous lands. See DNREC SP-9.
- Mitigation is required and a DNREC approved mitigation plan is pending. The Special Conditions of the Subaqueous Lands Permit states that DelDOT has 6 months to submit a mitigation plan for review and approval. See DNREC SP-13.
- The construction of the mitigation site must be completed within three years of the issuance of the Subaqueous Permit. See DNREC SP-14.
- Subaqueous Permit Special Conditions #15-#18 involves the mitigation plan, maintenance and monitoring of the mitigation. If DelDOT does a share-cost project (pending DNREC approval) with DNREC these conditions will be revised.

2. The U.S. Army Corps of Engineers (USACE) shall be notified at least 10 days prior to the commencement of authorized work by completing and signing the Commencement Form. USACE shall also be notified within 10 days of the completion of the authorized work by completing and signing the Completion Form.

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) for approval.



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

SHAILEN P. BHATT
SECRETARY

RAILROAD STATEMENT

For

State Contract No.: T201409502

Federal Aid No.:

Project Title: Carpenters Pit Road Improvements

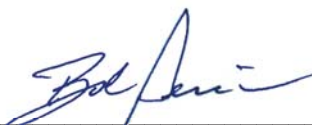
The following railroad companies maintain facilities within the contract limits:

- | | |
|--|---|
| <input type="checkbox"/> Amtrak | <input type="checkbox"/> Maryland & Delaware |
| <input type="checkbox"/> CSX | <input type="checkbox"/> Norfolk Southern |
| <input type="checkbox"/> Delaware Coast Line | <input type="checkbox"/> Wilmington & Western |
| <input type="checkbox"/> East Penn | <input checked="" type="checkbox"/> None |

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

1/13/2015

DATE

BID PROPOSAL FORMS

CONTRACT T201409502.01

DELAWARE DEPARTMENT OF TRANSPORTATION
SCHEDULE OF ITEMS

PAGE: 1
DATE:

CONTRACT ID: T201409502.01

PROJECT(S): T201409502

All figures must be typewritten.

CONTRACTOR :

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS

SECTION 0001 CARPENTER PIT ROAD IMPROVEMENTS

0010	201000 CLEARING AND GRUBBING	LUMP		LUMP		
0020	202000 EXCAVATION AND EMBANKMENT	CY	413.000			
0030	209001 BORROW, TYPE A	CY	593.000			
0040	210000 FURNISHING BORROW TYPE "C" FOR PIPE, UTILITY TRENCH, AND STRUCTURE BACKFILL	CY	30.000			
0050	211000 REMOVAL OF STRUCTURES AND OBSTRUCTIONS	LUMP		LUMP		
0060	212000 UNDERCUT EXCAVATION	CY	97.000			
0070	302007 GRADED AGGREGATE BASE COURSE, TYPE B	CY	388.000			
0080	302008 GRADED AGGREGATE BASE COURSE, TYPE B, PATCHING	CY	18.000			
0090	401810 BITUMINOUS CONCRETE, SUPERPAVE, TYPE B, 160 GYRATIONS, PG 64-22	TON	280.000			

DELAWARE DEPARTMENT OF TRANSPORTATION
SCHEDULE OF ITEMS

PAGE: 2
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CONTRACTOR :

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
0100	401819 BITUMINOUS CONCRETE, SUPERPAVE, BITUMINOUS CONCRETE BASE COURSE, 160 GYRATIONS, PG 64-22	460.000 TON				
0110	401821 BITUMINOUS CONCRETE, SUPERPAVE, TYPE C, 160 GYRATIONS, PG 64-22, PATCHING	10.000 TON				
0120	401822 BITUMINOUS CONCRETE, SUPERPAVE, TYPE B, 160 GYRATIONS, PG 64-22, PATCHING	11.000 TON				
0130	401823 BITUMINOUS CONCRETE, SUPERPAVE, BITUMINOUS CONCRETE BASE COURSE, 160 GYRATIONS, PG 64-22, PATCHING	13.000 TON				
0140	401824 BITUMINOUS CONCRETE, SUPERPAVE, TYPE C, 160 GYRATIONS, PG 64-22, WEDGE	48.000 TON				
0150	401827 BITUMINOUS CONCRETE, SUPERPAVE, TYPE C, 160 GYRATIONS, PG 64-22 (NON-CARBONATE STONE)	535.000 TON				
0160	612022 REINFORCED CONCRETE PIPE, 18", CLASS IV	82.000 LF				
0170	612033 REINFORCED CONCRETE PIPE, 21", CLASS IV	84.000 LF				

DELAWARE DEPARTMENT OF TRANSPORTATION
SCHEDULE OF ITEMS

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CONTRACTOR : _____

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
0180	612221 REINFORCED CONCRETE ELLIPTICAL PIPE, 48"X76", CLASS IV	8.000 LF				
0190	712005 RIPRAP, R-4	10.000 SY				
0200	712006 RIPRAP, R-5	8.000 SY				
0210	713001 GEOTEXTILES, STABILIZATION	18.000 SY				
0220	715001 PERFORATED PIPE UNDERDRAINS, 6"	1126.000 LF				
0230	715500 UNDERDRAIN OUTLET PIPE, 6"	56.000 LF				
0240	720050 GALVANIZED STEEL BEAM GUARDRAIL, TYPE 1-31	478.000 LF				
0250	720544 REFLECTORS, WHITE, CONCRETE	8.000 EACH				
0260	720585 GUARDRAIL END TREATMENT ATTENUATOR, TYPE 1-31	4.000 EACH				
0270	725002 GUARDRAIL TO BARRIER CONNECTION, APPROACH TYPE 1-31	4.000 EACH				

DELAWARE DEPARTMENT OF TRANSPORTATION
SCHEDULE OF ITEMS

PAGE: 4
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CONTRACTOR : _____

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
0280	743000 MAINTENANCE OF TRAFFIC	LUMP	LUMP			
0290	743004 FURNISH AND MAINTAIN PORTABLE CHANGEABLE MESSAGE SIGN	EADY 46.000				
0300	743006 PLASTIC DRUMS	EADY 436.000				
0310	743010 FURNISH AND MAINTAIN TRUCK MOUNTED ATTENUATOR, TYPE II	EADY 7.000				
0320	743023 TEMPORARY BARRICADES, TYPE III	LFDY 141.000				
0330	743024 TEMPORARY WARNING SIGNS AND PLAQUES	EADY 1203.000				
0340	743051 FLAGGER, KENT COUNTY, STATE	53.000 HOUR				
0350	743063 FLAGGER, KENT COUNTY, STATE, OVERTIME	26.000 HOUR				
0360	748015 PERMANENT PAVEMENT STRIPING, SYMBOL/LEGEND ALKYD-THERMOPLAST IC	SF 40.000				
0370	748019 TEMPORARY MARKINGS, PAINT, 4"	1200.000 LF				

DELAWARE DEPARTMENT OF TRANSPORTATION
SCHEDULE OF ITEMS

PAGE: 5
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CONTRACTOR :

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
0380	748530 REMOVAL OF PAVEMENT STRIPING	100.000 SF				
0390	748548 PERMANENT PAVEMENT STRIPING, EPOXY RESIN PAINT, WHITE/YELLOW, 5"	4884.000 LF				
0400	748553 PREFORMED RETROREFLECTIVE THERMOPLASTIC PAVEMENT MARKINGS, BIKE SYMBOL	3.000 EACH				
0410	749687 INSTALLATION OR REMOVAL OF TRAFFIC SIGN(S) ON SINGLE SIGN POST	26.000 EACH				
0420	760003 PAVEMENT - MILLING, HOT-MIX, VARIABLE DEPTH	834.000 SY				
0430	761001 BUTT JOINTS, HOT MIX	145.000 SY				
0440	762001 SAW CUTTING, BITUMINOUS CONCRETE	1530.000 LF				
0450	763000 INITIAL EXPENSE	LUMP	LUMP			
0460	763501 CONSTRUCTION ENGINEERING	LUMP	LUMP			
0470	763597 UTILITY CONSTRUCTION ENGINEERING	16.000 HOUR				

DELAWARE DEPARTMENT OF TRANSPORTATION
SCHEDULE OF ITEMS

PAGE: 6
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CONTRACTOR :

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
0480	905001 SILT FENCE	2410.000 LF				
0490	907011 STONE CHECK DAM	3.000 TON				
0500	908004 TOPSOIL, 6" DEPTH	3449.000 SY				
0510	908014 PERMANENT GRASS SEEDING, DRY GROUND	3449.000 SY				
0520	908015 PERMANENT GRASS SEEDING, WET GROUND	25.000 SY				
0530	908017 TEMPORARY GRASS SEEDING	300.000 SY				
0540	908020 EROSION CONTROL BLANKET MULCH	3449.000 SY				
0550	908023 STABILIZED CONSTRUCTION ENTRANCE	120.000 TON				
	SECTION 0001 TOTAL					
	TOTAL BID					

CERTIFICATION
Contract No. T201409502.01

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: _____



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

CANNOT BE
USED FOR
BIDDING

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. T201409502.01, 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